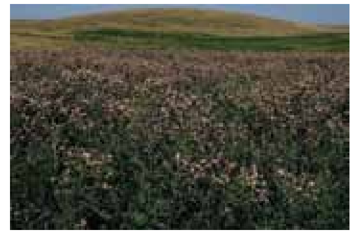
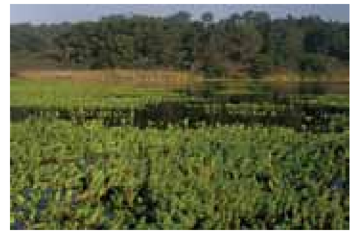
Final Environmental Impact Statement

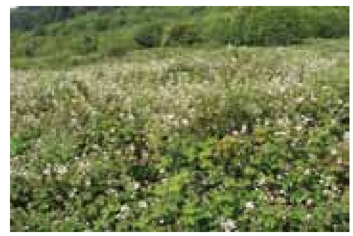
Bureau of Land Management

Vegetation Treatments Using Herbicides on BLM Lands in Oregon

Volume 2 - Appendices







BLM

Oregon State Office

July 2010

FES 10-23
BLM/OR/WA/AE-10/077+1792

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interest of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

Cover: Southeast of Richland, Oregon along the Brownlee Reservoir (Snake River), a rancher views vast stands of medusahead (a noxious weed). The area is mixed BLM/private ownership (photographer: Matt Kniesel).

Because science cannot, in any practical sense, assure safety through any testing regime, pesticide use should be approached cautiously.
(EPA scoping comment, July 28, 2008)

Our present technologies for countering invasive non-native weeds are rudimentary and few: control by biological agents, manual eradication, mechanized removal, fire, and herbicides. All have limitations; all are essential (Jake Sigg, California Native Plant Society 1999)

Table of Contents – Volume 2

Tables

Figures

Appendices

Changes Between Draft and Final EIS

The following changes were made to the Appendices between the draft and final EIS. Minor corrections, explanations, and edits are not included in this list.

Changes were made in:

- Appendix 3 - Monitoring, to better describe existing monitoring under the Northwest Forest Plan, PACFISH/INFISH, and the National Invasive Species Monitoring Systems, and to add information about State monitoring efforts;
- Appendix 5 – Endangered, Threatened, and other Special Status Species, to update it for expanded bull trout critical habitat, the listing of Pacific Eulachon, 12-month findings for petitions to list the greater sage grouse, and to add the Conservation Measures from the PEIS Consultation and Conferencing;
- Appendix 8 – Risk Assessments, to add newer risk assessments for hexazinone and clopyralid; and,
- Appendix 9 – Additional Information About the 18 Herbicides, to add individual information summary pages for each of the 18 herbicides, to add a list of BLM's currently approved adjuvants, and to clarify how the *Alternative where recommended herbicide available* determinations on Table A9-2 were made.

In addition, the following Appendices were added:

- Appendix 10 – Response to Public Comments on the September 2009 Draft EIS;
- Appendix 11 – Comment Letters from Federal, State, and local Government Agencies on the 2009 Draft EIS;
- Appendix 12 – 2,4-D provides additional information about 2,4-D, and specifically documents additional considerations of 2,4-D as a management tool; and,
- Appendix 13 – EPA Pesticide Registration and BLM/FS Risk Assessment Process describes the process and information considered during herbicide registration, and during the Agencies' Risk Assessment process. This Appendix includes additional information about incomplete and unavailable information about inerts and adjuvants to supplement the discussions in Chapter 3 and in the Incomplete and Unavailable information section early in Chapter 4.

Appendix 1 – The PEIS

This appendix consists of the *Final Vegetation Treatments Using Herbicides on Bureau of Land Management Lands in 17 Western States Programmatic Environmental Impact Statement* (PEIS) published in June 2007. The Oregon EIS is tiered to this 2007 analysis, and the PEIS is incorporated in its entirety into the Oregon EIS as Appendix 1. The PEIS is available at http://www.blm.gov/wo/st/en/prog/more/veg_eis.html. A CD or hard copy version can be obtained by emailing, writing, or calling the BLM at the contact points included in the front of this EIS.

The PEIS consists of three volumes and a separately published Biological Assessment. The volumes and sections within each are arranged on the website as follows:

Final Vegetation Treatments Using Herbicides Programmatic Environmental Impact Statement

Programmatic EIS Vol. 1

Appendix 2 - Standard Operating Procedures and Mitigation Measures from the PEIS

Introduction

The following Standard Operating Procedures and Mitigation Measures have been adopted from the Record of Decision for the PEIS. Minor edits have been made to some Standard Operating Procedures and Mitigation Measures to clarify intent.

Standard Operating Procedures (identified below with SOP) have been identified to reduce adverse effects to environmental and human resources from vegetation treatment activities based on guidance in BLM manuals and handbooks, regulations, and standard BLM and industry practices.[1] The list is not all encompassing, but is designed to give an overview of practices that would be considered when designing and implementing a vegetation treatment project on public lands (PER:2-29)[2]. Effects described in the EIS are predicated on application of the Standard Operating Procedures, that a site-specific determination is made that their application is unnecessary to achieve their intended purpose or protection, or that if the parent handbook or policy direction evolves, the new direction would continue to provide the appropriate environmental protections.

For example, the Standard Operating Procedure to "complete vegetation treatments seasonally before pollinator foraging plants bloom" would not be applied to treatments not likely to have a significant effect on pollinators.

PEIS Mitigation Measures (identified below with MM) were identified for all potential adverse effects identified in the PEIS. They are included in, and adopted by, the Record of Decision for the PEIS. Like the SOPs, application of the mitigation measures is assumed in this EIS. However, for PEIS Mitigation Measures, site-specific analysis and/or the use of Individual Risk Assessments Tools (see Chapter 3), or evolution of the PEIS Mitigation Measures into handbook direction at the national level, would be permitted to identify alternative ways to achieve the expected protections (PEIS:4-4).

Although not displayed here, Standard Operating Procedures for non-herbicide treatments (from regulation, BLM policy, and BLM Handbook direction) also apply (PER:2-31 to 44).

Standard Operating Procedures and Mitigation Measures for Applying Herbicides

Guidance Documents

BLM Handbook H-9011-1 (*Chemical Pest Control*); and manuals 1112 (*Safety*), 9011 (*Chemical Pest Control*), 9012 (*Expenditure of Rangeland Insect Pest Control Funds*), 9015 (*Integrated Weed Management)*, and 9220 (*Integrated Pest Management*).

1 Manual-directed standard operating procedures and other standing direction may be referred to as best management practices in resource management and other plans, particularly when they apply to water.

2 The PER includes Standard Operating Procedures for the full range of vegetation treatment methods. Only those applicable to herbicide application are included in this appendix.

General

- Prepare an operational and spill contingency plan in advance of treatment. *(SOP)*
- Conduct a pretreatment survey before applying herbicides. *(SOP)*
- Select the herbicide that is least damaging to the environment while providing the desired results. *(SOP)*
- Select herbicide products carefully to minimize additional impacts from degradates, adjuvants, other ingredients, and tank mixtures. *(SOP)*
- Apply the least amount of herbicide needed to achieve the desired result. *(SOP)*
- Follow herbicide product label for use and storage. *(SOP)*
- Have licensed or certified applicators or State-licensed "trainees" apply herbicides, or they can be applied by BLM employees under the direct supervision of a BLM-certified applicator. *(SOP)*
- Use only USEPA-approved herbicides and follow product label directions and "advisory" statements. *(SOP)*
- Review, understand, and conform to the "Environmental Hazards" section on the herbicide product label. This section warns of known herbicide risks to the environment and provides practical ways to avoid harm to organisms or to the environment. *(SOP)*
- Consider surrounding land use before assigning aerial spraying as a treatment method and avoid aerial spraying near agricultural or densely populated areas. *(SOP)*
- Minimize the size of application area, when feasible. *(SOP)*
- Comply with herbicide-free buffer zones to ensure that drift will not affect crops or nearby residents/landowners. *(SOP)*
- Post treated areas and specify reentry or rest times, if appropriate. *(SOP)*
- Notify adjacent landowners prior to treatment, if appropriate. *(SOP)*
- Keep a copy of Material Safety Data Sheets (MSDSs) at work sites. MSDSs are available for review at http://www.cdms.net/. *(SOP)*
- Keep records of each application, including the active ingredient, formulation, application rate, date, time, and location. *(SOP)*
- Avoid accidental direct spray and spill conditions to minimize risks to resources. *(SOP)*
- Avoid aerial spraying during periods of adverse weather conditions (snow or rain imminent, fog, or air turbulence). *(SOP)*
- Make helicopter applications at a target airspeed of 40 to 50 miles per hour (mph), and at about 30 to 45 feet above ground. *(SOP)*
- Take precautions to minimize drift by not applying herbicides when winds exceed >10 mph (>6 mph for aerial applications), or a serious rainfall event is imminent. *(SOP)*
- Use drift control agents and low volatile formulations. *(SOP)*
- Conduct pre-treatment surveys for sensitive habitat and Special Status species within or adjacent to proposed treatment areas. *(SOP)*
- Consider site characteristics, environmental conditions, and application equipment in order to minimize damage to non-target vegetation. *(SOP)*
- Use drift reduction agents, as appropriate, to reduce the drift hazard to non-target species. *(SOP)*
- Turn off application equipment at the completion of spray runs and during turns to start another spray run. *(SOP)*
- Refer to the herbicide product label when planning revegetation to ensure that subsequent vegetation would not be injured following application of the herbicide. *(SOP)*
- Clean OHVs to remove plant material. *(SOP)*

The BLM has suspended the use of the adjuvant R-11.

Air Quality
See Manual 7000 (*Soil, Water, and Air Management*)

- Consider the effects of wind, humidity, temperature inversions, and heavy rainfall on herbicide effectiveness and risks. *(SOP)*
- Apply herbicides in favorable weather conditions to minimize drift. For example, do not treat when winds exceed 10 mph (>6 mph for aerial applications) or rainfall is imminent. *(SOP)*
- Use drift reduction agents, as appropriate, to reduce the drift hazard. *(SOP)*
- Select proper application equipment (e.g., spray equipment that produces 200- to 800-micron diameter droplets [spray droplets of 100 microns and less are most prone to drift]). *(SOP)*
- Select proper application methods (e.g., set maximum spray heights, use appropriate buffer distances between spray sites and non-target resources). *(SOP)*

Soil
See Manual 7000 (*Soil, Water, and Air Management*)

- Minimize treatments in areas where herbicide runoff is likely, such as steep slopes when heavy rainfall is expected. *(SOP)*
- Minimize use of herbicides that have high soil mobility, particularly in areas where soil properties increase the potential for mobility. *(SOP)*
- Do not apply granular herbicides on slopes of more than 15% where there is the possibility of runoff carrying the granules into non-target areas. *(SOP)*

Water Resources
See Manual 7000 (*Soil, Water, and Air Management*)

- Consider climate, soil type, slope, and vegetation type when developing herbicide treatment programs. *(SOP)*
- Select herbicide products to minimize impacts to water. This is especially important for application scenarios that involve risk from active ingredients in a particular herbicide, as predicted by risk assessments. *(SOP)*
- Use local historical weather data to choose the month of treatment. (*SOP*)
- Considering the phenology of target aquatic species, schedule treatments based on the condition of the water body and existing water quality conditions. *(SOP)*
- Plan to treat between weather fronts (calms) and at appropriate time of day to avoid high winds that increase water movements, and to avoid potential stormwater runoff and water turbidity. *(SOP)*
- Review hydrogeologic maps of proposed treatment areas. Note depths to groundwater and areas of shallow groundwater and areas of surface water and groundwater interaction. Minimize treating areas with high risk for groundwater contamination. *(SOP)*
- Conduct mixing and loading operations in an area where an accidental spill would not contaminate an aquatic body. *(SOP)*
- Do not rinse spray tanks in or near water bodies. (*SOP*)
- Do not broadcast pellets where there is danger of contaminating water supplies. *(SOP)*
- Minimize the potential effects to surface water quality and quantity by stabilizing terrestrial areas as quickly as possible following treatment. *(SOP)*
- Establish appropriate (herbicide-specific) buffer zones for species/populations (Tables A2-1 and A2-2). (*MM*)
- Areas with potential for groundwater for domestic or municipal use shall be evaluated through the appropriate, validated model(s) to estimate vulnerability to potential groundwater contamination, and appropriate mitigation measures shall be developed if such an area requires the application of herbicides and cannot otherwise be treated with non-herbicide methods. (*MM*)
- Use appropriate herbicide-free buffer zones for herbicides not labeled for aquatic use based on risk assessment guidance, with minimum widths from water of 100 feet for aerial, 25 feet for vehicle, and 10 feet for hand spray applications. *(SOP)*

- Maintain buffers between treatment areas and water bodies. Buffer widths should be developed based on herbicide and site-specific conditions to minimize impacts to water bodies. *(SOP)*

Wetlands and Riparian Areas

- Use a selective herbicide and a wick or backpack sprayer. *(SOP)*
- Use appropriate herbicide-free buffer zones for herbicides not labeled for aquatic use based on risk assessment guidance, with minimum widths from water of 100 feet for aerial, 25 feet for vehicle, and 10 feet for hand spray applications. *(SOP)*
- See mitigation for Water Resources and Vegetation. (*MM*)

Vegetation
See Handbook H-4410-1 (*National Range Handbook*), and manuals 5000 (*Forest Management*) and 9015 (*Integrated Weed Management*)

- Refer to the herbicide label when planning revegetation to ensure that subsequent vegetation would not be injured following application of the herbicide. *(SOP)*
- Use native or sterile plants for revegetation and restoration projects to compete with invasive plants until desired vegetation establishes. *(SOP)*
- Use weed-free feed for horses and pack animals. Use weed-free straw and mulch for revegetation and other activities. *(SOP)*
- Identify and implement any temporary domestic livestock grazing and/or supplemental feeding restrictions needed to enhance desirable vegetation recovery following treatment. Consider adjustments in the existing grazing permit, to maintain desirable vegetation on the treatment site. *(SOP)*
- Minimize the use of terrestrial herbicides (especially bromacil, diuron, and sulfometuron methyl) in watersheds with downgradient ponds and streams if potential impacts to aquatic plants are identified. (*MM*)
- Establish appropriate (herbicide-specific) buffer zones (Tables A2-1 and 2) around downstream water bodies, habitats, and species/populations of interest. Consult the ecological risk assessments (ERAs) prepared for the PEIS for more specific information on appropriate buffer distances under different soil, moisture, vegetation, and application scenarios. (*MM*)
- Limit the aerial application of chlorsulfuron and metsulfuron methyl to areas with difficult land access, where no other means of application are possible. (*MM*)
- Do not apply sulfometuron methyl aerially. (*MM*)
- When necessary to protect Special Status plant species, implement all conservation measures for plants presented in the *Vegetation Treatments on Bureau of Land Management Lands in 17 Western States Programmatic Biological Assessment* (see Appendix 5). (*MM*)

Pollinators

- Complete vegetation treatments seasonally before pollinator foraging plants bloom. *(SOP)*
- Time vegetation treatments to take place when foraging pollinators are least active both seasonally and daily. *(SOP)*
- Design vegetation treatment projects so that nectar and pollen sources for important pollinators and resources are treated in patches rather than in one single treatment. *(SOP)*
- Minimize herbicide application rates. Use typical rather than maximum rates where there are important pollinator resources. *(SOP)*
- Maintain herbicide free buffer zones around patches of important pollinator nectar and pollen sources. *(SOP)*
- Maintain herbicide free buffer zones around patches of important pollinator nesting habitat and hibernacula. *(SOP)*
- Make special note of pollinators that have single host plant species, and minimize herbicide spraying on those plants and in their habitats. *(SOP)*

Fish and Other Aquatic Organisms

See manuals 6500 (*Wildlife and Fisheries Management*) and 6780 (*Habitat Management Plans*)

- Use appropriate buffer zones based on label and risk assessment guidance. *(SOP)*
- Minimize treatments near fish-bearing water bodies during periods when fish are in life stages most sensitive to the herbicide(s) used, and use spot rather than broadcast or aerial treatments. *(SOP)*
- Use appropriate application equipment/method near water bodies if the potential for off-site drift exists. *(SOP)*
- For treatment of aquatic vegetation, 1) treat only that portion of the aquatic system necessary to meet vegetation management objectives, 2) use the appropriate application method to minimize the potential for injury to desirable vegetation and aquatic organisms, and 3) follow water use restrictions presented on the herbicide label. *(SOP)*
- Limit the use of diquat in water bodies that have native fish and aquatic resources. (*MM*)
- Limit the use of terrestrial herbicides (especially diuron) in watersheds with characteristics suitable for potential surface runoff that have fish-bearing streams during periods when fish are in life stages most sensitive to the herbicide(s) used. (*MM*)
- To protect Special Status fish and other aquatic organisms, implement all conservation measures for aquatic animals presented in the *Vegetation Treatments on Bureau of Land Management Lands in 17 Western States Programmatic Biological Assessment* (see Appendix 5). (*MM*)
- Establish appropriate herbicide-specific buffer zones for water bodies, habitats, or fish or other aquatic species of interest (Tables A2-3 and A2-4, and recommendations in individual ERAs). (*MM*)
- Consider the proximity of application areas to salmonid habitat and the possible effects of herbicides on riparian and aquatic vegetation. Maintain appropriate buffer zones around salmonid-bearing streams. (*MM*)
- At the local level, consider effects to Special Status fish and other aquatic organisms when designing treatment programs. (*MM*)

Wildlife

See manuals 6500 (*Wildlife and Fisheries Management*) and 6780 (*Habitat Management Plans*)

- Use herbicides of low toxicity to wildlife, where feasible. *(SOP)*
- Use spot applications or low-boom broadcast operations where possible to limit the probability of contaminating non-target food and water sources, especially non-target vegetation over areas larger than the treatment area. *(SOP)*
- Use timing restrictions (e.g., do not treat during critical wildlife breeding or staging periods) to minimize impacts to wildlife. *(SOP)*
- To minimize risks to terrestrial wildlife, do not exceed the typical application rate for applications of dicamba, diuron, glyphosate, hexazinone, tebuthiuron, or triclopyr, where feasible. (*MM*)
- Minimize the size of application areas, where practical, when applying 2,4-D, bromacil, diuron, and Overdrive® to limit impacts to wildlife, particularly through contamination of food items. (*MM*)
- Where practical, limit glyphosate and hexazinone to spot applications in grazing land and wildlife habitat areas to avoid contamination of wildlife food items. (*MM*)
- Do not use the adjuvant R-11 (*MM*)
- Either avoid using glyphosate formulations containing POEA, or seek to use formulations with the least amount of POEA, to reduce risks to amphibians. (*MM*)
- Do not apply bromacil or diuron in rangelands, and use appropriate buffer zones (Tables A2-1 and 2) to limit contamination of off-site vegetation, which may serve as forage for wildlife. (*MM*)
- Do not aerially apply diquat directly to wetlands or riparian areas. (*MM*)
- To protect Special Status wildlife species, implement conservation measures for terrestrial animals presented in the *Vegetation Treatments on Bureau of Land Management Lands in 17 Western States Programmatic Biological Assessment* (See Appendix 5) (*MM*)

Threatened, Endangered, and Sensitive Species
See Manual 6840 (*Special Status Species*)

- Provide clearances for Special Status species before treating an area as required by Special Status Species Program policy. Consider effects to Special Status species when designing herbicide treatment programs. *(SOP)*
- Use a selective herbicide and a wick or backpack sprayer to minimize risks to Special Status plants. *(SOP)*
- Avoid treating vegetation during time-sensitive periods (e.g., nesting and migration, sensitive life stages) for Special Status species in area to be treated. *(SOP)*

Livestock
See Handbook H-4120-1 (*Grazing Management*)

- Whenever possible and whenever needed, schedule treatments when livestock are not present in the treatment area. Design treatments to take advantage of normal livestock grazing rest periods, when possible. *(SOP)*
- As directed by the herbicide product label, remove livestock from treatment sites prior to herbicide application, where applicable. *(SOP)*
- Use herbicides of low toxicity to livestock, where feasible. *(SOP)*
- Take into account the different types of application equipment and methods, where possible, to reduce the probability of contamination of non-target food and water sources. *(SOP)*
- Avoid use of diquat in riparian pasture while pasture is being used by livestock. *(SOP)*
- Notify permittees of the herbicide treatment project to improve coordination and avoid potential conflicts and safety concerns during implementation of the treatment. *(SOP)*
- Notify permittees of livestock grazing, feeding, or slaughter restrictions, if necessary. *(SOP)*
- Provide alternative forage sites for livestock, if possible. *(SOP)*
- Minimize potential risks to livestock by applying diuron, glyphosate, hexazinone, tebuthiuron, or triclopyr at the typical application rate where feasible. (*MM*)
- Do not apply 2,4-D, bromacil, dicamba, diuron, Overdrive®, picloram, or triclopyr across large application areas, where feasible, to limit impacts to livestock, particularly through contamination of food items. (*MM*)
- Where feasible, limit glyphosate and hexazinone to spot applications in rangeland. (*MM*)
- Do not apply bromacil or diuron in rangelands, and use appropriate buffer zones (Tables A2-1 and 2) to limit contamination of off-site vegetation, which may serve as forage for wildlife. (*MM*)

Wild Horses and Burros

- Minimize using herbicides in areas grazed by wild horses and burros. *(SOP)*
- Use herbicides of low toxicity to wild horses and burros, where feasible. *(SOP)*
- Remove wild horses and burros from identified treatment areas prior to herbicide application, in accordance with herbicide product label directions for livestock. *(SOP)*
- Take into account the different types of application equipment and methods, where possible, to reduce the probability of contaminating non-target food and water sources. *(SOP)*
- Minimize potential risks to wild horses and burros by applying diuron, glyphosate, hexazinone, tebuthiuron, and triclopyr at the typical application rate, where feasible, in areas associated with wild horse and burro use. (*MM*)
- Consider the size of the application area when making applications of 2,4-D, bromacil, dicamba, diuron, Overdrive®, picloram, and triclopyr in order to reduce potential impacts to wild horses and burros. (*MM*)
- Apply herbicide label grazing restrictions for livestock to herbicide treatment areas that support populations of wild horses and burros. (*MM*)
- Where practical, limit glyphosate and hexazinone to spot applications in rangeland. (*MM*)
- Do not apply bromacil or diuron in grazing lands within herd management areas (HMAs), and use appropriate buffer zones identified in Tables A2-1 and 2 to limit contamination of vegetation in off-site foraging areas. (*MM*)

- Do not apply 2,4-D, bromacil, or diuron in HMAs during the peak foaling season (March through June, and especially in May and June), and do not exceed the typical application rate of Overdrive® or hexazinone in HMAs during the peak foaling season in areas where foaling is known to take place. (*MM*)

Cultural Resources and Paleontological Resources

See handbooks H-8120-1 (*Guidelines for Conducting Tribal Consultation*) and H- 8270-1 (*General Procedural Guidance for Paleontological Resource Management*), and manuals 8100 (*The Foundations for Managing Cultural Resources*), 8120 (*Tribal Consultation Under Cultural Resource Authorities*),and 8270 (*Paleontological Resource Management*). See also: *Programmatic Agreement among the Bureau of Land Management, the Advisory Council on Historic Preservation, and the National Conference of State Historic Preservation Officers Regarding the Manner in Which BLM Will Meet Its Responsibilities Under the National Historic Preservation Act.*

- Follow standard procedures for compliance with Section 106 of the National Historic Preservation Act as implemented through the *Programmatic Agreement among the Bureau of Land Management, the Advisory Council on Historic Preservation, and the National Conference of State Historic Preservation Officers Regarding the Manner in Which BLM Will Meet Its Responsibilities Under the National Historic Preservation Act* and State protocols or 36 Code of Federal Regulations Part 800, including necessary consultations with State Historic Preservation Officers and interested tribes. *(SOP)*
- Follow BLM Handbook H-8270-1 (*General Procedural Guidance for Paleontological Resource Management*) to determine known Condition I and Condition 2 paleontological areas, or collect information through inventory to establish Condition 1 and Condition 2 areas, determine resource types at risk from the proposed treatment, and develop appropriate measures to minimize or mitigate adverse impacts. *(SOP)*
- Consult with tribes to locate any areas of vegetation that are of significance to the tribe and that might be affected by herbicide treatments; work with tribes to minimize impacts to these resources. *(SOP)*
- Follow guidance under Human Health and Safety in the PEIS in areas that may be visited by Native peoples after treatments. *(SOP)*
- Do not exceed the typical application rate when applying 2,4-D, bromacil, diquat, diuron, fluridone, hexazinone, tebuthiuron, and triclopyr in known traditional use areas. (*MM*)
- Avoid applying bromacil or tebuthiuron aerially in known traditional use areas. (*MM*)
- Limit diquat applications to areas away from high residential and traditional use areas to reduce risks to Native Americans. (*MM*)

Visual Resources

See handbooks H-8410-1 (*Visual Resource Inventory*) and H-8431-1 (*Visual Resource Contrast Rating*), and manual 8400 (*Visual Resource Management*)

- Minimize the use of broadcast foliar applications in sensitive watersheds to avoid creating large areas of browned vegetation. *(SOP)*
- Consider the surrounding land use before assigning aerial spraying as an application method. *(SOP)*
- Minimize off-site drift and mobility of herbicides (e.g., do not treat when winds exceed 10 mph; minimize treatment in areas where herbicide runoff is likely; establish appropriate buffer widths between treatment areas and residences) to contain visual changes to the intended treatment area. *(SOP)*
- If the area is a Class I or II visual resource, ensure that the change to the characteristic landscape is low and does not attract attention (Class I), or if seen, does not attract the attention of the casual viewer (Class II). *(SOP)*
- Lessen visual impacts by: 1) designing projects to blend in with topographic forms; 2) leaving some low-growing trees or planting some low-growing tree seedlings adjacent to the treatment area to screen short-term effects; and 3) revegetating the site following treatment. *(SOP)*
- When restoring treated areas, design activities to repeat the form, line, color, and texture of the natural landscape character conditions to meet established Visual Resource Management (VRM) objectives. *(SOP)*

Wilderness and Other Special Areas

See handbooks H-8550-1 (*Management of Wilderness Study Areas (WSAs)*), and H-8560-1 (*Management of Designated Wilderness Study Areas*), and Manual 8351 (*Wild and Scenic Rivers*)

- Encourage backcountry pack and saddle stock users to feed their livestock only weed-free feed for several days before entering a wilderness area, and to bring only weed-free hay and straw onto BLM lands. *(SOP)*
- Encourage stock users to tie and/or hold stock in such a way as to minimize soil disturbance and loss of native vegetation. *(SOP)*
- Revegetate disturbed sites with native species if there is no reasonable expectation of natural regeneration. *(SOP)*
- Provide educational materials at trailheads and other wilderness entry points to educate the public on the need to prevent the spread of weeds. *(SOP)*
- Use the "minimum tool" to treat noxious weeds and other invasive plants, relying primarily on the use of ground-based tools, including backpack pumps, hand sprayers, and pumps mounted on pack and saddle stock. *(SOP)*
- Use herbicides only when they are the minimum treatment method necessary to control weeds that are spreading within the wilderness or threaten lands outside the wilderness. *(SOP)*
- Give preference to herbicides that have the least impact on non-target species and the wilderness environment. *(SOP)*
- Implement herbicide treatments during periods of low human use, where feasible. *(SOP)*
- Address wilderness and special areas in management plans. *(SOP)*
- Control of weed infestations shall be carried out in a manner compatible with the intent of Wild and Scenic River management objectives. *(SOP)*
- Mitigation measures that may apply to wilderness and other special area resources are associated with human and ecological health and recreation (see mitigation measures for Vegetation, Fish and Other Aquatic Resources, Wildlife Resources, Recreation, and Human Health and Safety). (*MM*)

Recreation

See Handbook H-1601-1 (*Land Use Planning Handbook, Appendix C*)

- Schedule treatments to avoid peak recreational use times, while taking into account the optimum management period for the targeted species. *(SOP)*
- Notify the public of treatment methods, hazards, times, and nearby alternative recreation areas. *(SOP)*
- Adhere to entry restrictions identified on the herbicide product label for public and worker access. *(SOP)*
- Post signs noting exclusion areas and the duration of exclusion, if necessary. *(SOP)*
- Mitigation measures that may apply to recreational resources are associated with human and ecological health (see mitigation measures for Vegetation, Fish and Other Aquatic Resources, Wildlife Resources, and Human Health and Safety). (*MM*)

Social and Economic Values

- Consider surrounding land use before selecting aerial spraying as a treatment method, and avoid aerial spraying near agricultural or densely-populated areas. *(SOP)*
- Post treated areas and specify reentry or rest times, if appropriate. *(SOP)*
- Notify grazing permittees of livestock feeding restrictions in treated areas, if necessary, as per herbicide product label instructions. *(SOP)*
- Notify the public of the project to improve coordination and avoid potential conflicts and safety concerns during implementation of the treatment. *(SOP)*
- Control public access until potential treatment hazards no longer exist, per herbicide product label instructions. *(SOP)*
- Observe restricted entry intervals specified by the herbicide product label. *(SOP)*

- Notify local emergency personnel of proposed treatments. *(SOP)*
- Use spot applications or low-boom broadcast applications where possible to limit the probability of contaminating non-target food and water sources. *(SOP)*
- Consult with Native American tribes to locate any areas of vegetation that are of significance to the tribes and Native groups and that might be affected by herbicide treatments. *(SOP)*
- To the degree possible within the law, hire local contractors and workers to assist with herbicide application projects and purchase materials and supplies for herbicide treatment projects (including the herbicides) through local suppliers. *(SOP)*
- To minimize fears based on lack of information, provide public educational information on the need for vegetation treatments and the use of herbicides in an integrated vegetation management program for projects proposing local use of herbicides. *(SOP)*

Rights-of-way

- Coordinate vegetation treatment activities where joint or multiple use of a ROW exists. *(SOP)*
- Notify other public land users within or adjacent to the ROW proposed for treatment. *(SOP)*
- Use only herbicides that are approved for use in ROW areas. *(SOP)*

Human Health and Safety

- Establish a buffer between treatment areas and human residences based on guidance given in the HHRA, with a minimum buffer of ¼ mile for aerial applications and 100 feet for ground applications, unless a written waiver is granted. *(SOP)*
- Use protective equipment as directed by the herbicide product label. *(SOP)*
- Post treated areas with appropriate signs at common public access areas. *(SOP)*
- Observe restricted entry intervals specified by the herbicide product label. *(SOP)*
- Provide public notification in newspapers or other media where the potential exists for public exposure. *(SOP)*
- Store herbicides in secure, herbicide-approved storage. (*SOP*)
- Have a copy of MSDSs at work site. *(SOP)*
- Notify local emergency personnel of proposed treatments. *(SOP)*
- Contain and clean up spills and request help as needed. *(SOP)*
- Secure containers during transport. *(SOP)*
- Follow label directions for use and storage. *(SOP)*
- Dispose of unwanted herbicides promptly and correctly. *(SOP)*
- Use the typical application rate, where feasible, when applying 2,4-D, bromacil, diquat, diuron, fluridone, hexazinone, tebuthiuron, and triclopyr to reduce risk to workers and the public. (*MM*)
- Avoid applying bromacil and diuron aerially. Do not apply sulfometuron methyl aerially. (*MM*)
- Limit application of chlorsulfuron via ground broadcast applications at the maximum application rate. (*MM*)
- Limit diquat application to ATV, truck spraying, and boat applications to reduce risks to workers; limit diquat applications to areas away from high residential and subsistence use to reduce risks to the public. (*MM*)
- Evaluate diuron applications on a site-by-site basis to avoid risks to humans. There appear to be few scenarios where diuron can be applied without risk to workers. (*MM*)
- Do not apply hexazinone with an over-the-shoulder broadcast applicator (backpack sprayer). (*MM*)

TABLE A2-1. Buffer Distances to Minimize Risk to Vegetation from Off-Site Drift of BLM-Evaluated Herbicides

Application Scenario	BROM[1]	CHLR[1]	DIQT[1]	DIUR[1]	FLUR[1]	IMAZ[1]	OVER[1]	SULF[1]	TEBU[1]
Buffer Distance (feet) from Non-target Aquatic Plants									
Typical Application Rate									
Aerial	NA	0	NE	NA	NE	0	NA	1,300	NE
Low Boom[2]	100	0	NE	900	NE	0	100	900	0
High Boom[2]	900	0	NE	1,000	NE	0	900	900	0
Maximum Application Rate									
Aerial	NA	300	NE	NA	NE	300	NA	1,500	NE
Low Boom[2]	900	0	NE	1,000	NE	0	900	900	0
High Boom[2]	900	0	NE	1,000	NE	0	900	900	0
Buffer Distance (feet) from Non-target Terrestrial Plants									
Typical Application Rate									
Aerial	NA	1,350	1,200	NA	NE	0	NA	0	NE
Low Boom[2]	950	900	100	0	NE	0	0	0	0
High Boom[2]	950	900	900	100	NE	0	100	0	0
Maximum Application Rate									
Aerial	NA	1,350	1,200	NA	NE	900	NA	0	NE
Low Boom[2]	1,000	1,000	900	200	NE	0	100	0	50
High Boom[2]	1,000	1,000	900	500	NE	0	100	0	50
Buffer Distance (feet) from Threatened, Endangered, and Sensitive Plants									
Typical Application Rate									
Aerial	NA	1,400	1,200	NA	NE	0	NA	1,500	NE
Low Boom[2]	1,200	1,000	900	1,000	NE	0	100	1,100	0
High Boom[2]	1,200	1,000	900	1,000	NE	0	900	1,000	50
Maximum Application Rate									
Aerial	NA	1,400	1,200	NA	NE	900	NA	1,500	NE
Low Boom[2]	1,200	1,050	1,000	1,000	NE	0	900	1,100	100
High Boom[2]	1,200	1,000	1,000	1,000	NE	0	900	1,000	500

[1] BROM = Bromacil; CHLR = Chlorsulfuron; DIQT = Diquat; DIUR = Diuron; FLUR = Fluridone; IMAZ = Imazapic; OVER = Diflufenzopyr + Dicamba (Overdrive); SULF = Sulfometuron methyl; and TEBU = Tebuthiuron.
[2] High boom is 50 inches above ground and low boom is 20 inches above ground.
NE = Not evaluated and NA = not applicable.
Buffer distances are the smallest modeled distance at which no risk was predicted. In some cases, buffer distances were extrapolated if the largest distance modeled still resulted in risk, or interpolated if greater precision was required.

Table A2-2. Buffer Distances to Minimize Risk to Vegetation from Off-Site Drift of Forest Service-Evaluated Herbicides

Application Scenario	2,4-D	Dicamba	Clopyralid	Glyphosate	Hexazinone	Imazapyr	Metsulfuron Methyl	Picloram	Triclopyr
Buffer Distance (feet) from Susceptible Plants[1]									
Typical Application Rate									
Aerial	NE	>900	900	300	300	900	900	>900	500
Low Boom	NE	300	900	50	NE	900	900	>900	300
Maximum Application Rate									
Aerial	NE	>900	1,000	300	900	>900	>900	>900	>900
Low Boom	NE	900	1,000	300	NE	>900	>900	>900	>900
Buffer Distance (feet) from Tolerant Terrestrial Plants									
Typical Application Rate									
Aerial	NE	0	0	25	NE	100	50	25	NE
Low Boom	NE	0	0	25	0	25	25	25	NE
Maximum Application Rate									
Aerial	NE	0	25	50	NE	300	100	50	NE
Low Boom	NE	0	25	25	100	50	25	25	NE

NE = Not evaluated.
Buffer distances are the smallest modeled distance at which no risk was predicted. In some cases, buffer distances were extrapolated if the largest distance modeled still resulted in risk, or interpolated if greater precision was required.
[1] Mitigation measures for Bureau Sensitive or Federally Listed species use these buffer distances

Table A2-3. Buffer Distances to Minimize Risk to Non-Special Status Fish and Aquatic Invertebrates from Off-Site Drift of BLM-Evaluated Herbicides from Broadcast and Aerial Treatments

Application Scenario	BROM[1]	CHLR	DIQT	DIUR	FLUR	IMAZ	OVER	SULF	TEBU
Minimum Buffer Distance (feet) from Fish and Aquatic Invertebrates									
Typical Application Rate									
Aerial	NA	0	NA	NA	NA	0	NA	0	NA
Low boom	0	0	NA	0	NA	0	0	0	0
High boom	0	0	NA	0	NA	0	0	0	0
Maximum Application Rate									
Aerial	NA	0	NA	NA	NA	0	NA	0	NA
Low boom	0	0	NA	100	NA	0	0	0	0
High boom	0	0	NA	100	NA	0	0	0	0

[1] BROM = Bromacil; CHLR = Chlorsulfuron; DIQT = Diquat; DIUR = Diuron; FLUR = Fluridone; IMAZ = Imazapic; OVER = Diflufenzopyr + Dicamba (Overdrive); SULFM = Sulfometuron methyl; and TEBU = Tebuthiuron.
NA = Not applicable.
Boom height = The Tier I ground application model allows selection of a low (20 inches) or a high (50 inches) boom height.

Table A2-4. Buffer Distances to Minimize Risk to Special Status Fish and Aquatic Organisms from Off-Site Drift of BLM-Evaluated Herbicides from Broadcast and Aerial Treatments

Application Scenario	BROM[1]	CHLR	DIQT	DIUR	FLUR	IMAZ	OVER	SULF	TEBU
Minimum Buffer Distance (feet) from Fish and Aquatic Invertebrates									
Typical Application Rate									
Aerial	NA	0	NA	NA	NA	0	NA	0	NA
Low boom	0	0	NA	0	NA	0	0	0	0
High boom	0	0	NA	100	NA	0	0	0	0
Maximum Application Rate									
Aerial	NA	0	NA	NA	NA	0	NA	0	NA
Low boom	0	0	NA	100	NA	0	0	0	0
High boom	0	0	NA	900	NA	0	0	0	0

[1] BROM = Bromacil; CHLR = Chlorsulfuron; DIQT = Diquat; DIUR = Diuron; FLUR = Fluridone; IMAZ = Imazapic; OVER = Diflufenzopyr + Dicamba (Overdrive); SULFM = Sulfometuron methyl; and TEBU = Tebuthiuron.
NA = Not applicable.
Boom height = The Tier I ground application model allows selection of a low (20 inches) or a high (50 inches) boom height.

Appendix 3 – Monitoring

Introduction

Monitoring is the orderly collection, analysis, and interpretation of resource data to evaluate progress toward meeting management objectives. Two types of monitoring are addressed here. One type is implementation monitoring, which answers the question, "Did we do what we said we would do?" The second type is effectiveness monitoring, which answers the question, "Were treatment and restoration projects effective?" Implementation monitoring is usually done at the land use planning level or through annual work plan accomplishment reporting. Effectiveness monitoring is usually done at the local project implementation level.

Consistent with the FLPMA's broad mandates for resource management, and focused most specifically by each district's Resource Management Plan, vegetation management and related monitoring is already being done on BLM lands in Oregon to meet a variety of objectives. These objectives include fuels reduction, range improvements, wildlife habitat improvement, watershed restoration, invasive plant control, and timber harvest. *Implementation* monitoring of these treatments is usually done at the plan level through annual work plan accomplishment reporting, and by a variety of formal or semi-formal post-project reviews done by staff, district management teams, or next-level reviews. *Effectiveness* monitoring takes place both formally and informally within two to three years. Examples include seedling survival exams and follow-up monitoring of invasive plant populations. *Evaluations* of the appropriateness and effectiveness of the overall Resource Management Plan direction are done periodically, usually every five years, to determine if Resource Management Plan direction is meeting overall goals.

Herbicides are one of the tools currently being used to meet the noxious weed control objectives identified in the Resource Management Plans. Herbicides are currently being applied to more than 12,000 acres annually, mostly as spot spraying of individual weeds. Herbicides can be uniquely hazardous and adverse effects can be difficult to observe directly, so specialized controls and monitoring requirements are applied. Management objectives for herbicide use include protection of the public, environmental safety, and efficient control of target vegetation. Existing monitoring would apply to the selected alternative and continue to provide the primary controls for assuring treatments adhere to established standards for herbicide use. Existing monitoring is described (in part) below, as it is being applied not only across Oregon but in other states as well.

Part I - Existing Monitoring

Policy Requirements

Monitoring ensures that vegetation management is an adaptive process that continually builds upon past successes and learns from past mistakes. The adaptive management framework employed by the State Office includes developing stated management objectives to guide decisions about what actions to take and identifying explicit assumptions about expected outcomes that are then compared against actual outcomes. This framework acknowledges uncertainty about how natural resources systems function and how they would respond to management actions, and it makes use of management intervention and monitoring to improve subsequent decision-making (USDI 2008). The regulations of 43 C.F.R 1610.4-9 require that land use plans establish intervals and standards for monitoring and evaluating land management actions. Within BLM district Resource Management Plans, integrated vegetation management objectives and actions are outlined and the effectiveness of those actions are evaluated as part of the overall effectiveness monitoring of the Resource Management Plans. The 1601 Land Use Planning Manual requires that monitoring and evaluation of Resource Management Plans take place at prescribed intervals (typically every five years) and in accordance with standards identified in those plans.

BLM Manual Section 9011, Chemical Pest Control, institutes implementation monitoring requirements for pesticide applications as part of an integrated vegetation management strategy. Manual Section 9011 requires that a Pesticide Use Proposal be prepared for each chemical application. This Pesticide Use Proposal must be reviewed and approved by the BLM State Office prior to the pesticide application. Once the application of the pesticide is completed, a Pesticide Application Record is completed. This record documents the pesticide application that occurred and is then kept on file for ten years. These records are used by the BLM to track pesticide use, which is reported to the EPA annually.

Numerous other BLM Manuals and Handbooks describe applicable monitoring policy and practices, including:
- ***BLM Technical Reference 1730-1 Measuring and Monitoring Plant Populations (1998).*** Provides technical guidance on how to develop and implement effective monitoring plans for vegetation and use monitoring in adaptive management.
- ***Manual Section 9011 Chemical Pest Control (1992).*** Establishes requirements for monitoring pesticide applications.
- ***Manual Section 9014 Use of Biological Control Agents of Pests on Public Lands (1990).*** Establishes requirements to monitor success or failure in survival, control, and spread of biological agents.
- ***Manual Section BLM Manual 9015, Integrated Weed Management.*** Outlines the BLM's integrated weed management policy and within that sets out requirements related to monitoring in those areas where management actions have a potential to introduce or spread noxious weeds or when the action is taking place in an area where known noxious weeds already exist.
- ***Guidelines for Coordinated Management of Noxious Weeds (1990).*** Provides guidance on establishing monitoring plans for noxious weeds and their control.
- ***NEPA Handbook H-1790-1 Chapter VI – Monitoring (1988).*** All actions and mitigation measures, including monitoring and enforcement programs, adopted in a decision document are legally enforceable commitments. The purposes of monitoring in a NEPA context are to 1) ensure compliance with decisions, 2) measure effectiveness of decisions, and 3) evaluate validity of decisions.
- ***Manual Section 1734 Monitoring and Inventory Coordination (1983).*** Provides the BLM with technical guidance on how to develop and implement effective monitoring plans for vegetation.

Other technical references for inventory, monitoring, and assessment of the cross section of BLM-managed resources are found at http://www.blm.gov/nstc/library/techref.htm.

Implementation Monitoring

Implementation monitoring answers the question, "Did we do what we said we would do?"

During preparation of implementation plans, treatment objectives, standards, and guidelines are stated in measurable terms, where feasible, so that treatment outcomes can be measured, evaluated, and used to guide future treatment actions. This approach ensures that vegetation treatment processes are effective, adaptive, and based on prior experience (Record of Decision for the PEIS:2-6).

According to BLM Manual Section 9011 and noted above, implementation monitoring specified in the local Resource Management Plans, project-specific NEPA documents, and/or the Biological Assessment or Opinions associated with the project may be accomplished by reviewing the Pesticide Application Records (PAR) completed at the time of treatment and comparing them with the Pesticide Use Proposal, Standard Operating Procedures, and specific mitigation measures prescribed in the project NEPA decision. The PAR documents the actual rate, date, time, and location of herbicide application. It also documents the species treated and climatic characteristics such as wind speed and air temperature. The Pesticide Application Record, which must be completed within 24 hours of the application, documents the actual rate of application and that all the PUP and NEPA Standard Operating Procedures and mitigation measures were taken into account. Review of the PARs can determine whether actual application was consistent with plans and requirements documented in the site-specific NEPA decision or Pesticide Use Proposal. Pesticide Application Records are used to develop annual state summaries of herbicide use for the BLM (Record of Decision for the PEIS:App. D). Pesticide Application Records are used for site-specific implementation monitoring. For example, the time of application recorded in the PAR can be compared with the prescribed mitigations to determine whether the application was made at the correct time, or if mitigation for sensitive wildlife concerns identified were observed during treatment.

Invasive plant implementation monitoring for non-herbicide treatments is accomplished through site revisits performed during the growing season of the target species to determine if treatments were implemented correctly and decide the best time for follow-up treatments (Record of Decision for the PEIS:App. D).

Adaptive management strategies require implementation monitoring to determine whether the plan was followed and obtained the expected results. Monitoring also ensures that vegetation treatment Standard Operating Procedures and mitigation measures are adopted and implemented appropriately and determined to be effective (Record of Decision for the PEIS:2-6).

Effectiveness Monitoring

Effectiveness monitoring answers the question, "Were treatment and restoration projects effective?" The BLM 9011 Handbook provides technical guidance on post-treatment evaluations for pesticide applications. Effectiveness monitoring can be formal or informal and typically compares vegetation characteristics of a site before and after treatment. Effectiveness monitoring typically occurs within two years of treatment, and results in recommendations for additional monitoring and weed or other vegetation management actions.

A purpose of effectiveness monitoring is to demonstrate the effects of pest control and the cost effectiveness of various treatment methods or combination of methods (USDI 1992c:Chapter 2. IV. A. Post-Treatment Evaluation Procedures). However, the objective of weed control is not just to kill weeds, but to protect, maintain, and enhance native plant communities and the ecosystems that depend on them.

Thorough effectiveness monitoring determines if the actions taken had the intended outcome or effect. Monitoring of invasive plant treatment effectiveness (regardless of the treatment method) can range from site visits to compare the targeted population size against pre-treatment inventory data, to comparing pre-treatment and post-treatment photo points, to more elaborate transect work, depending on the species and site-specific variables. The goals of monitoring should be to answer questions such as the following:

- What changes in the distribution, amount, and proportion of invasive plant infestations have resulted due to treatments?
- Has infestation size been reduced at the project level or larger scale (such as a watershed)?
- Which treatment methods, separate or in combination, are most successful for a particular species? (Record of Decision for the PEIS:App D)

A long-term adaptive management approach is based on changing conditions. The invasive plant infestation conditions need to be monitored in order to know when it is appropriate for action to be taken, and whether that action is effective. If treatment was not effective, the decision maker would review the strategy (USDA 2005:2-15)

Water quality monitoring is conducted at the discretion of the district. Typically water quality monitoring would be conducted to check the effectiveness of buffer strips and administrative controls on protecting water quality and aquatic environments (USDI 1992:Chapter 2. IV. B). BLM's Chemical Pest Control Handbook notes that the need for and type of monitoring are dictated by the nature of the critical components of the environment in the treatment area. Thus, a toxic chemical proposed for use in a sensitive area, such as near a residential area, or domestic water supply must be monitored intensively. Chemical residues in air, vegetation, soil, and water may need to be determined. A less toxic chemical used on other areas may require only limited stream monitoring to ensure that significant quantities of the chemical do not enter the stream. An innocuous chemical used on a small remote area may require no monitoring (USDI 1992).

There might also be a need to determine if the Conservation Measures were effective at reducing potential effects to Federally Listed species and/or designated critical habitat.

Monitoring Biological Control Agent Releases

BLM Manual Section 9014 requires that a Biological Control Agent Release Proposal be prepared when a district is considering the use of a biological control agent as part of an integrated vegetation management strategy. The Proposal is reviewed and approved by the BLM State Office. Upon completion of the biological control release, a Biological Control Agent Release Record is prepared and the State Office maintains a permanent record of all releases and locations. In addition to this implementation monitoring, Manual Section 9014 also requires that BLM conduct effectiveness monitoring of the release, and document the success or failure in terms of species survival, control, and spread. All biological control agents must be approved by the State Department of Agriculture.

Monitoring BLM Management Activities for Weed Spread

BLM Manual 9015, Integrated Weed Management outlines the BLM's integrated weed management policy and within that, sets out requirements related to monitoring in those areas where BLM management actions have a potential to introduce or spread noxious weeds or when the action is taking place in an area where known noxious weeds already exist. If, through a risk assessment process, it is determined that a proposed management activity (such as a timber sale or road construction) has a moderate or high risk for establishing noxious weeds, BLM is required to prescribe follow-up monitoring as well as identify project actions that need to be taken in order to reduce or prevent the spread of noxious weeds.

Northwest Forest Plan Aquatic and Riparian Effectiveness Monitoring Program (AREMP)

The purpose of AREMP is to assess the status and trend of watershed attributes to determine if the Forest Service and BLM's Northwest Forest Plan Aquatic Conservation Strategy[1] is achieving its goals of maintaining and restoring watersheds. Monitoring determines watershed condition every five years for every 6th-field watershed (with > 25% federal ownership along the stream length) based on upslope and riparian data derived from GIS layers and satellite imagery. In-channel attributes are also measured each year in a subset of

1 The Northwest Forest Plan Aquatic Conservation Strategy is a common set of watershed management standards and guidelines added to BLM district and National Forest Land and Resource Management Plans within the range of the northern spotted owl in 1994. A joint-agency common monitoring strategy is used.

watersheds to supplement the watershed condition assessments and validate the models used to assess stream condition. Watershed condition assessments are done using decision-support models. AREMP also tracks changes in watershed condition over time, and reports on the Forest Plan's effectiveness across the region. Although the program was not designed to monitoring pesticides or track invasive plants, invasive plants are recorded when found.

The program's 2008 Annual Technical Report noted AREMP staff "participated in the second year of a pilot regional survey effort to locate aquatic invasive species on federal lands. Protocols developed by Oregon State University Sea Grant College Program personnel were used to survey for 11 aquatic plants and animals identified as primary threats to northwest watersheds. Among the key species included were; …yellow flag iris, knotweed, hydrilla, Chinese mitten crabs, and four species of nonnative crayfish. Included also were fifteen species of secondary concern" (USDA, USDI 2008).

PACFISH/INFISH Biological Opinion (PIBO) Effectiveness Monitoring Program

Similar to the AREMP, the goal of the PACFISH/INFISH Biological Opinion Effectiveness Monitoring Program (PIBO) is to determine whether the aquatic conservation strategies within PACFISH and INFISH, or revised land management plans, are effective in maintaining or restoring the structure and function of riparian and aquatic systems. This affects Oregon BLM streams with anadromous fish and bull trout outside of the Northwest Forest Plan area. Like AREMP, the program is not designed to monitor pesticides. PIBO monitoring does establish transects on each stream reach and are records vegetation down to species. This data could be used to track the spread or occurrence of invasive plants if we choose to query them.

National Invasive Species Information Management System (NISIMS)

In 2007, the BLM began field-testing a new data management system for documentation, mapping, treating, and monitoring of invasive species. When fully operational, the system will provide tools for data collection and the generation of BLM-wide analysis and statistics for invasive species infestations and treatments. The objective of this project is to develop a BLM-wide invasive species geodatabase that is web-enabled.

The deployment of a BLM-wide database supports the BLM strategies of the delivery of information directly to the program specialists/decision makers; establish accountability, responsibility, and standardized, comprehensive management of BLM information.

Primary functions of the system are:

- Track invasive species infestation areas and treatments of infestation areas.
- Generate yearly reports and other reports as required by various constituents of the weed program.
- Provide standardized data for analysis of invasive species infestations/inventories.
- Provide bi-directional synchronization between system and field collection devices.
- Serve tabular and spatial BLM-wide invasive species data and analysis to internal and external customers. Geospatial components facilitate weed control effectiveness monitoring.
- Provide capability to share corporate data set with other national applications.
- Provide components that could be utilized in the development of other national datasets.

Part II – Potential Monitoring

Introduction

In addition to existing monitoring, the selection of one of the action alternatives could create a changed circumstance or condition (e.g. a concern over a potential environmental effect) that would suggest a need for additional monitoring. Those circumstances might include the use of different herbicides with different ecological risks, more acres being treated, more acres being treated in proximity to people or sensitive environmental resources, more use of broadcast spraying with its potential for drift, or simply increasing the use of "new" herbicides as weed specialists become more familiar with their advantages. This section describes changes that might suggest additional, EIS-specific monitoring and describes some options as to what form that monitoring might take. These descriptions should be viewed the same as Potential Mitigation, they do not apply unless the decision maker specifically selects them in the Record of Decision. Potential monitoring could also be adopted during site-specific NEPA.

Implementation Monitoring

Monitoring for Concerns Identified in the EIS - For each of the first five years of EIS implementation, a subset of the year's herbicide application projects could be identified using parameters identified in the EIS as having the potential for adverse effects. A list of what constitutes qualifying parameters may be compiled after the Final EIS is issued. For example, parameters might include aerial spray within a certain distance of population centers or Federally Listed species, treatments exceeding some number of acres with herbicides having a high risk of environmental damage to non-target species (other than non-special status plants), treatments where PEIS Mitigation Measure buffers around sensitive species were reduced by more than 50 percent, aquatic treatments, riparian treatments for streams with Federally Listed fish, use of known ground-water contaminants on the west side, projects that required formal consultation, sprays within riparian management zones, broadcast sprays of over 100 contiguous acres, roadside boom sprays on native plants, use of diuron, bromacil, tebuthiuron, or 2,4-D at higher than 50% of the typical rate for over 100 net acres in any one thousand acre area, and so forth.

From this "higher risk" subset, a representative sample (at least three) of State Office randomly selected projects could be identified. Both the east and west side would be represented by at least one selection assuming there are projects that qualify. For selected projects, the full set of planning and reporting documents would be reviewed, as well as field implementation records, monitoring, applicator licenses, adherence to Standard Operating Procedures and appropriate mitigations measures, and all other project requirements. A questionnaire listing these review elements would be prepared by the State Office. The review could be conducted by a team that includes, at minimum, at least one non-BLM person from a Resource Advisory Committee, County Weed Board, County Board of Supervisors, or Oregon Department of Agriculture Invasive Plant or Pesticide Enforcement Division, and; a line officer, District Weed Coordinator, or State Office Restoration Program lead from a different district or the State Office.

Implementation Monitoring on the Avoidance and Mitigation of Adverse Impacts to Non-target Resources - The above project monitoring would not preclude the need to identify specific, or narrow, concerns with specific herbicides regarding certain parameters. Pre-emergent herbicides with long soil half-lives may suggest soil monitoring. Water monitoring should be conducted, particularly where there are Federally Listed fish species, when there is a possibility herbicides toxic to fish could drift onto, or be washed into, streams. This type of monitoring is already described in the BLM's Chemical Pest Control Handbook (USDI 1992), in Chapter 1. I. E, Chemical Residue Monitoring, for when toxic materials are introduced near sensitive areas such as residences or domestic water supplies. Suggested monitoring points include air, vegetation, soil, and water. Although this represents existing monitoring, it is included here to suggest using the EIS analysis to help identify monitoring points.

Effectiveness Monitoring

Five-year Examination of Weed Spread - The action alternatives are expected to have a significant effect on, but not stop, noxious weed spread on BLM lands in Oregon. Assuming an action alternative is selected and a more complete set of tools are available for weed control and are being utilized; a more careful estimate of noxious weed spread rate should be made to determine if a change in the control strategy is warranted. Setting up a statewide series of randomly selected (but unmarked) plots soon, and then rechecking them in five years or other selected interval, could provide a statistically valid estimate of weed spread rate. This effort might be done cooperatively with other agencies.

Restoration Monitoring – The action alternatives would make imazapic available, and districts estimate its primary use would follow wildfire or prescribed burns in, or threatened by, medusahead or other invasive annual grasses. Imazapic was desired because it would leave more native forbs than glyphosate. Because large applications will be expensive and may not occur annually at least on any one district, a detailed examination of the first two or three large-scale uses could help ensure this new tool achieves maximum effectiveness while protecting non-target vegetation and other resources.

State of Oregon Information Sharing

The Oregon Department of Environmental Quality has requested that the BLM coordinate with them when sending data electronically for potential entry into the Oregon Department of Environmental Quality's Laboratory Analytical Storage and retrieval Database (LASAR). In addition, the Oregon Department of Environmental Quality has requested copies of any monitoring reports of herbicide effectiveness and impacts on water quality and ecological conditions.

Similarly, the state of Oregon encourages the BLM to share any water quality effectiveness monitoring data collected in support of this EIS with the State of Oregon's Water Quality Pesticide Management Team (WQMPT). The multi-agency WQMPT acts to review and respond to pesticide detections in Oregon's ground and surface water in support of Oregon's Pesticide Management Plan for Water Quality Protection (see http://egov.oregon.gov/ODA/PEST/docs/pdf/wqpmtPMP.pdf).

References

USDA Forest Service. 2005. Pacific Northwest Region Invasive Plant Program: Preventing and Managing Invasive Plants. Final Environmental Impact Statement. Available at http://www.fs.fed.us/r6/invasiveplant-eis/

USDA Forest Service, USDI Bureau of Land Management. 2008. Aquatic and Riparian Effectiveness Monitoring Program, 2008 Annual Technical Report. Available at http://www.reo.gov/monitoring/reports/watershed/2008-AREMP-Tech-Report.pdf

USDI Bureau of Land Management. 1992c. Chemical Pest Control Handbook (BLM Manual 9011)

USDI Bureau of Land Management.. 2008d. 522 Department Manual 1; Adaptive Management. Washington D.C. 3 pp.

Appendix 4 – Protocol for Identifying, Evaluating, and Using New Herbicides

The Oregon EIS evaluates a proposal and alternatives that would make up to 18 herbicides available to the BLM districts in Oregon for use in their existing noxious weed, invasive plants, and other vegetation management programs (except for projects specifically designed to improve livestock forage or timber production). These herbicides were analyzed in the 2007 PEIS and approved for use in the 17 western states by the 2007 Record of Decision. This EIS does not propose or assume the use of any herbicides other than these 18. Should other herbicide active ingredients be desired for use in the future, Appendix A of the 2007 Record of Decision for the PEIS entitled, *Protocol for Identifying, Evaluating, and Using New Herbicides* outlines a protocol that is to be followed. This protocol applies to BLM nationally; individual State BLM offices do not implement the process independently. However, the BLM in Oregon may help identify future herbicide active ingredients needed, and propose them to the National Office under this protocol.

The PEIS protocol (summarized below) addresses the identification and approval of new herbicide products and technologies, requires that there be a determination of the need for the herbicide, involves a formal request for use of the herbicide be made to the BLM National Office, requires that the herbicide active ingredient have completed EPA Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) registration and be labeled for use on the site type proposed, and requires National Environmental Policy Act (NEPA) compliance. The BLM National Office would take the lead on conducting the NEPA analysis for new herbicide active ingredients.

Summary of 2007 Record of Decision Appendix A – Protocol for Identifying, Evaluating, and Using New Herbicides

The BLM may become aware of new herbicide active ingredients, products, and technologies that are developed and marketed in the future, and may consider application of these products or technologies to vegetation treatment projects.

Identification and Approval of New Herbicide Products and Technologies

The means by which the BLM could learn of new products and their applications include, but are not limited to, professional networking, technical research and publications, and vendor marketing.

Networking

The BLM participation in professional networks is an important method for learning or staying current about the technical, regulatory, efficacy, and environmental aspects of herbicide products in the development phase and those currently on the market. These networks include other state and Federal agencies such as the U.S. EPA and Oregon Department of Agriculture, as well as county weed districts, university extension services, the Weed

Science Society of America, and numerous others. For the most part, networking occurs at the local level, with BLM professional staff and managers working with local representatives of the organizations mentioned above. BLM State Office weed coordinators and vegetation management professionals often represent the BLM at annual meetings and workshops.

Occasionally, members of the public who are interested in various approaches to vegetation treatment send relevant information to the BLM. As with vegetation treatment methods identified through other avenues, if the BLM determines that the approach may have some utility for meeting its needs, a product demonstration or additional information may be requested.

Research and Demonstration

Demonstration areas for current and emerging technologies play an important role in facilitating research and evaluating efficacy of treatment applications. Current BLM practice allows for limited and controlled use of new herbicides on demonstration plots up to 5 acres in size, with a maximum of 15 acres per field office. Approval to adopt a new herbicide for research and demonstration use is provided by the BLM National Office after an initial evaluation of FIFRA registration materials and risk assessments. If research and demonstration results appear favorable, the BLM then considers the herbicide for further human health and ecological risk assessments, and those results are evaluated through the NEPA process.

Technical Research and Publications, and Vendor Marketing

The BLM also obtains information on vegetation management and herbicide treatments from professional journals associated with vegetation management societies and associations, working though a wide variety of publication compilation services. The general public and non-governmental organizations also provide the BLM with information through the NEPA process and other participatory processes. For example, scoping comments received for this EIS suggested that aminopyralid (e.g. Milestone®) should be the next herbicide adopted for use by the BLM. Also, vendors of invasive plant control technologies, including agrochemical company representatives, contact the BLM to introduce new active ingredients and new formulations, and to provide updates on existing products.

Determining the Need for New Herbicides

In order for the BLM to consider and approve a new active ingredient or formulation, the BLM must first consider whether there is a need for an available product. Factors that would be considered when assessing the need for adopting an available product include, but are not limited to: spectrum of application, efficacy, factors that could limit efficacy, extent or scope of use, cost, availability, availability of substitute or alternative products or technologies, expected effectiveness compared to any currently used methods, previous use reports at other sites and their outcomes, results from research and demonstration use, training and personnel requirements, and any other relevant factors including hazards and risks. Once a need is determined, the BLM would then integrate the approval process with its annual budget cycle. In general, the approval/budget process should take approximately two fiscal years to complete once a need for an available product is identified.

The determination for the need is a primarily a "bottom up" process that would typically start with a BLM field or state office collecting information regarding the need. To assess the potential for site-specific effectiveness, the BLM field office manager will investigate its use through professional networks, technical publications, and research reports, such as those described in the previous section. Requests are forwarded to the BLM National Office with annual statewide pesticide use reports. Proposed herbicide active ingredients must already have a completed FIFRA registration in place, and be labeled for use on the site proposed (e.g. rangeland, pasture, non-cropland, aquatic habitat). The BLM will not consider any active ingredients in its review and approval process, including research and demonstration, if it does not have a completed FIFRA registration. The BLM will comply with label directions and with state registration requirements. Thus, if current state requirements do not allow the application of an herbicide being considered for use by the BLM, the BLM will not apply that herbicide in that state.

Weed specialists and others in the BLM National Office will determine whether the new active ingredient being proposed will benefit the BLM and whether the cost of analysis is likely to be justified. If approved, funds will be requested in the following fiscal year's budget process to conduct a risk assessment.

Assessment of Hazards and Risks

FIFRA registration already requires product performance data relating to each product's effectiveness. This requirement was designed "to ensure that pesticide products will control the pests listed on the label and that unnecessary pesticide exposure to the environment will not occur as a result of the use of ineffective products" (40 C.F.R. 158.202[i]). Therefore, any new pesticide registered under FIFRA is expected to be generally effective for the labeled uses.

For an herbicide to be considered for use on public lands, the EPA-reviewed toxicological, environmental fate, and ecotoxicity data submitted by the pesticide manufacturer to support its registration application will be available for review. These data could then be used to conduct an assessment of the potential human health and ecological risks from the herbicide's use, including, but not limited to, the following components:

- Identification of potential use patterns, including target plants, formulation, application methods, locations to be treated, application rate, and anticipated frequency of use;
- Review of herbicide hazards relevant to the human health risk assessment, including systemic and reproductive effects, skin and eye irritation, allergic hypersensitivity, carcinogenicity, dermal absorption, eurotoxicity, immunotoxicity, and endocrine disruption;
- Estimation of exposure to workers applying the herbicide or reentering a treated area;
- Environmental fate and transport, including drift, leaching to groundwater, and runoff to surface streams and ponds;
- Estimation of exposure to members of the public;
- Review of available ecotoxicity data, including hazards to mammals, birds, reptiles, amphibians, fish, and aquatic invertebrates;
- Estimation of exposure to terrestrial and aquatic wildlife species; and,
- Characterization of risk to human health and wildlife.

If the available toxicity or ecotoxicity data were inconclusive, or if substantial disagreement occurs among the results of technical studies that could affect the potential risk conclusions for the herbicide, the BLM will conduct a formal peer review of the available scientific information to develop a consensus about the endpoint(s) in question. The peer review process is based largely on EPA's peer review process (EPA 2000).

If review of the registration information supports use, the next step is to confirm or redesign the human health and ecological risk assessment protocols and complete the assessment(s). The risk assessment protocols used by the BLM must reflect the best science available and ensure current standards for environmental review are utilized while the risk assessments are conducted.

NEPA Documentation

The potential use of new herbicide active ingredients will require compliance with NEPA. That requirement might be met all or in part by tiering to an existing document, supplementing an existing document, and/or incorporating or adopting another analysis as appropriate under NEPA. If existing NEPA documentation is determined to be inadequate, a new NEPA document will be prepared.

In any event, the process for complying with NEPA for proposals to use new herbicide active ingredients on BLM lands differs from the standard NEPA screening process for other Federal actions. For example, neither the USDI, nor the BLM have categorical exclusions[1] that address the use of herbicides; therefore, this step does not apply. The BLM, through this and previous EISs, has already determined that approval of herbicides for future use on public lands is a controversial Federal action significantly affecting the human environment. It is therefore inappropriate to use an Environmental Assessment and Finding of No Significant Impact for such approval. This is not to say a particular project involving the use of herbicides could not be assessed with an Environmental Assessment level analysis, properly tiered to a land use plan EIS or other NEPA document, such as this Programmatic EIS. This determination of significance only applies to the approval of a new active ingredient for use by BLM overall. Site-specific impacts for any project using herbicides will be assessed at a level appropriate for the project, using the standards for "significantly" found under 40 C.F.R. 1508.27.

Initially, the BLM expects to use the PEIS as its basis for conducting future risk assessments and approvals. Following the guidance under 40 C.F.R. 1502.9 (4) *Environmental Impact Statement, Draft, Final and Supplemental Statements*, the BLM will conduct risk assessments on new active ingredients and build on the analysis contained in the PEIS through the issuance of a Supplemental Environmental Impact Statement (SEIS). A final decision on whether an active ingredient is approved would be recorded in a Record of Decision. SEISs would be utilized for approvals of new active ingredients until such time as the need for a new programmatic EIS was warranted and such a document was prepared. For cost efficiency, BLM would likely assess several active ingredients together in one SEIS.

Special Status Species

As part of any NEPA analysis of new herbicides, the BLM would consult with the FWS and NMFS as required under Section 7 of the Endangered Species Act. As part of this process, the BLM would prepare a consultation package that could include a description of the program; species listed as threatened or endangered, species proposed for listing, and critical habitats that could be affected by the program, and; a Biological Assessment that evaluates the likely impacts to listed species, species proposed for listing, and critical habitats from the proposed vegetation treatment program. The BLM will also provide guidance on actions that will be taken by the BLM to avoid adversely impacting species or destroying critical habitat.

References

ENSR. 2004. Vegetation Treatments Programmatic EIS Ecological Risk Assessment Protocol. Report Prepared for the Bureau of Land Management, Reno, Nevada. Westford, Massachusetts.

1 Categorical exclusions are "a category of [federal] actions that does not individually or cumulatively have a significant effect on the human environment…for which, therefore, neither an Environmental Assessment (EA) nor an EIS is required" (40 C.F.R. 1508.4).

ENSR. 2005. Human Health Risk Assessment Final Report. Report Prepared for the Bureau of Land Management, Reno, Nevada. Westford, Massachusetts.

U.S. Department of the Interior Bureau of Land Management (USDI BLM). 1988. National Environmental Policy Act Handbook. Bureau of Land Management Handbook H-1790-1 Washington, D.C.

U.S. Environmental Protection Agency (USEPA). 2000. Peer Review Handbook 2nd Edition. Washington, D.C. Available at: http://www.epa.gov/osp/spc/prhandbk.pdf.

Appendix 5 – Federally Listed and other Special Status Species

This appendix addresses species Federally Listed or proposed as threatened or endangered, and Bureau Sensitive species (collectively referred to as Special Status Species), and proposed or designated critical habitat. Since this EIS is programmatic, tiered to the PEIS, and all of its action alternatives are wholly consistent with the selected alternative in the Record of Decision for the PEIS, the Biological Assessment for the PEIS[1] is incorporated by reference in accordance with 50 CFR 402.12 (g). That statute says:

> If a proposed action requiring the preparation of a biological assessment is identical, or very similar, to a previous action for which a biological assessment was prepared, the Federal agency may fulfill the biological assessment requirement for the proposed action by incorporating by reference the earlier biological assessment, plus any supporting data from other documents that are pertinent to the consultation, into a written certification that:
> (1) The proposed action involves similar impacts to the same species in the same geographic area;
> (2) No new species have been listed or proposed or no new critical habitat designated or proposed for the action area; and
> (3) The biological assessment has been supplemented with any relevant changes in information.

This Appendix serves as that supplement. Updated information is provided for bull trout Critical Habitat, Pacific Eulachon, and greater sage grouse. Oregon-specific information about the effects of the alternatives is presented in Chapter 4.

Table of Contents

1 The PEIS is the Final Vegetation Treatments Using Herbicides on Bureau of Land Management Lands in 17 Western States Programmatic Environmental Impact Statement, June 2007. The Biological Assessment is available on the PEIS website at http://www.blm.gov/wo/st/en/prog/more/veg_eis.html

Summary of the Action Alternatives

The selected alternative in the Record of Decision for the PEIS and to which the PEIS Biological Opinion applied, would make 18 herbicides available to the BLM in the 17 western states for use in their vegetation management program. The action alternatives in the Oregon EIS are subsets of that alternative, using fewer herbicides and/or restricting their use to particular plants or management objectives as described below.

As with the PEIS, an estimate has been made of the acres to be sprayed with each herbicide (Table 3-3 in Chapter 3). This estimate is for analysis purposes, and the estimated acres are not part of the alternative descriptions themselves. The estimates are comparable to the estimates made for the PEIS.

An important overriding assumption of the Biological Assessment (BA) is that each site-specific action that could occur under the Proposed Action will be analyzed as required by NEPA and the Endangered Species Act, and that there will be compliance with all Federal laws during implementation of the project. Since this EIS is programmatic in nature, it does not authorize a specific commitment of resources. Therefore, any proposed site-specific activity will require a site-specific NEPA analysis and consultation, if necessary, between the local BLM field office and the Services.

The Action Alternatives

Alternative 3 would add 8 and 9 herbicides on the west and east side of the Cascades respectively, to the 4 herbicides already being used on BLM lands in Oregon for noxious weeds. They could be used on noxious weeds and other invasive plants, and on native plants as needed to control plant pests and diseases in State-identified control areas.

Alternative 4, the proposed action, would add 9 herbicides west of the Cascades, and 12 herbicides east of the Cascades, to the four already in use, and to expand their use from noxious weeds to all invasive plants, the control of pests and diseases, the control of native vegetation in rights-of-way, administrative sites, and recreation sites, and to improve wildlife habitat where specified in interagency Recovery/Delisting Plans or Conservation Strategies.

Alternative 5 would add 14 herbicides to the 4 already being used, and permit them to be used to achieve any management objective except livestock forage or timber production. Except for the inability to use herbicides for livestock forage or timber production, this alternative corresponds to the selected alternative from the PEIS.

The complete description of these alternatives, as well as the No Action Alternative (Alternative 2) and the Reference Analysis, which would cease the use of herbicides completely, is in Chapter 2.

Summary of Applicable Standard Operating Procedures and PEIS Mitigation Measures

Standard Operating Procedures were identified in the PEIS and adopted by the Record of Decision for the PEIS. They are included in this EIS, Appendix 2, with minor edits for clarity. Standard Operating Procedures reduce adverse effects to environmental and human resources from vegetation treatment activities, and are based on guidance in BLM manuals and handbooks, regulations, and standard agency and industry practices. The list is not all encompassing, but is designed to give an overview of practices that would be considered when designing and implementing a vegetation treatment project on public lands (PER:2-29). Effects described in the EIS are predicated on application of the Standard Operating Procedures or that a site-specific determination is made that their application is unnecessary to achieve their intended purpose or protection. As with the corresponding protective measures listed in the Biological Opinion, BLM field offices would tailor these national Standard Operating Procedures based on local conditions and the habitat needs of the particular threatened and endangered species that could be affected by the treatments (PEIS Biological Opinion [Record of Decision for the PEIS:Appendix C-22]).

Mitigation Measures were identified for all potential adverse effects identified in the PEIS, and they were adopted by the Record of Decision for the PEIS. They are included in this EIS with minor edits for clarity, in Appendix 2 with the Standard Operating Procedures. Like the Standard Operating Procedures, application of the mitigation measures is assumed in the analysis. However, for PEIS mitigation measures, site-specific analysis, the use of Individual Risk Assessment Tools, or the evolution of these measures into similar handbook direction is permitted to identify alternative ways to achieve the expected protections.

Consultation

For the PEIS, the BLM consulted with the U.S. Fish and Wildlife Service (FWS) and National Marine Fisheries Service (NMFS) as required under Section 7 of the Endangered Species Act (PEIS:Chapter 5 and Appendix G). The BLM prepared a formal initiation package that included: 1) a description of the program, listed threatened and endangered species, species proposed for listing, and critical habitats that may be affected by the program; and, 2) a Biological Assessment for Vegetation Treatments on Bureau of Land Management Lands in 17 Western States (BA). That BA evaluated the likely impacts to listed species, species proposed for listing, and critical habitats from the proposed use of herbicides and other treatment methods in its vegetation treatment program, and also identified management practices to minimize impacts to these species and habitats.

The FWS issued a Letter of Concurrence on September 1, 2006, which concurred that the proposed action as described in the PEIS and Biological Assessment, with all PEIS Mitigation Measures and Standard Operating Procedures and the Biological Assessment's Conservation Measures, would not likely adversely affect any threatened or endangered species under the jurisdiction of the FWS. In addition, the FWS recognized that any future site-specific[2] actions carried out under the PEIS would undergo additional consultation as appropriate.

The Biological Opinion issued by the NMFS on June 26, 2007 concluded that the proposed action as described in the PEIS and Biological Assessment, in addition to Biological Assessment-identified Conservation Measures for Aquatic Species (referred to in the Biological Opinion as Protective Measures), was not likely to jeopardize the continued existence of endangered and threatened salmon and trout, threatened green sturgeon, and threatened southern resident killer whales. Since the PEIS does not authorize any site-specific actions, subsequent Section 7 review on proposed site-specific vegetation treatments will be required. There is no incidental take[3] identified or exempted by the Biological Opinion for the PEIS. If take is anticipated for site-specific treatments, then the amount or extent of take will be identified during consultation for those treatments.

Like the PEIS, this programmatic EIS does not authorize site-specific actions or amend RMPs. In addition, the three action alternatives in this EIS are subsets of the selected alternative in the PEIS. Therefore this EIS is incorporating the PEIS Biological Assessment by reference (50 CFR 402.12(g)). A discussion of the Federally Listed (and proposed) species in Oregon, proposed and designated critical habitat, and a list of the Bureau Sensitive species in Oregon are included in this appendix. Informal consultation with the FWS (50 CFR

2 Site, area, or project-specific level

3 "take" means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct.

402.13), and formal consultation with NMFS (50 CFR 402.14), are expected to confirm and apply the PEIS consultation results to this EIS. Specific treatment projects that tier to this EIS will be subject to site–specific consultation as appropriate.

Biological Assessment Conservation Measures

The BLM will incorporate mitigation and conservation measures identified in the Ecological Risk Assessments and Biological Assessment, and from analysis of exposure levels based on modeling, to eliminate or reduce risks to Threatened, Endangered and Proposed species. It is possible that conservation measures would be less restrictive than those listed in subsequent sections of this appendix if local site conditions were evaluated using the Ecological Risk Assessments when developing project-level conservation measures. Conservation measures specifically listed in the Biological Assessment for the PEIS are included in this appendix for all of the species to which they apply.

Endangered and Threatened Species in Oregon

Birds

Endangered

<u>*California Brown Pelican*</u>
The primary reference for this section is: USFWS. No Date. Brown Pelican, (*Pelicanus occidentalis*). Available at: http://species.fws.gov.

The brown pelican (*Pelicanus occidentalis*), also called the American brown pelican or common pelican, inhabits the Atlantic, Pacific, and Gulf coasts of North and South America. On the Atlantic Coast, pelicans can be found from Virginia south to the mouth of the Amazon River in Brazil; on the Pacific, they range from central California to south-central Chile and the Galapagos Islands; and on the Gulf of Mexico, they are found in Alabama, Louisiana, and Texas. Brown pelicans are rarely seen either inland or far out at sea.

Pelicans are primarily fish eaters, and require up to 4 pounds of fish a day. Their diet consists mainly of "rough" fish, species considered unimportant commercially. Examples of rough fish species are menhaden, herring, sheepshead, pigfish, mullet, grass minnows, topminnows, and silversides. Brown pelicans have also been known to eat some crustaceans, usually prawns. Brown pelicans have extremely keen eyesight. As they fly over the ocean, sometimes at heights of 60 to 70 feet, they can spot a school of small fish, or even a single fish. Diving steeply into the water, they may submerge completely or only partly, depending on the height of the dive, and come up with a mouthful of fish. Air sacs beneath the pelican's skin cushion the impact and help it surface.

Pelicans are social and gregarious. Males and females, juveniles and adults, congregate in large flocks for much of the year. The only breeding area in the western U.S. is in Channel Islands National Park in California. Pelicans nest in large colonies on the ground, in bushes, or in the tops of trees. On the ground, a nest may be a shallow depression lined with a few feathers and a rim of soil built up 4 to 10 inches above ground, or it may be a large mound of soil and debris with a cavity in the top. A treetop nest is built of reeds, grass, and straw heaped on a mound of sticks interwoven with the supporting tree branches. In most of the pelican's U.S. nesting range, peak egg-laying occurs in March and April. Two or three chalky white eggs hatch in approximately 1 month. Like many birds, newly hatched pelicans are blind, featherless, and completely dependent upon their parents. Average age at first flight is 75 days.

The brown pelican was Federally Listed as endangered on June 2, 1970. Critical habitat has not been designated. On February 4, 1985, brown pelican populations on the Atlantic Coast of the U.S. (including all of Florida and Alabama), had recovered to the point that the species could be removed from the Endangered Species List in that part of its range. The U.S. Gulf Coast population, which is still considered endangered, was recently estimated at nearly 6,000 breeding pairs. The brown pelican is also endangered in the Pacific Coast portion of its range, and in Central and South America. The southern California population of brown pelicans today is estimated at 4,500 to 5,000 breeding pairs. Brown pelicans have few natural enemies. Although ground nests are sometimes destroyed by hurricanes, flooding, or other natural disasters, the biggest threat to pelican survival comes from human activities. Pelican populations have been heavily affected by past hunting to protect commercial fishery resources, as well as the use of DDT and other pesticides. Current threats to the species include human development along the coast, abandoned fishing lines and tackle, and potential future oil spills.

Conservation Measures for the California Brown Pelican

Although treatment activities are unlikely to negatively affect the brown pelican or its habitat, extra steps could be taken by the BLM to ensure that herbicide treatments conducted in brown pelican wintering habitat did not result in negative effects to the species:

- If feasible, conduct vegetation treatments in brown pelican wintering habitat outside the period when pelicans are likely to be present.
- If herbicide treatments in brown pelican habitats must be conducted during the wintering period:
- Do not use 2,4-D in pelican wintering habitat.
- Prior to conducting herbicide treatments on pelican wintering habitat, survey the area for pelicans. Wait for pelicans to leave the area before spraying.
- Do not broadcast spray clopyralid, glyphosate, hexazinone, picloram, or triclopyr in pelican wintering habitats.
- If broadcast spraying imazapyr or metsulfuron methyl in pelican wintering habitats, use the typical rather than the maximum application rate.
- If conducting manual spot applications of glyphosate, hexazinone, or triclopyr to vegetation in brown pelican wintering habitat, utilize the typical, rather than the maximum, application rate.

Threatened

Marbled Murrelet

The primary references for this section are: USFWS. 1992j. Determination of Threatened Status for the Washington, Oregon, and California Population of the Marbled Murrelet. Federal Register 57(191):45328-45337; and National Audubon Society. 2002a. Marbled murrelet (*Brachyramphus marmoratus*). Available at: http://audubon2.org/webapp/watchlist/. References cited in this section are internal to the above-referenced USFWS document. A complete list of these references is available from the USFWS Portland Field Office, Portland, Oregon.

The North American subspecies of marbled murrelet (*Brachyramphus marmoratus marmoratus*) is a small seabird found on the Pacific Coast of North America. Marbled murrelets are generally found in nearshore waters (within about 3 miles of shore) near their nesting sites. They nest in a narrow range along the Pacific, from the Aleutian Islands of Alaska south through British Columbia, Washington, and Oregon, to central California. The species generally occupies nesting areas on a year-round basis, although in certain places in Alaska and British Columbia, birds move to more protected waters during the winter. This species can also be found wintering south of its breeding range, along the coast of southern California to extreme northwestern Baja California. The states of California, Oregon, and Washington encompass roughly one-third of the geographic area occupied by this subspecies, comprising an important portion of its range. The amount of nesting habitat has undergone a tremendous decline since the late 1800s (most of which has taken place during the last 30 to 40 years), especially in the coastal areas of all three states. Therefore, the marbled murrelet is listed only in these three states, which together constitute a distinct population segment of the eastern Pacific subspecies.

Marbled murrelets feed primarily on fish and invertebrates in nearshore marine waters. During the summer, major food items include Pacific sand lance, northern anchovy, Pacific herring, and other small schooling fish, while during the winter, krill, amphipods, and herring are major prey items. Marbled murrelets usually forage alone, or in pairs, and are active in search of food both day and night. Although the majority of birds are found within or adjacent to the marine environment, there have been detections of marbled murrelets on rivers and inland lakes (Carter and Sealy 1986). Marbled murrelets spend the majority of their lives on the ocean, and come inland to nest, although they visit some inland stands during all months of the year. There are records of marbled murrelets up to 50 miles inland in Washington (Hamer and Cummins 1991), 35 miles inland in Oregon (Nelson 1990), 22 miles inland in northern California (Carter and Erickson 1988, Paton and Ralph 1990), and 11 miles inland in central California (Paton and Ralph 1990). However, the majority of detections were recorded closer to the coast. Marbled murrelets are semi-colonial in their nesting habits, and simultaneous detections of more than one bird are frequently made at inland sites. Nesting birds are often aggregated, with separate nests located close together.

Marbled murrelets do not reach sexual maturity until their second year, and adults have a variable reproductive rate (i.e., not all adults may nest every year). They produce one egg per nest, which the female lays on the limb of an old-growth conifer tree. Nesting occurs over an extended period from mid-April to late September (Carter and Sealy 1987). Incubation lasts about 30 days, and fledging takes another 28 days (Simons 1980; Hirsch et al. 1981). Both sexes incubate the egg in alternating 24-hour shifts (Simons 1980; Singer et al. 1991). Flights from ocean feeding areas to inland nest sites occur most often at dusk and dawn (Hamer and Cummins 1991). The adults feed the chick at least once per day, carrying one fish at a time (Carter and Sealy 1987; Hamer and Cummins 1991; Nelson 1992; Singer et al. 1992). Before leaving the nest, the young molt into a distinctive juvenile plumage. Fledglings appear to fly directly from the nest to the sea, rather than exploring the forest environment first (Hamer and Cummins 1991).

In California, Oregon, and Washington, marbled murrelets use older forest stands near the coastline for nesting. These forests are generally characterized by large trees (32 inches diameter at breast height or larger), a multi-storied stand, and a moderate to high canopy closure. In certain parts of the range, marbled murrelets are also known to use mature forests with an old-growth component. In order to provide suitable nest platforms, trees must have large branches or deformities (Binford et al. 1975; Carter and Sealy 1987; Hamer and Cummins 1990, 1991; Singer et al. 1991, 1992). Marbled murrelets tend to nest in the oldest trees in the stand. Observations of nests indicate that they tend to be located high above ground, usually with good overhead protection, in locations that allow easy access to the exterior of the forest. In Oregon and Washington, nests are located in stands dominated by Douglas-fir, and in California they are located in old-growth redwood stands.

In California, the species is restricted to old-growth redwood forests in Del Norte, Humboldt, San Mateo, and Santa Cruz Counties (Paton and Ralph 1988). In northwest Washington, marbled murrelets are mostly found at old-growth/mature sites (Hamer and Cummins 1990), and in Oregon, they occupy stands dominated by larger trees more often than those dominated by smaller trees (Nelson 1990). Large geographic gaps in offshore marbled murrelet numbers occur between central and northern California (a distance of 300 miles), and between Tillamook County, Oregon, and the Olympic Peninsula (a distance of about 120 miles), where nearly all older forest has been removed near the coast.

The marbled murrelet was Federally Listed as threatened in California, Oregon, and Washington on October 1, 1992. On May 24, 1996, 32 critical habitat units in Washington, Oregon, and California, encompassing approximately 3,887,800 acres of land, were designated for the species. Critical habitat areas focused on two primary constituent elements: individual trees with potential nesting platforms, and forested areas within 0.5 miles of these trees with a canopy height of at least one-half the site-potential tree height. The principal factor affecting the marbled murrelet in the three-state area, and the main cause of population decline has been the loss of older forests and associated nest sites. Older forests have declined throughout the range of the marbled murrelet as a result of commercial timber harvest, with additional losses from natural causes such as fire and wind throw. Most suitable nesting habitat on private lands within the range of the subspecies in Washington, Oregon, and California has been eliminated by timber harvest (Green 1985; Norse 1988; Thomas et al. 1990). Remaining tracts of potentially suitable habitat on private lands throughout the range are subject to continuing timber harvest operations. Mortality associated with oil spills and gill-net fisheries (in Washington) are lesser threats. It has been estimated that marbled murrelets are experiencing an annual population decline throughout their range as great as 4 to 7% per year. Surveys from Vancouver Island conducted 10 years apart suggest that populations there may have decreased by 40%. Populations in the northern Gulf of Alaska, meanwhile, may have declined by 50 to 73% over a 17- to 20-year period of time.

Western Snowy Plover

The primary reference for this section is: USFWS. 1993n. Determination of Threatened Status for the Pacific Coast Population of the Western Snowy Plover. Federal Register 58(42):12864-12874. References cited in this section are internal to the above-referenced document. A complete list of these references is available from the USFWS Sacramento Field Office, Sacramento, California.

There are two distinct populations of western snowy plover (*Charadrius alexandrinus nivosus*), only one of which is a Federally Listed. The Pacific coast population of the western snowy plover, which is genetically isolated from interior-breeding western snowy plovers, is defined as those individuals that nest adjacent to or near tidal waters, including all nesting colonies on the mainland coast, peninsulas, offshore islands, adjacent bays, and estuaries. It is the Pacific coast population that is addressed in this document.

In the U.S., three breeding areas currently exist in southern Washington, and nesting birds have been recorded in nine locations in Oregon (USFWS 2001). In California, eight geographic areas support over three-quarters of the breeding population in that state: San Francisco Bay, Monterey Bay, Morro Bay, the Callendar-Mussel Rock Dunes area, the Point Sal to Point Conception area, the Oxnard lowland, Santa Rosa Island, and San Nicolas Island (Page et al. 1991).

The coastal population of the western snowy plover consists of both resident and migratory birds. Some birds winter in the same areas used for breeding, while other birds migrate either north or south to wintering areas (Warriner et al. 1986), the majority of which are south of Bodega Bay, California. Pacific coast western snowy plovers breed primarily on coastal beaches from southern Washington to Mexico. It is estimated that, at most, about 2,000 snowy plovers breed along the U.S. Pacific Coast (Page et al. 1995). Nest sites occur in flat, open areas with sandy or saline substrates, usually in areas where vegetation and driftwood are sparse or absent (Widrig 1980; Wilson 1980; Stenzel et al. 1981). Nesting habitat is unstable and ephemeral as a result of unconsolidated soil characteristics influenced by high winds, storms, wave action, and colonization by plants. Other, less common nesting habitats include salt pans, coastal dredged spoil disposal sites, dry salt ponds, and salt pond levees. Sand spits, dune-backed beaches, unvegetated beach stands, open areas around estuaries, and beaches at river mouths are the preferred habitats for nesting (Wilson 1980; Stenzel et al. 1981). Snowy plovers forage on invertebrates in the wet sand and among surf-cast kelp within the intertidal zone; in dry, sandy areas above the high tide; on salt pans; at spoil sites; and along the edges of salt marshes and salt ponds.

Snowy plovers breed in loose colonies that range in size from 2 to 318 adults. Based on concentrations of breeding birds along the coast, it is believed that the center of the plovers' coastal distribution lies close to the southern boundary of California (Page and Stenzel 1981). The breeding season of coastal western snowy plovers extends from mid-March through mid-September. The majority of snowy plovers are site-faithful, returning to the same breeding site each year, and often nesting in exactly the same locations. Nest initiation and egg laying occurs from mid-March through mid-July (Wilson 1980; Warriner et al. 1986). Typically, the clutch size is three eggs, and incubation averages 27 days, with both sexes incubating the eggs (Warriner et al. 1986).

The Pacific coast population of the snowy plover was Federally Listed as threatened on March 5, 1993. On December 7, 1999, the USFWS designated 28 areas along the coast of California, Oregon, and Washington (totaling approximately 18,000 acres and 180 miles of coastline) as critical habitat for this population segment.

Declines in snowy plover populations have been attributed to poor reproductive success resulting from human disturbance, predation, and inclement weather, combined with habitat loss resulting from urban development and the encroachment of introduced European beachgrass. These factors continue to threaten existing coastal populations of this species.

Conservation Measures for the Western Snowy Plover

The following conservation measures are the minimum steps required of the BLM to ensure that treatment methods would be unlikely to negatively affect TEP species. Survey for western snowy plovers, piping plovers, and interior least terns (and their nests) in suitable areas on proposed treatment areas, prior to developing treatment plans.

- Do not treat vegetation in nesting areas during the breeding season (as determined by a qualified biologist).
- Do not allow human (or domestic animal) disturbance within ¼ mile of nest sites during the nesting period.
- Ensure that nest sites are at least 1 mile from downwind smoke effects during the nesting period.
- Conduct beachgrass treatments during the plant's flowering stage, during periods of active growth.
- Closely follow all application instructions and use restrictions on herbicide labels; in wetland habitats use only those herbicides that are approved for use in wetlands.
- Do not use 2,4-D in western snowy plover, piping plover, or interior least tern habitats; do not broadcast spray 2,4-D within ¼ mile of western snowy plover, piping plover, or interior least tern habitat.
- Where feasible, avoid use of the following herbicides in western snowy plover and piping plover habitat: clopyralid, diquat, diuron, glyphosate, hexazinone, imazapyr, metsulfuron methyl, picloram, and triclopyr; in interior least tern habitat avoid the use of clopyralid, glyphosate, hexazinone, imazapyr, metsulfuron methyl, picloram, and triclopyr.
- Do not broadcast spray clopyralid, diquat, diuron, glyphosate, hexazinone, picloram, or triclopyr in western snowy plover or piping plover habitat; do not broadcast spray these herbicides in areas adjacent to western snowy plover or piping plover habitat under conditions when spray drift onto the habitat is likely.
- Do not broadcast spray clopyralid, glyphosate, hexazinone, picloram, or triclopyr in interior least tern habitat; do not broadcast spray these herbicides in areas adjacent least tern habitat under conditions when spray drift onto the habitat is likely.
- If broadcast spraying imazapyr or metsulfuron methyl in or adjacent to western snowy plover, piping plover, or interior least tern habitat, apply at the typical, rather than the maximum, application rate.
- If conducting manual spot applications of glyphosate, hexazinone, or triclopyr to vegetation in western snowy plover, piping plover, or interior least tern habitat, utilize the typical, rather than the maximum, application rate.

Additional, project-specific conservation measures would be developed at the local level, as appropriate.

Northern Spotted Owl

The primary reference for this section is: USFWS. 1990g. Determination of Threatened Status for the Northern Spotted Owl. Federal Register 55(123):26114-26194. References cited in this section are internal to the above-referenced document. A complete list of references is available from the USFWS, Fish and Wildlife Enhancement, Portland, Oregon.

The northern spotted owl (*Strix occidentalis caurina*) is one of three subspecies of the spotted owl, a nocturnal bird of forest habitats. The current range of the northern spotted owl is from southwestern British Columbia, through western Washington, western Oregon, and northern California south to San Francisco Bay. Throughout this present range, individuals are not evenly distributed. The majority of individuals are found in the Cascade Mountains of Oregon and the Klamath Mountains in southwestern Oregon and northwestern California (USDA 1989; Gould 1989). Evidently, northern spotted owls reach their highest population densities and may have their best reproductive success in suitable habitat in this part of their range (USDI 1987, 1989; Franklin and Gutierrez 1988; Miller and Meslow 1988; Franklin et al. 1989; Robertson 1989).

The northern spotted owl is known from most of the major types of coniferous forests in the Pacific Northwest (Gould 1974, 1975, 1979; Forsman et al. 1977, 1984; Garcia 1979; Marcot and Gardetto 1980; Solis 1983; Sisco and Gutierrez 1984; Gutierrez et al. 1984; Forsman and Meslow 1985). In California, northern spotted owls most commonly use the Douglas-fir and mixed conifer forest types (Marcot and Gardetto 1980, Soils 1983, Gutierrez 1985). In Washington's coastal forests, the spotted owl is found in forests dominated by Douglas-fir and western hemlock. At higher elevations in western Washington, Pacific silver fir is commonly used by owls, whereas on the east side of the Cascades, Douglas-fir and grand fir are used (Postovit 1977). Extensive studies of spotted owls during the last 20 years have shown the species to be strongly associated with late-successional forests throughout much of its range.

Northern spotted owls have been observed over a wide range of elevations, although they seem to avoid higher elevation, subalpine forests (USDA 1986). The age of forests is not as important a factor in determining habitat suitability as are vegetational and structural components. Suitable owl habitat has moderate to high canopy closure (60 to 80%); a multi-layered, multi-species canopy dominated by large (> 30 inches diameter at breast height) overstory trees; a high incidence of large trees with various deformities (e.g., large cavities, broken tops, dwarf-mistletoe infections, and other evidence of decadence); numerous large snags; large accumulations of fallen trees and other woody debris on the ground; and sufficient open space below the canopy for owls to fly (Thomas et al. 1990). Usually, the features characteristic of owl habitat are most commonly associated with old-growth forests or mixed stands of old-growth and mature trees, which do not assimilate these attributes until 150 to 200 years of age.

Although a secretive and mostly nocturnal bird, the northern spotted owl is relatively unafraid of human beings (Bent 1938; Forsman et al. 1984; USDA 1986). The adult spotted owl maintains a territory year-round; however, individuals may shift their home ranges between the breeding and nonbreeding season. Northern spotted owls are perch-and-dive predators; over 50% of their prey items are arboreal or semi-arboreal species. They subsist on a variety of mammals, birds, reptiles, and insects, with small mammals (e.g., flying squirrels, red tree voles, and dusky-footed woodrats) making up the bulk of the food items throughout the range of the species (Solis and Gutierrez 1982; Forsman et al. 1984; Barrows 1985).

Monogamous and long-lived, northern spotted owls tend to mate for life. However, specific northern spotted owl pairs usually do not nest every year, nor are nesting pairs successful every year. Nesting behavior begins in February to March, with nesting occurring from March to June. The timing of nesting and fledging varies with latitude and elevation (Forsman et al. 1984). The number of eggs in a clutch ranges from one to four, with two eggs being most common. Fledging occurs from mid-May to late June, with parental care continuing into September. Females are capable of breeding in their second year, but it is likely that most do not breed until their third year (Barrows 1985; Miller and Meslow 1985b; Franklin et al. 1986). Males do most of the foraging during incubation, and assist with foraging during the fledging period.

The northern spotted owl was Federally Listed as a threatened species on June 26, 1990. On January 15, 1992, critical habitat was designated for the subspecies in 190 areas, encompassing a total of nearly 6.9 million acres of land. Throughout its range, the northern spotted owl is threatened by the loss and modification of suitable habitat as a result of timber harvesting. These threats are exacerbated by risks of catastrophic events such as fire, volcanic eruption, and wind storms. The population of the northern spotted owl is estimated at approximately 3,800 pairs and 1,000 individuals (National Audubon Society 2002).

Conservation Measures for the Northern Spotted Owl

The following programmatic-level conservation measures are the minimum steps required of the BLM to ensure that treatment methods would be unlikely to negatively affect the marbled murrelet, northern spotted owl, or Mexican spotted owl.

- Survey for marbled murrelets, northern spotted owls, and Mexican spotted owls (and their nests) on suitable proposed treatment areas, prior to developing treatment plans.
- Delineate a 100-acre buffer around nests prior to mechanical treatments or prescribed burns.
- Do not allow human disturbance within ¼ mile of nest sites during the nesting period (as determined by a local biologist).
- Ensure that nest sites are at least 1 mile from downwind smoke effects during the nesting period.
- Protect and retain the structural components of known or suspected nest sites during treatments; evaluate each nest site prior to treatment and protect it in the most appropriate manner.
- Maintain sufficient dead and down material during treatments to support spotted owl prey species (minimums would depend on forest types, and should be determined by a wildlife biologist).
- Do not conduct treatments that alter forest structure in old-growth stands.
- Do not use 2,4-D in marbled murrelet, northern spotted owl, or Mexican spotted owl habitats; do not broadcast spray 2,4-D within ¼ mile of marbled murrelet, northern spotted owl, or Mexican spotted owl habitat.
- Where feasible, avoid use of the following herbicides in northern spotted owl and Mexican spotted owl habitat: bromacil, clopyralid, diquat, diuron, glyphosate, hexazinone, imazapyr, metsulfuron methyl, picloram, and triclopyr.
- Where feasible, avoid use of the following herbicides in marbled murrelet habitat: clopyralid, glyphosate, hexazinone, imazapyr, metsulfuron methyl, picloram, and triclopyr.
- Do not broadcast spray clopyralid, glyphosate, hexazinone, picloram, or triclopyr in marbled murrelet, northern spotted owl, or Mexican spotted owl habitat; do not broadcast spray these herbicides in areas adjacent to marbled murrelet, northern spotted owl, or Mexican spotted owl habitat under conditions when spray drift onto the habitat is likely.
- Do not broadcast spray diuron in Mexican or northern spotted owl habitat; do not broadcast spray these herbicides in areas adjacent to Mexican or northern spotted owl habitat under conditions when spray drift onto the habitat is likely.
- If broadcast spraying imazapyr or metsulfuron methyl in or adjacent to marbled murrelet, northern spotted owl, or Mexican spotted owl habitat, apply at the typical, rather than the maximum, application rate.
- If broadcast spraying bromacil or diquat in or adjacent to Mexican or northern spotted owl habitat, apply at the typical, rather than the maximum, application rate.

- If conducting manual spot applications of glyphosate, hexazinone, or triclopyr to vegetation in marbled murrelet, northern spotted owl, or Mexican spotted owl habitat, utilize the typical, rather than the maximum, application rate.
- Follow all instructions and Standard Operating Procedures to avoid spill and direct spray scenarios into aquatic habitats, particularly marine habitats where murrelets forage for prey.

Additional conservation measures would be developed, as necessary, at the project level to fine-tune protection of these species.

Other

Greater Sage Grouse

The primary references for this section are: Federal Register/Vol. 75, No. 55/Tuesday, March 23, 2010/13910-140014/ Proposed Rules, available at http://www.regulations.gov; Hagen, C. A. 2005. Greater sage-grouse conservation assessment and strategy for Oregon: a plan to maintain and enhance populations and habitat. Oregon Department of Fish and Wildlife, Salem, USA; and, Instruction Memo OR-2007-073, July 25, 2007, Sage-Grouse Guidelines.

On March 23, 2010 the Fish and Wildlife Service (Service) announced three 12-month findings on petitions to list three entities of the greater sage grouse (*Centrocerus urophasinus*) as threatened or endangered under the Endangered Species Act of 1973, as amended. The Service found that listing the greater sage grouse (rangewide) is warranted, but precluded by higher priority listing actions and will develop a proposed rule to list the greater sage-grouse as priorities allow (1). Therefore the greater sage-grouse remains a Bureau Sensitive species in Oregon and no ESA consultation is required. Oregon BLM districts will continue to implement the conservation guidance provided in *Greater Sage-Grouse Conservation Assessment and Strategy for Oregon A Plan to Maintain and Enhance Populations and Habitat* as per Oregon Instruction Memo OR-2007-073.

Fish

Endangered

Modoc Sucker

The Modoc sucker (*Catostomus microps*) is known from only a few widely separated tributary systems to the upper Pit River in northeastern California—the Rush-Ash Creek system and the Washington-Turner-Hulbert system (Moyle 1976, Ford 1977). This species occurs primarily in sections of stream with low or intermittent flow, or pools of the meadowlands (Moyle and Mariochi 1975, Moyle 1976, Ford 1977). In general, sites where Modoc suckers have been found are characterized by the following: low flows (intermittent in some); largely shallow pools; muddy bottoms; partial shade trees, shrubs, boulders, or undercut banks; abundant cover from riparian vegetation and undercut banks; and moderately clear water (Moyle and Mariochi 1975). Water temperatures (summer and fall) in Modoc sucker habitat range from 46 F (fall) to 74 F (summer; Ford 1977). Modoc suckers are omnivorous, feeding on detritus, diatoms, filamentous algae, chironomid larvae, crustaceans, and aquatic insect larvae. Adult suckers usually remain on the bottom or close to it (Martin 1972).

Spawning usually occurs from mid-April to the last week in May or the first week in June (Boccone and Mills 1979). Spawning occurs over coarse fine gravel in the lower end of pools with abundant cover. Water temperatures range from 56 to 61 F. There is some evidence from Johnson and Washington Creeks of upstream migration by Modoc suckers to small intermittent tributaries, such as Higgins and Rice flats, during spawning season. Also, a possible spawning migration of Modoc suckers has been observed from Moon (Lake) Reservoir upstream into Cedar Creek.

The Modoc sucker was Federally Listed as endangered on June 11, 1985. Critical habitat has been designated in Modoc County, California. Designated habitat includes intermittent and permanent water and adjacent land areas that provide vegetation for cover and protection from soil erosion of all or portions of: Turner Creek, Hulbert Creek, Cedar Creek, Washington Creek, Coffee Mill Gulch, Johnson Creek, Higgins and Rice flats, and Rush Creek, Modoc County, California. The Modoc sucker is endangered because of its very restricted distribution combined with destruction of habitat. A major portion of the Rush Creek Modoc sucker habitat is on privately-owned land used for grazing sheep and cattle, which trample streambanks, thereby causing destruction of habitat through increased erosion of streambanks, removal of aquatic and riparian vegetation needed as cover, and siltation (Moyle 1976; Cooper et al. 1978; Mills 1980; Cooper 1983; Chesney 1985). Destruction of natural barriers to the Sacramento sucker by flooding areas for the creation of pastures, and by channelization, has resulted in losses through hybridization and backcrossing in several of the Modoc sucker streams (Ford 1977; Cooper et al. 1978; Mills 1980; Cooper 1983; Chesney 1985). Diversions of water for irrigation reduce the number and sizes of pools available to the Modoc suckers (Ford 1977). In addition, introductions of brown trout have added to the predation pressure on the Modoc sucker (Cooper et al. 1978; Mills 1980; Cooper 1983). Destruction of habitat by overgrazing and limited distribution of pure populations of the Modoc sucker still threaten the species (Ford 1977, Chesney 1985).

<u>Lost River and Shortnose Suckers</u>

The primary reference for this section is: USFWS. 1993l. Lost River (*Deltistes luxatus*) and Shortnose (*Chasmistes brevirostris*) Sucker Recovery Plan. Portland, Oregon. References cited in this section are internal to the above-referenced document. They are included in the Bibliography.

The Lost River sucker (*Deltistes luxatus*) and shortnose sucker (*Chasmistes brevirostris*) are large, long-lived suckers endemic to the upper Klamath Basin of Oregon and California. Historical records indicate that the two species were once widespread and abundant within their range. The present distribution of the Lost River sucker includes Upper Klamath Lake and its tributaries, Clear Lake Reservoir and its tributaries, Tule Lake and the Lost River up to Anderson-Rose Dam, and the Klamath River downstream to Copco Reservoir (Beak Consultants Incorporated 1987; Buettner and Scoppettone 1990, 1991). The present distribution of the shortnose sucker includes Upper Klamath Lake and its tributaries, Klamath River downstream to Iron Gate Reservoir, Clear Lake Reservoir and its tributaries, Gerber Reservoir and its tributaries, the Lost River, and Tule Lake.

Lost River and shortnose suckers are omnivores that feed primarily on zooplankton and insects. Both species generally spawn in rivers or streams and then return to the lake (Buettner and Scoppettone 1990). However, both species have separate populations that spawn near springs in upper Klamath Lake (Klamath Tribe 1993). Larval suckers usually spend relatively little time in tributary streams before they migrate back to the lake. Migration from spawning sites can begin in May or June. During the day, larvae typically move to shallow (depths of less than 20 inches) shoreline areas in the river, over substrates of sand, mud, and concrete (Buettner and Scoppettone 1990). Larvae are generally found in close proximity to rooted aquatic vegetation, and appear to avoid areas devoid of vegetation (Coleman and McGie 1988). It is believed that the suckers once used the extensive marsh system of the lower river as nursery habitat. Much of this habitat has been replaced by gently sloping, sandy, unvegetated shorelines. Adult Lost River and shortnose suckers usually spend relatively little time in tributary streams and migrate back to the lake after spawning. Adults appear to prefer areas with relatively low densities of algae and good water quality in terms of pH and dissolved oxygen, such as areas of the lake near inflows from streams or springs.

The Lost River and shortnose sucker were Federally Listed as endangered on July 18, 1988. The designation of critical habitat for both species was proposed in 1994, but has not occurred. The limited distribution of both sucker species, combined with the level of agricultural development and associated water and land use threats within the drainage, make these fishes susceptible to past and present habitat loss and degradation throughout their distribution. Cumulative impacts of land management on public and private lands has led to the endangered status of the Lost River sucker and shortnose sucker, and continues to hinder their recovery. Inputs of sediment and nutrients, and changes in timing and duration of stream flow as a result of road building have altered lake habitats. Habitat has also been lost through construction of dams, diversion of water from streams, reclamation of wetlands, and other changes.

Borax Lake Chub

The permanent habitat of the Borax Lake chub (*Gila boraxobius*) is a 10.2-acre thermal lake located in the Borax Lake Basin of Oregon. This lake, which is shallow and fed by hot and cool springs, is perched about 30 feet above the desert floor in a "pedestal" of deposited salts. The saline lake bottom is inhospitable to rooted plants, although some of the precipitated minerals are finely divided and silt-like. Irrigation channels have been dug from the lake to supply water for hay fields, and the chub may also be found in these channels. The chub is found in Lower Borax Lake, an artificial pond, when it has water in it. This habitat is highly alkaline, with murky water and little vegetation. If enough overflow water is received, marshes and temporary pools may also provide habitat for the chub. All of the Borax Lake chub's known habitats in southeastern Oregon comprise approximately 640 acres.

The Borax Lake chub is an opportunistic omnivore (Hudson et al. 2000). Spawning can occur year-round, but primarily occurs in the spring. Substantial spawning activity and larval chubs have been observed during autumn, following the cessation of unusually hot spring inflows during the preceding months.

The Borax Lake chub was Federally Listed as endangered on October 5, 1982. Critical habitat has been designated in Harney County, Oregon, and includes all 640 acres of habitat in Township 37 South, Range 33 East, including Borax Lake, marsh areas to the south and southwest, Lower Borax Lake, and hot springs north of Borax Lake. Because the lake depends upon several subterranean springs for its water supply, lowering the rim of the lake or tapping and diverting the springs could have severe effects upon the species. Borax Lake is in a known geothermal resource area, and both diversion and geothermal exploration appear to constitute a threat to the species.

Steelhead

Along the west coast, steelhead trout (*Oncorhynchus mykiss*) are distributed across about 15 degrees of latitude from the U.S. Canada border south to the mouth of Malibu Creek, California. In some years, steelhead may be found as far south as the Santa Margarita River in San Diego County. There are 10 listed steelhead ESUs, 8 of which are found in the project area: Central California Coast, Upper Columbia River, Snake River Basin, Lower Columbia River, California Central Valley, Upper Willamette, Middle Columbia River, and Northern California.

Steelhead have the greatest diversity of life history patterns of any Pacific salmonid species, including varying degrees of anadromy, differences in reproductive biology, and plasticity of life history between generations. Within the range of West Coast steelhead, spawning migrations occur throughout the year, with seasonal peaks of activity. In any given river basin there may be one or more peaks of migration activity; some rivers may have multiple runs, and fish are divided into either winter, spring, summer, or fall run steelhead. North American steelhead commonly spend 2 years in the ocean before entering fresh water to spawn. Summer steelhead enter fresh water up to a year prior to spawning. Steelhead may spawn more than once. In some cases, the separation between anadromous steelhead and rainbow or redband trout is obscured.

Upper Columbia River

The Upper Columbia River ESU was Federally Listed as endangered on August 18, 1997. This ESU occurs in streams in the Columbia River Basin upstream from the Yakima River, Washington, to the U.S.-Canada border. Wells Hatchery stock steelhead are also part of the listed ESU. NMFS filed final critical habitat designation for this species on August 15, 2005. Approximately 1,262 stream miles and 7 square miles of lake habitat has been designated as critical habitat. Major river basins containing spawning and rearing habitat for this ESU comprise approximately 9,545 square miles in Oregon and Washington. The following counties lie partially or wholly within these basins (or contain migration habitat for the species): Oregon—Clatsop, Columbia, Gilliam, Hood River, Morrow, Multnomah, Sherman, Umatilla, and Wasco; and Washington—Benton, Chelan, Clark, Cowlitz, Douglas, Franklin, Gilliam, Grant, Kittitas, Klickitat, Okanogan, Pacific, Skamania, Wahkiakum, Walla Walla, and Yakima. Critical habitat is found in the following counties: Oregon—Clatsop, Columbia, Gilliam, Hood River, Morrow, Multnomah, Umatilla, and Wasco; and Washington—Adams, Benton, Chelan, Clark, Cowlitz, Douglas, Franklin, Grant, Kittitas, Klickitat, Okanogan, Skamania, Wahkiakum, Walla Walla, and Yakima. BLM-administered lands are found in all counties with critical habitat except Wahkiakum.

Snake River

The Snake River ESU of steelhead was Federally Listed as threatened on August 18, 1997. This ESU occurs in streams in the Snake River Basin of southeast Washington, northeast Oregon, and Idaho. NMFS filed final critical habitat designation for this species on August 15, 2005. Approximately 8,049 stream miles and 4 square miles of lake habitat has been designated as critical habitat. Major river basins containing spawning and rearing habitat for this ESU comprise approximately 29,282 square miles in Idaho, Oregon, and Washington. The following counties lie partially or wholly within these basins (or contain migration habitat for the species): Idaho—Adams, Blaine, Boise, Clearwater, Custer, Idaho, Latah, Lemhi, Lewis, Nez Perce, and Valley; Oregon—Baker, Clatsop, Columbia, Hood River, Morrow, Multnomah, Sherman, Umatilla, Union, Wallowa, and Wasco; and Washington—Asotin, Benton, Clark, Columbia, Cowlitz, Franklin, Garfield, Gilliam, Klickitat, Skamania, Wahkiakum, Walla Walla, and Whitman. Critical habitat is found in the following counties: Idaho—Adams, Blaine, Clearwater, Custer, Idaho, Latah, Lemhi, Lewis, Nez Perce, and Valley; Oregon—Clatsop, Columbia, Gilliam, Hood River, Morrow, Multnomah, Sherman, Umatilla, Union, Wallowa, and Wasco; and Washington—Asotin, Benton, Clark, Columbia, Cowlitz, Franklin, Garfield, Klickitat, Skamania, Wahkiakum, Walla Walla, and Whitman. BLM-administered lands are found in all counties with critical habitat except Wahkiakum.

Lower Columbia River

The Lower Columbia River ESU was Federally Listed as threatened on March 19, 1988. This ESU occurs in streams and tributaries to the Columbia River between the Cowlitz and Wind rivers, Washington (inclusive) and the Willamette and Hood rivers, Oregon (inclusive). Excluded are steelhead in the upper Willamette River Basin above Willamette Falls and steelhead from the Little and Big White Salmon rivers in Washington. NMFS filed final critical habitat designation for this species on August 15, 2005. Approximately 2,324 stream miles and 27 square miles of lake habitat has been designated as critical habitat. Major river basins containing spawning and rearing habitat for this ESU comprise approximately 5,017 square miles in Oregon and Washington. The following counties lie partially or wholly within these basins (or contain migration habitat for the species): Oregon—Clackamas, Clatsop, Columbia, Hood River, Marion, Multnomah, and Washington; and Washington—Clark, Cowlitz, Lewis, Pacific, Skamania, and Wahkiakum. Critical habitat is found in the following counties: Oregon—Clackamas, Clatsop, Columbia, Hood River, Marion, and Multnomah; and Washington—Clark, Cowlitz, Klickitat, Lewis, Skamania, and Wahkiakum. BLM-administered lands are found in all counties with critical habitat except Wahkiakum.

Upper Willamette

The Upper Willamette ESU of steelhead was Federally Listed as threatened on March 25, 1999. This ESU includes all naturally-spawned populations of winter-run steelhead in the Willamette River, Oregon, and its tributaries upstream from Willamette Falls to the Calapooia River, inclusive. NMFS filed final critical habitat designation for this species on August 15, 2005. Approximately 1,276 stream miles and 2 square miles of lake habitat has been designated as critical habitat. Major river basins containing spawning and rearing habitat for this ESU comprise approximately 4,872 square miles in Oregon and Washington. The following counties lie partially or wholly within these basins (or contain migration habitat for the species): Oregon—Benton, Clackamas, Clatsop, Columbia, Lincoln, Linn, Marion, Multnomah, Polk, Tillamook, Washington, and Yamhill; and Washington—Clark, Cowlitz, Pacific, and Wahkiakum. Critical habitat is found in the following counties: Oregon—Benton, Clackamas, Clatsop, Columbia, Linn, Marion, Multnomah, Polk, Tillamook, Washington, and Yamhill; and Washington—Clark, Cowlitz, and Wahkiakum. BLM-administered lands are found in all counties with critical habitat except Wahkiakum.

Middle Columbia River

The Middle Columbia River ESU was Federally Listed as threatened on March 25, 1999. This ESU occurs in streams from above the Wind River, Washington, and the Hood River, Oregon (exclusive), upstream to, and including, the Yakima River, Washington. Excluded are steelhead from the Snake River Basin. NMFS filed final critical habitat designation for this species on August 15, 2005. Approximately 5,815 stream miles has been designated as critical habitat. Major river basins containing spawning and rearing habitat for this ESU comprise approximately 26,739 square miles in Oregon and Washington. The following counties lie partially or wholly within these basins (or contain migration habitat for the species): Oregon—Clatsop, Columbia, Crook, Gilliam, Grant, Harney, Hood River, Jefferson, Morrow, Multnomah, Sherman, Umatilla, Union, Wallowa, Wasco, and Wheeler; and Washington—Benton, Clark, Columbia, Cowlitz, Franklin, Kittitas, Klickitat, Pacific, Skamania, Wahkiakum, Walla Walla, and Yakima. Critical habitat is found in the following counties: Oregon—Clatsop, Columbia, Crook, Gilliam, Grant, Hood River, Jefferson, Morrow, Multnomah, Sherman, Umatilla, Union, Wallowa, Wasco, and Wheeler; and Washington—Benton, Clark, Columbia, Cowlitz, Franklin, Kittitas, Klickitat, Skamania, Wahkiakum, Walla Walla, and Yakima. BLM-administered lands are found in all counties with critical habitat except Wahkiakum.

Chinook Salmon

Chinook salmon (*Oncorhynchus tshawtscha*) are found from the Bering Strait south to Southern California. Historically, they ranged as far south as the Ventura River in California. There are 17 ESUs of chinook salmon along the west coast of the United States, which range from southern California to the Canadian border and east to the Rocky Mountains. In the project area, there are eight listed ESUs: Sacramento Winter-run; Snake River Fall-run; Snake River Spring/Summer-run; Lower Columbia River; Upper Willamette River; Upper Columbia River Spring-run; Central Valley Spring-run; and California Coastal.

Chinook salmon are the largest of any salmon, with adults often exceeding 40 pounds. Like coho salmon, they are anadromous and spawn only once before dying. Chinook salmon stocks exhibit considerable variability in size and age of maturation, at least some of which is genetically determined. The relationship between size and length of migration may also reflect the earlier timing of river entry and the cessation of feeding for salmon stocks that migrate to the upper reaches of river systems. Body size, which is correlated with age, may be an important factor in migration and the successful construction of redds (spawning beds).

There are different seasonal runs of chinook salmon, which correspond to the timing of migration from ocean to freshwater. These runs have been identified on the basis of when adults enter freshwater to begin their spawning migration. However, distinct runs also differ in the degree of maturation at the time of river entry, the thermal regime and flow characteristics of their spawning site, and their actual time of spawning.

Adult female chinook prepare spawning beds in stream areas with suitable gravel composition, water depth, and velocity. The female then lays eggs, which she guards for a brief period before dying. Eggs hatch between 90 and

150 days after deposition, depending on water temperatures. The following spring, young salmon fry emerge, and may spend from 3 months to 2 years in freshwater before migrating to estuarine areas as smolts, and then into the ocean to feed and mature. Chinook salmon remain at sea for 1 to 6 years, with the exception of a small number of yearling males that mature in freshwater, or return after 2 to 3 months in salt water.

There are two distinct races of chinook salmon: stream-type and ocean-type. Stream-type chinook have a longer freshwater residency and perform extensive offshore migrations before returning to their natal streams in the spring and summer months. Ocean-type chinook, which are commonly found in coastal streams, typically migrate to sea within the first 3 months of emergence, but may spend up to a year in fresh water prior to emigration. They also spend their ocean life in coastal waters, utilizing estuaries and coastal areas more extensively for juvenile rearing.

Snake River Fall Run

The Snake River Fall-run ESU was Federally Listed as a threatened species on April 22, 1992. This ESU includes all natural populations occurring in the mainstem Snake River and any of the following subbasins: Tucannon River, Grande Ronde River, Imnaha River, Salmon River, and Clearwater River.

Critical habitat (designated on December 28, 1993) includes all river reaches presently or historically accessible (except reaches above impassable natural falls, and Dworshak and Hells Canyon dams) in the Columbia River, from a straight line connecting the west end of the Clatsop jetty (south jetty, Oregon side) and the west end of the Peacock jetty (north jetty, Washington side). Critical habitat also includes all Columbia River estuarine areas and river reaches proceeding upstream to the confluence of the Columbia and Snake rivers. On the Snake River, all reaches from the confluence of the Columbia River, upstream to Hells Canyon Dam are included. Also included are the Palouse River from its confluence with the Snake River upstream to Palouse Falls; the Clearwater River from its confluence with the Snake River upstream to its confluence with Lolo Creek; and the North Fork Clearwater River from its confluence with the Clearwater River upstream to Dworshak Dam. Major river basins containing spawning and rearing habitat for this ESU comprise approximately 13,679 square miles in Idaho, Oregon, and Washington. The following counties lie partially or wholly within these basins: Idaho—Adams, Benewah, Clearwater, Idaho, Latah, Lewis, Nez Perce, and Shoshone Valley; Oregon—Baker, Union, and Wallowa; and Washington—Adams, Asotin, Columbia, Franklin, Garfield, Walla Walla, and Whitman. Counties with critical habitat are: Idaho—Adams, Clearwater, Idaho, Latah, Lemhi, Lewis, and Nez Perce; Oregon—Baker, Clatsop, Columbia, Gilliam, Hood River, Morrow, Multnomah, Sherman, Umatilla, Wallowa, and Wasco; and Washington—Adams, Asotin, Benton, Clark, Columbia, Cowlitz, Franklin, Garfield, Klickitat, Lincoln, Pacific, Skamania, Spokane, Wahkiakum, Walla Walla, and Whitman. BLM-administered lands are found in all counties with critical habitat except Wahkiakum County.

Snake River Spring/Summer Run

The Snake River Spring/Summer-run ESU was Federally Listed as a threatened species on April 22, 1992. Included in this ESU are all natural populations occurring in the mainstem Snake River and in the subbasins of the Tucannon River, Grande Ronde River, Imnaha River, and Salmon River.

Critical habitat (designated on December 28, 1993) is similar to that for the Snake Fall-run ESU, except that stretches of the Palouse River, Clearwater River, and the North Fork Clearwater are not included. There are a total of 22,390 square miles of major river basins containing spawning and rearing habitat for this ESU in Idaho, Oregon, and Washington. The following counties lie partially or wholly within these basins: Idaho—Adams, Blaine, Custer, Idaho, Lemhi, Lewis, Nez Perce, and Valley; Oregon—Baker, Umatilla, Union, and Wallowa; and Washington—Adams, Asotin, Columbia, Franklin, Garfield, Walla Walla, and Whitman. Counties with critical habitat are: Idaho—Adams, Blaine, Custer, Idaho, Lemhi, Lewis, Nez Perce, and

Valley; Oregon—Baker, Clatsop, Columbia, Gillium, Hood River, Morrow, Multnomah, Sherman, Umatilla, Union, Wallowa, and Wasco; and Washington—Asotin, Benton, Clark, Columbia, Cowlitz, Franklin, Garfield, Klickitat, Pacific, Skamania, Wahkiakum, Walla Walla, and Whitman. BLM-administered lands are found in all counties with critical habitat except Wahkiakum County.

Lower Columbia River

The Lower Columbia River ESU was Federally Listed as threatened on March 24, 1999. Included in this ESU are all naturally-spawned populations occurring in the Columbia River and its tributaries, from its mouth at the Pacific Ocean upstream to a transitional point between Washington and Oregon east of the Hood River and the White Salmon River This ESU also includes populations in the Willamette River to Willamette Falls, Oregon, exclusive of spring-run chinook salmon in the Clackamas River.

On August 15, 2005, NMFS filed the final critical habitat designation for this species in Clackamas, Clatsop, Columbia, Hood River, Multnomah, Wasco counties in Oregon; and Clark, Cowlitz, Klickitat, Lewis, Pacific, Pierce, Skamania, Wahkiakum, and Yakima counties in Washington. Major river basins that contain spawning and rearing habitat for this ESU comprise approximately 6,338 square miles in Oregon and Washington. There are approximately 1,311 stream miles and 33 square miles of lake habitat within this ESU that is designated as critical habitat. The following counties lie partially or wholly within these basins, or contain migration habitat for the ESU: Oregon—Clackamas, Clatsop, Columbia, Hood River, Marion, Multnomah, Wasco, and Washington; and Washington—Clark, Cowlitz, Klickitat, Lewis, Pacific, Pierce, Skamania, Wahkiakum, and Yakima. Critical habitat is found in the following counties: Oregon—Clackamas, Clatsop, Columbia, Hood River, and Multnomah; and Washington—Clark, Cowlitz, Klickitat, Lewis, Pacific, Skamania, and Wahkiakum. BLM-administered lands are found in all counties with critical habitat except Pierce and Wahkiakum counties.

Upper Willamette River

The Upper Willamette River chinook salmon ESU was Federally Listed as threatened on March 24, 1999. This ESU includes all naturally-spawned populations occurring in the Clackamas River and in the Willamette River, and its tributaries, above Willamette Falls, Oregon.

NMFS filed final critical habitat designation for this species on August 15, 2005. Approximately 1,472 stream miles and 18 square mile of lake habitat has been designated as critical habitat in this ESU. Major river basins containing spawning and rearing habitat for this ESU comprise approximately 8,575 square miles. The following counties lie partially or wholly within these basins (or contain migration habitat for the species): Oregon—Benton, Clackamas, Clatsop, Columbia, Douglas, Lane, Lincoln, Linn, Marion, Multnomah, Polk, Tillamook, Washington, and Yamhill; and Washington—Clark, Cowlitz, Pacific, and Wahkiakum. Critical habitat has been designated in the following counties: Oregon—Benton, Clackamas, Clatsop, Columbia, Lane, Linn, Marion, Multnomah, Polk, and Yamhill; and Washington—Clark, Cowlitz, and Wahkiakum. BLM-administered lands are found in all counties with critical habitat except Wahkiakum County.

Upper Columbia River Spring Run

The Upper Columbia River Spring-run ESU was Federally Listed as threatened on March 24, 1999. Included in this ESU are all naturally-spawned populations occurring in all accessible river reaches in Columbia River tributaries upstream of the Rock Island Dam and downstream of Chief Joseph Dam in Washington, excluding the Okanogan River. Chinook salmon (and their progeny) from the following hatchery stocks are considered part of the listed ESU: Chiwawa River (spring run); Methow River (spring run); Twisp River (spring run); Chewuch River (spring run); White River (spring run); and Nason Creek (spring run).

NMFS filed final critical habitat designation for this species on August 15, 2005. Approximately 974 stream miles and 4 square miles of lake habitat has been designated as critical habitat in this ESU. Major river basins containing spawning and rearing habitat for this ESU comprise approximately 7,003 square miles in Oregon and Washington. The following counties lie partially or wholly within these basins (or contain migration corridors for the species): Oregon—Clatsop, Columbia, Hood River, Gilliam, Morrow, Multnomah, Sherman, Umatilla, and Wasco; and Washington—Benton, Chelan, Clark, Cowlitiz, Douglas, Franklin, Grant, Klickitat, Kittitas, Okanogan, Pacific, Skamania, Wahkiakum, Walla Walla, and Yakima. Critical habitat for this ESU is found in the following counties: Oregon—Clatsop, Columbia, Gilliam, Hood River, Morrow, Multnomah, Sherman, Umatilla, and Wasco; and Washington—Benton, Chelan, Clark, Cowlitiz, Douglas, Franklin, Grant, Kittitas, Klickitat, Okanogan, Pacific, Skamania, Wahkiakum, Walla Walla, and Yakima. BLM-administered lands are found in all counties with critical habitat except Wahkiakum County.

Threatened

Warner Sucker

The primary reference for this section is: USFWS. 1998l. Recovery Plan for the Native Fishes of the Warner Basin and Alkali Subbasin. Portland, Oregon. References cited in this section are internal to the above-referenced document. They are included in the Bibliography.

The Warner sucker (*Catostomus warnerensis*) is endemic to the Warner Basin of southeastern Oregon. The probable historic range of this species includes the main Warner Lakes (Pelican, Crump, and Hart), and other accessible standing or flowing water in the Warner Valley, as well as the low-to-moderate gradient reaches of the tributaries that drain into the valley. Studies conducted between 1977 and 1991 indicate that when adequate water is present, Warner suckers may inhabit all the lakes, sloughs, and potholes in the Warner Valley. Stream resident populations are found in Honey Creek, Snyder Creek, Twentymile Creek, and Twelvemile Creek.

There are two phenotypic variations, or morphs of the Warner sucker, which correspond to the two generally continuous aquatic habitat types provided by the Warner Basin. Stream morphs occur in the temporally stable stream environments, and lake morphs occur in the temporally less stable lake environments. Individual fish can opportunistically change from one morph to another based on the types of habitat that are available. The exact nature of the relationship between lake and stream morphs is not well studied, and remains poorly understood.

The feeding habitats of the Warner sucker depend to a large degree on habitat and life history stage, with adult suckers becoming more generalized than juveniles and young-of-year. Larvae have terminal mouths and short digestive tracts, enabling them to feed selectively in midwater or at the surface. Invertebrates, particularly planktonic crustaceans, make up most of their diet. As the suckers grow, they develop subterminal mouths and longer digestive tracts, and gradually become benthic feeders, eating diatoms, filamentous algae, and detritus. Adult stream morph suckers forage nocturnally over a wide variety of substrates, such as boulders, gravel, and silt. Adult lake morph suckers are thought to have a similar diet, though they feed over predominantly muddy substrates (Tait and Mulkey 1993a, b).

Spawning usually occurs in April and May in streams, although variations in water temperature and stream flows may result in either earlier or later spawning. Temperature and flow cues appear to trigger spawning, with most taking place at 57 to 68 °F when stream flows are relatively high. Suckers spawn in sand or gravel beds in slow pools (White et al. 1990, 1991; Kennedy and North 1993). In years when access to stream spawning areas is limited by low flow or by physical in-stream blockages, suckers may attempt to spawn on gravel beds along the lake shorelines.

Larvae are found in shallow backwater pools or on stream margins where there is no current, often among or near macrophytes. Young-of-year are often found over still, deep water from midwater to the surface, but also move into faster flowing water near the heads of pools (Coombs et al. 1979). Juveniles (1 to 2 years old) are usually found at the bottom of deep pools or in other habitats that are relatively cool or permanent, such as near springs. In general, adults use stretches of streams where the gradient is sufficiently low to allow the formation of long (167 feet or longer) pools. These pools tend to have undercut banks, large beds of aquatic macrophytes, root wads or boulders, a surface to bottom temperature differential of at least 36 °F, a maximum depth greater than 5 feet, and overhanging vegetation.

The Warner sucker was Federally Listed as threatened on September 27, 1985, with critical habitat designated at the time of listing. Critical habitat for this species includes the following areas: 1) Twentymile Creek from the confluence of Twelvemile and Twentymile Creeks upstream for about 4 miles; 2) Twentymile Creek starting about 9 miles upstream of the confluence of Twelvemile and Twentymile Creeks and extending downstream for about 18 miles; 3) Spillway Canal north of Hart Lake and continuing about 2 miles downstream; 4) Snyder Creek from the confluence of Snyder and Honey Creeks upstream for about 3 miles; and 5) Honey Creek from the confluence of Hart Lake upstream 16 miles.

The Warner sucker is threatened by human-induced stream channel and watershed degradation; irrigation diversion practices that block its spawning migration routes and reduce stream flows below the points of diversion; and predation by and competition with non-native game fish such as crappie, bullhead catfish, and bass that were previously stocked in Warner Basin lakes.

Hutton Tui Chub

The following information, taken from Moyle (1976), refers to tui chubs in general. Tui chubs occur in a wide variety of habitats, most commonly in the weedy shallows of lakes and quiet waters in sluggish rivers. They do well in a wide variety of water conditions from warm to cold, and clear to eutrophic. In the fall, they seek out deeper water and may spend winters in a semi-dormant state on the bottom of lakes. Tui chubs are opportunistic omnivores concentrating on invertebrates associated with bottom or aquatic plants (i.e., clams, insect larvae, insects, crayfish), as well as algae and plant material.

Tui chub usually spawn from late April to late June; eggs adhere to plants or the bottom and hatch in 9 days. In large deep lakes, they tend to form large schools in shallow water frequently associated with beds of aquatic vegetation. In shallow lakes, with heavy aquatic growth, schooling is less noticeable. Tui chubs tend to disperse amongst the vegetation, presumably as protection from predators. They also appear to be able to adapt to the severe long- and short-term climatic fluctuations characteristic of the interior basins where they are most common. The minnow family in general has been successful because they have a well-developed sense of hearing, release a fear scent when injured (a warning signal to others), have a broad diet, and exhibit high fecundity. Despite these advantages, many native minnows are declining in numbers as their environment deteriorates beyond their ability to cope with the changes or they are displaced by more aggressive introduced species.

The Hutton tui chub (*Gila bicolor* ssp.) is endemic to Hutton Spring and a nearby unnamed spring in Lake County, south-central Oregon (NatureServe Explorer 2001). These springs are located in a grassy rangeland bordered to the north and west by shrubby rangeland and to the east and south by the lake bed of pluvial Alkali Lake.

The Hutton tui chub was Federally Listed as threatened on March 28, 1985. Critical habitat has not been designated. The current isolation of the Hutton tui chub was caused by the desiccation of pluvial Alkali Lake (Snyder 1908a, Hubbs and Miller 1942). Present status is in part a result of past access by cattle to the springs in which the Hutton tui chub occurs (Franzreb 1985). Threats include pumping of water from the springs, which occurred in the past but is no longer occurring (Bond 1974, Franzreb 1985), and contamination of groundwater by dispersal of chemicals from a nearby herbicide-manufacturing residue disposal site (Franzreb 1985). Modification of the springs by heavy equipment (causing siltation, erosion, vegetation cover loss, water diversion and drawdown) has also had detrimental effects on the chub population.

<u>*Lahontan Cutthroat Trout*</u>

The primary reference for this section is: Hudson, B., J. Augsburger, M. Hillis, and P. Boehne. 2000. Draft Biological Assessment for the Interior Columbia River Basin Ecosystem Management Project Final Environmental Impact Statement. USDI BLM and USDA Forest Service. Boise, Idaho. References cited in this section are internal to the above-referenced document. Full citations have been included in the Bibliography.

The Lahontan cutthroat trout (*Oncorhyncus clarki henshawi*) in the only trout native to the Lahontan subbasin of the American Great Basin, west-central Nevada. Historically, the subspecies was found in the Carson, Humboldt, Truckee, and Walker rivers, and in their tributary lakes and streams. Since the late 19^{th} century, fluvial (stream) and lacustrine (lake) populations of the Lahontan cutthroat trout have been reduced to approximately 10.7% and 0.4% of their original habitat, respectively.

Lahontan cutthroat trout occupy a great variety of habitats, from large rivers and lakes to small tributary streams. They are unusually tolerant of both high temperatures (> 81 °F) and large daily fluctuations in temperature (up to 68 °F). In addition, they are tolerant of high alkalinity (>3,000 ppm) and dissolved solids (>10,000 ppm). However, they are intolerant of competition or predation by non-native salmonids (LaRivers 1962, Trotter 1987, Behnke 1992).

Lahontan cutthroat trout are obligate but opportunistic stream spawners. Typically, they spawn from April through July, depending on water temperature and flow characteristics, though autumn spawning runs have also been reported for some populations. Fish may spawn more than once, although post-spawning mortality rates of 60 to 90% have been reported. Lake residents migrate into streams to spawn, typically on well-washed gravels in riffles. Adults court, pair, and deposit and fertilize eggs in a spawning bed dug by the female, which may then be defended for some period of time.

The Lahontan cutthroat trout was Federally Listed as threatened on July 16, 1975. Critical habitat has not been designated. The observed major decline in this species has been attributed to habitat loss, introgression with introduced rainbow trout, and competition with other introduced species of trout, such as brown and brook trout. Habitat loss and the negative impacts of non-native fishes continue to be the primary threats to the Lahontan cutthroat trout (Coffin and Cowan 1995, Gerstrung 1998).

<u>*Coho Salmon*</u>

Historically, coho salmon (*Oncorhyncus kisutch*) were distributed throughout the North Pacific Ocean, from Central California to Point Hope, Alaska, through the Aleutian Islands, and from the Anadyr River, Russia south to Hokkaido, Japan. The species probably once inhabited most coastal streams in Washington, Oregon, and northern California. Some populations, now considered extinct, are believed to have migrated hundreds of miles inland to spawn in tributaries of the upper Columbia River in Washington and the Snake River in Idaho. There are six distinct ESUs of coho salmon along the West Coast of the United States, three of which are listed and occur in the project area: Central California, Southern Oregon/Northern California Coast, and Oregon Coast.

Coho salmon are anadromous; adults migrate from a marine environment into the freshwater streams and rivers of the birth. The species spawns only once, and then dies. Coho spend approximately the first half of their life cycle rearing in streams and small freshwater tributaries. The remainder of their life cycle is spent foraging in estuarine and marine waters of the Pacific Ocean, prior to returning to their stream of origin to spawn and die. Most fish return to spawn at 3 years old, although some precocious males may do so at 2 years of age.

Southern Oregon/Northern California Coasts

The Southern Oregon/Northern California Coasts ESU was Federally Listed as threatened on May 6, 1997. This ESU includes all naturally spawned populations occurring in coastal streams between Cape Blanco, Oregon, and Punta Gorda, California. Critical habitat (designated on May 5, 1999) includes all accessible reaches within this range, with the exception of areas above specific dams or above longstanding, naturally impassable barriers. Major river basins containing spawning and rearing habitat for this ESU comprise approximately 18,090 square miles in California and Oregon. Counties that lie partially or wholly within watersheds inhabited by this ESU include Del Norte, Glenn, Humboldt, Lake, Mendocino, Siskiyou, and Trinity counties in California, and Coos, Curry, Douglas, Jackson, Josephine, and Klamath counties in Oregon. Counties with critical habitat are Del Norte, Glenn, Humboldt, Lake, Mendocino, Siskiyou, and Trinity counties in California, and Curry, Douglas, Jackson, Josephine, and Klamath counties in Oregon; BLM-administered lands are also found in these counties.

Lower Columbia River

The Lower Columbia River ESU was Federally Listed as threatened on June 28, 2005. This ESU includes all naturally spawned populations occurring in the Columbia River and its tributaries in Washington and Oregon, from the mouth of the Columbia River up to and including the Big White Salmon and Hood Rivers. This ESU also includes the Willamette River to Willamette Falls, Oregon, as well as 25 artificial propagation programs. Critical habitat for this ESU is currently under development, and has not yet been proposed for designation.

Foskett Speckled Dace

The Foskett speckled dace (*Rhinichthys osculus* ssp.) is endemic to Foskett Spring in south-central Oregon, a small spring system in the Coleman Basin on the west side of Warner Valley. Habitat is a small springhole and overflow rivulets that occur in what appears to be mixed rangeland at the edge of an alkali playa. The wet areas at the spring, along the course of the rivulets, and at the sump on the edge of the playa supports grasses and some aquatic vegetation, including cattails. The main population is in the springhole, which is about 6 feet in diameter and mostly 6 to 12 inches deep. Individuals also live in tiny outflow rivulets that are at times only a few inches wide and deep. Some are found in cattle tracks into which water seeps continuously (Bond 1974). Cover utilized includes overhanging bank edges, grass, exposed grass roots, and filamentous algae. Water in the spring is clear, and the current is slow. The bottom is primarily mud. The dace has also been introduced into Dace Spring, an excavated area at a spring source located on public land about 1 mile south of Foskett Spring. This artificial habitat is muddy and well-vegetated (Armantrout 1985). Although individuals have been collected from shallow water habitats associated with filamentous algae, exposed grass roots, and emergent aquatic vegetation, this habitat is not believed to be optimal. Based on conditions under which other speckled dace live, it is likely that deeper water with moderate vegetative cover would be better habitat.

The Foskett speckled dace appears to feed primarily on invertebrates. Extensive migration is not known, but larval and early juvenile dace have been observed only in the marsh at the edge of the lake bed (Hayes 1980), so there is either a migration of adults downstream to spawn, or a migration of the hatched larvae from the spring hole or rivulets to the marsh (a distance of about 6 to 12 feet). Reproduction apparently occurs in the second year of age, and spawning is believed to occur between late May and early July (Hayes 1980).

The Foskett speckled dace was Federally Listed as threatened on March 28, 1985. Critical habitat has not been designated. The subspecies apparently became isolated in Foskett Spring about 9,000 to 10,000 years ago, when Lake Warner went dry (Hubbs and Miller 1948a). Its main natural habitat has been overrun by vegetation or heavily trampled by cattle. Future perceived threats are essentially the same as the past reasons for decline, although the dace population seems to have stabilized to a point compatible with present use of the area by cattle. A spring to which the dace was transplanted by the BLM is fenced to exclude cattle (Armantrout and Bond 1981), and the main threat at this site is the encroachment of vegetation (cattails and possible rushes), and the resulting decrease in dissolved oxygen. Pumping of groundwater or channelization (via heavy equipment, such as a backhoe) at either site could impact the habitat as well (USFWS 1985i). Both springs that contain the dace are in a known geothermal area, so there is also a potential future threat of energy development.

<u>Bull Trout</u>

The primary references for this section are: USFWS. 1999h. Determination of Threatened Status for Bull Trout in the Coterminous United States Final Rule. Federal Register 64(210):58909-58933; Federal Register/Vol. 75, No. 9/Thursday, January 14, 2010/2270-2431/Proposed Rules; and, USFWS Biological Opinion and Letter of Concurrence USDA Forest Service, USDI Bureau of Land Management and the Coquille Indian Tribe for Programmatic Aquatic Habitat Restoration Activities in Oregon and Washington That Affect ESA-listed Fish, Wildlife, and Plant Species and their Critical Habitats, June 14, 2007. References cited in this section are internal to these documents.

Bull trout (*Salvelinus confluentus*) are native to the Pacific Northwest and western Canada. They historically occurred in major river drainages in the Pacific Northwest, from the southern limits in the McCloud River in northern California and the Jarbidge River in Nevada, north to the headwaters of the Yukon River in Northwest Territories, Canada (Cavender 1978, Bond 1992). To the west, the range of the bull trout includes the Puget Sound, and various coastal rivers of Washington, British Columbia, Canada, and southeast Alaska (Bond 1992, Leary and Allendorf 1997). Bull trout are relatively dispersed throughout tributaries of the Columbia River Basin, including its headwaters in Montana and Canada. Bull trout also occur in the Klamath River Basin of south-central Oregon. East of the Continental Divide, they are found in the headwaters of the Saskatchewan River in Alberta and the MacKenzie River system in Alberta and British Columbia (Cavender 1978, Brewin and Brewin 1997).

Bull trout exhibit both resident and migratory life-history strategies through much of their current range (Rieman and McIntyre 1993). Resident bull trout complete their life cycles in the tributary streams in which they spawn and rear. Migratory bull trout spawn in tributary streams, and juvenile fish rear from 1 to 4 years before migrating to either a lake (adfluvial), river (fluvial), or in certain coastal areas, saltwater (anadromous), to mature (Fraley and Shepard 1989, Goetz 1989). Anadromy is the least studied life-history stage in bull trout, and some biologists believe the existence of true anadromy in bull trout is still uncertain (McPhail and Baxter 1996). Resident and migratory forms may be found together, and bull trout may produce offspring exhibiting either resident or migratory behavior (Rieman and McIntyre 1993).

Compared to other salmonids, bull trout have more specific habitat requirements (Rieman and McIntyre 1993) that appear to influence their distribution and abundance. Critical parameters include water temperature, cover, channel form and stability, valley form, spawning and rearing substrates, and migratory corridors (Oliver 1979; Pratt 1984, 1992; Fraley and Shepard 1989; Goetz 1989; Hoelscher and Bjornn 1989; Sedell and Everest 1991; Howell and Buchanan 1992; Rieman and McIntyre 1993, 1995; Rich 1996; Watson and Hillman 1997). Watersheds must have specific physical characteristics to provide the necessary habitat requirements for bull trout spawning and rearing, although these characteristics are not necessarily ubiquitous throughout watersheds in which bull trout occur. Because bull trout exhibit a patchy distribution, even in undisturbed habitats (Rieman and McIntyre 1993), fish would not likely occupy all available habitats simultaneously (Rieman et al. 1997).

Bull trout are typically associated with the colder streams in a river system, although fish can occur throughout larger river systems (Fraley and Shepard 1989; Rieman and McIntyre 1993, 1995; Buchanan and Gregory 1997; Rieman et al. 1997). Spawning areas are often associated with cold-water springs, groundwater infiltration, and the coldest streams in a given watershed (Pratt 1992; Rieman and McIntyre 1993; Rieman et al. 1997). All life history stages of bull trout are associated with complex forms of cover, including large woody debris, undercut banks, boulders, and pools (Oliver 1979, Fraley and Shepard 1989, Goetz 1989, Hoelscher and Bjornn 1989, Sedell and Everest 1991, Pratt 1992, Thomas 1992, Rich 1996, Sexauer and James 1997, Watson and Hillman 1997). Maintaining bull trout populations requires stream channel and flow stability (Rieman and McIntyre 1993). Juvenile and adult bull trout frequently inhabit side channels, stream margins, and pools with suitable cover (Sexauer and James 1997). These areas are sensitive to activities that directly or indirectly affect stream channel stability and alter natural flow patterns.

Preferred spawning habitat generally consists of low gradient stream reaches, which are often found in high gradient streams that have loose, clean gravel (Fraley and Shepard 1989) and water temperatures of 41 to 48 °F in late summer to early fall (Goetz 1989). The size and age of maturity for bull trout is variable depending upon life-history strategy. Growth of resident fish is generally slower than that of migratory fish; resident fish tend to be smaller at maturity and less fecund (productive; Fraley and Shepard 1989, Goetz 1989). Bull trout normally reach sexual maturity in 4 to 7 years, and can live 12 or more years. Biologists report repeat and alternate year spawning, although repeat spawning frequency and post-spawning mortality are not well known (Leathe and Graham 1982, Fraley and Shepard 1989, Pratt 1992, Rieman and McIntyre 1996). Bull trout typically spawn from August to November during periods of decreasing water temperatures. However, migratory bull trout may begin spawning migrations as early as April, and move upstream as far as 155 miles to spawning grounds in some areas of their range (Fraley and Shepard 1989, Swanberg 1997). Depending on the water temperature, egg incubation is normally 100 to 145 days (Pratt 1992), and juveniles remain in the substrate after hatching. Fry normally emerge from early April through May, depending on water temperatures and increasing stream flows (Pratt 1992, Ratliff and Howell 1992).

Bull trout are opportunistic feeders, with food habits primarily a function of size and life-history strategy. Resident and juvenile bull trout prey on terrestrial and aquatic insects, macro-zooplankton, amphipods, mysids, crayfish, and small fish (Wyman 1975, Rieman and Lukens 1979 *cited in* Rieman and McIntyre 1993, Boag 1987, Goetz 1989, Donald and Alger 1993). Adult migratory bull trout are primarily piscivorous, known to feed on various trout and salmon species, whitefish, yellow perch and sculpin (Fraley and Shepard 1989, Donald and Alger 1993).

The bull trout was Federally Listed as threatened throughout its entire range in the coterminous United States on November 1, 1999. On October 6, 2004, approximately 1,748 miles of streams and 61,235 acres of lakes and reservoirs in Oregon, Washington, and Idaho were designated as critical habitat for the Klamath River and Columbia River populations of bull trout. However, the USFWS is currently re-evaluating this designation. The decline of bull trout is primarily attributable to habitat degradation and fragmentation, blockage of migratory corridors, poor water quality, past fisheries management practices, and the introduction of non-native species.

On January 14, 2010 the USFWS issued a proposed rule to revise the designation of critical habitat for the bull trout with a final decision to be submitted to the Federal Register by September 30, 2010. This proposed revision identifies additional streams, rivers, lakes, reservoirs, and near shore areas as critical habitat in Oregon, Idaho, Washington, Montana, and Nevada. In addition to implementing SOPs and mitigation measures identified in this EIS, and in the absence of additional site-specific analysis or consultation, the BLM in Oregon will continue to follow applicable project design criteria as identified in the USFWS Biological Opinion and Letter of Concurrence for the Programmatic Aquatic Habitat Restoration Activities in Oregon and Washington That Affect ESA-listed Fish, Wildlife, and Plant Species and their Critical Habitats. The BLM is Conferencing with the Service on this proposed rule as per section 7(a)4 of the Act with documentation to be provided as part of the Service's letter of concurrence for the proposed action.

Pacific Eulachon

The primary references for this section area: Federal Register/Vol. 75, No. 52/Thursday, March 18, 2010/13012-13024; and, NMFS Endangered Species Act – Section 7 Programmatic Consultation Biological Opinon and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation, June 27, 2008.

On March 18, 2010 the National Marine Fisheries Service (NMFS) issued a final determination to list the southern Distinct Population Segment (DPS) of the Pacific eulachon (*Thaleichthys pacificus*) as a threatened species under the Endangered Species Act of 1973, as amended (6). NMFS intends to consider protective regulations and critical habitat for this DPS in separate rule making to occur at a later date. In the absence of finer scale distribution maps, it is assumed that the eulachon occurs in Oregon within the Salem District (eg. Sandy River) and may also occur on the Eugene and Coos Bay Districts. The most significant threat to eulachon identified by NMFS are changes in ocean conditions due to climate change followed by a moderate threat associated with climate-induced change to freshwater habitats (6). Since there are no anticipated contributions to climate change which would result from implementing any of the alternatives analyzed in the Oregon EIS (FEIS 162), there are not likely to be any adverse affects to eulachon or their ocean and freshwater habitats. In addition to Conservation Measures identified in the NMFS PEIS Biological Opinion for anadromous fish, and in the absence of additional site-specific analysis or consultation, Oregon will continue to follow applicable project design criteria as identified in the NMFS *Endangered Species Act-Section 7 Programmatic Consultation Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation* (7). ESA Consultation is ongoing with NMFS and any applicable direction concerning the eulachon will be addressed in the forthcoming biological opinion.

Conservation Measures for Aquatic Animals

Many local BLM offices already have management plans in place that ensure the protection of these species, and have completed formal or informal consultations on similar treatment activities. These consultations have identified protection zones alongside aquatic habitats that support these species. The conservation measures discussed below are probable steps required of the BLM to ensure that vegetation treatments would minimize impacts to TEP species. These conservation measures are intended as broad guidance at the programmatic level; further analysis of treatment programs and species habitats at the local level is required to better reduce potential impacts from proposed vegetation treatments. Completion of consultation at the local level will fine-tune conservation measures associated with treatment activities and ensure consistency of the treatments with ESA requirements.

The aquatic TEP species considered in this programmatic BA occur in varied habitats, over a large geographic area. The conservation measures guidance presented below is intended to apply broadly to aquatic species and habitats over the entire region covered by this BA, based on the common features found in nearly all aquatic and riparian habitats. Some species with alternate or unusual habitat requirements may require additional conservation measures to ensure a Not Likely to Adversely Affect determination at the local level. Such additional conservation measure are outside the scope of this BA, and will be completed at the local level.

Some local BLM plans have delineated protected riparian areas, or portions of watersheds where riparian-dependent resources receive primary emphasis, and management activities are subject to specific standards and guidelines (USDA Forest Service 1995). These protected riparian areas include traditional riparian corridors, wetlands, intermittent streams, and other areas that help maintain the integrity of aquatic ecosystems by 1) influencing the delivery of coarse sediment, organic matter, and woody debris to streams; 2) providing root strength for channel stability; 3) shading the stream; and 4) protecting water quality. Examples of protected riparian areas are the BLM's Riparian Reserves of the Pacific Northwest and the Interior Columbia Basin, as described in the Aquatic Conservation Strategy (USDA Forest Service and USDI BLM 1994). The term "riparian areas," as used in the conservation measures guidance below, refers to riparian protected areas, wherever such designations apply. However, since not all local BLM plans have made such designations, "riparian areas," when the above-mentioned use is not applicable, generally refers to: 1) for streams, the stream channel and the extent of the 100-year floodplain; and 2) for wetlands, ponds, and lakes, and other aquatic habitats, the area extending to the edges of the riparian vegetation, provided it is no less than the minimum buffer distance for a given site established by local BLM biologists.

Conservation Measures for Site Access and Fueling/Equipment Maintenance

For treatments occurring in watersheds with TEP species or designated or undesignated critical habitat (i.e., unoccupied habitat critical to species recovery):

- Where feasible, access work site only on existing roads, and limit all travel on roads when damage to the road surface will result or is occurring.
- Where TEP aquatic species occur, consider ground-disturbing activities on a case by case basis, and implement Standard Operating Procedures to ensure minimal erosion or impact to the aquatic habitat.
- Within riparian areas, do not use vehicle equipment off of established roads.
- Outside of riparian areas, allow driving off of established roads only on slopes of 20% or less.
- Except in emergencies, land helicopters outside of riparian areas.
- Within 150 feet of wetlands or riparian areas, do not fuel/refuel equipment, store fuel, or perform equipment maintenance (locate all fueling and fuel storage areas, as well as service landings outside of protected riparian areas).
- Prior to helicopter fueling operations prepare a transportation, storage, and emergency spill plan and obtain the appropriate approvals; for other heavy equipment fueling operations use a slip-tank not greater than 250 gallons; Prepare spill containment and cleanup provisions for maintenance operations.
- Do not conduct biomass removal (harvest) activities that will alter the timing, magnitude, duration, and spatial distribution of peak, high, and low flows outside the range of natural variability.

Conservation Measures Related to Revegetation Treatments

- Outside riparian areas, avoid hydro-mulching within buffer zones established at the local level. This precaution will limit adding sediments and nutrients and increasing water turbidity.
- Within riparian areas, engage in consultation at the local level to ensure that revegetation activities incorporate knowledge of site-specific conditions and project design.

Conservation Measures Related to Herbicide Treatments

The complexity of this action within riparian areas requires local consultation, which will be based on herbicide risk assessments.

Possible Conservation Measures:

- Maintain equipment used for transportation, storage, or application of chemicals in a leak proof condition.
- Do not store or mix herbicides, or conduct post-application cleaning within riparian areas.
- Ensure that trained personnel monitor weather conditions at spray times during application.
- Strictly enforce all herbicide labels.
- Do not broadcast spray within 100 feet of open water when wind velocity exceeds 5 mph.
- Do not broadcast spray when wind velocity exceeds 10 mph.

- Do not spray if precipitation is occurring or is imminent (within 24 hours).
- Do not spray if air turbulence is sufficient to affect the normal spray pattern.
- Do not broadcast spray herbicides in riparian areas that provide habitat for TEP aquatic species. Appropriate buffer distances should be determined at the local level to ensure that overhanging vegetation that provides habitat for TEP species is not removed from the site. Buffer distances provided as conservation measures in the assessment of effects to plants (Chapter 4 of this BA) and fish and aquatic invertebrates should be consulted as guidance (Table A2-3). (Note: the Forest Service did not determine appropriate buffer distances for TEP fish and aquatic invertebrates when evaluating herbicides in Forest Service ERAs; buffer distances were only determined for non-TEP species.)
- Do not use diquat, fluridone, terrestrial formulations of glyphosate, or triclopyr BEE, to treat aquatic vegetation in habitats where aquatic TEP species occur or may potentially occur.
- Avoid using glyphosate formulations that include R-11 in the future, and either avoid using any formulations with POEA, or seek to use the formulation with the lowest amount of POEA available, to reduce risks to aquatic organisms.
- Follow all instructions and Standard Operating Procedures to avoid spill and direct spray scenarios into aquatic habitats. Special care should be followed when transporting and applying 2,4-D, bromacil, clopyralid, diuron, glyphosate, hexazinone, imazapyr, metsulfuron methyl, picloram, tebuthiuron, and triclopyr.
- Do not broadcast spray diuron, glyphosate, picloram, or triclopyr BEE in upland habitats adjacent to aquatic habitats that support (or may potentially support) aquatic TEP species under conditions that would likely result in off-site drift.
- In watersheds that support TEP species or their habitat, do not apply bromacil, diuron, tebuthiuron, or triclopyr BEE in upland habitats within ½ mile upslope of aquatic habitats that support aquatic TEP species under conditions that would likely result in surface runoff.

Numerous conservation measures were developed from information provided in ERAs. The measures listed below would apply to TEP fish and other aquatic species at the programmatic level in all 17 western states. However, local BLM field offices could use interactive spreadsheets and other information contained in the ERAs to develop more site-specific conservation measures and management plans based on local conditions (soil type, rainfall, vegetation type, and herbicide treatment method). It is possible that conservation measures would be less restrictive than those listed below if local site conditions were evaluated using the ERAs when developing project-level conservation measures.

Conservation Measures Related to Non-herbicide Treatments

Conservation Measures Related to Prescribed Fire

Within riparian areas, in watersheds with TEP species or their habitats:

- Conduct prescribed burning only when long-term maintenance of the riparian area is the primary objective, and where low intensity fires can be maintained.
- Do not construct black lines, except by non-mechanized methods.
- Utilize/create only the following firelines: natural barriers; hand-built lines parallel to the stream channel and outside of buffer zones established at the local level; or hand built lines perpendicular to the stream channel with waterbars and the same distance requirement.
- Do not ignite fires using aerial methods.
- In forested riparian areas, keep fires to low severity levels to ensure that excessive vegetation removal does not occur.
- Do not camp, unless allowed by local consultation.

- Have a fisheries biologist determine whether pumping activity can occur in streams with TEP species.
- During water drafting/pumping, maintain a continuous surface flow of the stream that does not alter original wetted stream width.
- Do not alter dams or channels in order to pump in streams occupied by TEP species.
- Do not allow helicopter dipping from waters occupied by TEP species, except in lakes outside of the spawning period.
- Consult with a local fisheries biologist prior to helicopter dipping in order to avoid entrainment and harassment of TEP species.

Conservation Measures Related to Mechanical Treatments

Note: these measures apply only to treatments occurring in watersheds that support TEP species or in unoccupied habitat critical to species recovery (including but not limited to critical habitat, as designated by USFWS).

Outside riparian areas in watersheds with TEP species or designated or undesignated critical habitat (i.e., unoccupied habitat critical to species recovery):

- Conduct soil-disturbing treatments only on slopes of 20% or less, where feasible.
- Do not conduct log hauling activities on native surface roads prone to erosion, where feasible.

Within riparian areas in these watersheds, more protective measures will be required to avoid negatively affecting TEP species or their habitat:

- Do not use vehicles or heavy equipment, except when crossing at established crossings.
- Do not remove large woody debris or snags during mechanical treatment activities.
- Do not conduct ground disturbing activities (e.g., disking, drilling, chaining, and plowing).
- Ensure that all mowing follows guidance to avoid negative effects to streambanks and riparian vegetation and major effects to streamside shade.
- Do not use equipment in perennial channels or in intermittent channels with water, except at crossings that already exist.
- Leave suitable quantities (to be determined at the local level) of excess vegetation and slash on site.
- Do not apply fertilizers or seed mixtures that contain chemicals by aerial methods.
- Do not apply fertilizer within 25 feet of streams and supersaturated soils; apply fertilizer following labeling instructions.
- Do not apply fertilizer in desert habitats.
- Do not completely remove trees and shrubs.

Conservation Measures Related to Biological Control Treatments using Livestock

For treatments occurring in watersheds that support TEP species or in critical habitat:

- Where terrain permits, locate stock handling facilities, camp facilities, and improvements at least 300 feet from lakes, streams, and springs.
- Educate stock handlers about at-risk fish species and how to minimize negative effects to the species and their associated habitat.
- Employ appropriate dispersion techniques to range management, including judicial placement of saltblocks, troughs, and fencing, to prevent damage to riparian areas but increase weed control.
- Equip each watering trough with a float valve.

Within riparian areas of these watersheds, more protective measures are required.

- Do not conduct weed treatments involving domestic animals, except where it is determined that these treatments will not damage the riparian system, or will provide long-term benefits to riparian and adjacent aquatic habitats.
- Do not locate troughs, storage tanks, or guzzlers near streams with TEP species, unless their placement will enhance weed-control effectiveness without damaging the riparian system.

Local BLM offices should design conservation measures for treatment plans using the above conservation measures as guidance, but altering it as needed based on local conditions and the habitat needs of the particular TEP aquatic species that could be affected by the treatments. Locally-focused conservation measures would be necessary to reduce or avoid potential impacts such that a Not Likely to Adversely Affect determination would be reached during the local-level NEPA process. BLM offices that are responsible for the protection of Northwest salmonids are directed to the guidance document: Criteria for At-Risk Salmonids: National Fire Plan Activities, Version 2.1 (National Fire Plan Technical Team 2002), which contains detailed instructions for developing suitable conservation measures for these TEP species in conjunction with vegetation treatment programs, and from which many of the above-listed conservation measures were taken.

Invertebrates

Endangered

Fender's Blue Butterfly

The primary reference for this section is: USFWS. 2000i. Endangered Status for *Erigeron decumbens* var. *decumbens* (Willamette Daisy) and *Plebejus icarioides fenderi* (Fender's Blue Butterfly) and Threatened Status for *Lupinus sulphureus* ssp. *kincaidii* (Kincaid's Lupine). Federal Register 65(16):3875-3890.

The Fender's blue butterfly (*Plebejus icarioides fenderi*) is endemic to upland prairies of the Willamette Valley in Oregon. Although the precise historic distribution of this subspecies is unknown, recent surveys have indicated that the insect is confined to the Willamette Valley and currently occupies 32 sites in Yamhill, Polk, Benton, and Lane counties (Hammond and Wilson 1993, Schultz 1996). One population is found in wet, hairgrass-type prairie, while the remaining sites are found on drier upland prairies characterized by fescue. Fender's blue butterflies occupy sites located almost exclusively on the western side of the valley, within 21 miles of the Willamette River.

The primary habitat requirement for the fender's blue is its host plant, Kincaid's lupine, which is the larval food source. Of the 32 sites where Fender's blue butterfly occurs, Kincaid's lupine co-occurs as a larval host plant at 27. Spurred lupine and sickle keeled lupine may be secondary food plants used by the insect (Hammond and Wilson 1993).

It is thought that the life cycle of Fender's blue is similar those of related subspecies (Hammond and Wilson 1993, Mattoni 1997, Pratt 1997). Adult butterflies lay their eggs on the host plant, which serves as a food source for the caterpillars during May and June. Newly hatched larvae feed for a short time, reaching their second developmental stage in the early summer, at which point they enter an extended diapause (maintaining a state of suspended activity). Diapausing larvae remain in the leaf litter at or near the base of the host plant through the fall and winter, and may become active again in March or April of the following year. Some larvae may be able to extend diapause for more than one season depending upon the individual and environmental conditions (Mattoni 1997). Once diapause is broken, the larvae feed and grow through three to four additional developmental stages, enter their pupal stage, and then emerge as adult butterflies in April and May. A Fender's blue butterfly may complete its life cycle in 1 year.

References cited in this section are internal to the above referenced document. A complete list of these references is available from the USFWS Oregon State Office, Portland, Oregon.

The Fender's blue was Federally Listed as endangered on January 25, 2000. The designation of critical habitat for this species was deemed prudent, but has been deferred. The primary threats are habitat loss from agriculture and urban development, the invasion of non-native plant species into prairie habitat, and the small size of the remaining populations. Herbicide use and collecting are also factors that can impact this subspecies.

Threatened

Vernal Pool Fairy Shrimp

The primary reference for this section is: USFWS. 1994e. Endangered and Threatened Wildlife and Plants; Determination of Endangered Status for the Conservancy Fairy Shrimp, Longhorn Fairy Shrimp, and the Vernal Pool Tadpole Shrimp; and Threatened Status for the Vernal Pool Fairy Shrimp. Final Rule. Federal Register 59(180):48136-48153. References cited in this section are internal to the above-referenced document. A complete list of these references is available from the USFWS Sacramento Field Office, Sacramento, California.

The Conservancy fairy shrimp (*Branchinecta conservatio*), longhorn fairy shrimp (*B. longiantenna*), vernal pool fairy shrimp (*B. lynchi*), and vernal pool tadpole shrimp (*Lepidurus packardi*) are aquatic crustaceans that are endemic to vernal pools in California. The vernal pools in which these species occur are found in the Central Valley, the Coast Range, and a limited number of sites in the Transverse Range and Santa Rosa Plateau. All four species are sporadic in their distribution, often inhabiting only one or a few pools in vernal pool complexes that are quite widespread (Eng 1990, King 1992, Simovich 1992; Brusca 1992). None are known to occur in riverine waters, marine waters, or other permanent bodies of water.

The three fairy shrimp and the vernal pool tadpole shrimp are ecologically dependent on seasonal fluctuations in their habitat, such as absence or presence of water during specific times of the year, duration of inundation, and other environmental factors that include specific salinity, conductivity, dissolved solids, and pH levels. The Conservancy fairy shrimp inhabits vernal pools with highly turbid waters. It is known from six disjunct populations, occurring in large pools with low conductivity, total dissolved solids, and alkalinity (Barclay and Knight 1984; Eng et al. 1990). The Conservancy fairy shrimp is usually collected at cool temperatures and appears to be relatively long-lived (Patton 1984; Simovich et al. 1992). This species has been observed from November to early April.

The longhorn fairy shrimp inhabits clear to turbid, grass-bottomed vernal pools in grasslands, and clear-water pools in sandstone depressions. The water in grassland pools inhabited by this species has very low conductivity, total dissolved solids, and alkalinity (Eng et al. 1990). This species is only known from four disjunct populations along the eastern margin of the central coast range. All vernal pools inhabited by this species are filled by winter and spring rains, and may remain inundated until June. The longhorn fairy shrimp has been observed from late December until late April.

The vernal pool fairy shrimp, although it has a relatively wide range, primarily occurs in vernal pools with clear to tea-colored water, most commonly in grass- or mud-bottomed swales, or in basalt flow depression pools in unplowed grasslands. However, one population occurs in sandstone rock outcrops, and another population occurs in alkaline vernal pools. The water in pools inhabited by this species has low total dissolved solids, conductivity, alkalinity, and chloride (Collie and Lathrop 1976). Vernal pool fairy shrimp have been collected from early December to early May.

The vernal pool fairy shrimp has a sporadic distribution within vernal pool complexes (Patton 1984; County of Sacramento 1990; Jones and Stokes 1992, 1993; Stromberg 1993; Sugnet and Associates 1993b), wherein the majority of pools in a given complex are not inhabited by the species. The species is typically found at low population densities (Simovich et al. 1992), and only rarely does it co-occur with other fairy shrimp species. Although the vernal pool fairy shrimp can mature quickly, allowing populations to persist in shorter-lived pools, it also persists later into the spring where pools are longer lasting.

The vernal pool tadpole shrimp inhabits vernal pools containing clear to highly turbid water, and ranging in size from 54 square feet to 89 acres. Pools have low conductivity, alkalinity, and total dissolved solids (Barclay and Knight 1984; Eng et al. 1990). These pools are located most commonly in grass-bottomed swales of grasslands in old alluvial soils underlain by hardpan, or in mud-bottomed pools containing highly turbid water. The vernal pool tadpole shrimp is known from 18 populations in the Central Valley, and from a single pool complex located on the San Francisco Bay National Wildlife Refuge in the city of Fremont, Alameda County, California.

The life history of the vernal pool tadpole shrimp is linked to the phenology of the vernal pool habitat. After winter rainwater fills the pools, the populations are re-established from eggs that have been dormant in the dry pool sediments (Ahl 1991, Lanway 1974). Eggs hatch shortly after inundation, with sexually reproductive adults appearing in about 3 to 4 weeks after hatching (Ahl 1991). A female surviving to large size may lay up to six clutches of eggs, which are sticky, and readily adhere to plant matter and sediment particles (Simovich et al. 1992). A portion of the eggs hatch immediately, and the rest become dormant and remain in the soil to hatch during later rainy seasons (Ahl 1991). The vernal pool tadpole shrimp matures slowly and is a long-lived species (Alexander 1976, Ahl 1991). Adults are often present and reproductive until the pools dry up in the spring (Ahl 1991, Simovich 1992).

Nearly all fairy shrimp feed on algae, bacteria, protozoa, rotifers, and bits of detritus (Pennak 1989). The females carry eggs in an oval or elongate ventral brood sac. The eggs are either dropped to the pool bottom or remain in the brood sac until the female dies and sinks. The “resting” or “summer” eggs are capable of withstanding heat, cold, and prolonged desiccation. When the pools refill in the same or subsequent seasons some, but not all, of the eggs may hatch. The egg bank in the soil may be comprised of the eggs from several years of breeding (Donald 1983). The eggs hatch when the vernal pools fill with rainwater. The early stages of the fairy shrimp develop rapidly into adults. These non-dormant populations often disappear early in the season long before the vernal pools dry up. Tadpole shrimp are primarily benthic animals that swim with their legs down. They climb or scramble over objects, as well as plow along in bottom sediments, and their diet consists of organic detritus and living organisms, such as fairy shrimp and other invertebrates (Fryer 1987, Pennak 1989). Female tadpole shrimp deposit their eggs on vegetation and other objects on the bottom. Vernal pool tadpole shrimp populations pass the dry summer months as dormant eggs in pool sediments. Some of the eggs hatch as the vernal pools are filled with rainwater in the fall and winter of subsequent seasons.

The Conservancy fairy shrimp, longhorn fairy shrimp, and vernal pool tadpole shrimp were listed as endangered on September 19, 1994. The vernal pool fairy shrimp was listed as threatened on the same date. On August 6, 2003, the USFWS designated approximately 1,184,513 acres of vernal pool habitat as critical habitat for these and other vernal pool species. Urban, water, flood control, highway, and utility projects, as well as conversion to agricultural use, have eliminated vernal pools in southern California (Riverside and San Diego counties), the Central Valley, and the San Francisco Bay area (Jones and Stokes Associates 1987). Factors that threaten these species include changes in hydrologic patterns, overgrazing, OHV use, and any human activities that alter the watershed of the vernal pools. For some species, continued development could destroy existing habitat.

See *Conservation Measures for Aquatic Animals* in the Fish section of this appendix for Vernal Pool Fairy Shrimp Conservation Measures.

Oregon Silverspot Butterfly
The primary reference for this section is: USFWS. 2001h. Oregon Silverspot Butterfly (*Speyeria zerene hippolyta*) Revised Recovery Plan. Portland, Oregon. References cited in this section are internal to the above-referenced document. Full citations have been included in the Bibliography.

The Oregon silverspot butterfly (*Speyeria zerene hippolyta*) occurs at disjunct sites near the Pacific coast, from Del Norte County, California, north to Long Beach Peninsula, Washington. The subspecies occupies three types of grassland habitat: marine terrace and coastal "salt spray" meadows, stabilized dunes, and montane grasslands. The first two habitats are strongly influenced by proximity to the ocean, with mild temperatures, high rainfall, and persistent fog. Of the two, the dune habitat tends to have lower relief, highly porous soils, and less exposure to winds. Conditions at the montane sites include colder temperatures, frequent cloud cover, substantial snow accumulations, less coastal fog, and no salt spray.

Oregon silverspot butterfly populations currently (as of 2001) are known to occur at only six sites. One is in Del Norte County (Lake Earl), two are in Lane County (Rock Creek-Big Creek and Bray Point), and two are in Tillamook County (Cascade Head and Mount Hebo). The population at a sixth site in Clatsop County (Clatsop Plains) has declined in recent surveys, with only one Oregon silverspot butterfly documented in 1998 (VanBuskirk 1993, 1998).

Each type of habitat must provide the Oregon silverspot with host plants, nectar sources, and other suitable environmental conditions. Caterpillars feed primarily on early blue violets. Stands of violets that are large enough to provide enough food for larval butterflies on the Oregon coast occur only in relatively open and low-growing grasslands, where violets may be an abundant component of the plant community (Hammond and McCorkle 1984). Apart from early blue violets, Oregon silverspot caterpillars are also known to feed on a few other violet species, such as yellow stream violets and Aleutian violets. Nectar plants most frequently used by Oregon silverspot butterflies are members of the aster family, including the following native species: Canada goldenrod, dune goldenrod, California aster, pearly everlasting, dune thistle, and yarrow. They are also known to nectar on two common introduced species: tansy ragwort and false dandelion. The flowering seasons of these species overlap, providing an array of nectar choices for adult butterflies throughout the flight season.

The Oregon silverspot butterfly goes through six larval instars and a pupal stage before metamorphosing into an adult. Newly hatched first-instar larvae immediately enter diapause after eating the lining of the eggshell. They remain in diapause until host plants send up new growth in spring, and feed until pupation in the summer. Very little is known about the biology of the caterpillar or pupae. Adult emergence starts in July and extends into September, with many males appearing several weeks before females appear. Mating usually takes place in relatively sheltered areas. Adults will often move long distances for nectar or to escape windy and foggy conditions.

The Oregon silverspot butterfly was Federally Listed as threatened on July 2, 1980, and critical habitat was designated at the same time. Lands included in the critical habitat designation are those that were known to be occupied by the butterfly at the time: portions of Section 15 and the south half of Section 10 that are west of a line parallel to and about 1,500 feet west of the eastern section boundaries of Sections 10 and 15, Township 16 South, Range 12 West, Lane County, Oregon. Invasion by exotic species, natural succession, fire suppression, and land development have resulted in the loss and modification of the species' habitat. Land use practices have altered disturbance regimes needed to maintain existing habitats and create new habitats for species expansion. Other threats to the subspecies include OHVs, grazing, erosion, road kill, and pesticides. The Oregon silverspot butterfly is also sought by collectors.

Conservation Measures for Butterflies

Many local BLM offices already have management plans in place that ensure the protection of these species during activities on public lands. The following conservation measures are the minimum steps required of the BLM to ensure that treatment methods would be unlikely to negatively affect TEP species.
Each local BLM office is required to draw up management plans related to treatment activities that identify any TEP butterfly or moth species or their critical habitat that are present in the proposed treatment areas, as well as the measures that will be taken to protect these species.
Management plans should, at a minimum, follow this general guidance:

- Use an integrated pest management approach when designing programs for managing pest outbreaks.
- Survey treatment areas for TEP butterflies/moths and their host/nectar plants (suitable habitat) at the appropriate times of year.
- Minimize the disturbance area with a pre-treatment survey to determine the best access routes. Areas with butterfly/moth host plants and/or nectar plants should be avoided.
- Minimize mechanical treatments and OHV activities on sites that support host and/or nectar plants.
- Carry out vegetation removal in small areas, creating openings of 5 acres or less in size.
- Avoid burning all of a species' habitat in any 1 year. Limit area burned in butterfly/moth habitat in such a manner that the unburned units are of sufficient size to provide a refuge for the population until the burned unit is suitable for recolonization. Burn only a small portion of the habitat at any one time, and stagger timing so that there is a minimum 2-year recovery period before an adjacent parcel is burned.
- Where feasible, mow or wet around patches of larval host plants within the burn unit to reduce impacts to larvae.
- In TEP butterfly/moth habitat, burn while butterflies and/or moths of concern are in the larval stage, when the organisms would receive some thermal protection.
- Wash equipment before it is brought into the treatment area.
- Use a seed mix that contains host and/or nectar plant seeds for road/site reclamation.
- To protect host and nectar plants from herbicide treatments, follow recommended buffer zones and other conservation measures for TEP plants species when conducting herbicide treatments in areas where populations of host and nectar plants occur.
- Do not broadcast spray herbicides in habitats occupied by TEP butterflies or moths; do not broadcast spray herbicides in areas adjacent to TEP butterfly/moth habitat under conditions when spray drift onto the habitat is likely.
- Do not use 2,4-D in TEP butterfly/moth habitat.
- When conducting herbicide treatments in or near habitat used by TEP butterflies or moths, avoid use of the following herbicides, where feasible: bromacil, clopyralid, diquat, diuron, glyphosate, hexazinone, imazapyr, picloram, tebuthiuron, and triclopyr.
- If conducting manual spot applications of diquat, diuron, glyphosate, hexazinone, tebuthiuron, or triclopyr to vegetation in TEP butterfly or moth habitat, utilize the typical, rather than the maximum, application rate.

Mammals

Endangered

Gray Wolf

The primary reference for this section is: USFWS. 2000p. Proposal to Reclassify and Remove the Gray Wolf From the List of Endangered and Threatened Wildlife in Portions of the Coterminous United States; Proposal To Establish Three Special Regulations for Threatened Gray Wolves; Proposed Rule. Federal Register Volume

65(135):43449-43496. References cited in this section are internal to the above-referenced document. A complete list of these references is available from the USFWS Region 3 Office, Fort Snelling, Minnesota.

Gray wolves (*Canis lupus*) are the largest wild members of the dog family. The species historically occurred across most of North America, Europe, and Asia. In North America, wolves occurred from the northern reaches of Alaska, Canada, and Greenland to the central mountains and the high interior plateau of southern Mexico. The only areas of the contiguous U.S. that apparently lacked gray wolves are much of California and the Gulf and Atlantic coastal plain south of Virginia. In addition, wolves were generally absent from the extremely arid deserts and the mountaintops of the western United States (Goldman 1944, Hall 1959, Mech 1974). The cultural attitudes of European settlers, coupled with perceived and real conflicts between wolves and human activities along the frontier, led to widespread persecution of wolves. Poisons, trapping, and shooting—spurred by federal, state, and local government bounties—resulted in extirpation of the species from more than 95% of its range in the 48 coterminous states.

Wolves are predators of large animals. Wild prey species in North America include white-tailed deer, mule deer, moose, elk, woodland caribou, barren ground caribou, bison, muskox, bighorn sheep, Dall sheep, mountain goat, beaver, and snowshoe hare, with small mammals, birds and large invertebrates sometimes being taken (Mech 1974, Stebler 1944, Wisconsin Department of Natural Resources 1999a). Wolves may also feed on domestic animals (Paul 1999). Wolves are social animals, normally living in packs of 2 to 10 members. Packs are primarily family groups consisting of a breeding pair, their pups from the current year, offspring from the previous year, and occasionally an unrelated wolf. Packs occupy, and defend from other packs and individual wolves, a territory of 20 to 214 square miles (though typically larger in the Rocky Mountains). Normally, only the top-ranking male and female in each pack breed and produce pups. Litters are born from early April into May; they can range from 1 to 11 pups, but generally contain 4 to 6 pups (USFWS 1992a, Michigan Department of Natural Resources 1997). Yearling wolves frequently disperse from their natal packs, although some remain with their pack. Dispersers may become nomadic and cover large areas as lone animals, or they may locate suitable unoccupied habitat and a member of the opposite sex and begin their own territorial pack. Dispersal movements of over 500 miles have been documented (Fritts 1983).

As many as 24 distinct subspecies of gray wolf have been recognized, and federal listings were originally at the subspecies level. On March 9, 1978, the gray wolf was relisted as endangered throughout the conterminous 48 States and Mexico. In Minnesota, however, the gray wolf was reclassified to threatened. In addition, critical habitat was designated in Isle Royale National Park, Michigan, and Minnesota. On November 22, 1994, areas in Idaho, Montana, and Wyoming were designated as nonessential experimental populations in order to initiate gray wolf reintroduction projects in central Idaho and the Greater Yellowstone area. On January 12, 1998, a nonessential experimental population was established for the Mexican gray wolf in portions of Arizona, New Mexico, and Texas.

On July 13, 2000, the USFWS proposed the establishment of four distinct population segments (DPSs) for the gray wolf in the United States and Mexico. Under this proposal, gray wolves in the Western Great Lakes DPS (North Dakota, South Dakota, Minnesota, Wisconsin, and Michigan), the Western DPS (Washington, Oregon, Idaho, Montana, Wyoming, Utah, Colorado, and parts of Arizona and New Mexico), and the Northeastern DPS (New York, Vermont, New Hampshire, and Maine) would be reclassified from endangered to threatened, except where already classified as an experimental population or as threatened. Gray wolves in the Southwestern (Mexican) DPS (portions of Arizona and New Mexico) would retain their endangered status. All three existing gray wolf experimental population designations would be retained. In all other areas of the 48 conterminous states, gray wolves would be removed from the protections of the ESA. Gray wolf populations in all DPSs, except the Southwestern DPS, have shown steady increases from the late 1970s to the present. As of the 1998/1999 census, there were a total of 22 gray wolves in the Southwestern DPS. Gray wolves are still threatened by direct human-caused mortality, and potentially by habitat loss.

Conservation Measures for the Gray Wolf

Although the proposed vegetation treatments would not be likely to have negative effects on wolves or their habitat, the following programmatic-level conservation measures are recommended to ensure protection of the species. Additional or more specific guidance would also be provided at the project level, as appropriate.

- Avoid human disturbance and/or associated activities within 1 mile of a den site during the breeding period (as determined by a qualified biologist).
- Avoid human disturbance and/or associated activities within 1 mile of a rendezvous site during the breeding period (as determined by a qualified biologist).
- Do not use 2,4-D in areas where gray wolves are known to occur; do not broadcast spray within ¼ mile of areas where gray wolves are known to occur.
- Where feasible, avoid use of the following herbicides in gray wolf habitat: bromacil, clopyralid, diquat, diuron, glyphosate, hexazinone, imazapyr, metsulfuron methyl, picloram, and triclopyr.
- Do not broadcast spray clopyralid, diuron, glyphosate, hexazinone, picloram, or triclopyr in gray wolf habitat; do not broadcast spray these herbicides in areas adjacent to gray wolf habitat under conditions when spray drift onto the habitat is likely.
    - If broadcast spraying bromacil, diquat, imazapyr, or metsulfuron methyl in or near gray wolf habitat, apply at the typical, rather than the maximum, application rate.
- If conducting manual spot applications of glyphosate, hexazinone, or triclopyr to vegetation in gray wolf habitat, utilize the typical, rather than the maximum, application rate.

<u>Columbian White-tailed Deer</u>

The primary reference for this section is: USFWS. 2002m. Supplemental Proposed Rule to Remove the Douglas County Population of Columbian White-tailed Deer From the Federal List of Endangered and Threatened Wildlife. Federal Register 67(120):42217-42229. References cited in this section are internal to the above-referenced document. A complete list of these references is available from the USFWS, Oregon Fish and Wildlife Office, Portland, Oregon.

The Columbian white-tailed deer (*Odocoileus virginianus leucurus*) is the westernmost representative of 30 subspecies of white-tailed deer in North and Central America. The subspecies was formerly distributed throughout the bottomlands and prairie woodlands of the lower Columbia, Willamette, and Umpqua River basins in Oregon and southern Washington (Bailey 1936, Verts and Carraway 1998). It is believed that this deer was locally common, particularly in riparian areas along major rivers (Gavin 1978). With the arrival and settlement of pioneers in the fertile river valleys, the decline in Columbian white-tailed deer numbers was rapid (Gavin 1978). By 1940, a population of 500 to 700 animals along the lower Columbia River in Oregon and Washington, and a disjunct population of 200 to 300 in Douglas County survived (Crews 1939, Gavin 1984, Verts and Carraway 1998).

Columbian white-tailed deer in Douglas County are most often associated with riparian habitats, though the deer also uses a variety of lower elevation habitat types (e.g., grassland, grass shrub, oak savanna, oak-hardwood woodland, oak-hardwood savanna shrub, oak-hardwood conifer, conifer, and urban/suburban yards; Ricca 1999). Open areas are used for feeding between dusk and dawn. The Columbia River population occurs in wet bottomlands and dense forest swamps where there is little elevational relief, and which receive a large amount of precipitation. The diet of Columbian white-tailed deer consists of forbs, shrubs, grasses, and a variety of other foods, such as lichens, mosses, ferns, seeds, and nuts (Whitney 2001).

Like other types of deer, Columbian white-tailed deer breed in the winter, primarily in November and December. Most fawns are born between mid-May and mid-June. Columbian white-tailed deer first breed as yearlings (18 months), and young females typically give birth to a single fawn. After 2 years of age, twins are more common.

The Columbian white-tailed deer was Federally Listed as endangered on March 11, 1967. Protection under the Endangered Species Act has resulted in acquisition, protection, and improvement of habitat, which has allowed the two populations to increase in size. A recovery plan was developed for the two populations of Columbian white-tailed deer in 1983. Many of the tasks identified in the Recovery Plan have been implemented. In 1972, the Julia Butler Hansen Refuge for the Columbian White-tailed Deer was established in Wahkiakum County, Washington.

In Douglas County, the Bureau of Land Management acquired a large parcel of habitat, known as the North Bank Habitat Management Area (NBHMA), through a land exchange specifically to benefit the Columbian white-tailed deer. This parcel alone provides over 6,000 acres of good habitat for the deer. The USFWS has coordinated with the BLM and the Oregon Department of Fish and Wildlife at the NBHMA to accomplish recovery of the Columbian white-tailed deer. The acquisition and management of the NBHMA was instrumental in the delisting of the Douglas County subpopulation in 2003 (http://www.fws.gov/oregonfwo/species/data/columbianwhitetaileddeer/).

Numbers of white-tailed deer have more than doubled since the species was first listed. The Douglas County subpopulation is now estimated at over 5,000 animals, and the Columbia River subpopulation is estimated at approximately 1,000 animals. This species is primarily threatened by a lack of suitable habitat. Logging has degraded forest habitat in some areas. In addition, periodic flooding of the Columbia River, and residential development along the North Umpqua River are also threats to the subspecies.

Conservation Measures for the Columbian white-tailed deer
The projected short-term negative effects of vegetation treatments on the Columbian white-tailed deer could be avoided by implementing the following programmatic-level conservation measures.

- Prior to treatments, survey for evidence of white-tailed deer use of areas in which treatments are proposed to occur.
- Address the protection of Columbian white-tailed deer in local management plans developed in association with treatment programs.
- In areas that are likely to support Columbian white-tailed deer, protect riparian areas from degradation by avoiding them altogether, or utilizing Standard Operating Procedures. Consult Chapter 5 for appropriate conservation measures to be used in protected riparian areas.
- In habitats used by deer, conduct treatments that use domestic animals during the plant growing season, and remove the animals after clearing has been achieved.
- Do not use domestic animals to control weeds in woodland habitats utilized by Columbian white-tailed deer.
- In areas where Columbian white-tailed deer occur, or may possibly occur, avoid the use of fences to keep domestic animals out of sensitive habitats or to otherwise restrict their movement (fence accidents are associated with deer mortality).
- Avoid burning in deer habitats during the fawning season.
- Closely follow all application instructions and use restrictions on herbicide labels; in riparian habitats use only those herbicides that are approved for use in riparian areas.
- Avoid broadcast spray treatments in areas where Columbian white-tailed deer are known to forage.
- Do not use 2,4-D in Columbian white-tailed deer habitats; do not broadcast spray 2,4-D within ¼ mile of Columbian white-tailed deer habitat.
- Where feasible, avoid use of the following herbicides in Columbian white-tailed deer habitat: bromacil, clopyralid, diquat, diuron, glyphosate, hexazinone, imazapyr, metsulfuron methyl, Overdrive®, picloram, tebuthiuron, and triclopyr.
- Do not broadcast spray bromacil, clopyralid, diquat, diuron, glyphosate, hexazinone, Overdrive®, picloram, or triclopyr in Columbian white-tailed deer habitat; do not broadcast spray these herbicides in areas adjacent to Columbian white-tailed deer habitat under conditions when spray drift onto the habitat is likely.

- If broadcast spraying imazapyr, metsulfuron methyl, or tebuthiuron in or near Columbian white-tailed deer habitat, apply at the typical, rather than the maximum, application rate.
- If conducting manual spot applications of glyphosate, hexazinone, imazapyr, metsulfuron methyl, tebuthiuron, or triclopyr to vegetation in Columbian white-tailed deer habitat, utilize the typical, rather than the maximum, application rate.

In addition, site-specific and project specific conservation measures would need to be developed by local BLM offices to ensure complete protection of the Columbian white-tailed deer.

Threatened

Canada Lynx

The primary reference for this section is: USFWS. 2000m. Determination of Threatened Status for the Contiguous U.S. Distinct Population Segment of the Canada Lynx and Related Rule. Federal Register 65(58):16051-16086. References cited in this section are internal to the above-referenced document. A complete list of these references is available from the USFWS Montana Field Office, Helena, Montana.

Lynx occur in moist coniferous forests that provide a prey base of snowshoe hare (Quinn and Parker 1987; Koehler 1990; Koehler and Brittell 1990; Mowat et al. 1999). In the contiguous United States, the Canada lynx (*Lynx canadensis*) historically occurred in the Cascades Range of Washington and Oregon; the Rocky Mountain Range in Montana, Wyoming, Idaho, eastern Washington, eastern Oregon, northern Utah, and Colorado; the western Great Lakes Region; and the northeastern United States region from Maine southwest to New York (McCord and Cardoza 1982, Quinn and Parker 1987). This distribution associated with the southern boreal forest, comprising of subalpine coniferous forest in the West and primarily mixed coniferous/deciduous forest in the East (Aubry et al. 1999). In Canada and Alaska, however, lynx inhabit the classic boreal forest ecosystem known as the taiga (McCord and Cardoza 1982; Quinn and Parker 1987; Agee 1999; McKelvey et al. 1999b). Within these general forest types, lynx are most likely to persist in areas that receive deep snow, for which the lynx is highly adapted (Ruggiero et al. 1999b).

The lynx population in the contiguous U.S. is considered by the USFWS to be part of a larger metapopulation whose core is located in the northern boreal forest of central Canada (Buskirk et al. 1999b; McKelvey et al. 1999a, 1999b). The boreal forest extends south into the contiguous United States along the Cascade and Rocky Mountain ranges in the West, the western Great Lakes Region, and along the Appalachian Mountain Range of the northeastern United States. At its southern margins, the boreal forest becomes naturally fragmented into patches of varying size as it transitions into other vegetation types. These southern boreal forest habitat patches are small relative to the extensive northern boreal forest of Canada and Alaska, which constitutes the majority of the lynx range. Many of these southern boreal forest habitat patches within the contiguous U.S. are able to support resident populations of lynx and snowshoe hare. It is likely that some of the habitat patches act as sources of lynx (recruitment is greater than mortality) that are able to disperse and potentially colonize other patches (McKelvey et al. 1999a). Other habitat patches act as “sinks” where lynx mortality is greater than recruitment and lynx are lost from the overall population. The ability of naturally dynamic habitat to support lynx populations may change as the habitat undergoes natural succession following natural or manmade disturbances (i.e., fire, clearcutting). In addition, fluctuations in the prey populations may cause some habitat patches to change from being sinks to sources and vice versa.

It is believed that historic and current lynx densities in the contiguous U.S. are naturally low relative to lynx densities in the northern boreal forest. At present, in the western states, resident populations currently exist only in Montana and Washington, and populations that are no longer self-sustaining occur in Oregon, Idaho, Wyoming, Utah, and Colorado. Because the lynx is a secretive animal, there are no reliable population estimates for this species. However, sightings of lynx throughout the U.S. have continued to decrease over the years.

Lynx are highly specialized predators whose primary prey is the snowshoe hare, a species that has evolved to survive in areas that receive deep snow (Bittner and Rongstad 1982). Snowshoe hares use forests with dense understories that provide forage, cover to escape from predators, and protection during extreme weather (Wolfe et al. 1982; Monthey 1986; Hodges 1999a, 1999b). Generally, earlier successional forest stages have greater understory structure than do mature forests and therefore support higher hare densities (Hodges 1999a, 1999b). However, mature forests can also provide snowshoe hare habitat as openings develop in the canopy of mature forests when trees succumb to disease, fire, wind, ice, or insects, and the understory grows (Buskirk et al. 1999b). Lynx concentrate their hunting activities in areas where hare activity is relatively high (Koehler et al. 1979; Parker 1981; Ward and Krebs 1985; Major 1989; Murray et al. 1994; O'Donoghue et al. 1997, 1998a). Lynx also prey opportunistically on other small mammals and birds, particularly when hare populations decline (Nellis et al. 1972; O'Donoghue 1997, 1998a). Red squirrels are an important alternate prey (Apps 1999; Aubry et al. 1999). However, a shift to alternate food sources may not compensate for the decrease in hares consumed (Koehler and Aubry 1994). In northern regions, when hare densities decline, the lower quality diet causes sudden decreases in the productivity of adult female lynx and decreased survival of kittens, which causes the numbers of breeding lynx to level off or decrease (Nellis et al. 1972; Brand et al. 1976; Slough and Mowat 1996; O'Donoghue et al. 1997).

The breeding period for Canada lynx is late winter to early spring, with adult females producing one litter every 1 to 2 years. The gestation period typically lasts from 62 to 74 days, and the litter size is 3 to 4 kittens, on average. Females may reach reproductive maturity by as early as 1 year (Brainerd 1985).

Lynx use large woody debris, such as downed logs and windfalls, to provide denning sites with security and thermal cover for kittens (McCord and Cardoza 1982, Koehler 1990, Koehler and Brittell 1990, Squires and Laurion 1999, Organ 1999). For lynx den sites, the age of the forest stand does not seem as important as the amount of downed, woody debris available (Mowat et al. 1999). The size of lynx home ranges varies by the animal's gender, abundance of prey, season, and the density of lynx populations (Hatler 1988; Koehler 1990; Poole 1994; Slough and Mowat 1996; Aubry et al. 1999; Mowat et al. 1999). Documented home ranges vary from 3 to 300 square miles (Saunders 1963; Brand et al. 1976; Mech 1980; Parker et al. 1983; Koehler and Aubry 1994; Apps 1999; Mowat et al. 1999; Squires and Laurion 1999).

The population of the Canada lynx occurring in the contiguous U.S. was Federally Listed as threatened on March 24, 2000. The designation of critical habitat for the species was deemed prudent, but has not yet occurred. According to the USFWS, the primary factor affecting lynx in the contiguous U.S. is the lack of guidance for conservation of lynx in federal land management plans. People change forests through timber harvest, fire suppression, and conversion of forest lands to agriculture. Forest fragmentation may eventually become severe enough to isolate habitat into small patches, thereby reducing the viability of lynx populations, which are dependent on larger areas of forest habitat (Litvaitis and Harrison 1989). In addition, human alteration of forests may facilitate competition by creating habitats that are more suitable to potential lynx competitors (McCord and Cardoza 1982, Quinn and Parker 1987, Buskirk et al. 1999a). Finally, lynx movements may be negatively influenced by high traffic volume on roads that bisect suitable lynx habitat, such as in the Southern Rockies and in some parts of the Northern Rockies/ Cascades Region.

Vascular Plants

Endangered

McDonald's Rock-cress

McDonald's rock-cress (*Arabis mcdonaldiana*) appears to be restricted to serpentine soils in northern California and immediately adjacent southwestern Oregon. The species occurs at Red Mountain, a dome of red colored rock forming an island of peculiar vegetation protruding through the carpet of mixed evergreen forest indigenous to the Coast Ranges of northern California. The majority of rock-cress populations occupy conspicuously open habitats, scree slopes, rocky ridges, and barren rocky outcrops devoid of competing vegetation and exposed to full sun. This species appears to show long-term stability in open rocky habitats devoid of competition from other plant species. The densest populations occur in areas of north and east exposures or in sheltered saddles, which probably have the most persistent accumulations of snow. Rock-cress roots penetrate rock crevices, and areas of substantial sheet erosion appear to be poor areas of establishment. Temporarily successful at this site, McDonald's rock-cress is likely a transitional member of this rapidly changing chaparral community (Baad 1985).

The vegetation covering the crest of Red Mountain is notably sparse, consisting of an open forest of sugar pine, ponderosa pine, Jeffrey pine, and incense-cedar. An understory of chaparral species forms a patchy mosaic of dense cover alternating with extensive park-like expanses of open forest. Frequent herbaceous associates include Red Mountain buckwheat and Red Mountain stonecrop (Baad 1985). McDonald's rock-cress is found at elevations of 3,200 to 4,100 feet.

McDonald's rock-cress is a perennial herb whose aboveground parts remain alive year-round (Rollins 1941, 1973; Baad 1985). Germination commences with fall rains. Flowering occurs from April through June, and fruiting occurs from July through August, with dispersal from August through mid-September (Baad 1985). A number of insect visitors appear to be potential pollinators of rock-cress, including Syrphid flies, solitary bees, and bumblebees. Individual plants produce a variable number of fruits, which split open in August.

McDonald's rock-cress was Federally Listed as endangered on September 28, 1978. Critical habitat has not been designated. Although approximately two-thirds of the plants occur on public land, all populations are potentially endangered by plans to mine exploitable nickel and chromium deposits occurring within this area. A large-scale surface mining operation immediately adjacent to the total distribution of the species represents a serious threat to the survival of McDonald's rock-cress.

<u>Marsh Sandwort</u>

The primary reference for this species is: USFWS. 1998k. Recovery Plan for Marsh Sandwort (*Arenaria paludicola*) and Gambel's Watercress (*Rorippa gambelii*). Portland, Oregon. References cited in this section are internal to the above-referenced document. Full citations have been included in the Bibliography.

The Marsh sandwort (*Arenaria paludicola*) was historically found in scattered locations near the Pacific coast in southern and central California and Washington. The species occurs in freshwater marshes at elevations from sea level to 1,480 feet. Soils in these habitats are saturated, acidic bog soils that are predominantly sandy and have a high organic content. Presently, there are only two known populations of this species in the United States, both in San Luis Obispo County, California: one of fewer than 10 individuals in Black Lake Canyon, and one of more than 85 individuals at Oso Flaco Lake. The Marsh sandwort has been listed by the Washington Natural Heritage Program as "possibly extirpated" in Washington State. Nonetheless, it is thought that suitable habitat for the species remains in Washington State, and that populations could exist there now or in the future. As this species occurs on the BLM's Washington/Oregon special status species list, but not on the California list, it is unlikely that this species presently occurs on public lands.

Because there are so few individuals of the Marsh sandwort remaining, studying the life history of this species has been difficult. Although plants have been observed flowering and fruiting minimally, and a viable seed bank has been identified, information about the species' pollinators, seed germination and dispersal, and seedling recruitment is lacking.

The Marsh sandwort was Federally Listed as endangered on August 3, 1993. Critical habitat has not been designated. Threats to the species include encroaching vegetation (both native and non-native) associated with lowered water tables, agricultural and residential development, and OHV use. In addition, the very low number of individuals in the remaining populations puts this species at a great risk of extinction as a result of random, naturally occurring events.

<u>*Applegate's Milk-vetch*</u>
The primary reference for this section is: Hudson, B., J. Augsburger, M. Hillis, and P. Boehne. 2000. Draft Biological Assessment for the Interior Columbia River Basin Ecosystem Management Project Final Environmental Impact Statement. BLM and Forest Service. Boise, Idaho. Other references used are cited in the text and included in the Bibliography.

Applegate's milk-vetch (*Astragalus applegatei*) is a narrow endemic, known only from the Lower Klamath Basin near the city of Klamath Falls in southern Oregon. It is restricted to flat-lying, seasonally moist, strongly alkaline soils (USFWS 1997g). Although it is currently replete with introduced grasses and other weeds, the species' habitat was historically characterized by sparse, native bunchgrasses and patches of bare soil. Currently, there are two known populations of the species, which occur over a total area of less than 10 acres, and which form a total metapopulation of fewer than 20,000 individuals. Of the two populations, one is on land leased by The Nature Conservancy and one is on state land. There are no populations on federal lands.

Applegate's milk-vetch appears to be dependent on the seasonal flooding that occurs at sites where it is found, which may limit the dominance of other species and create favorable openings for the establishment of new plants. Applegate's milk vetch hosts an unknown species of beetle larvae, and is pollinated by ground-nesting beetles.

Applegate's milk-vetch was federally-listed as endangered on July 28, 1993. Critical habitat has not been designated. The primary threats to this species include invasion of habitat by exotic species such as quackgrass and cheatgrass, urban development, and road construction. Low population numbers, loss of habitat, wildlife grazing (rabbits), and management controls that alter natural wildfire and flooding regimes all pose serious threats to this species.

<u>*Willamette Valley Daisy*</u>
The primary reference for this section is: USFWS. 1997f. Endangered Status for *Erigeron decumbens* var. *decumbens* (Willamette Daisy) and Fender's Blue Butterfly (*Plebejus icarioides fenderi*) and Threatened Status for *Lupinus sulphureus* ssp. *kincaidii* (Kincaid's Lupine). Federal Register 65(16):3875-3890. References cited in this section are internal to the above-referenced document. A complete list of these references is available from the USFWS Oregon State Office, Portland, Oregon.

The Willamette Valley daisy(*Erigeron decumbens* var. *decumbens*) is restricted primarily to the Willamette Valley of Oregon. The valley is an alluvial floodplain that is 130 miles long and 20 to 40 miles wide, with an overall northward gradient (Orr et al. 1992). The valley is narrow and flat at its southern end, widening and becoming hilly near its northern end at the confluence of the Willamette and Columbia rivers. The alluvial soils of the Willamette Valley and southern Washington host a mosaic of grassland, woodland, and forest communities. The Willamette Valley daisyoccupies native grassland habitats within the Willamette Valley. The vast majority of Willamette Valley grasslands require natural or human-induced disturbance for their maintenance (Franklin and Dryness 1973), and would likely be forested if left undisturbed (Johannessen et al. 1971).

The Kalapooya Indians cleared and burned lands in the Willamette Valley used for hunting and food gathering. Accounts by early explorers suggest a pattern of annual burning by the Kalapooya Indian tribe resulted in the maintenance of extensive wet and dry prairie grasslands (Johannessen et al. 1971). Although much of the woody vegetation was prevented from becoming established on the grasslands by this treatment, the random survival of young fire-resistant species such as Oregon white oak, accounted for the widely-spaced trees on the margins of the valley (Habeck 1961). After 1848, burning decreased sharply through the efforts of settlers to suppress large-scale fires. Consequently, the open, park-like nature of the valley floor was lost, replaced by agricultural fields, dense oak and fir forests, and scrublands following logging.

The primary habitat for the Willamette Valley daisy is native wetland prairie. This habitat is characterized by the seasonally wet tufted hairgrass community that occurs in low, flat regions of the Willamette Valley where flooding creates anaerobic and strongly reducing soil conditions. This wet prairie community includes rushes and California oatgrass as co-dominant native species, as well as the introduced species tall fescue, Japanese brome, and sweet vernal grass.

The Willamette Valley daisy is a perennial herb, 0.6 to 2.4 inches tall, with erect to sometimes prostrate stems at the base. As with many species in the Aster family, the Willamette Valley daisy produces large quantities of wind-dispersed seeds. Flowering typically occurs in June and July with pollination carried out by flies and bees. Seeds are released in July and August. Although the seeds are wind-dispersed, the short stature of this species likely prevents the long-distance travel of many of these seeds. The Willamette Valley daisy is capable of vegetative spreading and is commonly found in large clumps scattered throughout a site (Clark et al. 1993).

The Willamette Valley daisy was Federally Listed as endangered on January 25, 2000. At the time of listing, the USFWS indicated that designation of critical habitat was prudent, but that it would be deferred until resources became available to do so. The Willamette Valley daisy likely once occurred over a large distribution throughout the historic native prairie. However, native prairie vegetation in the Willamette Valley was decimated by the rapid expansion of agriculture from the 1850s to the present. In addition, fire suppression allowed shrub and tree species to overtake grasslands, while agricultural practices hastened the decline of native prairie species through habitat loss and increased grazing (Johannessen et al. 1971; Franklin and Dyrness 1973). Currently, the species is threatened by commercial and/or residential development, agriculture, silvicultural practices, road improvement, collection, herbicide use, and naturally occurring demographic and random environmental events.

<u>*Gentner's Fritillary*</u>

The primary reference for this section is: BLM. 2008. Biological Assessment FY 2009-2013 Programmatic Assessment For Activities that May Affect the Listed Endangered Plant Species Gentner's Fritillary, Cook's Lomatium, McDonald's Rockcress, and Large-flowered Wooly Meadowfoam. USFWS concurred with this assessment on 9/25/08. References cited in this section are internal to the above-referenced document.

Gentner's fritillary (*Fritillaria gentneri*), a perennial herb of the lily family, is restricted to southwestern Oregon and northern California where it is known from scattered localities in the Rogue and Klamath River basins in Josephine, Jackson and Siskiyou counties. The species is known from a wide variety of habitats and soil types across its range. The recovery plan (USDI 2003) identifies over 25 soil types and about 16 different plant communities that this species can occupy. Elevations of known occurrences range from 600 feet near the Rogue River to nearly 5,000 feet near Soda Mountain and can occur on nearly all aspects. Gentner's fritillary is most often found in forest ecotones or transitional areas, especially along ridgelines or aspect changes. No estimates of suitable habitat have been done because of the wide range of habitats in which it has been found. There are 194 known occurrences on all ownerships; 146 sites (75%) occur on federal lands, 16 sites (8%) occur on State, County or City owned public lands and 32 sites (16%) on private lands (Medford BLM, 2008; USDI FWS 2002; USDI FWS, 2003).

Gentner's fritillary is found in four general habitat types: ecotones between (and inclusions within) forested sites and more open habitat (oak woodlands/grasslands/chaparral);open canopied woodlands and mixed evergreen forests of madrone and Douglas-fir; permanent openings and edges of openings in forest and woodlands; riparian zone edges with canopy gaps and or deciduous tree canopies.

The primary means of reproduction of Gentner's fritillary is asexual. Small plants arise from near the base of larger flowering plants, presumably from underground bulblets coming off the parent bulb. The flowering season for this species is April-June. Few plants set fruit containing viable seed and most occurrences of this species contain few flowering plants. Plants may remain dormant for several years without producing above-ground stems and flowers. Hummingbirds (McFarlane 1980), and andrinid and halictid bees (Donham 2002) are the likely pollinators. About 3,000 flowering plants are documented on federal lands, and it is estimated that about 140,000 vegetative plants exist, although since the amount of genetic diversity within patches is very low, the number of distinct genotypes may be fewer than a few hundred. Three populations on private lands are believed to be extirpated.

Gentner's fritillary was Federally Listed as endangered on December 10, 1999. Critical habitat has not been designated. The species is threatened by residential development, agricultural activities, browsing by deer and livestock, logging, road and trail improvement, OHV use, collection for gardens, and problems associated with small population size. The recovery plan calls for intensive augmentation of populations with nursery-grown plants.

<u>*Western Lily*</u>
The primary reference for this section is: USFWS. 1998e. Recovery Plan for the Endangered Western Lily (*Lilium occidentale*). Portland, Oregon.

The western lily (*Lilium occidentale*) occurs in early successional bogs or coastal scrub on poorly drained soils, usually those underlain by a hard, poorly permeable layer. Currently, the species occurs in widely scattered locations near the Pacific Ocean. Populations occur along a 200-mile stretch of the Pacific Coast, from near Coos Bay in Oregon, south to Humboldt Bay in California. The plants grow at low elevations, from almost sea level to about 300 feet, and from ocean-facing bluffs to about 4 miles inland. Common plant associates include the shrubs salal, western wax myrtle, western spiraea, huckleberry, blackberry, black twinberry, and glandular Labrador tea. Common tree associates include shore pine, Sitka spruce, red alder, Port Orford cedar, and willow. Common herbaceous associates include Pacific reed-grass, slough sedge, bunchberry, staff gentian, bracken fern, peat moss, and western tofieldia.

The western lily appears to require a habitat that maintains a delicate balance between having some shrubbery and having too much. Vegetation less than 3 feet tall can be beneficial to the lily by sheltering juvenile plants from browsing by large mammals, and by providing shelter from the heat in July and August. This protection is most critical during spring and early summer, because seedlings appear to tolerate dieback of aboveground parts later in the growing season. Dense, tall shrub growth reduces reproduction and survivorship, and closure of the forest canopy will eventually eliminate a population entirely.

The western lily is an herbaceous perennial that grows from an unbranched, scaly, bulblike rhizome. The species reproduces primarily by seed, but asexual reproduction is possible from detached bulb scales growing into new plants. Shoots emerge primarily in March and April, although they can emerge as early as January in some locations. Flowers bloom in May to July. Rhizomes may produce one or more flowering shoots per year, each typically with one to three, but up to 25, pendant flowers. Flowers often emerge above the surrounding shrubs, where they are available to pollinators such as hummingbirds. Capsular fruits become erect and may produce over 100 seeds when mature. Seeds are dispersed primarily by wind and gravity, generally within a radius of about 13 feet. Each year the aboveground portion of the plants die back and individuals overwinter underground as rhizomes/bulbs.

The western lily was Federally Listed as endangered on August 17, 1994. Critical habitat has not been designated. The species is known or assumed to be extirpated in at least nine historical sites, as a result of forest succession, cranberry farm development, livestock grazing, deer and mammal herbivory, highway construction, and other development. These factors continue to threaten the western lily, with development taking a primary role. Populations of the western lily appear to have been maintained in the past by occasional fires, at least at some sites in Oregon, and by grazing. Among the most serious threats to this species is loss of habitat as a result of ecological succession facilitated by aggressive fire suppression.

Large-flowered Woolly Meadowfoam
The primary reference for this species is: USFWS. 2002c. Determination of Endangered Status for *Lomatium cookii* (Cook's Lomatium) and *Limnanthes floccosa* ssp. *grandiflora* (Large-flowered Woolly Meadowfoam) from Southern Oregon. Federal Register 67(216):68003-68015.

References cited in this section are internal to the above-referenced document. A complete list of these references is available from the State Supervisor, USFWS, Oregon Fish and Wildlife Office, Portland, Oregon.

Large-flowered woolly meadowfoam (*Limnanthes floccosa* ssp. *grandiflora*), like Cook's Lomatium discussed in the previous species account, occurs in vernal pool habitats in a small area of Jackson County, southwestern Oregon. The species is known to occur at about 15 sites in Jackson County (M. Jones, USDI BLM 2002; Oregon Natural Heritage Information Center Database 2002).

The large-flowered woolly meadowfoam occurs within the Agate Desert, a landform that was described in the previous species account. This landform is characterized by shallow soils, a relative lack of trees, sparse prairie vegetation, and agates commonly found on the soil surface (Oregon Natural Heritage Program 1997). Vernal pools in the Agate Desert vary in size from 3 to 100 feet across, and attain a maximum depth of about 12 inches. Common associated native species in these vernal pools include popcorn flower, a rush, navarretia, common woolly meadowfoam, and annual hairgrass.

The large-flowered woolly meadowfoam is a delicate annual of the meadowfoam family that is covered with short, fuzzy hairs. Like Cook's Lomatium, plants are adapted to grow, flower, and set seed during the short time that water is available in the spring, finishing their life cycle before the dry hot summers. Each year, plant populations exhibit some natural variation in numbers, related primarily to temperature and rainfall conditions for that year.

The large-flowered woolly meadowfoam was Federally Listed as endangered on November 7, 2002. Designation of critical habitat has been deferred. The primary threat to the large-flowered woolly meadowfoam is the destruction of vernal pool habitat by industrial and residential development, including road and powerline construction and maintenance. Agricultural conversion, certain grazing practices, and OHV use also contribute to population declines and local extirpations. Recent evidence also indicates that non-native annual grasses, particularly medusahead, are a greater problem than previously believed, as discussed in the species account for Cook's Lomatium.

Bradshaw's Desertparsley
The primary reference for this section is: USFWS. 1993g. *Lomatium bradshawii* (Bradshaw's desertparsley) Recovery Plan. Portland, Oregon. References cited in this section are internal to the above-referenced document. They are included in the Bibliography.

Bradshaw's desertparsley , or Bradshaw's desert-parsley (*Lomatium bradshawii*) is endemic to the central and southern portions of the Willamette Valley, in western Oregon. It is known from Marion, Linn, Benton, and Lane counties. The majority of the sites and plants occur in and adjacent to the Eugene metropolitan area, with the greatest concentration found in West Eugene. Bradshaw's desertparsley occurs in two very distinct habitats. The rarest are the shallow, stream-covered basalt areas found in Marion and Linn counties neat the Santiam River. At these sites, the plants occur in areas with almost no soil, usually in vernal wetlands or along stream channels. The majority of the species' populations occur on seasonally saturated or flooded prairies, which are common by creeks and small rivers in the southern Willamette Valley. They occur in areas with deep, pluvial clays, usually in a matrix with alluvial silts. The slowly permeable clay layer results in a perched water table in winter and spring, so soils are generally saturated to the surface or slightly inundated during the wet season. This relic wetland prairie has been described as the tufted hairgrass valley prairie, which ranges from fairly wet areas with high sedge and rush cover, to drier bunchgrass prairie. In the wet areas, Bradshaw's desertparsley occurs on the edges of tufted-hairgrass or sedge bunches, in patches of bare or open soil. In the drier areas, it is found in low areas, such as small depressions, trails, or seasonal channels, also with open, exposed soils.

Bradshaw's desertparsley reproduces entirely by seeds, which are produced on umbels. Flowers are visited by numerous pollinators, and require insects for pollination. The species blooms fairly early in the spring, usually in April or early May. In the Willamette Valley, these are often wet, rainy weeks, when large bees and butterflies are largely absent. The very general nature of the insect pollinators probably buffers the species from population swings of any one pollinator (Kaye 1992). A typical population of Bradshaw's desertparsley is composed of many more vegetative plants than reproductive plants. In general, populations that have experienced prescribed fire have a higher probability of survival.

Bradshaw's desertparsley was Federally Listed as endangered on September 30, 1988. Critical habitat has not been designated. The species' habitat is presently being destroyed or modified by a number of factors: invasion of prairie vegetation by trees and shrubs; changes in flooding patterns and water movement (which may be critical to seedling establishment); urban development; and agricultural or rural development. In addition, disease caused by a fungal parasite, and insect predation of plants and fruit may threaten smaller populations. Finally, natural factors such as inbreeding or limited pollinator availability may reduce fecundity, and therefore reproductive capacity of the species.

<u>Cook's Lomatium</u>
The primary reference for this species is: USFWS. 2002c. Determination of Endangered Status for *Lomatium cookii* (Cook's Lomatium) and *Limnanthes floccosa* ssp. *grandiflora* (Large-flowered Woolly Meadowfoam) from Southern Oregon. Federal Register 67(216):68003-68015. References cited in this section are internal to the above-referenced document. A complete list of these references is available from the State Supervisor, USFWS, Oregon Fish and Wildlife Office, Portland, Oregon.

Cook's Lomatium (*Lomatium cookii*) occurs in vernal pool habitats in a small area of Jackson County, southwestern Oregon. It is also known to occur in seasonally wet habitats at a few sites in Josephine County, the adjacent county to the west. Cook's Lomatium is known to occur at about 15 sites in Jackson County and at about 21 sites in Josephine County (M. Jones, USDI BLM 2002; Oregon Natural Heritage Information Center Database 2002).

Cook's Lomatium occurs within a 32-square-mile landform in southwestern Oregon known as the Agate Desert in Jackson County. This landform is characterized by shallow soils, a relative lack of trees, sparse prairie vegetation, and agates commonly found on the soil surface (Oregon Natural Heritage Program 1997). Vernal pools in the Agate Desert vary in size from 3 to 100 feet across, and attain a maximum depth of about 12 inches (Oregon Natural Heritage Program 1997). Common associated native species in these vernal pools include popcorn flower, a rush, navarretia, common woolly meadowfoam, and annual hairgrass.

Cook's desert parsley also occurs in another area of about 4 square miles in adjacent Josephine County. This area, referred to as French Flat, is located within the Illinois Valley near the Siskiyou Mountains. In this area, Cook's desert parsley grows in wet meadow areas underlain with floodplain bench deposits that contain sufficient clay to form a clay pan at 24 to 35 inches below the soil surface (U.S. Department of Agriculture 1983). The clay pan creates seasonally wet areas similar to the vernal pools of the Agate Desert, but mostly lacking in mound-swale topography. Common associated species include California oatgrass, popcorn flower, horkelia, mariposa lily, and trout lily. The surrounding forest contains ponderosa pine and Jeffrey pine.

Cook's Lomatium is a perennial forb in the carrot family that grows from a slender, twisted taproot. The species is adapted to grow, flower, and set seed during the short time that water is available in the spring, finishing its life cycle before the dry hot summers.

Cook's Lomatium was Federally Listed as endangered on November 7, 2002. Designation of critical habitat for this species has been deferred. The primary threat to Cook's Lomatium is the destruction of vernal pool habitat by industrial and residential development, including road and powerline construction and maintenance. Agricultural conversion, certain grazing practices, and OHV use also contribute to population declines and local extirpations. Recent evidence also indicates that non-native annual grasses, particularly medusahead, are a greater problem than previously believed. Unlike native perennial bunchgrasses that originally occupied the area, annual grasses die back each year, creating a buildup of thatch from the dead leaves that interferes with the seed germination of native species. Current observations indicate that, without control of annual grasses through mowing, grazing, or prescribed burns, populations tend to decrease over time, and could be extirpated within a relatively short time frame as a result of competition with non-native grasses (Borgias 2002). Additionally, Cook's Lomatium sites in Josephine County are threatened by habitat alteration associated with gold mining and woody species encroachment resulting from fire suppression.

Critical habitat designation for the listed Cook's Lomatium and *Limnanthes floccosa* spp. *grandiflora* is out in draft (June 2006), and a recent settlement agreement says it will be done by July 2010.

Rough Popcorn flower

The primary reference for this species is: USFWS. 2000f. Endangered Status for the Plant *Plagiobothrys hirtus* (Rough Popcorn flower). Federal Register 65(16):3866-3875. References cited in this section are internal to the above-referenced document. A complete list of these references is available from the USFWS Oregon State Office, Portland, Oregon.

The rough popcorn flower (*Plagiobothrys hirtus*) is endemic to seasonal wetlands (e.g., wet swales and meadows) of the interior valley of the Umpqua River in southwestern Oregon (Amsberry and Meinke 1997b). The plant grows at elevations ranging from 98 to 886 feet, in open microsites within interior valley grasslands. Common associates include one-sided sedge, meadow barley, tufted hairgrass, American slough grass, great camas, water foxtail, baltic rush, wild mint, Willamette downingia, and bentgrass (Gamon and Kagan 1985).

The rough popcorn flower is an annual herb on drier sites or a perennial herb on wetter sites (Amsberry and Meinke 1997a). It grows in scattered groups and reproduces largely by insect-aided cross-pollination and partially by self-pollination. The taxon is considered dependent on seasonal flooding and/or fire to maintain open habitat and to limit competition with invasive non-native plant species, such as Himalayan blackberry, teasel, Canada thistle and pennyroyal and native Oregon ash (Gamon and Kagan 1985, Almasi and Borgias 1996).

Approximately 20 occurrences of this species are known, all of which are located in Douglas County, in the vicinity of Wilbur, Sutherlin and Yoncalla, Oregon. Fifteen populations naturally occurring and two are reintroduced. Of the naturally occurring populations, only 5 are legally protected. Two are on Oregon Department of Transportation land and 3 are on private land managed by The Nature Conservancy. The remaining populations are on private, commercial, residential and agricultural land. There is an estimated 7,000 individuals, with patch sizes ranging from 1 to 3,000 individuals. However, since *Plagiobothrys hirtus* ssp. *hirtus* can spread vegetatively, it is difficult to estimate the total number of genetic individuals. Total occupied habitat is only about 45 acres (USFWS 2000).

In cooperation with the Bureau of Land Management (BLM - Roseburg District) and USFWS, ODA created three new populations on the North Bank Habitat Management Area, a 6,000 acre ranch currently managed by the BLM for multi-species habitat conservation. Planted in 1998, these populations continue to thrive, and make a significant contribution to the recovery of this species. ODA continues to monitor these created populations and cooperate with BLM to ensure their long term viability (ODA 2008).

The rough popcorn flower was Federally Listed as endangered on January 25, 2000. Critical habitat has not yet been designated for this species. Draining of wetlands for urban and agricultural uses and road and reservoir construction, however, has altered the original hydrology of the valley to such an extent that the total area of suitable habitat for the species has been substantially reduced. In addition to the ongoing threat of direct loss of habitat from conversion to urban and agricultural uses, hydrological alterations, and fire suppression, other threats to the species include spring and summer livestock grazing, roadside mowing, spraying, competition with non-native vegetation, and landscaping (Gamon and Kagan 1985, Kagan 1995).

Malheur Wire-lettuce

The primary reference for this section is: Hudson, B., J. Augsburger, M. Hillis, and P. Boehne. 2000. Draft Biological Assessment for the Interior Columbia River Basin Ecosystem Management Project Final Environmental Impact Statement. BLM and Forest Service. Boise, Idaho.

Malheur wire-lettuce (*Stephanomeria malheurensis*) is an annual plant that is found at only one 70-acre location near Malheur National Wildlife Refuge in Harney County, Oregon. This population is found within the high desert environment typical of the northern portion of the Great Basin, on top of a dry, broad hill. The substrate at this location is an azonal soil derived from the volcanic tuff layered with thin crusts of limestone. By contrast, the surrounding soils are derived from basalt. The top of the hill is about 500 feet above the surrounding flats, which consist of sagebrush-rabbitbrush desert. The immediate site itself is dominated by big sagebrush, common or gray rabbitbrush, and cheatgrass. Malheur wire-lettuce appears to be one of the few species that is able to survive on and around the otherwise barren harvester ant hills at the site. The area has been fenced to protect the population.

Because the species is an annual, the numbers of plants vary greatly from year to year, and depend largely on the amount of precipitation received prior to and during the spring growing season. Seeds germinate in the fall after a late summer / early fall rain.

The Malhuer wire-lettuce was Federally Listed as endangered on November 10, 1982, and critical habitat was designated to include the 160-acre Scientific Study Area on public land administered by the BLM, located 27 miles south of Burns in Harney County, Oregon. Because of its extremely restricted range and low numbers, this species is vulnerable to even small land disturbances in and around its habitat. Potential future zeolite mining in the area also endangers the continued existence of this species. Other threats to this species that have been identified include competition with cheatgrass, grazing by native herbivores, and possible foraging by beetle larvae.

Threatened

Golden Paintbrush

The primary references for this section are the listing notice (Final Rule) in the June 11, 1997 Federal Register, Vol.62, No. 112, 31740-31748, and Recovery Plan, August 23, 2000, in Portland OR.

Golden paintbrush (*Castilleja levisecta*) inhabits gravelly prairies at low elevations, west of the Cascades from Vancouver Island south through the Puget Trough of Washington. Historically, golden paintbrush was found as far north as British Columbia, and as far south as the Willamette Valley of Oregon. Golden paintbrush is believed to have been extirpated from Oregon although remnants of its Willamette Valley habitat still exists and botanists continue to search for this species. Many populations have been destroyed by the conversion of native prairie habitat to agricultural, residential, and commercial uses. The decline of golden paintbrush is also correlated with fire suppression. Fire disturbance is an integral component of the prairie ecosystem, maintaining grassland by preventing the successional encroachment of woody shrubs and trees. As a direct consequence of these land-use changes, golden paintbrush has not been seen in Oregon for over 40 years. It is found in openings damp in the winter but not from standing water, and it is typically associated with Idaho or red fescue, meadow checkerbloom, camas, cinquefoil, peacock larkspur, Hall's aster, and hairgrass.

Golden paintbrush is a multi-stemmed perennial with covered with soft, somewhat sticky hairs. Flower bracts are about the same width as the upper leaves and are a brilliant golden to yellow color. Plants emerge in early March and flower from April to early September. Bumblebees are most frequently observed foraging on the flowers, and are suspected of being a primary pollinator. Seed production is rather prolific, and cold stratification is required for germination. Like many species within the family Scrophulariaceae, and particularly within the genus Castilleja, golden paintbrush is considered to be a facultative root parasite.

Golden paintbrush was federally-listed as threatened on June 11, 1997. Critical habitat has not been designated. Threats to the extant populations include loss of suitable habitat, the invasion of grassland habitat by native and non-native species, herbivory, trampling, fire suppression, and collecting by humans. The few remaining populations of golden paintbrush in the Pacific Northwest region are isolated, fragmented, and most are quite small. As such, they are vulnerable to extirpation from random, stochastic events, and are individually and collectively critical for the long term survival of this species. USFWS. 1997.

<u>Water Howellia</u>

The primary reference for this section is: Hudson, B., J. Augsburger, M. Hillis, and P. Boehne. 2000. Draft Biological Assessment for the Interior Columbia River Basin Ecosystem Management Project Final Environmental Impact Statement. BLM and Forest Service. Boise, Idaho.

Water howellia (*Howellia aquatilis*) is an annual aquatic plant with a scattered distribution in the Pacific Northwest. The species is known to be extant in Idaho, Montana, and Washington, but is also historically known from California and Oregon. Sites in California and Oregon have not been recently relocated, despite intensive field surveys in both states. Within its current range, water howellia is known from a total of 110 occurrences. There are two main centers of distribution within this range: one in the Swan River Valley in Montana, and one in the vicinity of Spokane, Washington. Populations of water howellia in these centers range from one to 1,000 plants, and occur mostly on publicly-owned land, and at elevations of 400 to 2,320 feet. Two occurrences are known in northern Idaho, in private ownership, and two others are found in western Washington. The total known occupied habitat for this species is less than 100 acres.

Water howellia is restricted to small pothole ponds or the quiet water of shallow, abandoned river oxbows. These wetland habitats typically occur in a matrix of dense forest vegetation, and all known sites have at least some deciduous tree cover around a portion of the pond. Ponderosa pine forests typically surround the ponds, and red-osier dogwood is usually present around the perimeters. The bottom surfaces of the wetlands consist of firm, consolidated clay and organic sediments. These wetlands are generally filled by snowmelt runoff and spring rains, but then dry out to varying degrees by late summer or early fall, depending on annual patterns of temperature and precipitation. The ponds are typically shallow, averaging 1 to 2 feet in depth during the middle of summer.

The bloom period of water howellia varies by geographic location, but typically occurs in May and June. The drying of the wetland habitat in late summer is critical to the species' life cycle; the seeds will only germinate if they are exposed to the atmosphere. After the seedlings appear, usually in October, they overwinter under the snowpack. In late spring and early summer, the plants resume growth in the water that accumulates in the ponds. This ecological relationship has a profound influence on the size of occurrences from year to year; the summer climate determines the degree of pond drying, and thus the amount of seed germination in the fall. During years when seed germination is reduced, few plants are present the following summer.

Water howellia was listed as threatened on July 14, 1994, but critical habitat was not designated. The highly specialized ecological adaptations of the species make it vulnerable to both short- and long-term natural environmental changes, such as succession or climate change. Land management activities and habitat destruction have also affected this species. Development, construction of dams, livestock grazing and trampling, timber harvesting, and road building are some of the human activities that alter the habitat of this species. Competition with introduced plant species, such as reed canarygrass and purple loosestrife, is also a threat.

<u>*Kincaid's Lupine*</u>

The primary references for this section is: USFWS. 1997f. Endangered Status for *Erigeron decumbens* var. *decumbens* (Willamette Daisy) and Fender's Blue Butterfly (*Plebejus icarioides fenderi*) and Threatened Status for *Lupinus sulphureus* ssp. *kincaidii* (Kincaid's Lupine). Federal Register 65(16):3875-3890 and the Management Plan for Kincaid's Lupine (*Lupinus sulphureus* ssp. *kincaidii*) in Douglas County, Oregon by BLM, USDA FS, USFWS. 2008. References cited in this section are internal to the above-referenced documents. A complete list of these references is available from the USFWS Oregon State Office, Portland, Oregon.

In 2008, Kincaid's lupine was known from 76 occurrences, totaling approximately 1,150 acres (465 ha) in size, scattered across six counties (Yamhill, Polk, Benton, Lane, and Douglas Counties in Oregon and Lewis County, Washington) (USFWS 2005). In the Willamette Valley, Kincaid's lupine is typically found in native upland prairie with red fescue and/or Idaho fescues, the dominant species, and Tolmie's mariposa, Hooker's catchfly, broadpetal strawberry, rose checker-mallow, and lomatium species serving as herbaceous indicator species (Hammond and Wilson 1993). The primary habitat for Kincaid's lupine in Douglas County is open woodland and meadow edges, often near roadsides, associated with Pacific madrone *(Arbutus menziesii*), incense cedar *(Calocedrus decurrens*), and Douglas-fir *(Pseudotsuga menziesii*) trees with a relatively open canopy cover. Most of the Douglas County populations appear to tolerate more shaded habitat conditions than the Willamette Valley populations with canopy cover of 50 to 80 percent (Barnes 2004). However, canopy covers between zero and 50 percent occur at the Callahan Meadows and Callahan Ridge sites. Elevations are generally below 460 meters (1,500 feet) and soils are typically shallow and rocky over bedrock, or sometimes deep and very well drained (Chappell and Kagan 2001).

Kincaid's lupine populations in Douglas County, represent the furthest southern extent of the current range. These populations are highly disjunct and isolated from the Willamette Valley populations with approximately 54 miles (87 km) separating Oregon's south Willamette Valley populations from the Douglas County populations. In Douglas County, Kincaid's lupine occurs at 14 sites ranging in size from 0.21 to 3.55 acres. Of these, nine sites occur on public lands. The Douglas County populations may be adapted to tolerate more extreme habitat and/or other environmental conditions. (BLM, USDA FS, USFWS. 2008. Management Plan for Kincaid's Lupine (*Lupinus sulphureus* ssp. *kincaidii*) in Douglas County, Oregon.) In addition to its Oregon occurrences, this species is known from two small sites in Lewis County, southern Washington, 40 miles north of the Willamette Valley.

Kincaid's lupine is a long-lived perennial species, with a maximum reported age of 25 years (Wilson 1993). Individual plants are capable of spreading by rhizomes, producing clumps of plants exceeding 66 feet in diameter

(Hammond 1994). The long rhizomes do not produce adventitious roots (secondary roots growing from stem tissue) and apparently do not separate from the parent clump, and the clumps may be short-lived, regularly dying back to the crown (Kuykendall and Kaye 1993a). Kincaid's lupine is pollinated by solitary bees and flies (Hammond 1994). Seed set and seed production are low, with few (but variable) numbers of flowers producing fruit from year to year, and each fruit containing an average of 0.3 to 1.8 seeds (Liston et al. 1994). Seeds are dispersed from fruits that open explosively upon drying. Kincaid's lupine is the host plant of the federally endangered Fender's blue butterfly.

Kincaid's lupine was Federally Listed as threatened on January 25, 2000. Critical habitat was designated in 2007 for Willamette Valley populations, and a management plan for the species in Douglas County was developed in lieu of critical habitat in 2008. Kincaid's lupine likely once occurred over a large distribution throughout the historic native prairie. However, native prairie vegetation in the Willamette and Umpqua Valleys. Fire was the primary mode of disturbance which kept grassland habitats open and free from encroaching trees and shrubs; the settlement of the Willamette and Umpqua Valleys by Euro-Americans resulted in the conversion of grasslands to urban and agriculture uses, and severely restricted the frequency of fires (Chappell and Kagan 2001). Currently, Kincaid's lupine is threatened by commercial and/or residential development, agriculture, silvicultural practices, road improvement, collection, herbicide use, and naturally occurring demographic and random environmental events. Populations of *Lupinus sulphureus* ssp. *kincaidii* occur on public lands or lands that are managed by a conservation organization at William L. Finley National Wildlife Refuge and Baskett Slough National Wildlife Refuge, Fern Ridge Reservoir, Bureau of Land Management units in Lane and Douglas Counties, the Umpqua National Forest, Willow Creek Preserve, and at the McDonald State Forest. All of these parcels have some level of management for native prairie habitat values.

McFarlane's Four-o'clock

The primary reference for this section is: USFWS. 1996c. Reclassification of *Mirabilis Macfarlanei* (MacFarlane's Four-o'clock) from Endangered to Threatened Status. Federal Register 61(52):10693-10697. References cited in this section are internal to the above-referenced document. A complete list of these references is available from the USFWS Snake River Basin Office, Boise, Idaho.

MacFarlane's four-o'clock (*Mirabilis macfarlanei*) is found on talus slopes in canyonland corridors where the climate is regionally warm and dry, and where precipitation occurs mostly during the period from winter to spring. It can be found in three disjunct areas in Oregon and Idaho that are associated with the Snake, Salmon, and Imnaha rivers. The species occurs as scattered plants on open, steep (50%) slopes of sandy soils, which generally have a west to southeast aspect. Talus rock underlies the soil in which the plants are rooted. Although a variety of soils support this plant throughout its range, the more common sandy soils are quite susceptible to displacement by wind and water erosion.

The plant community in which MacFarlane's four-o'clock occurs is a transition zone between bluebunch wheatgrass-Sandberg bluegrass and smooth sumac-bluebunch wheatgrass, consisting of bluebunch wheatgrass, cheatgrass, sand dropseed, scorpion weed, desert parsley, hackberry, smooth sumac, yarrow, and rabbit bush (Daubenmire 1970, Franklin and Dyrness 1973).

One geographic unit of MacFarlane's four-o'clock includes approximately 25 acres along 6 miles of Hells Canyon on the banks and canyonland slopes above the Snake River in Idaho County, Idaho, and Wallowa County, Oregon. The second geographic unit includes approximately 68 acres along 18 miles of banks and canyonland slopes above the Salmon River in Idaho County, Idaho. The third geographic unit includes about 70 acres of habitat along 3 miles of canyonland slopes over the Imnaha River in Wallowa County, Oregon.

MacFarlane's four-o'clock is a perennial plant with a stout, deep-seated taproot. Flowering occurs from early May to early June, and peaks in mid-May.

MacFarlane's four-o'clock was Federally Listed as endangered on October 26, 1979. After additional populations were discovered, the plant was reclassified as threatened on March 15, 1996. Critical habitat has not been designated. Threats to the species include lack of plant recruitment in some areas, insect predation, invasions of non-native plants (often as a result of grazing practices), and the small size of some populations.

Nelson's Checker-mallow

The primary reference for this section is: USFWS. 1998j. Recovery Plan for the Threatened Nelson's Checker-mallow (*Sidalcea nelsoniana*). Portland, Oregon. References cited in this section are internal to the above-referenced document. They are included in the Bibliography.

Nelson's checker-mallow (*Sidalcea nelsoniana*) occurs as scattered populations in two distinct ecological regions: the northern Coast Range and the Willamette Valley of Oregon (includes two outlying populations in the Puget Trough of Washington). The species is not restricted to a single habitat type. Rather, it occupies a broad range of soils that vary in texture, drainage, and disturbance regimes (CH2M Hill 1986b). Plants appear to favor primary drainages, or those that receive mostly ground flow of stormwater runoff, rather than drainages fed by stream sources.

Although occasionally occurring in the understory of woodlands or among woody shrubs, populations of Nelson's checker-mallow in the Willamette Valley usually occupy open habitats that support early successional species (i.e., plants that colonize openings and then disappear as trees shade them out). These habitats are frequently represented by margins of sloughs, ditches, and streams, roadsides, fence rows, drainage swales, native prairie remnants, and fallow fields. Most sites have been densely colonized by invasive weeds, especially introduced forage grasses. Commonly associated plant species include: tall fescue, rose, common rush, Canada thistle, common St. Johnswort, blackberry, sedge, timothy, velvet grass, yarrow, vetch, western spiraea, bird's-foot trefoil, ox-eye daisy, colonial bent-grass, meadow foxtail, reed canarygrass, Douglas' hawthorn, wild carrot, large-leaved avens, geranium, and Oregon ash (Oregon Department of Agriculture 1995).

Populations of Nelson's checker-mallow in the Coast Range generally occur in open, wet-to-dry meadows, intermittent stream channels, and along the margins of coniferous forests. These areas typically support larger components of native vegetation than the Willamette Valley sites. Commonly associated plant species include tansy ragwort, spear-head senecio, strawberry, velvet grass, timothy, rush, sedge, and yarrow.

Nelson's checker-mallow is an herbaceous perennial plant species in the mallow family. In the Willamette Valley, flowering begins as early as mid-May, and continues through August to early September, depending on the moisture and climatic conditions of each site. Coast Range populations experience a shorter growing season and generally flower later and go dormant earlier. Seeds are deposited locally at or near the base of the parent plant, and may be shed immediately or persist into winter within the dry flower parts that remain attached to the dead stems. Seed dissemination could conceivably be accomplished through ingestion by deer and elk, particularly in the Coast Range. Aboveground portions of the plant die back in the fall, usually followed by some degree of re-greening at the base. It is not uncommon for some plants to continue producing flowers into the fall and early winter. Sexual reproduction appears to be accomplished entirely by insect pollinators.

Nelson's checker-mallow was Federally Listed as threatened on February 12, 1993. Critical habitat has not been designated. Prior to European settlement, Nelson's checker-mallow habitats were likely maintained and kept free of overgrowth and woody vegetation by natural wildfires, fires set by Native Americans (Johannessen et al. 1971; Franklin and Dyrness 1973; Boyd 1986), and sporadic flooding. The landscape and processes such as flooding and fire have been dramatically altered since the onset of European settlement. Today, no natural prairie remains in the Willamette Valley without evidence of livestock grazing, agriculture, and fire suppression (Moir and Mika 1972). Urbanization and conversion of the native prairies into intensively managed croplands and pastures have eliminated and fragmented grasslands to the extent that Nelson's checker-mallow is now restricted to sparsely distributed patches within narrow highway and country road ROW, undeveloped tracts, ditches, fence rows, abandoned fields, parks, and wildlife refuges. Populations in the Willamette Valley are threatened by roadside maintenance, herbicide application and mowing, soil cultivation, ditching, and other habitat modifications.

Land threats are less extreme in the Coast Range, where the meadows occupied by Nelson's checker-mallow are isolated from agricultural and urban development. Potential threats to these populations include a planned water impoundment project, herbicide application associated with timber harvest, and motorcyclists. Other threats to the species as a whole are competition with invasive plant species, the encroachment of trees and shrubs, limited seed production, and the species' small population size and fragmentation.

<u>*Spalding's Catchfly*</u>

The primary reference for this section is: USFWS. 2001c. Final Rule to List *Silene spaldingii* (Spalding's catchfly) as Threatened. Federal Register 66(196):51598-51606. References cited in this section are internal to the above-referenced document. A complete list of these references is available from the USFWS Snake River Basin Office, Boise, Idaho.

Spalding's catchfly (*Silene spaldingii*) is primarily restricted to mesic grasslands that make up the Palouse region in southeastern Washington, northwestern Montana, adjacent portions of Idaho and Oregon, and British Columbia. Palouse prairie is considered a subset of the Pacific Northwest bunchgrass habitat type (Tisdale 1986). Spalding's catchfly is also found in canyon grassland habitat, which is another division of the Pacific Northwest bunchgrass habitat type. Canyon grasslands are dominated by the same bunchgrass species as the Palouse prairie, but the two habitat types differ in their overall plant species composition (Hill 2000, Yuncevich 2000). In addition, canyon grasslands occur in steep, highly dissected canyon systems, whereas Palouse grasslands generally occur on gently rolling plateaus. The steep slopes in canyon grasslands result in pronounced habitat diversity (Yuncevich 2000). This steepness has also prevented the conversion of canyon grasslands to other uses, such as agriculture.

Spalding's catchfly is typically associated with grasslands dominated by native perennial bunchgrasses such as Idaho fescue or rough fescue. Other associated species include bluebunch wheatgrass, prairie Junegrass, snowberry, Nootka rose, yarrow, prairie smoke avens, sticky purple geranium, and arrowleaf balsamroot (Lichthardt 1997, Montana Natural Heritage Program 1998). Scattered individuals of ponderosa pine may also be found in or adjacent to Spalding's catchfly habitat. Sites on which Spalding's catchfly occurs range from approximately 1,500 feet to 5,100 feet in elevation (Oregon Natural Heritage Program 1998, Washington Natural Heritage Program 1998).

At the time of listing in 2001, this species was known from a total of 52 populations in the United States and British Columbia, 51 of which were in the United States (7 in Idaho, 7 in Oregon, 9 in Montana, and 28 in Washington). The range of individuals in each population ranges from one to several thousand. Much of the remaining habitat occupied by Spalding's catchfly is fragmented, with clusters of populations geographically isolated from one another.

Spalding's catchfly is a long-lived perennial herb that ranges from 8 to 24 inches in height (Lichthardt 1997). The species does not possess rhizomes or other means of vegetative reproduction, and reproduces by seed only (Lesica 1992). Plants are typically pollinated by bumblebees, which appear to be critical to population viability (Lesica 1993).

Spalding's catchfly was Federally Listed as threatened on October 10, 2001. At the time of listing, designation of critical habitat was deemed prudent, but was deferred until resources become available. Large-scale ecological changes in the Palouse region over the past century, including agricultural conversion, changes in fire frequency, and alterations of hydrology, have resulted in the decline of Spalding's catchfly. More than 98% of the original Palouse prairie habitat has been lost or modified be agricultural conversion, grazing, invasions of non-native plant species, altered fire regimes, and urbanization (Noss et al. 1995). In addition, the less accessible canyon grasslands have been disturbed by livestock grazing and the invasion of non-native plant species. Threats to this species include habitat destruction and fragmentation resulting from agriculture and urban development, grazing and trampling by domestic livestock and native herbivores, herbicide treatment, and competition from non-native plant species.

<u>*Howell's Spectacular Thelypody*</u>
The primary reference for this section is: USFWS. 1999c. Threatened Status for the Plant *Thelypodium howellii* ssp. *spectabilis* (Howell's Spectacular Thelypody). Federal Register 64(101):28393-28403. References cited in this section are internal to the above-referenced document. They are included in the Bibliography.

Howell's spectacular thelypody (*Thelypodium howellii* var. *spectabilis*) occurs in moist, alkaline meadow habitats at approximately 3,000 feet to 3,500 feet elevation in northeastern Oregon. The plant is currently known from 11 sites (five populations) ranging in size from 0.03 to 41 acres in the Baker-Powder River Valley in Baker and Union counties. The total occupied habitat for this species is approximately 100 acres, and its range lies entirely within a 13-mile radius of Haines, Oregon. Howell's spectacular thelypody usually grows in valley bottoms around woody shrubs that dominate the habitat on the knolls, and along the edge of wet meadow habitat between the knolls. Associated species include greasewood, alkali saltgrass, giant wild rye, alkali cordgrass, and alkali bluegrass (Kagan 1986). Soils are pluvial-deposited alkaline clays mixed with recent alluvial silts, and are moderately well-drained.

Howell's spectacular thelypody is an herbaceous biennial that reaches a height of approximately 2 feet, with branches arising from near the base of the stem. Flowers are purple and borne on short stalks, and fruits are long, slender pods (Greenleaf 1980, Kagan 1986). The taxon may be dependent on periodic flooding, since it appears to rapidly colonize areas adjacent to streams that have flooded (Kagan 1986). In addition, this taxon does not compete well with encroaching weedy vegetation such as teasel (Davis and Youtie 1995).

Howell's spectacular thelypody was listed as threatened on May 26, 1999. Critical habitat has not been designated. Factors that threaten this taxon include habitat destruction and fragmentation caused by agricultural and urban development, grazing by domestic livestock, competition from non-native vegetation, and alteration of wetland hydrology.

Conservation Measures for Vascular Plants

As dictated in BLM Manual 6840 (Special Status Species Management), local BLM offices are required to develop and implement management plans and programs that will conserve listed species and their habitats. In addition, NEPA documentation related to treatment activities (i.e., projects) will be prepared that identify any TEP plant species or their critical habitat that are present in the proposed treatment areas, and that list the measures that will be taken to protect them.

Many local BLM offices already have management plans in place that ensure the protection of these plant species during activities on public land. However, a discussion of these existing plans is outside the scope of this programmatic BA. The following general guidance applies to all management plans developed at the local level.

Required steps include the following:

- A survey of all proposed action areas within potential habitat by a botanically qualified biologist, botanist, or ecologist to determine the presence/absence of the species.
- Establishment of site-specific no activity buffers by a qualified botanist, biologist, or ecologist in areas of occupied habitat within the proposed project area. To protect occupied habitat, treatment activities would not occur within these buffers.
- Collection of baseline information on the existing condition of TEP plant species and their habitats in the proposed project area.
- Establishment of pre-treatment monitoring programs to track the size and vigor of TEP populations and the state of their habitats. These monitoring programs would help in anticipating the future effects of vegetation treatments on TEP plant species.
- Assessment of the need for site revegetation post treatment to minimize the opportunity for noxious weed invasion and establishment.

At a minimum, the following must be included in all management plans:

- Given the high risk for damage to TEP plants and their habitat from burning, mechanical treatments, and use of domestic animals to contain weeds, none of these treatment methods should be utilized within 330 feet of sensitive plant populations UNLESS the treatments are specifically designed to maintain or improve the existing population.
- Off-highway use of motorized vehicles associated with treatments should be avoided in suitable or occupied habitat.
- Biological control agents (except for domestic animals) that affect target plants in the same genus as TEP species must not be used to control target species occurring within the dispersal distance of the agent.
- Prior to use of biological control agents that affect target plants in the same family as TEP species, the specificity of the agent with respect to factors such as physiology and morphology should be evaluated, and a determination as to risks to the TEP species made.
- Post-treatment monitoring should be conducted to determine the effectiveness of the project.

In addition, the following guidance must be considered in all management plans in which herbicide treatments are proposed to minimize or avoid risks to TEP species. The exact conservation measures to be included in management plans would depend on the herbicide that would be used, the desired mode of application, and the conditions of the site. Given the potential for off-site drift and surface runoff, populations of TEP species on lands not administered by the BLM would need to be considered if they are located near proposed herbicide treatment sites.

- Herbicide treatments should not be conducted in areas where TEP plant species may be subject to direct spray by herbicides during treatments.
- Applicators should review, understand, and conform to the “Environmental Hazards” section on herbicide labels (this section warns of known pesticide risks and provides practical ways to avoid harm to organisms or the environment).
- To avoid negative effects to TEP plant species from off-site drift, surface runoff, and/or wind erosion, suitable buffer zones should be established between treatment sites and populations (confirmed or suspected) of TEP plant species, and site-specific precautions should be taken (refer to the guidance provided below).
- Follow all instructions and Standard Operating Procedures to avoid spill and direct spray scenarios into aquatic habitats that support TEP plant species.
- Follow all BLM operating procedures for avoiding herbicide treatments during climatic conditions that would increase the likelihood of spray drift or surface runoff.

The following conservation measures refer to sites where broadcast spraying of herbicides, either by ground or aerial methods, is desired. Manual spot treatment of undesirable vegetation can occur within the listed buffer zones if it is determined by local biologists that this method of herbicide application would not pose risks to TEP plant species in the vicinity. Additional precautions during spot treatments of vegetation within habitats where TEP plant species occur should be considered while planning local treatment programs, and should be included as conservation measures in local-level NEPA documentation.

The buffer distances provided below are conservative estimates, based on the information provided by ERAs, and are designed to provide protection to TEP plants. Some ERAs used regression analysis to predict the smallest buffer distance to ensure no risks to TEP plants. In most cases, where regression analyses were not performed, suggested buffers extend out to the first modeled distance from the application site for which no risks were predicted. In some instances the jump between modeled distances was quite large (e.g., 100 feet to 900 feet). Regression analyses could be completed at the local level using the interactive spreadsheets developed for the ERAs, using information in ERAs and for local site conditions (e.g., soil type, annual precipitation, vegetation type, and treatment method), to calculate more precise, and possibly smaller buffers for some herbicides.

2,4-D

- Because the risks associated with this herbicide were not assessed, do not spray within ½ mile of terrestrial plant species or aquatic habitats where TEP aquatic plant species occur.
- Do not use aquatic formulations in aquatic habitats where TEP aquatic plant species occur.
- Assess local site conditions when evaluating the risks from surface water runoff to TEP plants located within ½ mile downgradient from the treatment area.
- In areas where wind erosion is likely, do not apply within ½ mile of TEP plant species.

Bromacil

- Do not apply within 1,200 feet of terrestrial TEP plant species.
- If using a low boom at the typical application rate, do not apply within 100 feet of an aquatic habitat in which TEP plant species occur.
- If using a low boom at the maximum application rate or a high boom, do not apply within 900 feet of an aquatic habitat in which TEP plant species occur.
- In areas where wind erosion is likely, do not apply within ½ mile of TEP plant species.

Chlorsulfuron

- Do not apply by ground methods within 1,200 feet of terrestrial TEP species.
- Do not apply by aerial methods within 1,500 feet of terrestrial TEP species.
- Do not apply by ground methods within 25 feet of aquatic habitats where TEP plant species occur.
- Do not apply by aerial methods at the maximum application rate within 300 feet of aquatic habitats where TEP plant species occur.
- Do not apply by aerial methods at the typical application rate within 100 feet of aquatic habitats where TEP plant species occur.
- In areas where wind erosion is likely, do not apply within ½ mile of TEP plant species.

Clopyralid

- Since the risks associated with using a high boom are unknown, use only a low boom during ground applications of this herbicide within ½ mile of terrestrial TEP plant species or aquatic habitats in which TEP plant species occur.
- Do not apply by ground methods at the typical application rate within 900 of terrestrial TEP species.
- Do not apply by ground methods at the typical application rate within ½ mile of terrestrial TEP species.

- Do not apply by aerial methods within ½ mile of terrestrial TEP species.
- In areas where wind erosion is likely, do not apply within ½ mile of TEP plant species.

Dicamba

- If using a low boom at the typical application rate, do not apply within 1,050 feet of terrestrial TEP plant species.
- If using a low boom at the maximum application rate, do not apply within 1,050 feet of terrestrial TEP plant species.
- If using a high boom, do not apply within 1,050 feet of terrestrial TEP plant species.
- Do not apply within 25 feet of aquatic habitats where TEP plant species occur.
- In areas where wind erosion is likely, do not apply within ½ mile of TEP plant species.

Diflufenzopyr

- If using a low boom at the typical application rate, do not apply within 100 feet of terrestrial TEP plant species.
- If using a high boom, or a low boom at the maximum application rate, do not apply within 900 feet of terrestrial TEP plant species.
- If using a high boom, do not apply within 500 feet of terrestrial TEP plant species.
- Do not apply within 25 feet of aquatic habitats where TEP plant species occur.
- In areas where wind erosion is likely, do not apply within ½ mile of TEP plant species.

Diquat

- Do not use in aquatic habitats where TEP aquatic plant species occur.
- Do not apply by ground methods within 1,000 feet of terrestrial TEP species at the maximum application rate.
- Do not apply by ground methods within 900 feet of terrestrial TEP species at the typical application rate.
- Do not apply by aerial methods within 1,200 feet of terrestrial TEP species.

Diuron

- Do not apply within 1,100 feet of terrestrial TEP species.
- If using a low boom at the typical application rate, do not apply within 900 feet of aquatic habitats where TEP aquatic plant species occur.
- If using a high boom, or a low boom at the maximum application rate, do not apply within 1,1000 feet of aquatic habitats where TEP aquatic plant species occur.
- In areas where wind erosion is likely, do not apply within ½ mile of TEP plant species.

Fluridone

- Since effects on terrestrial TEP plant species are unknown, do not apply within ½ mile of terrestrial TEP species.

Glyphosate

- Since the risks associated with using a high boom are unknown, use only a low boom during ground applications of this herbicide within ½ mile of terrestrial TEP plant species.
- Do not apply by ground methods at the typical application rate within 50 feet of terrestrial TEP plant species.
- Do not apply by ground methods at the maximum application rate within 300 feet of terrestrial TEP plant species.
- Do not apply by aerial methods within 300 feet of terrestrial TEP plant species.

Hexazinone
- Since the risks associated with using a high boom or an aerial application are unknown, only apply this herbicide by ground methods using a low boom within ½ mile of terrestrial TEP plant species and aquatic habitats that support aquatic TEP species.
- Do not apply by ground methods at the typical application rate within 300 feet of terrestrial TEP plant species or aquatic habitats that support aquatic TEP plant species.
- Do not apply by ground methods at the maximum application rate within 900 feet of terrestrial TEP plant species or aquatic habitats that support aquatic TEP plant species.
- In areas where wind erosion is likely, do not apply within ½ mile of TEP plant species.

Imazapic
- Do not apply by ground methods within 25 feet of terrestrial TEP species or aquatic habitats where TEP plant species occur.
- Do not apply by helicopter at the typical application rate within 25 feet of terrestrial TEP plant species.
- Do not apply by helicopter at the maximum application rate, or by plane at the typical application rate, within 300 feet of terrestrial TEP plant species.
- Do not apply by plane at the maximum application rate within 900 feet of terrestrial TEP species.
- Do not apply by aerial methods at the maximum application rate within 300 feet of aquatic TEP species.
- Do not apply by aerial methods at the typical application rate within 100 feet of aquatic TEP species.
- In areas where wind erosion is likely, do not apply within ½ mile of TEP plant species.

Imazapyr
- Since the risks associated with using a high boom are unknown, use only a low boom for ground applications of this herbicide within ½ mile of terrestrial TEP plant species or aquatic habitats in which TEP plant species occur.
- Do not apply at the typical application rate, by ground or aerial methods, within 900 feet of terrestrial TEP plant species or aquatic habitats in which aquatic TEP species occur.
- Do not apply at the maximum application rate, by ground or aerial methods, within ½ mile of terrestrial TEP plant species or aquatic habitats in which aquatic TEP species occur.
- Do not use aquatic formulations in aquatic habitats where TEP aquatic plant species occur.
- In areas where wind erosion is likely, do not apply within ½ mile of TEP plant species.

Metsulfuron Methyl
- Since the risks associated with using a high boom are unknown, use only a low boom for ground applications of this herbicide within ½ mile of terrestrial TEP plant species or aquatic habitats in which TEP plant species occur.
- Do not apply at the typical application rate, by ground or aerial methods, within 900 feet of terrestrial TEP plant species or aquatic habitats in which aquatic TEP species occur.
- Do not apply at the maximum application rate, by ground or aerial methods, within ½ mile of terrestrial TEP plant species or aquatic habitats in which aquatic TEP species occur.
- In areas where wind erosion is likely, do not apply within ½ mile of TEP plant species.

Diflufenzopyr + Dicamba
- If using a low boom at the typical application rate, do not apply within 100 feet of terrestrial TEP plant species.
- If using a low boom at the maximum application rate, do not apply within 900 feet of terrestrial TEP plant species.
- If using a high boom, do not apply within 900 feet of terrestrial TEP plant species.

- Do not apply within 25 feet of aquatic habitats where TEP plant species occur.
- In areas where wind erosion is likely, do not apply within ½ mile of TEP plant species.

Picloram

- Do not apply by ground or aerial methods, at any application rate, within ½ mile of terrestrial TEP plant species.
- Assess local site conditions when evaluating the risks from surface water runoff to TEP plants located within ½ mile downgradient from the treatment area.
- In areas where wind erosion is likely, do not apply within ½ mile of TEP plant species.

Sulfometuron Methyl

- Do not apply by ground or aerial methods within 1,500 feet of terrestrial TEP species.
- Do not apply by ground methods within 900 feet of aquatic habitats where TEP plant species occur, or by aerial methods within 1,500 feet of aquatic habitats where TEP plant species occur.
- In areas where wind erosion is likely, do not apply within ½ mile of TEP plant species.

Tebuthiuron

- If using a low boom at the typical application rate, do not apply within 25 feet of terrestrial TEP plant species.
- If using a low boom at the maximum application rate or a high boom at the typical application rate, do not apply within 50 feet of terrestrial TEP plant species.
- If using a high boom at the maximum application rate, do not apply within 900 feet of terrestrial TEP plant species.
- Do not apply within 25 feet of aquatic habitats where TEP plant species occur.
- In areas where wind erosion is likely, do not apply within ½ mile of TEP plant species.

Triclopyr Acid

- Since the risks associated with using a high boom are unknown, use only a low boom during ground applications of this herbicide within ½ mile of terrestrial TEP plant species.
- Since the risks associated with using a high boom are unknown, use only a low boom during ground applications at the maximum application rate of this herbicide within ½ mile of aquatic habitats in which TEP plant species occur.
- Do not apply by ground methods at the typical application rate within 300 feet of terrestrial TEP plant species.
- Do not apply by aerial methods at the typical application rate within 500 feet of terrestrial TEP plant species.
- Do not apply by ground or aerial methods at the maximum application rate within ½ mile of terrestrial TEP plant species or aquatic habitats in which TEP plant species occur.
- If applying to aquatic habitats in which aquatic TEP plant species occur, do not exceed the targeted water concentration on the product label.
- In areas where wind erosion is likely, do not apply within ½ mile of TEP plant species.

Triclopyr BEE

- Since the risks associated with using a high boom are unknown, use only a low boom for ground applications of this herbicide within ½ mile of terrestrial TEP plant species or aquatic habitats in which TEP plant species occur.
- Do not apply by ground methods at the typical application rate within 300 feet of terrestrial TEP plant species or aquatic habitats in which TEP plant species occur.

- Do not apply by aerial methods at the typical application rate within 500 feet of terrestrial TEP plant species or aquatic habitats in which TEP plant species occur.
- Do not apply by ground or aerial methods at the maximum application rate within ½ mile of terrestrial TEP plant species or aquatic habitats in which TEP plant species occur.
- Do not use aquatic formulations in aquatic habitats where TEP aquatic plant species occur.
- In areas where wind erosion is likely, do not apply within ½ mile of TEP plant species.

The information provided in Table 4-4 provides a general guideline as to the types of habitats in which treatments (particularly fire) may be utilized to improve growing conditions for TEP plant species. However, at the local level, the BLM must make a further determination as to the suitability of vegetation treatments for the populations of TEP species that are managed by local offices. The following information should be considered: the timing of the treatment in relation to the phenology of the TEP plant species; the intensity of the treatment; the duration of the treatment; and the tolerance of the TEP species to the particular type of treatment to be used. When information about species tolerance is unavailable or is inconclusive, local offices must assume a negative effect to plant populations, and protect those populations from direct exposure to the treatment in question.

Treatment plans must also address the presence of and expected impacts on noxious weeds on the project site. These plans must be coordinated with BLM weed experts and/or appropriate county weed supervisors to minimize the spread of weeds. In order to prevent the spread of noxious weeds and other unwanted vegetation in occupied or suitable habitat, the following precautions should be taken:

- Cleared areas that are prone to downy brome or other noxious weed invasions should be seeded with an appropriate seed mixture to reduce the probability of noxious weeds or other undesirable plants becoming established on the site.
- Where seeding is warranted, bare sites should be seeded as soon as appropriate after treatment, and at a time of year when it is likely to be successful.
- In suitable habitat for TEP species, non-native species should not be used for revegetation.
- Certified noxious weed seed free seed must be used in suitable habitat, and preference should be given to seeding appropriate plant species when rehabilitation is appropriate.
- Straw and hay bales used for erosion control in suitable habitat must be certified weed- and seed-free.
- Vehicles and heavy equipment used during treatment activities should be washed prior to arriving at a new location to avoid the transfer of noxious weeds.

When BAs are drafted at the local level for treatment programs, additional conservation measures may be added to this list. Where BLM plans that consider the effects of vegetation treatments on TEP plant species already exist, these plans should be consulted, and incorporated (e.g., any guidance or conservation measures they provide) into local level BAs for vegetation treatments.

Table A5-1. State Director's Special Status Species List – Federally Threatened, Endangered, or Proposed, Oregon January 2008

Scientific Name	Common Name		Listed	Critical Habitat	Recovery Plan
Birds					
Endangered					
Pelecanus occidentalis californicus	California brown pelican		1970	None	Final 1983
Threatened					
Brachyramphus marmoratus	Marbled murrelet		1992	Designated 1996	Final 1997
Charadrius alexandrinus nivosus	Western snowy plover *(Pacific Coastal population)*		1993	Designated 2005	Final 2007
Strix occidentalis caurina	Northern spotted owl		1990	Designated 1992	Draft 2007
Fish					
Endangered					
Catostomus microps	Modoc sucker		1985	Designated 1985	None
Chasmistes brevirostris	Shortnose sucker		1988	Proposed 1994	Final 1993
Deltistes luxatus	Lost river sucker		1988	Proposed 1994	Final 1993
Gila boraxobius	Borax lake chub		1980	Final 1982	Final 1987
Oncorhynchus mykiss	Steelhead *(Upper Columbia River)*		1997	Designated 2005	Final 2007
Oncorhynchus tshawytscha	Chinook salmon *(Upper Columbia River Spring run)*		1999	Designated 2005	Final 2007
Threatened					
Catostomus warnerensis	Warner sucker		1985	Designated 1985	Final 1998
Gila bicolor ssp.	Hutton tui chub		1985	None	Final 1998
Oncorhynchus clarki henshawi	Lahontan cutthroat trout		1970	None	Final 1995
Oncorhynchus kisutch	Coho salmon	*(Lower Columbia River)*	2005	None	None
		(Northern CA / Southern Oregon Coast)	1997	Designated 1999	None
Oncorhynchus mykiss	Steelhead	*(Lower Columbia River)*	1998	Designated 2005	None
		(Middle Columbia River)	1999	Designated 2005	None
		(Upper Willamette River)	1999	Designated 2005	None
		(Snake River Basin)	1997	Designated 2005	None
Oncorhynchus tshawytscha	Chinook salmon	*(Lower Columbia River)*	1999	Designated 2005	None
		(Upper Willamette River)	1999	Designated 2005	None
		(Snake River – Fall/Spring/Summer runs)	1992	Designated 1993	None
Rhinichthys osculus ssp.	Foskett speckled dace		1985	None	Final 1998
Salvelinus confluentus	Bull trout	*(Columbia River)*	1998	Final 2005	Draft 2002
		(Klamath River)	1998	Final 2005	Draft 2002
		(Coastal / Puget Sound)	1999	Final 2005	Draft 2004

Table A5-1. State Director's Special Status Species List – Federally Threatened, Endangered, or Proposed, Oregon January 2008 (continued)

Invertebrates				
Endangered				
Plebejus icarioides fenderi	Fender's blue butterfly	2000	Proposed 2005	None
Threatened				
Branchinecta lynchi	Vernal pool fairy shrimp	1994	Designated 2003	Final 2005
Speyeria zerene hippolyta	Oregon silverspot butterfly	1980	Designated 1980	Final 2001
Mammals				
Endangered				
Canis lupus	Gray wolf	2003	None in OR or WA	Final 1987
Odocoileus virginianus leucurus	Columbian white-tailed deer *(Columbia River population)*	1967	None	Final 1983
Threatened				
Lynx canadensis	Canada lynx	2000	Designated 2006	None
Vascular Plants				
Endangered				
Arabis macdonaldiana	Macdonald's rock-cress	1978	None	Final 1984
Arenaria paludicola	Marsh sandwort	1993	None	Final 1998
Astragalus applegatei	Applegate's milk-vetch	1993	None	Final 1998
Erigeron decumbens var. *decumbens*	Willamette valley daisy	2000	Proposed 2005	None
Fritillaria gentneri	Gentner's fritillary	1999	None	Final 2003
Lilium occidentale	Western lily	1994	None	Final 1998
Limnanthes floccosa ssp. *grandiflora*	Large-flowered wooly meadowfoam	2002	None	Draft 2006
Lomatium bradshawii	Bradshaw's desertparsley	1988	None	Final 1993
Lomatium cookii	Cook's lomatium	2002	None	Draft 2006
Plagiobothrys hirtus	Rough popcorn flower	2001	None	Final 2003
Stephanomeria malheurensis	Malheur wire-lettuce	1982	Final 1982	Final 1991
Threatened				
Castilleja levisecta	Golden paintbrush	1997	None	Final 2000
Howellia aquatilis	Water howellia	1994	None	Draft 1996
Lupinus sulphureus ssp. *kincaidii*	Kincaid's lupine	2000	Designated 2006	None
Mirabilis macfarlanei	Macfarlane's four o'clock	1979	None	Final 2000
Sidalcea nelsoniana	Nelson's checkermallow	1993	None	Final 1998
Silene spaldingii	Spalding's catchfly	2001	None	Final 2007
Thelypodium howellii ssp. *spectabilis*	Howell's spectacular thelypody	1999	None	Final 2002

Table A5-2. State Director's Special Status Species List – Bureau Sensitive, January 2008, Oregon BLM

Scientific name	*Common name*
Amphibians	
Aneides flavipunctatus	Black salamander
Ascaphus montanus	Inland tailed frog
Batrachoseps attenuatus	California slender salamander
Batrachoseps wrightorum	Oregon slender salamander
Bufo woodhousii	Woodhouse's toad
Dicamptodon copei	Cope's giant salamander
Plethodon larselli	Larch mountain salamander
Plethodon stormi	Siskiyou mountains salamander
Rana boylii	Foothill yellow-legged frog
Rana luteiventris	Columbia spotted frog (Great Basin population)
Rana pipiens	Northern leopard frog
Rana pretiosa	Oregon spotted frog
Birds	
Agelaius tricolor	Tricolored blackbird
Ammodramus savannarum	Grasshopper sparrow
Bartramia longicauda	Upland sandpiper
Branta canadensis occidentalis	Dusky canada goose
Branta hutchinsii leucopareia	Aleutian canada goose
Bucephala albeola	Bufflehead
Centrocercus urophasianus	Greater sage-grouse
Charadrius alexandrinus nivosus	Western snowy plover (outside Pacific Coastal population)
Coccyzus americanus	Yellow-billed cuckoo
Coturnicops noveboracensis	Yellow rail
Cygnus buccinator	Trumpeter swan
Cypseloides niger	Black swift
Dolichonyx oryzivorus	Bobolink
Egretta thula	Snowy egret
Elanus leucurus	White-tailed kite
Eremophila alpestris strigata	Streaked horned lark
Falco peregrinus anatum	American peregrine falcon
Fratercula cirrhata	Tufted puffin
Haliaeetus leucocephalus	Bald eagle
Histrionicus histrionicus	Harlequin duck
Larus pipixcan	Franklin's gull
Leucosticte atrata	Black rosy finch
Melanerpes lewis	Lewis' woodpecker
Pelecanus erythrorhynchos	American white pelican
Picoides albolarvatus	White-headed woodpecker
Podiceps auritus	Horned grebe
Podiceps grisegena	Red-necked grebe
Pooecetes gramineus affinis	Oregon vesper sparrow
Progne subis	Purple martin
Seiurus noveboracensis	Northern waterthrush
Tympanuchus phasianellus columbianus	Columbian sharp-tailed grouse

Table A5-2. State Director's Special Status Species List – Bureau Sensitive, January 2008, Oregon BLM (cont.)

Fish	
Catostomus tahoensis	Tahoe sucker
Cottus pitensis	Pit sculpin
Gila alvordensis	Alvord chub
Gila bicolor eurysoma	Sheldon tui chub
Gila bicolor oregonensis	Oregon lakes tui chub
Gila bicolor ssp.	Summer basin tui chub
Gila bicolor ssp.	Catlow tui chub
Gila bicolor thalassina	Goose lake tui chub
Lampetra minima	Miller lake lamprey
Lampetra tridentata ssp.	Goose lake lamprey
Lavinia symmetricus mitrulus	Pit roach
Oncorhynchus clarki lewisi	Westslope cutthroat trout
Oncorhynchus clarkii	Coastal cutthroat trout (Columbia River / SW Washington)
Oncorhynchus keta	Chum salmon (Pacific Coast)
Oncorhynchus kisutch	Coho Salmon (Oregon Coast)
Oncorhynchus mykiss	Steelhead (Klamath Mountains Province)
Oncorhynchus mykiss	Steelhead (Oregon Coast)
Oncorhynchus mykiss	Inland redband trout
Oncorhynchus tshawytscha	Chinook salmon (Southern Oregon / N. California Coast)
Oregonichthys kalawatseti	Umpqua chub
Rhinichthys cataractae ssp.	Millicoma dace
Richardsonius egregius	Lahontan redside shiner
Mammals	
Antrozous pallidus	Pallid bat
Arborimus longicaudus	Oregon red tree vole (NW Oregon, North of Hwy. 20)
Brachylagus idahoensis	Pygmy rabbit (outside Columbia Basin population)
Corynorhinus townsendii	Townsend's big-eared bat
Enhydra lutris	Sea otter
Euderma maculatum	Spotted bat
Gulo gulo luteus	California wolverine
Martes pennanti	Fisher
Myotis thysanodes	Fringed myotis
Odocoileus virginianus leucurus	Columbian white-tailed deer (Douglas County population)
Spermophilus washingtoni	Washington ground squirrel
Vulpes macrotis	Kit fox
Invertebrates	
Algamorda newcombiana	Newcomb's littorine snail
Allomyia scotti	Scott's apatanian caddisfly
Boloria bellona	Meadow fritillary

Table A5-2. State Director's Special Status Species List – Bureau Sensitive, January 2008, Oregon BLM (cont.)

Boloria selene	Silver-bordered fritillary
Bombus franklini	Franklin's bumblebee
Callophrys johnsoni	Johnson's hairstreak
Callophrys polios maritima	Hoary elfin
Chloealtis aspasma	Siskiyou short-horned grasshopper
Cicindela hirticollis siuslawensis	Siuslaw sand tiger beetle
Colligyrus sp. nov. 1	Columbia duskysnail
Cryptomastix devia	Puget oregonian
Cryptomastix populi	Hells canyon land snail
Deroceras hesperium	Evening fieldslug
Euphydryas editha taylori	Taylor's checkerspot
Fluminicola insolitus	Donner und blitzen pebblesnail
Fluminicola sp. nov. 11	Nerite pebblesnail
Fluminicola sp. nov. 3	Klamath rim pebblesnail
Gliabates oregonius	Salamander slug
Gonidea angulata	Western ridged mussel
Helisoma newberryi newberryi	Great basin ramshorn
Helminthoglypta hertleini	Oregon shoulderband
Hemphillia glandulosa	Warty jumping-slug
Hesperarion mariae	Tillamook westernslug
Juga hemphilli dallesensis	Dalles juga
Juga hemphilli hemphilli	Barren juga
Juga hemphilli maupinensis	Purple-lipped juga
Lanx klamathensis	Scale lanx
Lanx subrotunda	Rotund lanx
Lygus oregonae	Oregon plant bug
Micracanthia fennica	Harney hot spring shore bug
Monadenia chaceana	Chase sideband
Monadenia fidelis beryllica	Green sideband
Monadenia fidelis celeuthia	Travelling sideband
Monadenia fidelis ssp. nov.	Deschutes sideband
Monadenia fidelis ssp. nov.	Modoc rim sideband
Ochlodes yuma	Yuma skipper
Oreohelix variabilis sp. nov.	Deschutes mountainsnail
Pisidium ultramontanum	Montane peaclam
Plebejus saepiolus littoralis	Insular blue butterfly
Polites mardon	Mardon skipper
Pomatiopsis binneyi	Robust walker
Pomatiopsis californica	Pacific walker
Pristiloma arcticum crateris	Crater lake tightcoil
Pristiloma pilsbryi	Crowned tightcoil
Prophysaon vanattae pardalis	Spotted tail-dropper
Pterostichus rothi	Roth's blind ground beetle
Pyrgulopsis intermedia	Crooked creek springsnail
Pyrgulopsis robusta	Jackson lake springsnail
Rhyacophila chandleri	A caddisfly
Rhyacophila haddocki	Haddock's rhyacophilan caddisfly
Saldula villosa	Hairy shore bug
Speyeria coronis coronis	Coronis fritillary
Vespericola sierranus	Siskiyou hesperian

Table A5-2. State Director's Special Status Species List – Bureau Sensitive, January 2008, Oregon BLM (cont.)

Reptiles	
Actinemys marmorata marmorata	Northwestern pond turtle
Chrysemys picta	Painted turtle
Vascular plants	
Abronia turbinata	Trans montane abronia
Abronia umbellata ssp. *breviflora*	Pink sand-verbena
Achnatherum hendersonii	Henderson's ricegrass
Achnatherum speciosum	Desert needlegrass
Achnatherum wallowaensis	Wallowa ricegrass
Adiantum jordanii	California maiden-hair
Agastache cusickii	Cusick's giant-hyssop
Agoseris elata	Tall agoseris
Agrostis howellii	Howell's bentgrass
Allenrolfea occidentalis	Iodine bush
Allium geyeri var. *geyeri*	Geyer's onion
Amsinckia carinata	Malheur valley fiddleneck
Anemone oregana var. *felix*	Bog anemone
Arabis koehleri var. *koehleri*	Koehler's rockcress
Arabis sparsiflora var. *atrorubens*	Sickle-pod rockcress
Arctostaphylos hispidula	Hairy manzanita
Argemone munita	Prickly-poppy
Arnica viscosa	Shasta arnica
Artemisia arbuscula ssp. *longicaulis*	Lahontan sagebrush
Artemisia campestris ssp. *borealis* var. *wormskioldii*	Northern wormwood
Artemisia papposa	Owyhee sagebrush
Artemisia pycnocephala	Coastal sagewort
Asplenium septentrionale	Grass-fern
Asplenium trichomanes-ramosum	Green spleenwort
Astragalus californicus	California milk-vetch
Astragalus calycosus	King's rattleweed
Astragalus collinus var. *laurentii*	Laurence's milk-vetch
Astragalus cusickii var. *sterilis*	Sterile milk-vetch
Astragalus diaphanus var. *diurnus*	South fork john day milk-vetch
Astragalus gambelianus	Gambel milk-vetch
Astragalus geyeri var. *geyeri*	Geyer's milk-vetch
Astragalus mulfordiae	Mulford's milk-vetch
Astragalus peckii	Peck's milk-vetch
Astragalus platytropis	Broad-keeled milk-vetch
Astragalus tegetarioides	Bastard kentrophyta
Astragalus tyghensis	Tygh valley milk-vetch
Bensoniella oregana	Bensonia
Botrychium ascendens	Upward-lobed moonwort
Botrychium campestre	Prairie moonwort
Botrychium crenulatum	Crenulate moonwort
Botrychium lineare	Slender moonwort
Botrychium lunaria	Moonwort
Botrychium minganense	Gray moonwort
Botrychium montanum	Mountain grape-fern

Table A5-2. State Director's Special Status Species List – Bureau Sensitive, January 2008, Oregon BLM (cont.)

Botrychium paradoxum	Twin-spiked moonwart
Botrychium pedunculosum	Stalked moonwort
Botrychium pumicola	Pumice grape-fern
Brodiaea terrestris	Dwarf brodiaea
Bupleurum americanum	Bupleurum
Calamagrostis breweri	Brewer's reedgrass
Callitriche marginata	Winged water-starwort
Calochortus coxii	Crinite mariposa-lily
Calochortus greenei	Greene's mariposa-lily
Calochortus howellii	Howell's mariposa-lily
Calochortus indecorus	Sexton mt. Mariposa-lily
Calochortus longebarbatus var. *peckii*	Peck's mariposa-lily
Calochortus macrocarpus var. *maculosus*	Green-band mariposa-lily
Calochortus monophyllus	One-leaved mariposa-lily
Calochortus nitidus	Broad-fruit mariposa-lily
Calochortus persistens	Siskiyou mariposa-lily
Calochortus umpquaensis	Umpqua mariposa-lily
Calyptridium roseum	Rosy pussypaws
Camassia howellii	Howell's camas
Camissonia graciliflora	Slender-flowered evening-primrose
Camissonia pygmaea	Dwarf evening-primrose
Cardamine pattersonii	Saddle mountain bittercress
Carex abrupta	Abrupt-beaked sedge
Carex atrosquama	Blackened sedge
Carex brevicaulis	Short stemmed sedge
Carex capillaris	Hairlike sedge
Carex capitata	Capitate sedge
Carex comosa	Bristly sedge
Carex constanceana	Constances's sedge
Carex cordillerana	Cordilleran sedge
Carex crawfordii	Crawford's sedge
Carex diandra	Lesser panicled sedge
Carex dioica var. *gynocrates*	Yellow bog sedge
Carex gynodynama	Hairy sedge
Carex idahoa	Idaho sedge
Carex klamathensis sp. nov.	A sedge
Carex lasiocarpa var. *americana*	Slender sedge
Carex livida	Pale sedge
Carex macrochaeta	Large-awn sedge
Carex media	Intermediate sedge
Carex nardina	Spikenard sedge
Carex nervina	Sierra nerved sedge
Carex pelocarpa	New sedge
Carex pyrenaica ssp. *micropoda*	Pyrenaean sedge
Carex retrorsa	Retrorse sedge
Carex scabriuscula	Siskiyou sedge
Carex scirpoidea var. *stenochlaena*	Alaskan single-spiked sedge
Carex serratodens	Saw-tooth sedge
Carex subnigricans	Dark alpine sedge

Table A5-2. State Director's Special Status Species List – Bureau Sensitive, January 2008, Oregon BLM (cont.)

Carex vernacula	Native sedge
Castilleja chlorotica	Green-tinged paintbrush
Castilleja fraterna	Fraternal paintbrush
Castilleja mendocinensis	Mendocino coast indian paintbrush
Castilleja rubida	Purple alpine paintbrush
Castilleja thompsonii	Thompson's paintbrush
Caulanthus crassicaulis var. *glaber*	Smooth wild cabbage
Caulanthus major var. *gevadensis*	Slender wild cabbage
Chaenactis xantiana	Desert chaenactis
Chaetadelpha wheeleri	Wheeler's skeleton-weed
Cheilanthes covillei	Coville's lip-fern
Cheilanthes feei	Fee's lip-fern
Cheilanthes intertexta	Coastal lipfern
Chlorogalum angustifolium	Narrow-leaved amole
Cicendia quadrangularis	Timwort
Cimicifuga elata var. *elata*	Tall bugbane
Collomia mazama	Mt. Mazama collomia
Coptis trifolia	Three-leaf goldthread
Cordylanthus maritimus ssp. *palustris*	Point reyes bird's beak
Corydalis aquae-gelidae	Cold-water corydalis
Cryptantha leiocarpa	Seaside cryptantha
Cryptantha milo-bakeri	Milo baker's cryptantha
Cryptogramma stelleri	Steller's rockbrake
Cupressus bakeri	Baker's cypress
Cymopterus acaulis var. *greeleyorum*	Greeley's cymopterus
Cymopterus longipes ssp. *ibapensis*	Ibapah wavewing
Cymopterus nivalis	Snowline spring-parsley
Cymopterus purpurascens	Purple cymopterus
Cyperus acuminatus	Short-pointed cyperus
Cyperus lupulinus ssp. *lupulinus*	A cyperus
Cypripedium fasciculatum	Clustered lady's-slipper
Delphinium bicolor	Flathead larkspur
Delphinium leucophaeum	White rock larkspur
Delphinium nudicaule	Red larkspur
Delphinium nuttallii	Nutall's larkspur
Delphinium pavonaceum	Peacock larkspur
Dicentra pauciflora	Few-flowered bleedingheart
Dodecatheon austrofrigidum	Frigid shootingstar
Dodecatheon pulchellum var. *shoshonense*	Darkthroat shootingstar
Draba howellii	Howell's whitlow-grass
Elatine brachysperma	Short seeded waterwort
Eleocharis bolanderi	Bolander's spikerush
Epilobium oreganum	Oregon willow-herb
Ericameria arborescens	Golden fleece
Erigeron cervinus	Siskiyou daisy
Erigeron disparipilus	White cushion erigeron
Erigeron engelmannii var. *davisii*	Engelmann's daisy
Erigeron howellii	Howell's daisy
Erigeron latus	Broad fleabane

Table A5-2. State Director's Special Status Species List – Bureau Sensitive, January 2008, Oregon BLM (cont.)

Erigeron oreganus	Oregon daisy
Eriogonum brachyanthum	Short-flowered eriogonum
Eriogonum chrysops	Golden buckwheat
Eriogonum crosbyae	Crosby's buckwheat
Eriogonum cusickii	Cusick's buckwheat
Eriogonum hookeri	Hooker's wild buckwheat
Eriogonum lobbii	Lobb's buckwheat
Eriogonum prociduum	Prostrate buckwheat
Eriogonum salicornioides	Playa buckwheat
Eriogonum umbellatum var. *glaberrimum*	Green buckwheat
Eriophorum chamissonis	Russet cotton-grass
Erythronium elegans	Coast range fawn-lily
Erythronium howellii	Howell's adder's-tongue
Eschscholzia caespitosa	Gold poppy
Eucephalus gormanii	Gorman's aster
Eucephalus vialis	Wayside aster
Filipendula occidentalis	Queen-of-the-forest
Fritillaria camschatcensis	Black lily
Galium serpenticum ssp. *warnerense*	Warner mt. Bedstraw
Gentiana newberryi	Newberry's gentian
Gentiana plurisetosa	Elegant gentian
Gentiana prostrata	Moss gentian
Gentiana setigera	Waldo gentian
Gentianella tenella ssp. *tenella*	Slender gentian
Geum rossii var. *turbinatum*	Slender-stemmed avens
Gilia millefoliata	Seaside gilia
Gratiola heterosepala	Boggs lake hedge-hyssop
Hackelia bella	Beautiful stickseed
Hackelia cronquistii	Cronquist's stickseed
Hackelia ophiobia	Three forks stickseed
Hastingsia bracteosa var. *atropurpurea*	Purple-flowered rush-lily
Hastingsia bracteosa var. *bracteosa*	Large-flowered rush-lily
Heliotropium curassavicum	Salt heliotrope
Hieracium horridum	Shaggy hawkweed
Horkelia congesta ssp. *congesta*	Shaggy horkelia
Horkelia tridentata ssp. *tridentata*	Three-toothed horkelia
Hydrocotyle verticillata	Whorled marsh-pennywort
Hymenoxys lemmonii	Cooper's goldflower
Iliamna latibracteata	California globe-mallow
Iris tenax var. *gormanii*	Gorman's iris
Ivesia rhypara var. *shypara*	Grimy ivesia
Ivesia rhypara var. *shellyi*	Shelly's ivesia
Ivesia shockleyi	Shockley's ivesia
Juncus triglumis var. *albescens*	Three-flowered rush
Kalmiopsis fragrans	Fragrant kalmiopsis
Keckiella lemmonii	Bush beardtongue
Kobresia bellardii	Bellard's kobresia
Kobresia simpliciuscula	Simple kobresia
Lasthenia ornduffii	Large-flowered goldfields

Table A5-2. State Director's Special Status Species List – Bureau Sensitive, January 2008, Oregon BLM (cont.)

Lathyrus holochlorus	Thin-leaved peavine
Lepidium davisii	Davis' peppergrass
Lewisia columbiana var. *columbiana*	Columbia lewisia
Lewisia leana	Lee's lewisia
Limnanthes floccosa ssp. *bellingeriana*	Bellinger's meadow-foam
Limnanthes floccosa ssp. *pumila*	Dwarf meadow-foam
Limnanthes gracilis var. *gracilis*	Slender meadow-foam
Limonium californicum	Western marsh-rosemary
Lipocarpha aristulata	Aristulate lipocarpha
Listera borealis	Northern twayblade
Lobelia dortmanna	Water lobelia
Lomatium engelmannii	Englemann's desert-parsley
Lomatium erythrocarpum	Red-fruited lomatium
Lomatium foeniculaceum ssp. *fimbriatum*	Fringed desert-parsley
Lomatium ochocense	Ochoco lomatium
Lomatium ravenii	Raven's lomatium
Lomatium suksdorfii	Suksdorf's desert parsley
Lomatium watsonii	Watson's desert parsley
Lotus stipularis	Stipuled trefoil
Luina serpentina	Colonial luina
Lupinus lepidus var. *cusickii*	Cusick's lupine
Lupinus nevadensis	Nevada lupine
Lupinus tracyi	Tracy's lupine
Lycopodiella inundata	Bog club-moss
Lycopodium complanatum	Ground cedar
Malacothrix sonchoides	Lyrate malacothrix
Meconella oregana	White fairypoppy
Mentzelia congesta	United blazingstar
Mentzelia mollis	Smooth mentzelia
Mentzelia packardiae	Packard's mentzelia
Microseris bigelovii	Coast microseris
Microseris howellii	Howell's microseris
Mimulus bolanderi	Bolander's monkeyflower
Mimulus congdonii	Congdon's monkeyflower
Mimulus evanescens	Disappearing monkeyflower
Mimulus hymenophyllus	Membrane-leaved monkeyflower
Mimulus latidens	Broad-toothed monkeyflower
Mimulus tricolor	Three-colored monkey-flower
Muhlenbergia minutissima	Annual dropseed
Navarretia leucocephala ssp. *leucocephala*	White-flowered navarretia
Nemacladus capillaries	Slender nemacladus
Oenothera wolfii	Wolf's evening-primrose
Ophioglossum pusillum	Adder's-tongue
Oxytropis sericea var. *sericea*	White locoweed
Pellaea andromedifolia	Coffee fern
Pellaea bridgesii	Bridges' cliff-brake
Pellaea mucronata ssp. *mucronata*	Bird's-foot fern
Penstemon barrettiae	Barrett's penstemon
Penstemon glaucinus	Blue-leaved penstemon

Table A5-2. State Director's Special Status Species List – Bureau Sensitive, January 2008, Oregon BLM (cont.)

Penstemon peckii	Peck's penstemon
Perideridia erythrorhiza	Red-rooted yampah
Phacelia argentea	Silvery phacelia
Phacelia gymnoclada	Naked-stemmed phacelia
Phacelia inundata	Playa phacelia
Phacelia leonis	Siskiyou phacelia
Phacelia lutea var. *mackenzieorum*	Mackenzie's phacelia
Phacelia minutissima	Dwarf phacelia
Phlox hendersonii	Henderson's phlox
Phlox multiflora	Many-flowered phlox
Physaria chambersii	Chambers' twinpod
Pilularia americana	American pillwort
Plagiobothrys austiniae	Austin's plagiobothrys
Plagiobothrys figuratus ssp. *corallicarpus*	Coral seeded allocarya
Plagiobothrys greenei	Greene's popcorn flower
Plagiobothrys lamprocarpus	Shiny-fruited popcorn flower
Plagiobothrys salsus	Desert allocarya
Platanthera obtusata	Small northern bog-orchid
Pleuropogon oregonus	Oregon semaphoregrass
Poa rhizomata	Timber bluegrass
Poa unilateralis	San francisco bluegrass
Pogogyne floribunda	Profuse-flowereed mesa mint
Polystichum californicum	California sword-fern
Potamogeton diversifolius	Rafinesque's pondweed
Pyrrocoma racemosa var. *racemosa*	Racemose pyrrocoma
Pyrrocoma radiata	Snake river goldenweed
Rafinesquia californica	California chicory
Ranunculus austrooreganus	Southern oregon buttercup
Ranunculus triternatus	Dalles mt. Buttercup
Rhamnus ilicifolia	Redberry
Rhynchospora alba	White beakrush
Ribes divaricatum var. *pubiflorum*	Straggly gooseberry
Romanzoffia thompsonii	Thompson's mistmaiden
Rorippa columbiae	Columbia cress
Rotala ramosior	Lowland toothcup
Rubus bartonianus	Bartonberry
Salix farriae	Farr's willow
Salix wolfii	Wolf's willow
Saxifraga adscendens ssp. *oregonensis*	Wedge-leaf saxifrage
Saxifragopsis fragarioides	Joint-leaved saxifrage
Scheuchzeria palustris var. *americana*	Scheuchzeria
Schoenoplectus subterminalis	Water clubrush
Scirpus pendulus	Drooping bulrush
Sedum moranii	Rogue river stonecrop
Senecio ertterae	Ertter's senecio
Sericocarpus rigidus	White-topped aster
Sesuvium verrucosum	Verrucose sea-purslane
Sidalcea hickmanii ssp. nov.	Hickman's checkerbloom
Sidalcea hirtipes	Bristly-stemmed sidalcea

Table A5-2. State Director's Special Status Species List – Bureau Sensitive, January 2008, Oregon BLM (cont.)

Sidalcea malviflora ssp. *patula*	Coast checker bloom
Silene hookeri ssp. *bolanderi*	Bolander's catchfly
Sisyrinchium hitchcockii	Hitchcock's blue-eyed grass
Sisyrinchium sarmentosum	Pale blue-eyed grass
Solanum parishii	Parish's horse-nettle
Sophora leachiana	Western sophora
Stanleya confertiflora	Biennial stanleya
Stellaria humifusa	Creeping chickweed
Streptanthus glandulosus	Common jewel flower
Streptanthus howellii	Howell's streptanthus
Streptopus streptopoides	Kruhsea
Suksdorfia violacea	Violet suksdorfia
Sullivantia oregana	Oregon sullivantia
Symphoricarpos longiflorus	Long-flowered snowberry
Talinum spinescens	Spinescent fameflower
Thalictrum alpinum	Alpine meadowrue
Thelypodium brachycarpum	Short-podded thelypody
Thelypodium eucosmum	Arrow-leaf thelypody
Townsendia montana	Mountain townsendia
Townsendia parryi	Parry's townsendia
Trifolium douglasii	Douglas' clover
Trifolium leibergii	Leiberg's clover
Trifolium owyheense	Owyhee clover
Trillium kurabayashii	Siskiyou trillium
Trollius laxus var. *albiflorus*	American globeflower
Utricularia gibba	Humped bladderwort
Utricularia minor	Lesser bladderwort
Utricularia ochroleuca	Northern bladderwort
Viola primulifolia ssp. occidentalis	Western bog violet
Wolffia borealis	Dotted water-meal
Wolffia columbiana	Columbia water-meal
Zigadenus fontanus	Small-flowered death camas
Bryophytes	
Andreaea schofieldiana	Moss
Barbilophozia lycopodioides	Liverwort
Bryum calobryoides	Moss
Calypogeia sphagnicola	Liverwort
Campylopus schmidii	Moss
Chiloscyphus gemmiparus	Liverwort
Codriophorus depressus	Moss
Cryptomitrium tenerum	Liverwort
Diplophyllum plicatum	Liverwort
Encalypta brevicollis	Moss
Encalypta brevipes	Moss
Encalypta intermedia	Moss
Entosthodon fascicularis	Moss
Ephemerum crassinervium	Moss
Gymnomitrion concinnatum	Liverwort
Helodium blandowii	Moss

Table A5-2. State Director's Special Status Species List – Bureau Sensitive, January 2008, Oregon BLM (cont.)

Herbertus aduncus	Liverwort
Iwatsukiella leucotricha	Moss
Jungermannia polaris	Liverwort
Kurzia makinoana	Liverwort
Limbella fryei	Moss
Lophozia laxa	Liverwort
Meesia uliginosa	Moss
Metzgeria violacea	Liverwort
Orthodontium pellucens	Moss
Peltolepis quadrata	Liverwort
Polytrichum sphaerothecium	Moss
Porella bolanderi	Liverwort
Pseudocalliergon trifarium	Moss
Ptilidium pulcherrimum	Liverwort
Rhizomnium nudum	Moss
Rhytidium rugosum	Moss
Schistidium cinclidodonteum	Moss
Schistostega pennata	Moss
Splachnum ampullaceum	Moss
Tayloria serrata	Moss
Tetraphis geniculata	Moss
Tetraplodon mnioides	Moss
Tomentypnum nitens	Moss
Tortula mucronifolia	Moss
Trematodon boasii	Moss
Tritomaria exsectiformis	Liverwort
Fungi	
Albatrellus avellaneus	
Alpova alexsmithii	
Arcangeliella camphorata	
Boletus pulcherrimus	
Bridgeoporus nobilissimus	
Chamonixia caespitosa	
Choiromyces venosus	
Cortinarius barlowensis	
Cudonia monticola	
Cystangium idahoensis	
Dermocybe humboldtensis	
Destuntzia rubra	
Gastroboletus imbellus	
Gastroboletus vividus	
Gomphus kauffmanii	
Gymnomyces fragrans	
Gymnomyces nondistincta	
Helvella crassitunicata	
Leucogaster citrinus	
Mythicomyces corneipes	
Octaviania macrospora	
Otidea smithii	

Table A5-2. State Director's Special Status Species List – Bureau Sensitive, January 2008, Oregon BLM (cont.)

Phaeocollybia californica	
Phaeocollybia dissiliens	
Phaeocollybia gregaria	
Phaeocollybia olivacea	
Phaeocollybia oregonensis	
Phaeocollybia pseudofestiva	
Phaeocollybia scatesiae	
Phaeocollybia sipei	
Phaeocollybia spadicea	
Pseudorhizina californica	
Ramaria amyloidea	
Ramaria gelatiniaurantia	
Ramaria largentii	
Ramaria rubella var. *blanda*	
Ramaria spinulosa var. diminutiva	
Rhizopogon chamaleontinus	
Rhizopogon ellipsosporus	
Rhizopogon exiguus	
Rhizopogon inquinatus	
Sowerbyella rhenana	
Stagnicola perplexa	
Thaxterogaster pavelekii	
Lichens	
Bryoria pseudocapillaris	
Bryoria spiralifera	
Bryoria subcana	
Calicium adspersum	
Chaenotheca subroscida	
Dermatocarpon meiophyllizum	
Erioderma sorediatum	
Heterodermia leucomela	
Heterodermia sitchensis	
Hypogymnia duplicata	
Hypotrachyna revoluta	
Leioderma sorediatum	
Leptogium burnetiae	
Leptogium cyanescens	
Lobaria linita	
Microcalicium arenarium	
Niebla cephalota	
Pannaria rubiginosa	
Pilophorus nigricaulis	
Pseudocyphellaria mallota	
Ramalina pollinaria	
Stereocaulon spathuliferum	
Teloschistes flavicans	
Texosporium sancti-jacobi	
Tholurna dissimilis	
Usnea nidulans	

Appendix 6 – Summary of Existing District Resource Management Plan Direction for Noxious Weeds

The public lands within the nine BLM Districts in Oregon are covered by 18 Resource Management Plans (RMPs) and accompanying environmental impact statements (Figure A6-1). The RMPs contain direction for allocated uses, protection for resource values, and objectives for vegetation management. All of the RMPs acknowledge the problem of noxious weeds and contain objectives for their control. However, like other objectives identified in RMPs, they are not prescriptive with regards to control methods, tools, seasons, or other treatment parameters. Following are the sections within each of the 18 RMPs that address noxious weeds and their treatment.

Acronyms specific to this Appendix
(Acronyms for the entire EIS be found in Volume I, page i of this EIS)

ACS	Aquatic Conservation Strategy
AMR	Appropriate Management Response
CMPA	Cooperative Management and Protection Area
CSNM	Cascade Siskiyou National Monument
DEA	Diversity Emphasis Area
FONSI	Finding of No Significant Impact
GIS	Geographic Information System
KFRA	Klamath Falls Resource Area
PNC	Potential Natural Communities
PRIA	Public Rangelands Improvement Act
RA	Resource Area
ROD	Record of Decision
SMA	Special Management Area
T&E	Threatened & Endangered
USFWS	U.S. Fish and Wildlife Service

References cited in this Appendix are internal to the RMP that the reference is cited in.

Salem Resource Management Plan, Salem District, 1995, Page 64

Noxious Weeds

Objectives

Contain and/or reduce noxious weed infestations on BLM-administered lands using an integrated pest management approach. Some noxious weeds expected to be subject to control are tansy ragwort, Canadian thistle, scotch broom, and knapweed.

Avoid introducing or spreading noxious weed infestations in any areas.

Land Use Allocations
No allocations are made for noxious weeds in the planning process.

Management Actions/Direction

Late-Successional Reserves

Evaluate impacts of nonnative plants (weeds) growing in Late-Successional Reserves.

Develop plans and recommendations for eliminating or controlling nonnative plants (weeds) which adversely effect Late-Successional Reserve objectives. Include an analysis of effects of implementing such programs on other species or habitats within reserves.

All Land Use Allocations

Continue to survey BLM-administered lands for noxious weed infestations, report infestations to the Oregon Department of Agriculture, and work with them to reduce infestations.

Use control methods which do not retard or prevent attainment of Aquatic Conservation Strategy objectives.

Apply integrated pest management methods (e.g., chemical, mechanical, manual and/or biological) in accordance with BLM's multistate environmental impact statement for noxious weed control and the related record of decision.

Eugene Resource Management Plan, Eugene District, 1995, Page 102

Noxious Weeds

Objectives

Contain and/or reduce noxious weed infestations on BLM administered land using an integrated pest management approach. Some noxious weeds expected to be subject to control are:

Common Name	Scientific Name
meadow knapweed	*Centaurea jacea x nigra*
tansy ragwort	*Senecio jacobaeae*
Canada thistle	*Cirsium arvense*
St.-Johns-wort	*Hypericum perforatum*
Scotch broom	*Cytisus scoparius*
French broom	*Cytisus monspessulanus*
gorse	*Ulex europaeus*
diffuse knapweed	*Centaurea diffusa*
spotted knapweed	*Centaurea maculosa*
purple loosestrite	*Lythrum salicaria*
puncture vine	*Tribulus terrestris*
bull thistle	*Cirsium vulgare*
distaff thistle	*Carthamus lanatu*s

Avoid introducing or spreading noxious weed infestations in any areas.

Land Use Allocations

No allocations are made for noxious weeds in the planning process.

Management Actions/Direction

Implement an integrated noxious weed control program. Develop a Prevention Plan and identification of Weed Free Areas. Site-specific plans will be prepared for 5-year periods. Control methods or combinations of methods proposed are dependent upon size, location, species, and type of weed infestation.

Evaluate impacts of nonnative plants (weeds) growing in all land use allocations.

Develop plans and recommendations for eliminating or controlling nonnative plants (weeds) that adversely affect Late-Successional Reserve objectives. Include an analysis of effects of implementing such programs on other species or habitats within reserves.

Continue to survey BLM administered land for noxious weed infestations, report infestations to the Oregon Department of Agriculture (ODA) and work with ODA to reduce infestations.

Use control methods that do not retard or prevent attainment of Aquatic Conservation Strategy objectives. Apply integrated pest management methods (chemical, mechanical, manual and/or biological) in accordance with BLM's multistate Environmental Impact Statement, Northwest Area Noxious Weed Control Program, 1985, as supplemented in 1987, and the related ROD.

Roseburg Resource Management Plan, Roseburg District, 1995, Page 74

Noxious Weeds

Objectives

Contain and/or reduce noxious weed infestations on BLM-administered land using an integrated pest management approach.

Avoid introducing or spreading noxious weed infestations in any areas.

Land Use Allocations

No allocations are made for noxious weeds in the planning process.

Management Actions/Direction

Late-Successional Reserves

Evaluate impacts of nonnative plants (weeds) growing in Late-Successional Reserves.

Develop plans and recommendations for eliminating or controlling nonnative plants (weeds) which adversely affect Late-Successional Reserve objectives. Include an analysis of effects of implementing such programs on other species or habitats within reserves.

All Land Use Allocations

Continue to survey BLM-administered land for noxious weed infestations, report infestations to the Oregon Department of Agriculture, and work with the department to control infestations.

Use control methods which do not retard or prevent attainment of Aquatic Conservation Strategy Objectives. Apply integrated pest management methods (e.g., chemical, mechanical, manual, and biological) in accordance with BLM's 1985 Northwest Area Noxious Weed Control Program Environmental Impact Statement, 1987 Supplement and respective Records of Decision.

Medford Resource Management Plan, Medford District, 1995, Page 92

Noxious Weeds

Objectives

Contain and/or reduce noxious weed infestations on BLM-administered land using an integrated pest management approach. Some noxious weeds expected to be subject to control are:

Common Name	Scientific Name
Rush skeleton weed	*Chondrilla juncea*
Tansy ragwort	*Senecio jacobaea*
Yellow star thistle	*Centaurea solstitialis*
Scotch broom	*Cytisus scoparius*
Puncturevine	*Tribulus terrestiris*
Canada thistle	*Cirsium arvense*
Leafy spurge	*Euphorbia esula*
Diffuse knapweed	*Centaurea diffusa*
Purple loosestrife	*Lythrum salicaria*

Avoid introducing or spreading noxious weed infestations in any areas. Reduce infestations where possible.

Land Use Allocations

None

Management Actions/Direction

Late-Successional Reserves

Evaluate impacts of nonnative plants (weeds) growing in late-successional reserves.

Develop plans and recommendations for eliminating or controlling nonnative plants (weeds) which adversely affect late-successional reserve objectives. Include an analysis of effects of implementing such programs on other species or habitats within late-successional reserves.

All Land Use Allocations

Continue to survey BLM-administered land for noxious weed infestations, report infestations to the Oregon Department of Agriculture (the department), and work with the department to reduce infestations.

Use control methods that do not retard or prevent attainment of Aquatic Conservation Strategy and riparian reserve objectives.

Apply integrated pest management methods (e.g., chemical, mechanical, manual and/or biological) in accordance with BLM's multistate environmental impact statement, Northwest Area Noxious Weed Control Program, 1986, as supplemented in 1987, and the related ROD.

Place priority on elimination or reduction of noxious weeds occurring within special areas.

Coos Bay Resource Management Plan, Coos Bay District, 1995, Page 72

Noxious Weeds

Objectives

Contain and/or reduce noxious weed infestations on BLM-administered land using an integrated pest management approach and avoid introducing or spreading noxious weed infestations in any areas. Some noxious weeds expected to be subject to control are:

Common Name	Scientific Name
Purple loosestrife	*Lythrum salicaria*
Gorse	*Ulex europaeus*
Scotch broom	*Cytisus scoparius*
French broom	*Genista monospessulana*
Yellow starthistle	*Centaurea solstitalis*
Tansy ragwort	*Senecio jacobaea*
Maltgrass	*Nardus stricta*
Thistles	*Cirsium* spp.

Land Use Allocations

No allocations are made for noxious weeds in the planning process.

Management Actions/Direction - Late-Successional Reserves

Evaluate impacts of non-native plants (weeds) growing in Late-Successional Reserves.

Develop plans and recommendations for eliminating or controlling non-native plants (weeds) that adversely affect Late-Successional Reserve objectives. Include an analysis of effects of implementing such programs on other species or habitats within reserves.

Management Actions/Direction - All Land Use Allocations

Continue to survey BLM-administered land for noxious weed infestations, report infestations to the Oregon Department of Agriculture, and coordinate with them to reduce infestations.

Use control methods that do not retard or prevent attainment of Aquatic Conservation Strategy Objectives.

Apply integrated pest management methods (e.g., chemical, mechanical, manual, and/or biological) in accordance with BLM's multi-state environmental impact statement, Northwest Area Noxious Weed Control Program, as supplemented, and the related ROD.

Klamath Falls Resource Management Plan, Lakeview District, 1995, Page 73

Noxious Weeds

Objectives
Avoid introducing or spreading noxious weed infestations in any areas.

Contain and/or reduce noxious weed infestations on BLM-administered land using an integrated pest management approach. Some noxious weeds expected to be subject to control are listed in Table 18.

Land Use Allocations

No allocations are made for noxious weeds in the planning process.

Management Actions/Direction

All Land Use Allocations

Continue to survey BLM-administered land for noxious weed infestations, report infestations to the Oregon Department of Agriculture, and work with the Department of Agriculture to reduce infestations.

Use control methods which do not retard or prevent attainment of Aquatic Conservation Strategy Objectives. Apply integrated pest management methods (for example, chemical, mechanical, manual, and/or biological) in accordance with the BLM's multi-state environmental impact statement, Northwest Area Noxious Weed Control Program, 1985, as supplemented in 1987, and the related Record of Decision, and as described in the Noxious Weed Strategy for Oregon/Washington (July 1994). Local direction for the planning area is from an integrated weed control plan and environmental assessment decision record of July 1993.

Design management actions to minimize the potential for noxious weed invasion and/or dominance of the affected area.

Late-Successional/District Designated Reserves
Evaluate impacts of non-native plants (weeds) growing in Late-Successional/District Designated Reserves.

Develop plans and recommendations for eliminating or controlling non-native plants (weeds) which adversely affect Late-Successional/District Designated Reserve objectives. Include an analysis of effects of implementing such programs on other species or habitats within reserves.

Cascade Siskiyou National Monument Record of Decision and Resource Management Plan, Medford District, August 2008, Pages 28, 31, 33, 45, 48, 49, 50, 56, 58, 67, 81, 83 and Appendix F

Page 28
Noxious Weeds/Invasive Plants
Noxious weeds and other non-native species are also a management concern. Canada thistle, yellow starthistle, and medusahead are the most common noxious weeds in the OGEA. Bulbous bluegrass, a non-native species, has established a strong foothold in all plant communities throughout the monument. Knapweeds show potential for spreading within the OGEA, but have so far been restricted to a few roadside populations that have been treated with herbicides.

Page 31
2) Protect or enhance existing habitat for species associated with late-successional forests.
- Reduce the threat of high-severity wildland fire or other major disturbance events (stand replacement) to areas currently functioning as late-successional habitat.
- Reduce mortality rates of large trees, especially pines, in mid- and late-successional stands with high tree densities.
- Maintain intact, healthy old-growth structure in forests. Focus treatments on stands where previous interventions or events have adversely impacted stand structure.
- Reintroduce fire to the landscape through the careful use of prescribed fire.
- Reduce the presence and spread of noxious weeds and undesirable non-native species.

Page 33
Noxious Weed Treatments
Noxious weed treatments are an important component of OGEA management. The tools that can be used to treat noxious weeds are described in Appendix F.

Page 45
Noxious Weeds/Invasive Plants
One of the primary management concerns in the DEA is the proliferation of weeds across the landscape (Map 15). Spatial analysis in GIS indicates that weeds are associated with roads, sites of acute disturbance (past timber harvest, power line corridors, pastures and other tilled areas), and areas of high livestock utilization. Disturbance associated with management activities may favor noxious weed invasion; therefore, limiting disturbance appears critical to controlling weeds. Some of the major ecological problems associated with grass/shrub/woodlands involve annual grasses, and noxious weeds like yellow starthistle and Canada thistle.

Page 48
1) Control the spread of noxious weeds and other invasive grasses.
- Maintain healthy herbaceous plant communities as a barrier to weed invasions.
- Improve conditions of stands that have a mixture of weeds and remnant native herbaceous species.
- Eradicate and restore small isolated weed patches to native herbaceous plant domination.
- Survey and treat primary travel corridors that serve as vectors for weed spread.
- Isolate and treat large extensive weed areas.
- Develop a long-term restoration plan for weedy areas greater than one acre.

Page 49

4) Protect monument resources from fires originating on adjacent private lands. Reduce the risk of wildland fires spreading to residential properties in the wildland-urban interface.

- Manage DEA lands in the WUI in a way that complements the management of adjacent lands in the OGEA.
- Where possible, reinforce fire hazard reduction activities on private lands by reducing fire hazard on adjoining monument lands.

The control of noxious weeds and the improvement of riparian habitats are management objectives that extend beyond the boundaries of the DEA. Although these objectives are of particular concern in the DEA, this section references rather than repeats the monument's landscape-wide noxious weed strategy (Appendix F) and the Riparian Areas and Aquatic Resources section of this chapter.

Page 50

Weed Abatement

DEA-1 The comprehensive strategy for treating noxious weeds across the monument described in Appendix F is adopted. The treatments described in this strategy will not be limited by the pilot studies described below. Noxious weed treatments can include manual weeding, biological control, herbicides, prescribed fire or prescribed grazing. Focal areas identified for immediate treatments are identified in the weed strategy. Noxious weeds will be treated aggressively, contingent on funding. Current funding has allowed a mixture of hand-pulling and herbicide treatments on approximately 1,000 to 2,000 acres each year for the past several years. The only herbicide currently used in the monument is RODEO® (glyphosate).

Page 56

Noxious Weeds/Invasive Plants

Noxious weeds and other invasive species are present in riparian areas and can displace the native vegetation used by aquatic and terrestrial wildlife. Some aquatic noxious weeds, such as purple loosestrife, are present in the region and could infest the monument's riparian ecosystems in the near future.

Page 58

2) Maintain and improve wetland and riparian plant communities and structure (ACS Objective 8).

- Promote herbaceous and woody-plant development.
- Protect existing late-successional structure in riparian areas.
- Promote the development of late-successional structure where appropriate.
- Reduce the presence and spread of noxious weeds and other non-native species.
- Restore floodplain plant communities and add large wood to floodplains.
- Where possible, improve, reconstruct or decommission constructed water sources to allow recovery of the former native plant communities.

Page 67

Noxious Weeds

The spread of noxious weeds is a problem throughout the monument, particularly in the Diversity Emphasis Area (DEA). Livestock are one vector associated with the spread of noxious weeds: livestock disturbance may increase site receptiveness to noxious weed invasions; and livestock movement through areas may also contribute to weed spread. To what extent do livestock, as compared to other historic or current disturbance factors, contribute to the introduction and/or spread of noxious weeds and undesirable non-native species in the monument?

Page 81

Disturbance associated with road construction and subsequent travel over roads provides corridors for the spread of noxious weeds and other invasive species. An analysis of the spatial relationship of individual weed populations relative to disturbance factors throughout the monument indicate that higher than expected counts of weed populations occur within 100 meters (328 feet) of roads. Most of the recorded weed populations within the monument are found in close proximity to roads (Map 15).

Page 83

Road Closures

Seasonal, temporary, and long-term road closures will be used to reduce the open road density in order to protect monument resources. Gates and road barriers regulate vehicle access in order to reduce maintenance costs, road damage, soil erosion, water quality degradation, the spread of noxious weeds, wildland fire risk, and wildlife disturbance. Road closures restrict unauthorized motorized access while allowing access for administrative purposes, ROW grants, reciprocal agreements, fire suppression, or other authorized uses. Roads that are closed but not decommissioned may be maintained. Seasonal closure of roads with natural surfaces may prevent damage during the wet season. Roads may also be closed on a seasonal basis to provide various species with protection from motorized traffic during the breeding season or other sensitive times.

APPENDIX F- STRATEGY FOR CONTROLLING THE SPREAD OF NOXIOUS WEEDS AND OTHER INVASIVE GRASSES IN THE CASCADE-SISKIYOU NATIONAL MONUMENT

WEED ABATEMENT MANAGEMENT STRATEGY

This appendix describes the strategy and objectives for weed management and provides a framework to control the spread of noxious weeds and other invasive grasses in the monument. Although this strategy is specific to the Cascade-Siskiyou National Monument (CSNM), it incorporates decisions and guidance provided in the following documents:

- The Decision Record, signed June 5, 1998, for the *Integrated Weed Management Plan* with the associated FONSI and Medford District Integrated Weed Management Plan.
- Instruction Memo OR 91-302 *Approved Herbicides for Noxious Weed Control* states: "A copy of this memorandum should be made a permanent part of your reference copy of the Record of Decision for the Northwest Area Noxious Weed Control Program., BLM offices in Oregon and Washington are authorized to use these herbicides for noxious weed control in accordance with BLM Manual H-9011-1."
- The Supplemental Record of Decision, signed May 5, 1987 for the Northwest Area Noxious Weed Control Program and the associated Final Environmental Impact Statement (March 1987).

The primary goal of monument management is to maintain, protect, and restore habitat and ecological processes critical to richness and abundance of the objects of biological interest for which the monument was proclaimed. The proliferation of weeds across the landscape is an obstacle to this goal, and is a management concern throughout the monument, especially in the Diversity Emphasis Area. Current objectives for weed management have been developed and are described below. Additional weed abatement objectives could be developed through research and pilot studies following the adaptive management strategy in Chapter 3 of this RMP.

Spatial analysis in GIS indicates that weeds are associated with roads, sites of acute disturbance (past timber harvest, pastures and other tilled areas), and areas of high livestock utilization. Some of the major ecological problems associated with grass/shrub/woodlands involve annual grasses, yellow starthistle, and Canada thistle displacing the native bunchgrasses found in the monument. Limiting disturbance, therefore, is critical to controlling weeds; reduction of soil surface disturbance and increased shading of the soil can help favor the growth of native bunchgrasses over noxious weeds and other invasive grasses.

The literature supports the following formulation of a general management strategy incorporating aspects of vegetation management and weed control:

Maintain healthy herbaceous plant communities as a barrier to weed invasions.
- Limit ground-disturbing activities.
- Collect and maintain sources of native grass and forb seed for emergency restoration.
- Sow with native seed where natural or ground-disturbing management activities take place.

Improve condition of stands that have a mixture of weeds and remnant native herbaceous species.
- Apply manual or spot herbicide treatments.
- Utilize prescribed burning where appropriate.
- Restore native species by seeding and/or planting.
- Utilize different grazing strategies to reduce disturbance.

Eradicate and restore small isolated weed patches to native herbaceous plant domination.
- Apply manual or spot herbicide treatment.
- Protect sensitive resources (e.g., wetlands, riparian, and rare plants). If herbicide treatments occur in riparian areas, use appropriate herbicides labeled for use in these communities.
- Seed areas with native grass and forbs.

Survey and treat primary travel corridors that serve as vectors for weed spread.
- Inventory roads and power line corridors.
- Apply manual or spot herbicide treatments in a systematic manner.
- Work with power companies, the county, and adjacent land owners to reduce periodic disturbance and treat weeds on adjacent non-federal land.
- Re-vegetate treated areas with native grass and forbs.

Isolate and treat large extensive weed areas.
- Minimize soil disturbance and activities that could spread weeds, especially during the wet season.
- Manually or spot spray large patches working from the "outside" in toward the center of the infestation.
- Seed or plant treated locations with native vegetation.

Implement a long-term restoration/management plan for extensive weedy areas (>1 acre)
- Work with local groups and land owners on noxious weed education and management.
- Identify high-priority treatment areas.
- Avoid disturbance in large patches.
- Monitor efficacy of treatment(s).
- Apply adaptive management strategy.

POTENTIAL MANAGEMENT TOOLS

Education and cooperative partnerships with adjacent landowners and local groups

Educating private land owners within the greater monument boundary on weed issues and treatment strategies is paramount to succeeding in controlling and eradicating weeds in the monument. Partnerships and cost-sharing projects, moreover, are an efficient way to treat larger landscape areas. Working with adjacent land owners, including companies under BLM-permitted activities (e.g., power companies), to prevent the spread of weeds across ownership boundaries, and addressing noxious weeds in all land management activities is critical to success for the landscape as a whole. Identification booklets, preventive strategies, and recommended treatment methods could be a valuable tool for educating and developing partnerships with the monument public.

Weed inventories
The use of surveys and inventories contribute to the understanding of the pattern and distribution of weeds within the monument, informing ongoing creation of adaptive strategies to control and eliminate such weeds from the monument. Surveys identify new species and patches becoming established, such that they become a treatment priority before they spread. Focused inventories along identified primary travel corridors and areas of primary concern will help target specific weed populations for containment and eradication.

Weed prevention and treatments
Weed prevention is an important tool to stop the introduction and spread of weeds. Prevention activities can reduce the spread and introduction of weeds. These activities include the use of "weed-free" hay, mulch, and seed for restoration activities; routinely washing the under-carriage of equipment and vehicles; and keeping vehicles and livestock out of heavily infested areas (i.e., reduce disturbance). All available means to effectively and efficiently prevent and treat weeds could be used in the monument, including manual weeding, hot foam treatments, cultural control, biological control, herbicides, prescribed fire, or grazing. Various treatments are discussed below in more detail.

Manual weeding can effectively remove target species over small- to medium-sized areas. Extensive manual weeding can also cause severe damage to micro-topography and microphytic crust through trampling, potentially leading to soil surface instability.

Hot foam treatment is a manual method that utilizes hot steam with foam (formulated from sugar extracts from corn and coconut). This treatment is used along roadways and other accessible areas to treat weeds. The steam and foam is delivered through a hose with a wand. The foam holds the temperature of the steam for several minutes, killing the unwanted vegetation.

The hot foam method is used on individual weed plants, usually in the rosette stage. The hot steam (212 degrees) can kill individual special status plants if treated, but pre-disturbance surveys for special status plants will identify plants to be protected.

Cultural treatments*,* such as disking or plowing, consist of entire plant removal from a specific site, but do have some negative side effects. For example, these treatments require precise timing to control the desired species; the acute ground disturbance resulting from these treatments can destroy the remnant native vegetation and promote additional weed invasion; and these treatments are difficult to apply in rough or rocky terrain, and will not occur in the monument with perhaps the exception of road-beds during decommissioning. Mowing or clipping removes the above-ground parts of all plants which is harmless to native bunchgrasses. Mowing can result in light to moderate damage to the soil surface, depending on the technique used. Mowing and manual seed head clipping can be effective in reducing a single year seed crop, although it does not kill the plants. However, some weeds, like starthistle or knapweeds, adapt quickly and will flower closer to the ground following mowing. Mowing may require multiple applications and can lead to soil surface instability. Mowing is not likely to be used in the monument except perhaps along road edges.

Bio-control involves the use of insects to control noxious weeds. Insect releases for starthistle in the monument are ongoing. This method is only effective in certain locations. Currently, there are no effective bio-controls available for other weeds like Canada thistle, Dyer's woad, cheatgrass or medusahead. As new bio-controls are developed in the future, these could be incorporated into the monument's weed strategy.

Spot spraying with herbicides can target specific plants in specific areas. Herbicide application is the most cost-effective weed treatment over large areas and has a low level of soil disturbance. Within the monument, only spot spraying or individual plant wicking or wiping with approved chemicals will be used so as to reduce secondary harm to other life forms. In riparian areas, only chemicals approved for such areas will be used in weed treatment.

Prescribed fire can be used to reduce cheatgrass, medusahead, and starthistle when the timing and intensity of the application is carefully controlled. Prescribed fire also reduces litter build-up and rejuvenates bunchgrasses over large areas. While prescribed fire can result in mortality for some woody plant species and lichens, it can also serve to rejuvenate others.

Livestock grazing prescribed at the right time and intensity may allow removal of specific plants and weeds. When applied correctly, prescribed grazing may reduce litter and rejuvenate bunchgrasses over large areas. Changing the grazing system (e.g., rest-rotation) can serve to allow recovery of the native plant community in heavily utilized areas in combination with other treatment methods. Controlled grazing by goats could also be used to control starthistle. Insufficient livestock control, however, can result in degradation of adjacent biological resources from over-utilization (e.g., in wetlands, springs, and riparian areas). Livestock are also vector for weed spread.

Vegetative restoration
Native seed application is best used several years following weed control treatments, or in areas of acute ground disturbance to prevent weeds from becoming established. Local, adapted native sources of grass and forb species have been established. Planting native shrubs and trees, especially along treated riparian areas will help restore and maintain healthy plant communities that are resistant to weed invasion. Sowing or planting appropriate native plants following under-story burning can re-establish the native plant community and facilitate succession.

Monitoring
Implementation and validation monitoring of treated areas is critical to the adaptive management process. Multiple years are often involved in successful containment and eradication. Successful weed treatments could involve different or multiple treatment methods, depending on the local site conditions, the species of targeted weeds, and infestation levels.

A thorough literature review on control measures for noxious weeds can be found in the CSNM Draft Resource Management plan, Appendix GG, pages 396-411.

PRIORITY TREATMENT AREAS
The following list of focus areas is intended to provide a relative prioritization of areas in which to survey and treat noxious weeds. These focus areas are of major concern and include the primary travel corridors that can function to spread weeds. In general, these are the areas that contain higher densities of weed populations; containment and eventual eradication is the objective. The methods for containment and eradication can vary, depending on site-specific issues, but, in general, working from the outside into the center of the infestations is the model for manual or herbicide treatments.

Given the annual fluctuations in operational funds to treat weeds, not all areas will be treated annually. New areas may be added over time as new populations are discovered; as monitoring shows successful treatment, areas will be dropped. The focus areas outlined below are a starting point for controlling noxious weeds in the monument and are not intended to be an exhaustive list. Numerous small populations occur that are also important to treat before they spread. Knapweeds, for example, are new to the monument. Because they are forming new starts, they are a high priority for eradication while populations are small.

Infestations in areas utilized by livestock are also high on the list of treatment priorities so as to prevent further weed spread and to improve the range condition. Some of these infested areas targeted for weed treatment are around seeps, springs, and stock ponds. In some areas, pasture rotation or even rest for several years from grazing could be beneficial for recovery while they are treated.
The focus areas are listed by local name, township, range, and section and/or BLM road segments. Weed infestations in adjacent areas on private lands may also be of concern, but are not listed. When possible, partnerships with adjacent land owners will be formed to treat weeds within the sub-watershed across ownerships.

Focus areas (not in priority order):
- Soda Mountain area (T40S, R3E, sections 21, 27, 28)
- Box O ranch area (T40S, R4E, sections 21, 22, 27, 28)
- Parsnip Lakes (T40S, 3E, section 10)
- Agate Flat, T41S, R4E, sections 6 and 7
- Hobart Lake (T40S, 3e, section 16)
- Eastern Schoheim road (Camp Creek) T41S, R3E, Sections 11, 12 including road 41-2E-10.1
- Scotch Creek RNA (T41S, R3E, section 8,9)
- Jenny Creek (below the Box O to the California Border)
- Mariposa Lily Botanical Area (T41S, R 2E, Sections 8, 9)
- Buck Rock (T40S, 2E, section 11) and roads 39-2E-34 and 40-2E-1
- Chinquapin area (T39S, R3E, sections 23, 26, 35)

As important as actual infested acres are, linear features that serve as vectors for spread also require attention. The major roadways coming into the monument and the large PacifiCorp power line corridor that bisect the monument are areas that receive some level of periodic disturbance from vehicles, maintenance, and animals. Weeds are spreading along these areas, mostly by seed on vehicles, equipment, and animals, including livestock. Wind and water also serve as vectors. The periodic disturbance in these areas provides available habitat for weed species to become established and then spread to adjacent areas outside the corridors. In some areas, grazing is confined to accessible areas along the roads. These linear features need to be continually surveyed and monitored, and as infestations are detected, treatment will prevent further weed spread.

Primary travel routes
- PacifiCorp power line and associated access road: (T40S, R3E, section 16, 17, 21, 27, 35;
- T41S, R3E, sections 1, 12; T41S, R4E, sections 6, 7, 8);
- Tyler Creek Road (BLM road 40-3E-5);
- Upper Jenny Creek and Roads 39-4E-6, -7.5, -8);
- Keene Creek/Lincoln creek/Rancore Pass roads (40-3E-12-12.1);
- Soda Mountain Road (39-3E-32.3);
- Lower Keene creek road (40-3E-12.2, 40-3E-7).

MITIGATING MEASURES

RODEO® (glyphosate) would be used as the primary herbicide in efforts to control noxious weeds listed by Oregon Department of Agriculture in the monument. Manual and biological treatments may also occur in conjunction with the control efforts. Treatment operations would generally occur between March 15th and October 31st.

The following mitigating measures apply to noxious weed treatments in the monument:
- **Human buffer** – None of the products may be applied within 500 feet of any residence or other place of human occupation unless the occupant or resident gives their consent in writing.

- **Cropland buffer** – Commercial products will not be applied within 100 feet of any cropland.
- **25-foot water buffer** – Commercial products applied by ground vehicles equipped with boom sprayers will not be applied within 25 feet of any water, flowing/moist (i.e., not dry) streams, springs, and wetlands (saturated ground).
- **10-foot water buffer –** Spot treatments with vehicle-mounted handguns or with backpack sprayers will not be applied to within 10 feet of water. To add an extra measure of security, a ten-foot buffer "no spray" buffer will be respected along all flowing/moist (i.e., not dry) streams, springs, and wetlands. This will eliminate the potential for any drift entering waters (Hatterman-Valenti et al. 1995). Ground application within 10 feet of any flowing/moist waters will only be done by hand-wicking, wiping, or painting.
- **Spraying Prohibitions** – Spraying operations will be prohibited when wind velocity exceeds 5 mph; when temperatures exceed 80 degrees; when air turbulence would affect spray pattern; or in the event of any other kind of adverse weather conditions that could cause the glyphosate to impact non-target plants. These requirements would eliminate the potential for spray drift entering the stream channels.
- **Dry season application –** The herbicide treatment would occur only during months with little rain. These months will almost always be June - September; however, during some years, May can be hot and dry and weeds will ripen and begin to set seed early. Moreover, every few years, April can be almost rainless with weeks of temperatures in the high 70s. In such situations, glyphosate may be applied during April or May.
- **Weather Monitoring** – During application, weather conditions will be monitored periodically by trained personnel at spray sites. Weather will be monitored frequently during the first days of a prolonged project, especially projects within Riparian Reserves. Additional weather monitoring will occur whenever a weather change may affect safe placement of the herbicide on the target area. The intent is to ensure that weather conditions are within the parameters of this document and/or other regulatory restrictions.
- **Communication** – Prior to beginning treatment each year, the District Weed Specialist and/or Resource Area staff will provide the Resource Area Fisheries Biologists with the following information:
    - Locations to be treated
    - Riparian Reserves and approximate acres to be treated
    - Application method
    - Herbicide to be used
    - Approximate date of treatment
- **"No rain" rule –** Glyphosate would never be applied when weather reports predict precipitation within 24 hours of application, before or after. This ensures that glyphosate would not be washed off by precipitation into small rivulets, or enter ground water. From a practical perspective, glyphosate would not be as effective if sprayed when rain could wash it off.
- **Mixing and Loading Restrictions** – Herbicides will be mixed and loaded into tanks at least 100 feet from any stream channel or surface water or at a location where an accidental spill would not flow into or contaminate a stream or body of water.
- **Tank Washing and Disposal** – Spray tanks will not be washed or rinsed within 100 feet of any waters. All chemical containers will be disposed of at sites approved by the Oregon State Department of Environmental Quality.
- **Application Concentrations** – RODEO® and ACCORD® will be applied at or below concentrations allowable on the labels.
- **Quality Control** – Regular testing on field calibration and calculation will take place to prevent gross application errors. A licensed/certified herbicide applicator will oversee all spray projects. Dye or a similar method will be used to ensure that chemical application occurs only in target areas. (See "Monitoring" below.)
- **Spill Safety** – The BLM contract inspector will review the BLM spill response procedures outlined in the BLM manual 9011-1 with each applicator before commencing herbicide application operations. All hand-operated application equipment must be leak- and spill-proof.

- **Parsimony Rule** – Only the minimum area necessary for the control of noxious weeds will be treated
- **Monitoring –** Spray cards, dye, or other type of indicator to monitor chemical drift will be used at the water's edge on a small sample (no less than five sites) of riparian treatment areas. These indicators will provide visual verification that the application methods are minimizing risk to listed fish species.

Upper Klamath Basin and Wood River Wetland Resource Management Plan, Lakeview District, 1996, Page 18

Noxious Weed Management

Objective: Manage noxious weed species to facilitate restoration and maintenance of desirable plant communities and healthy ecosystems; prevent introduction, reproduction, and spread of noxious weeds into and within the property; and manage existing populations of noxious weeds to levels that minimize the negative impacts of noxious weed invasions.

Federal agencies are directed to control noxious weeds on federal lands by the Carlson-Foley Act (Public Law (PL) 90-583) and the Federal Noxious Weed Act of 1974 (PL 93-629). Noxious weed management on the Wood River property will be part of an integrated noxious weed management program as described in the Integrated Weed Control Plan and Environmental Assessment (EA) for the Klamath Falls Resource Area (OR-014-93-09). An appropriate combination of manual, mechanical, chemical, and biological methods, and water level manipulation will be used to control noxious weed species. Seasonal timing will be considered in any control program. Herbicide use will be in accordance with the program design features outlined in the KFRA Integrated Weed Control Plan and EA.

All chemical and some mechanical treatments for noxious weeds will be accomplished through a contract with Klamath County or other appropriate contractors, if populations of these species are identified for control. Appropriate herbicides will be used for treatment of noxious weeds in or adjacent to wetlands. Biological control organisms are supplied and/or distributed by the Oregon Department of Agriculture (ODA) through a memorandum of understanding between ODA and the BLM's Oregon State Office.

Lakeview Resource Management Plan, Lakeview District, 2003, Page 37

Noxious Weeds and Competing Undesirable Vegetation Management Goal—Control the introduction and proliferation of noxious weeds and competing undesirable plant species, and reduce the extent and density of established populations to acceptable levels.

Rationale

FLPMA and PRIA direct BLM to ". . . manage public lands according to the principles of multiple-use and sustained yield . . ." and ". . . manage the public lands to prevent unnecessary degradation . . . so they become as productive as feasible." The introduction and spread of noxious weeds and undesirable plants within the planning area contributes to the loss of rangeland productivity, increased soil erosion, reduced species and structural diversity, loss of wildlife habitat, and in some instances may pose a threat to human health and welfare. The "Carlson-Foley Act" (Public Law 90-583) and the "Federal Noxious Weed Act" (Public Law 93-629) direct weed control on public land. Protection of natural resource values depends on educating people about the negative impacts of weeds and what actions agencies and individuals can take to prevent weeds from becoming established.

Management Direction

Noxious weed prevention and control will continue to be a priority. Weeds will be controlled in an integrated weed management program that includes prevention education and cultural, physical, biological, and chemical treatments. Preventative measures such as public education and livestock and wildlife management will be employed to maintain or enhance desirable vegetation cover and reduce the distribution and introduction of noxious weed seed and plant parts. Mechanical and manual control methods and burning treatments will physically remove noxious weeds and unwanted vegetation; biological controls will introduce and cultivate agents such as insects and pathogens that naturally limit the spread of noxious weeds; and chemical treatments using approved herbicides will be applied where mechanical and/or biological controls are not feasible. Integrated weed management will be implemented in cooperation with the State of Oregon, Lake County, private interests, and neighboring counties and Federal jurisdictions.

Existing weed management plans for two specific geographic areas, the "Warner Basin Weed Management Area Plan" (USDI-BLM 1999g) and the "Abert Rim Weed Management Area Plan" (USDI-BLM 1995e), will continue to be implemented. A Greater Abert Weed Management Area will be proposed which will include the existing Abert Rim Weed Management Area and the rest of the Lake Abert Subbasin. The plan will be developed in consultation and cooperation with private landowners, ODFW, USFWS, U.S. Forest Service (USFS), Tribal governments, and other stakeholders in the Lake Abert Basin. The plan will be patterned after the "Warner Basin Weed Management Area Plan."

The weed control program is designed to address the dynamic nature of noxious weeds such as increasing numbers of species, different plant physiology for the various species, changing conditions of infestations, and changing technologies. Selection of the appropriate control method will be based on such factors as the growth characteristics of the target species, size of the infestation, location of the infestation, accessibility of equipment, potential impacts to nontarget species, use of the area by people, effectiveness of the treatment on target species, and cost. Depending on the plant's characteristics, these methods may be used individually or in combination and may be utilized over several years. Due to the length of seed viability, annual germination of seed from previous years, and the characteristics of certain plants, treatments could occur annually for a period of 10 or more years. Because weed infestations vary annually due to new introductions, spread of existing infestations, and the results of prior year treatments, site-specific reviews of known locations will be conducted annually prior to initiating weed treatment activities.

Approved weed control methods, including mechanical, biological, and chemical treatments as identified in "Vegetation Treatment on BLM Lands in Thirteen Western States FEIS and ROD" (USDI-BLM 1991b), "Supplement to the Northwest Area Noxious Weed Control Program FEIS and ROD" (USDI-BLM 1987a), and the "Integrated Noxious Weed Control Program Environmental Assessment" (USDA-BLM 1994d) will continue to be applied. Emphasis is on detection of new invaders and inventory and control in proven hot spots such as roads, rights-of-way, waterholes, and recreation sites, but with an expanded program to inventory areas that are less disturbed, remote, or previously uninventoried. Weed sites will be restored to desirable species. Control efforts will be expanded to include any new sites detected. Education and outreachHerbicide treatment: Herbicides that may be used are those approved in the "Vegetation Treatment on BLM Lands in Thirteen Western States EIS" (USDI-BLM 1991b), or any that are approved through an amendment or other agency approval process (see Appendix G of the "Proposed RMP/ EIS"(USDI-BLM 2003) for the current list of approved chemicals). Application will take place only in accordance with the manufacturer's label and by qualified/certified applicators.

Methods of application include wiping or wicking, backpack spraying, spraying from a vehicle with a hand gun or boom, aerial spraying, or other approved methods. WSAs: Noxious weeds occurring in WSA's will be treated with methods that are in accordance with the provisions of the wilderness IMP (USDI-BLM 1995b).

Monitoring

Management Goal**.** Evaluation of treatments will continue in cooperation with the State of Oregon, Lake County, and private interests as well as, neighboring counties and Federal jurisdictions. Inventories to identify new introductions, distribution, and density of noxious weed populations will be carried out on an annual basis in cooperation with these entities. Known noxious weed sites which are identified for treatment will be visited each year and evaluated for effectiveness of control. Known sites not identified for treatment will be visited on a rotational basis over 3years. All known sites visited will be located with a global positioning system unit, photographed, measured, and a determination of the need for future treatment will be made.

Inventories for new noxious weeds will be conducted each year on a 3-year rotation through the resource area. All burned areas (natural and prescribed) will be surveyed for noxious weeds for 3 years following the burn. Any newly discovered sites will be located with a global positioning system unit, photographed, measured, and a determination of the need for future treatment will be made. Ecological trends due to changes in vegetation composition over time, in areas dominated by competing undesirable plant species, will be measured through periodic rangeland health assessments following procedures outlined in "Interpreting Indicators of Rangeland Health" (Shaver et al. 2000). Efforts will be expanded to include areas outside of Lake County in an effort to "head-off" species that may spread into the resource area.

Appendix D, Best Management Practices, Page A-6
Noxious Weed Management

1) All contractors and land-use operators moving surface-disturbing equipment in or out of weed-infested areas should clean their equipment before and after use on public land.

2) Control weeds annually in areas frequently disturbed such as gravel pits, recreation sites, road sides, livestock concentration areas.

3) Consider livestock quarantine, removal, or timing limitations in weed-infested areas.

4) All seed, hay, straw, mulch, or other vegetation material transported and used on public land weed-free zones for site stability, rehabilitation, or project facilitation should be certified by a qualified Federal, state or county officer as free of noxious weeds and noxious weed seed. All baled feed, pelletized feed, and grain transported into weed-free zones and used to feed livestock should also be certified as free of noxious weed seed.

5) It is recommended that all vehicles, including offroad and all-terrain, traveling in or out of weed-infested areas should clean their equipment before and after use on public land.

Appendix F, Watershed and Water Quality, Page A-160-161
Noxious Weeds and Competing Undesirable Vegetation Management Goal:

Control the introduction and proliferation of noxious weeds and competing undesirable plant species and reduce the extent and density of established populations to acceptable limits.

Three Rivers Resource Management Plan, Burns District, 1992, Page 2-53

Vegetation Program Objective and Rationale

V 1: Maintain, restore or enhance the diversity of plant communities and plant species in abundances and distributions, which prevent the loss of specific native plant community types or indigenous plant species within the RA. Rationale: FLPMA mandates that public lands be managed in a manner that will protect the quality of the ecological resources among others. The BLM is committed to maintaining and enhancing the vegetation of the RA in terms of diversity and abundance of species and diversity of plant communities. Such diversity is necessary to sustain the variety of uses that BLM managed lands receive.

Allocation/Management Action

V1.6:Apply approved weed control methods including manual, biological and chemical control methods as identified in the Weed Control EIS and Burns District Weed Control EA in an integrated pest management program to prevent the invasion of noxious weeds into areas presently free of such weeds and to improve the ecological status of sites which have been invaded by weeds. Weed control activities will be prioritized and funded based on the following criteria, as identified in Burns District's Weed Control EA:

Priority I: Potential New Invaders - Emphasizes education and awareness;
Priority II: Eradication of New Invaders-Emphasizes eradication, priority funding;
Priority III: Established Infestations - Emphasizes containment and control.

Procedures to Implement/Monitoring Needs

1. Inventory.
2. Prioritize infestations.
3. Apply manual or biological control procedures if appropriate.
4. Where chemical control is required, evaluate site for impacts, complete and submit pesticide use proposal (PUP) to Oregon State Office for approval.

Monitoring Needs:

- Monitoring to determine effectiveness of applied treatments will be done at least annually for the 5 years following treatment.
- NEPA documents compliance monitoring, if appropriate.

Andrews Management Unit Resource Management Plan, Record of Decision, Burns District, 2005, Page 31

Noxious Weeds

Goal - Control the introduction and proliferation of noxious weeds and reduce the extent and density of established populations to acceptable levels.

<u>*Objective 1*</u>**.** Treat noxious weeds and inventory for new infestations using the most effective means available, as outlined in the Burns District's Integrated Management Program EA/Decision Record.

Objective 2. Create public awareness on how to utilize public land without inadvertently spreading noxious weeds.
Objective 3. Maintain partnerships with local groups and government agencies to combine efforts in the control and prevention of noxious weed infestations.

Rationale

The FLPMA and PRIA direct the BLM to "…manage public lands according to the principles of multiple-use and sustained yield…" and to "…manage the public lands to prevent unnecessary degradation...so they become as productive as feasible." The introduction and spread of noxious weeds and undesirable plants within the AMU contributes to the loss of rangeland productivity, increased soil erosion, reduced species and structural diversity, loss of wildlife habitat, and in some instances may pose a threat to human health and welfare. The Carlson-Foley Act (Public Law [PL] 90-583), the Federal Noxious Weed Act (PL 93-629), and the Burns District's Integrated Management Program EA direct noxious weed inventory and control on public land in the AMU. In the future, additional weed management direction will come from the new National Vegetation Management EIS, which is currently being developed. Protection of natural resource values depends on educating people about negative impacts of weeds, and actions, which agencies and individuals can take to prevent introduction, establishment, and spread of invasive species.

The Burns District Noxious Weed Management Program addresses the dynamic nature of noxious weeds such as the increasing number of species, changing conditions of infestations, and changing technologies. Currently, 18 noxious weed species are known to occur within the AMU, infesting 1,457 acres. Selection of appropriate control methods is based on such factors as growth characteristics of the target species, size and location of infestation, accessibility/feasibility of equipment, potential impacts to nontarget species, human use of the area, effectiveness of the treatment on target species, and cost. In addition, all BLM-authorized activities are evaluated for potential to spread or cause new infestations. If necessary, effects from proposed activities shall be mitigated so weed establishment is minimal.

Depending on plant characteristics, control methods may be used individually or in combination and may be utilized over several years. Control treatments may include cultural, mechanical, chemical, or biological methods. Due to the length of seed viability, annual germination of seed from previous years, and characteristics of certain plants, treatment could occur annually for a period of ten or more years. Since weed infestations vary annually due to new introductions, spread of existing infestations, and results of prior treatments, annual site-specific reviews of known locations will be conducted prior to initiating weed treatment activities.

Herbicides that may be used are those approved in the Vegetation Treatment on BLM Lands in Thirteen Western States EIS (1991b), or any that are approved through an amendment or other agency approval process. Application will take place only in accordance with the manufacturer's label and by qualified/certified applicators. Methods of application include wiping or wicking, backpack spraying, spraying from a vehicle with a handgun or boom, aerial spraying, or other approved methods.

Noxious weeds occurring in special management areas, including areas with T&E species/habitat, will be treated with methods to protect resource values and in accordance with provisions of the Burns District's Integrated Management Program EA directing weed management.

Management Direction

Noxious weed prevention and control will continue to be a priority. Weeds will be controlled in an integrated weed management program, which includes prevention, education, and cultural, physical, biological, and chemical treatments. Preventive measures such as public education and livestock and wildlife management will be employed to maintain or promote desirable vegetation cover and reduce distribution and introduction of noxious weed seed and plant parts. Mechanical and manual control methods and burning treatments will physically remove noxious weeds and unwanted or invasive vegetation; biological controls will introduce and cultivate factors such as insects and pathogens that naturally limit the spread of noxious weeds; and chemical treatments using approved herbicides will be applied where mechanical or biological controls are not feasible. Periodic inventories will detect new infestations. Monitoring the extent of known infestations is key to controlling or eradicating noxious weeds.

Integrated management will be implemented for control of noxious weeds. Control on disturbed areas such as roads, ROWs, waterholes, and recreational sites will be emphasized. Priority is given to land with high quality natural resource values. Emphasis is on prevention, restoration, research, and expanded efforts to inventory and detect new infestations.

Public education concerning noxious weeds will be expanded to include areas outside Harney County.

The Harney County Weed Management partnership will continue.

Monitoring

Noxious weed infestations are a serious threat to all vegetative communities. Monitoring is focused on identification of new infestations, spread of existing infestations, and effectiveness of treatment activities. Monitoring for new infestations is accomplished through inventories, most commonly in areas previously disturbed by fire or other disturbance-causing activities, and also in areas with high resource values where early detection is critical to maintain those values. Spread of existing infestations and treatment effectiveness are often monitored simultaneously using stem counts, various estimation techniques, and calculations using calibrated herbicide application equipment.

See the Vegetation Monitoring Section for additional monitoring information.

Steens Mountain Cooperative Management and Protection Area Resource Management Plan, Record of Decision, Burns District, 2005, Page 32

Noxious Weeds

Goal - Control the introduction and proliferation of noxious weeds and reduce the extent and density of established populations to acceptable levels.

Objective 1. Treat noxious weeds and inventory for new infestations using the most effective means available, as outlined in the Burns District's Integrated Management Program EA/Decision Record.
Objective 2. Create public awareness on how to utilize public lands without inadvertently spreading noxious weeds.
Objective 3. Maintain partnerships with local groups and government agencies to combine efforts in the control and prevention of noxious weed infestations.

Rationale

The FLPMA and PRIA direct the BLM to "…manage public lands according to the principles of multiple-use and sustained yield…" and to "…manage the public lands to prevent unnecessary degradation ...so they become as productive as feasible." Introduction and spread of noxious weeds and undesirable plants within the CMPA contributes to loss of rangeland productivity, increased soil erosion, reduced species and structural diversity, loss of wildlife habitat, and in some instances may pose a threat to human health and welfare. The Carlson-Foley Act (Public Law [PL] 90-583), the Federal Noxious Weed Act (PL 93-629), and the Burns District Integrated Management Program EA direct noxious weed inventory and control on public lands in the CMPA. In the future, additional weed management direction will come from the new National Vegetation Management EIS, which is currently being developed. Protection of natural resource values depends on educating people about negative effects of weeds, and actions which agencies and individuals can take to prevent introduction, establishment, and spread of invasive species.

Burns District Noxious Weed Management Program addresses the dynamic nature of noxious weeds such as increasing number of species, changing conditions of infestations, and changing technologies. There are currently 17 noxious weed species known to occur within the CMPA, infesting 336 acres. Selection of appropriate control methods is based on such factors as growth characteristics of target species, size and location of infestation, accessibility/feasibility of equipment, potential impacts to nontarget species, human use of the area, effectiveness of treatment on target species, and cost. In addition, all BLM-authorized activities are evaluated for potential to spread or cause new infestations. If necessary, effects from proposed activities shall be mitigated so weed establishment is minimal.

Depending on plant characteristics, control methods may be used individually or in combination and may be utilized over several years. Control treatments may include cultural, mechanical, chemical, or biological methods. Due to length of seed viability, annual germination of seed from previous years, and characteristics of certain plants, treatment could occur annually for a period of ten or more years. Since weed infestations vary annually due to new introductions, spread of existing infestations, and results of prior treatments, annual site-specific reviews of known locations will be conducted prior to initiating weed treatment activities.

Herbicides that may be used are those approved in "Vegetation Treatment on BLM Lands in Thirteen Western States EIS" (1991b), or any approved through an amendment or other agency approval process. Application will take place only in accordance with the manufacturer's label and by qualified/certified applicators. Methods of application include wiping or wicking, backpack spraying, spraying from a vehicle with a handgun or boom, aerial spraying, or other approved methods.

Noxious weeds occurring in special management areas, including areas with T&E species/habitat, will be treated with methods to protect resource values and in accordance with provisions of Burns District Integrated Management Program EA directing weed management.

Management Direction

Noxious weed prevention and control will continue to be a priority. Weeds will be controlled in an integrated weed management program, which includes prevention, education, and cultural, physical, biological, and chemical treatments. Preventive measures such as public education and livestock and wildlife management will be employed to maintain or promote desirable vegetation cover and reduce distribution and introduction of noxious weed seed and plant parts. Mechanical and manual control methods and burning treatments will physically remove noxious weeds and unwanted or invasive vegetation. Biological controls will introduce and cultivate factors such as insects and pathogens that naturally limit spread of noxious weeds, and chemical treatments using approved herbicides will be applied where mechanical or biological controls are not feasible. Periodic inventories will detect new infestations. Monitoring the extent of known infestations is key to controlling or eradicating noxious weeds.

Integrated management will be implemented for control of noxious weeds. Control on disturbed areas such as roads, ROWs, waterholes, and recreational sites will be emphasized. Priority will be given to lands with high quality natural resource values. Emphasis is on prevention, restoration, research, and expanded efforts to inventory and detect new infestations.

Public education concerning noxious weeds will be expanded to include areas outside Harney County.

The Harney County Weed Management partnership will continue.

Monitoring

Noxious weed infestations are a serious threat to all vegetative communities. Monitoring is focused on identification of new infestations, spread of existing infestations, and effectiveness of treatment activities. Monitoring for new infestations is accomplished through inventories, most commonly in areas previously disturbed by fire or other disturbance causing activities, and also in areas with high resource values where early detection is critical to maintain those values. Spread of existing infestations and treatment effectiveness are often monitored simultaneously using stem counts, various estimation techniques, and calculations using calibrated herbicide application equipment.

See Vegetation Monitoring Section for additional monitoring.

Baker Resource Management Plan, Vale District, 1989, Page 50

(The Baker RMP is scheduled for revision in 2010.)

Noxious Weed Control

Infestations of noxious weeds are known to occur on some public lands in the planning area (refer to Figures 2 and 3). The most common noxious weeds are diffuse, spotted and Russian knapweed, yellow starthistle, Canadian thistle, and yellow leafy spurge. Control methods will be proposed and subject to site specific environmental analyses consistent with the Record of Decision on BLM's Northwest Area Noxious Weed Control Program EIS and EIS Supplement. Control methods will not be considered unless the weeds are confined to public lands or control efforts are coordinated with owners of adjoining infested non-public lands. Proper grazing management will be emphasized after control to minimize possible reinfestation. Coordination and cooperation with county weed control officers will continue on a regular basis.

Southeastern Oregon Resource Management Plan, Vale District, 2002

Record of Decision, Page 10
Forest and Woodland Management

Land suitable for timber production will be managed on a sustained yield basis. All forestland and western juniper and quaking aspen woodlands will be managed to protect long-term productivity, biological diversity, and watershed values.

The BLM will work with county, state, and Federal agencies to monitor the locations and spread of noxious weeds. Noxious weed control will be conducted in accordance with the integrated weed management guidelines and design features identified in the "Northwest Area Noxious Weed Control Program EIS" (USDI-BLM 1985).

Control of noxious weeds will occur in SMA's, if needed, but may include certain restrictions to reduce potential impacts on specific values. The BLM will assess land prior to acquisition to determine whether or not noxious weeds are present.

Record of Decision, Page 25

Rangeland vegetation includes a mosaic of multiple-aged shrubs, forbs, and native and desirable nonnative perennial grasses. Shrub overstories are present in a variety of spatial arrangements and scales across the landscape level, including some large contiguous blocks, islands, and corridors. Shrub overstories are present in predominantly mature, late structural status. Plant communities not meeting DRFC's show upward trends in condition and structural diversity. Desirable plants continue to improve in health and vigor. New infestations of noxious weeds are not common across the landscape, and existing large infestations are declining. Populations and habitat of rare plant species are stable or continue to improve in vigor and distribution.

Record of Decision Page 38 - 40
Rangeland Vegetation

Objective 1: Restore, protect, and enhance the diversity and distribution of desirable vegetation communities including perennial native and desirable introduced plant species. Provide for their continued existence and normal function in nutrient, water, and energy cycles.

Rationale: With passage of FLPMA and the "Public Rangelands Improvement Act" (PRIA) of 1978, objectives and priorities for the management of public land vegetation resources were more clearly defined. Guidance contained in 43 CFR 4180 of the regulations directs public land management toward the maintenance or restoration of the physical function and biological health of rangeland ecosystems. Standards of Rangeland Health and Guidelines for Livestock Grazing Management (S&G's) for public land administered by the BLM in Oregon and Washington were approved by the Secretary of the Interior on August 12, 1997 (USDI-BLM 1997). This objective will maintain and improve the condition and trend in plant communities that provide wildlife habitat, recreation, forage, scientific, scenic, ecological, and water and soil conservation benefits for consumptive and nonconsumptive uses. The long-term goal of vegetation management across the landscape is to maintain or improve rangeland condition to DRFC's which meet management objectives, not specifically late-potential natural communities (PNC's) ecological status.

Management actions authorized or implemented by BLM will influence future vegetation composition. These actions may include season, intensity, and duration of livestock grazing within diverse vegetation communities (Appendix R); the influence of fire and associated suppression actions; emergency fire rehabilitation and the reintroduction of grazing following fire; the use of natural and management-created firebreaks to protect early seral communities from frequent fire intervals; rehabilitation and reclamation actions following soil-disturbing activities; management of noxious weeds; OHV use; wild horse management; recreational use; and mining.

Vegetation management has been based on existing inventories delineating the ecological status of vegetation communities. Management objectives have been to improve early and middle seral stage vegetation communities to attain late seral or PNC within the limits of ecological site potential. Additionally, those vegetation communities in late seral stage or PNC have been managed to improve or maintain those desirable conditions. The basis for defining ecological status and potential is site descriptions that provide a summary of expected species composition and variability within climax vegetation communities, as well as anticipated responses with management. The delineation of ecological sites is based on soils and climatic conditions.

Management objectives within previous land use plans to attain late-PNC seral communities were based on the increased productivity of late-PNC seral communities relative to low seral communities, their greater ability to stabilize watersheds, and their improved role in water, nutrient, and energy cycling. Vegetation communities in late-PNC seral stage express a mosaic of species composition and structure consistent with site potential and, as such, reflect a range of possible plant communities that should meet the objectives defining desired future conditions within this land use plan.

Monitoring: Over the life of this plan, vegetation communities will be monitored to determine progress toward attaining DRFC's. Monitoring to determine success in meeting vegetation management objectives will include periodic measurements of plant composition, vigor, and productivity as well as measurement of the amount and distribution of plant cover and litter which protects the soil surface from raindrop impact, detains overland flow, protects the surface from wind erosion, and retards soil moisture loss through evaporation. Additional data, to determine the effectiveness of established tools in meeting objectives, may include herbaceous or woody utilization, actual use, and climatic parameters.

Management Actions: Upland native rangeland communities will be managed to attain a trend toward DRFC's based on management objectives and site potential. Management actions will maintain the condition of those native communities where vegetation composition and structure will be consistent with desired conditions and natural values. Nonnative seedings in poor or fair condition will be managed to restore production and vigor, as well as to improve structural and species diversity consistent with other management objectives. Nonnative seedings in good or excellent condition will be managed to maintain seeding health, improve structural and species diversity, and ensure continued forage production. Upland shrub cover across the landscape will be maintained at moderate to heavy levels of potential for wildlife cover values (see Appendix F, Table F-1) and structural diversity in most native vegetation communities where potential exists and in nonnative seedings as consistent with other resource management objectives. The frequency, distribution, and ecological integrity of native stands of mountain shrubs will be restored and maintained where site potential will support these species.

Management actions will be implemented to rehabilitate and/or vegetate plant communities that do not meet DRFC's due to dominance by annual, weedy or woody species. Vegetation manipulation projects will be implemented primarily to direct trend toward desired conditions, improve structural and species diversity, and protect soil, water, and vegetation resources. Emphasis will be placed on the use of prescribed and wildland fire to regulate woody species dominance and direct vegetation composition toward desired conditions. Appropriate Management Response (AMR) will be implemented on wildland fires to meet vegetation management and other objectives. Following wildland fire, priority will be placed on the rehabilitation of rangeland vegetation communities held at risk due to dominance by annual and woody species. Seedings will be implemented with appropriate mixes of adapted perennial species. Species mixes will be determined on a site-specific basis dependent on the probability of successful establishment, risks associated with seeding failure, and other management considerations. Preference will be toward the use of native species, though nonnative species may be used when better adapted to out-compete established annual species. Use of competitive native species or desirable nonnative species will be emphasized in seedings within sites moderately and highly susceptible to degradation. Treatment configuration will emphasize the maintenance of natural values as consistent with other resource management objectives.

Areas burned by wildland fire, including those subsequently rehabilitated, will be rested from grazing for one full year and through a second growing season at a minimum, or until monitoring data or professional judgment indicate that health and vigor of desired vegetation has recovered to levels adequate to support and protect upland function. Appropriate grazing use of healthy perennial vegetation communities, or areas dominated by annual species, prior to the two growing season limit may be allowed on a case-by-case basis, as consistent with objectives for improving or maintaining rangeland health and other objectives. Annual rangeland vegetation communities at risk from frequent fires will be protected through the establishment of appropriate firebreaks (such as greenstripping) using both desirable native and nonnative species. An emphasis will be placed on the establishment of effective firebreaks using seed mixes and project configurations consistent with resource management objectives and goals to maintain natural values.

Record of Decision, Page 40-41

Objective 3: Control the introduction and proliferation of noxious weed species and reduce the extent and density of established weed species to within acceptable limits.

Rationale: FLPMA and PRIA direct BLM to "manage public lands according to the principles of multiple use and sustained yield" and "manage the public lands to prevent unnecessary degradation . . . so they become as productive as feasible." "The Carlson-Foley Act" (Public Law 90-583) and the "Federal Noxious Weed Act" (Public Law 93-629) direct weed control on public land. The introduction and spread of noxious weeds within the planning area cause a decline in rangeland condition, expose soils to accelerated rates of erosion, reduce productivity, reduce dominance of individual species and communities of native plants, and reduce economic returns to individuals and society.

Monitoring: In cooperation with the State of Oregon, Malheur County, adjoining counties, and private landowners, inventories to identify the distribution and density of identified noxious weeds will continue. Inventories will be repeated as necessary in subsequent years following control actions to identify effectiveness.

Management Actions: The distribution and density of noxious weeds will be reduced through the application of approved control methods in an integrated program in cooperation with the State of Oregon, Malheur County, Harney County, and other adjoining counties, adjoining private landowners, and other affected agencies and interests (see Map SS-1). Control methods will include preventive management to maintain competitive vegetation cover and reduce the distribution and introduction of noxious weed seed; manual and mechanical methods to physically remove noxious weeds; biological methods to introduce and cultivate factors that naturally limit the spread of noxious weeds; cultural practices; and application of chemicals. Target species will include those identified by county, state and BLM weed priority lists.

Record of Decision, Appendix O, Page O-7

Noxious Weed Management

1) All contractors and land-use operators moving surface-disturbing equipment in or out of weed infested areas should clean their equipment before and after use on public land.

2) Control weeds annually in areas frequently disturbed such as gravel pits, recreation sites, road sides, livestock concentration areas.

3) Consider livestock quarantine, removal, or timing limitations in weed infested areas.

4) All seed, hay, straw, mulch, or other vegetation material transported and used on public land weed-free zones for site stability, rehabilitation or project facilitation should be certified by a qualified Federal, State, or county officer as free of noxious weeds and noxious weed seed. All baled feed, pelletized feed and grain transported into weed-free zones and used to feed livestock should also be certified as free of noxious weed seed.

5) It is recommended that all vehicles, including off-road and all-terrain, traveling in or out of weed infested areas should clean their equipment before and after use on public land.

For additional controls on noxious weed management please refer to the "Northwest Area Noxious Weed Control Program" (1987), its associated "Supplemental Environmental Impact Statement" and the "Vale District Fire-Year Noxious Weed Control Program Environment Assessment" (1987) with extensions.

John Day Resource Management Plan, 1995, as amended in 2001 through the John Day River Management Plan, Two Rivers, John Day and Baker Resource Management Plan Amendments, Page 154

Noxious Weeds

'Noxious' is a legal classification rather than an ecological term. Plants that can exert substantial negative environmental or economic impact can be designated as noxious by various government agencies. The single greatest threat to the native rangeland biodiversity and recovery of less than healthy rangelands and watersheds is the rapidly expanding invasion of noxious weeds (Asher 1993). Both forestland and rangeland are being invaded by noxious weeds at an accelerated rate. Noxious weed encroachment reduces the potential of forest and rangeland to support grazing timber production,wildlife use, and viewing by displacing native plant species and reducing natural biological diversity; degrading soil integrity, nutrient cycling, and energy flow; and interfering with site-recovery that allow a site to recover following disturbance (Quigley and Arbelbide 1997).

The weeds of most concern in the John Day basin are diffuse, spotted and Russian knapweeds; Dalmatian toadflax; yellow starthistle; Scotch thistle; purple loosestrife; rush skeletonweed; leafy spurge; poison hemlock; and medusahead rye. Weeds of special concern are those beginning to occupy very small niches with just a few plants along the high water line, and small patches on islands (mainly diffuse knapweed and Dalmatian toadflax) that could spread very rapidly. Also, small infestations of Russian knapweed and dalmatian toadflax are becoming more prevalent on the upper, sheltered alluvial flats. This is especially noteworthy for riparian areas below the confluence of Thirtymile Canyon at RM 84. In the Clarno area, medusahead rye is prevalent in the burned areas on the west side of the river, north and south of Highway 219. It is also prevalent in the Murderer's Creek drainage, a tributary of the South Fork of the John Day River. Diffuse knapweed is found along the road right-of-way, south of Clarno. Russian knapweed is prevalent in the Clarno and Bridge Creek areas, and has been found in numerous small patches on alluvial flats. Dalmatian toadflax has also been observed on these flats and up slope areas, particularly below Thirtymile Canyon. The thistles (Scotch, bull and Canada) and poison hemlock commonly occur at the small tributaries near and in riparian areas. Yellow starthistle has been found in several locations in the Clarno area and is especially prevalent in the upper Bridge Creek area near Mitchell. It is also prevalent around the Columbia River near Biggs and the Horn Butte ACEC, an area north and east of the John Day/Columbia River confluence. Leafy spurge is found in Grant County in the upper watersheds (Fox Valley and Cottonwood Creek) of the North Fork of the John Day. Four sites were found and treated in 1995, and 18 sites were found and treated between Monument and Spray in 1996. A very serious threat is noted in the recent increase of perennial pepperweed in the Bridge Creek drainage. Federal and state laws require certain actions be directed at managing noxious weeds. In large part, the 'invasion of alien plants into natural areas' and the crowding 'out of native flora and fauna has been stealthy and silent, and thus, largely ignored' (Cheater 1992).

Two Rivers Resource Management Plan District, Prineville District, 1986, Page 31

Noxious Weed Control

Infestations of noxious weeds are known to occur on some public lands in the planning area. The most common noxious weeds are diffuse, spotted and Russian knapweed, yellow star thistle, tion toadflax, and poison hemlock. Control methods will be proposed consistant with the Record of Decision on Northwest Area Noxious Weed Control Program EIS. Control methods will then be subjected to site specific environmental analyses tiered to that EIS. Control will be considered on public iands where efforts are coordinated with owners of adjoining infested, non public lands. Proper grazing management will be emphasized after control to minimize possible reinfestation. Coordination and cooperation with county weed control officers will continue on a regular basis.

Brothers/LaPine Resource Management Plan, Record of Decision, Prineville District, 1989, Page 126

Noxious Weed Control

Infestations of noxious weeds are known to occur on some public lands in the planning area. Control methods including grazing management as well as chemical/mechanical, thermal and biological methods will be proposed and subject to site-specific environmental analysis. Control methods will not be considered unless weeds are confined to public lands or control efforts are coordinated with owners of adjoining lands. Proper grazing management will be emphasized to minimize new invasions of weeds and after control to minimize possible reinfestation.

A multi-state BLM environmental impact statement on noxious weed control has been completed for Oregon, Washington, Idaho, Montana and Wyoming. A district-wide environmental assessment has also been completed by the Prineville BLM to assess specific noxious weed control sites throughout the district. Copies of these documents and the related State Director decisions for Oregon and Washington are available for public review at the Prineville District Office during normal working hours.

Upper Deschutes Record of Decision and Resource Management Plan, Prineville District, 2005, Page 37

Noxious Weeds

Objective V – 2: Maintain noxious weed-free plant communities or restore plant communities with noxious weed infestations through the use of broad-scale integrated weed management strategies. During planning for vegetation management and other ground disturbing activities, consider opportunities to manage undesirable non-native or invasive species.

<u>Rationale</u>:
The rapid expansion of noxious and other invasive species in portions of the planning area is one of the greatest threats to the integrity of native plant communities. Noxious weeds reduce the value of native plant communities in several ways.

<u>Guidelines</u>:

1. All land management activities and projects will assess the risk of introducing or spreading weeds. Integrated weed management strategies will be incorporated into the planning, design, implementation, monitoring, and follow-up actions of all ground-disturbing projects and activity plans.
2. Integrated weed management strategies will incorporate some or all of these objectives: detection, inventory, prevention, containment, control, and eradication of noxious weeds. Strategies may also target other undesirable plant communities as appropriate and practicable.
3. A balanced ecosystem approach for management of undesirable vegetation may include one or more of the following techniques: cultural, manual, mechanical, prescribed fire, competitive seeding, biological, and chemical.
4. When possible, grazing management practices will be designed to help control noxious weeds and other undesirable plants (such as cheatgrass, medusahead and thistles).
5. Opportunities will be sought to form partnerships with other public agencies and adjacent landowners to develop regionally effective and cost-efficient weed management strategies.
6. All treatments will be in accordance with policy and guidelines in the following current or subsequent programmatic vegetation management plans: (1) "Vegetation treatment on BLM administered lands in thirteen western States" (USDI-BLM, 1991) and (2) "Prineville District Integrated Weed Management Environmental Assessment (USDI-BLM 1994)."
7. Where possible, weed management within the planning area will be prioritized as follows:
    a. Prevent new infestations by limiting weed seed dispersal, minimizing soil disturbance, and properly managing desirable vegetation.
    b. Detect and eradicate new invaders.
    c. Target roadways, watercourses, campgrounds, utility corridors and other high disturbance areas for a prevention and containment program.
    d. Emphasize control of large-scale infestations (limiting the spread of noxious weeds and reducing the infestation level).
    e. Focus initial efforts on small, manageable units with a component of desirable native plants (or desirable non-native plants), and then focus on the remaining infestation. Start from the outside and work toward the center of the infestation.
8. In high risk areas, prevention measures will include provisions in all land management activities, projects and agreements to inspect or certify that vehicles, equipment, livestock, supplies, and materials entering, using, or transporting across public lands are free of noxious weed seed or other reproductive parts of noxious weeds. Precautions will include ensuring use of weed-free hay/feed for livestock and weed-free seed in seeding projects.
9. Consider limiting season of use for ground disturbing activities to prevent the spread of weeds during and immediately after the flowering and seed production period.
10. Consider potential for spread of cheatgrass and other undesirable plants that could occur with disturbance by land uses or vegetation treatments, particularly within the lower elevation pumice sand community types.

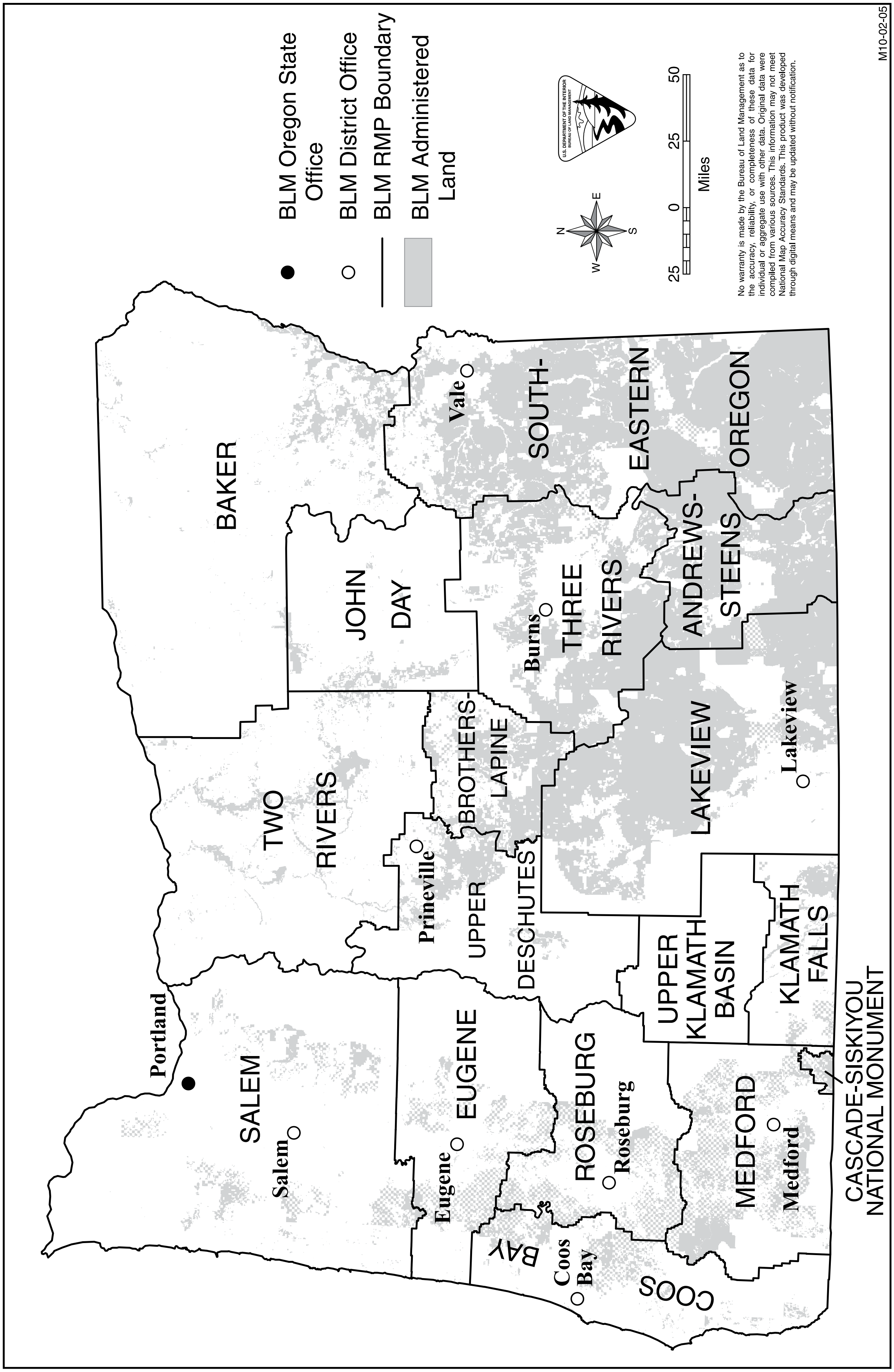


Figure A6-1. Resource Management Plan Areas

Appendix 7 – Additional Information about Noxious Weeds and Other Invasive Plants

Table of Contents

Oregon State Noxious Weed List

Table A7-1. Oregon State Noxious Weed List: Abundance and Alternative Where Effective Control Becomes Available - June 2010. This list includes most of the noxious weeds actively managed by the BLM in Oregon, but additional plants may be designated on Federal or County lists.

Alternative where effective control is available[1]	Common Name	Noxious State List[4]	Abundance Category[2]	Number of OR counties where weed			Weeds targeted for biocontrol agents
				is abundant	has limited distribution	is not known to occur	
RA[3]	Starthistle, Iberian	A	A	0	1	36	
RA[3]	Thistle, Taurian or bull cottonthistle	A	A	0	1	36	
RA[3]	Thistle, Plumeless	A	A	0	2	35	
RA[3]	Thistle, Wooly distaff	A	A	0	3	34	
RA[3]	Yellow floating heart	A	A	0	3	34	
RA[3]	Starthistle, Purple	A	A	0	1	26	
RA[3]	Thistle, Smooth distaff	A	N	0	0	37	
RA[3]	Policemans helmet	B	A	0	6	31	
RA[3]	Dyers woad	B	A	0	9	28	
RA[3]	Velvetleaf	B	A	0	11	26	
RA[3]	Thistle, Scotch	B	A	15	4	18	
RA[3]	Teasel, cutleaf	B	B	0	2	35	
RA[3]	Broom, Portugese	B	B	1	1	35	
RA[3]	Halogeton	B	B	1	2	33	
RA[3]	Cocklebur, spiny	B	B	1	10	26	
RA[3]	Thistle, Slender flowered	B	B	5	6	26	√
RA[3]	Buffalobur	B	B	0	15	22	
RA[3]	Spanish heath	B	C	3	3	31	
RA[3]	Broom, French	B	C	2	5	30	√
RA[3]	Ragweed	B	C	3	7	27	
RA[3]	Thistle, Italian	B	C	3	6	27	
RA[3]	Jubata grass (Purple Pampas grass)	B	C	2	9	26	
RA[3]	Mediterranean sage	B	C	2	9	26	
RA[3]	Thistle, Musk	B	C	4	10	23	√
RA[3]	Spurge laurel	B	C	3	12	22	
RA[3]	Thistle, Milk	B	C	11	5	21	√
RA[3]	Houndstongue	B	C	9	10	18	
RA[3]	Puncturevine	B	C	18	9	10	√
RA[3]	English Ivy	B	D	19	0	18	
RA[3]	Tansy ragwort	B	D	21	11	5	√
RA[3]	Knapweed, Diffuse	B	D	12	21	4	√
RA[3]	Thistle, Bull	B	D	37	0	0	√
RA[3]	Starthistle, Yellow	B	E	12	14	11	√
RA[3]	Broom, Scotch	B	E	21	10	6	√
RA[3]	Flowering rush	B	E	37	0	0	
RA[3]	Geranium, Herb Robert	B	N				
RA[3]	Geranium, Shiny leaf	B	N				
2	Camel thorn	A	A	0	0	37	
2	African rue	A	A	0	1	36	
2	Cordgrass, saltmeadow	A	A	0	1	36	
2	Goatgrass, Barbed	A	A	0	1	36	
2	Hawkweed, Mouse-eared	A	A	0	1	36	

Alternative where effective control is available[1]	Common Name	Noxious State List[4]	Abundance Category[2]	Number of OR counties where weed			Weeds targeted for biocontrol agents
				is abundant	has limited distribution	is not known to occur	
2	Matgrass	A	A	0	1	36	
2	Spurge, Myrtle	A	A	0	1	36	
2	Yellowtuft – murale	A	A	1	0	36	
2	Yellowtuft – corsicum	A	A	1	0	36	
2	Cordgrass, smooth	A	A	0	2	35	
2	Kudzu	A	A	0	2	35	
2	Paterson's curse	A	A	0	2	35	
2	Knapweed, Squarrose	A	A	0	3	34	
2	Hawkweed, Meadow	A	A	0	7	30	
2	Hawkweed, Orange	A	A	0	8	29	
2	Giant Hogweed	A	A	0	11	26	
2	Skeletonleaf bursage	A	C	5	6	26	
2	Cordgrass, common	A	N	0	0	37	
2	Cordgrass, dense flower	A	N	0	0	37	
2	European Water chestnut	A	N	0	0	37	
2	Goatgrass, Ovate	A	N	0	0	37	
2	Hawkweed, King-devil	A	N	0	0	37	
2	Hawkweed, Yellow	A	N	0	0	37	
2	Purple Nutsedge	A	N	0	0	37	
2	Silverleaf Nightshade	A	N	0	0	37	
2	Syrian bean-caper	A	N	0	0	37	
2	Goatsrue	A	N				
2	White Bryonia	A	N				
2	Oblong spurge	A	N	0	1	36	
2	Common reed	A	N				
2	Biddy-biddy	B	A	0	3	34	
2	Common cruprina	B	A	0	3	34	
2	Parrot's feather	B	A	0	3	34	
2	Lesser celadine or fig buttercup	B	A	0	4	33	
2	Broom, Spanish	B	A	0	5	32	
2	Common bugloss	B	A	0	5	32	
2	Spurge, Leafy	B	A	0	9	28	√
2	Garlic mustard	B	B	1	5	31	
2	Knotweed, Himalayan	B	B	1	7	29	
2	Johnsongrass	B	B	1	20	16	
2	Yellow Flag Iris	B	B	9	14	14	
2	Knotweed, Japanese	B	B	13	16	8	
2	Knotweed, Giant	B	B	13	17	7	
2	Purple loosestrife	B	B	17	16	4	√
2	False brome	B	C	4	7	26	
2	Gorse	B	C	4	7	26	√
2	Goatgrass, Jointed	B	C	7	5	25	
2	Butterfly bush	B	C	2	11	24	
2	Old man's beard	B	C	5	9	23	
2	Sulfur cinquefoil	B	C	5	10	22	
2	Whitetop,Hairy	B	C	4	12	21	
2	Knapweed, Russian	B	C	7	11	19	√
2	whitetop, Lens-podded	B	C	7	11	19	

Alternative where effective control is available[1]	Common Name	Noxious State List[4]	Abundance Category[2]	Number of OR counties where weed is abundant	has limited distribution	is not known to occur	Weeds targeted for biocontrol agents
2	Toadflax, Yellow	B	C	1	18	18	√
2	Rush skeletonweed	B	C	7	12	18	√
2	Whitetop, (Hoary cress)	B	C	7	13	17	
2	Kochia	B	C	18	2	17	
2	Knapweed, Meadow	B	C	14	9	14	√
2	Toadflax, Dalmation	B	C	9	16	12	√
2	Knapweed, spotted	B	C	8	27	2	√
2	Swainsonpea	B	C				
2	Poison hemlock	B	D	37	0	0	
2	St. Johnswort	B	D	37	0	0	√
2	Blackberry, Himalayan	B	E	20	16	1	
2	Quackgrass	B	E	35	2	0	
2	Thistle, Canada	B	E	37	0	0	√
2	Field bindweed	B	N	37	0	0	√
3	Coltsfoot	A	N	0	0	37	
3	Hydrilla	A	N	0	0	37	
3	Texas blueweed	A	N	0	0	37	
3	Creeping yellow cress	B	A	0	4	33	
3	Spikeweed	B	A	0	6	31	
3	Saltcedar	B	B	1	10	26	√
3	Brazilian or S American waterweed	B	B	7	12	18	
3	Yellow nutsedge	B	B	16	6	15	
3	Perennial peavine	B	C	3	2	32	
3	Watermilfoil, Eurasian	B	C	2	20	15	
3	Perennial pepperweed	B	D	9	10	18	
3	Medusahead rye	B	D	24	9	4	
5	Horsetail, Giant	B	C	14	3	20	
None	Japanese dodder	A	N				
None	Small broomrape	B	A	0	7	30	
None	Dodder	B	C	13	12	12	

RA = Reference Analysis

[1] Determined based on herbicides recommended by PNW Weed Management Handbook, internet sources or comparison of similar species. Other herbicides may be effective. Some of the herbicides may be effective only under certain conditions. It is based on individual species response to a particular treatment and without regard to infestation size, non-target species, access, slope, follow-up treatments, cost or other key factors in determining which treatment method is suitable for a particular infestation or site. Non-herbicide methods of treatment can be used to control species under the Reference Analysis when those treatments are feasible. Alternative 2 indicates that at least one of the currently available herbicides could be used to obtain some degree of control on these species. Alternatives 3, 4 or 5 indicates that of the treatments currently available none are effective. Information in this column, including identification of what species can be controlled with non-herbicide methods under the Reference Analysis, is derived from the information in Table A9-2 and the herbicides available under the different alternatives.

[2] Abundance Categories indicate number of acres statewide:
N= Not known A < 1000 B=1,000-10,000 C=10,000-100,000 D= 100,000-1,000,000 E>1,000,000

[3] Reference Analysis. Effective on small or new infestations – Manual/mechanical methods kill plants. Not feasible on larger or more established infestations.

[4] "A" designated weeds are weeds of known economic importance which occurs in the state in small enough infestations to make eradication or containment possible; or is not known to occur, but its presence in neighboring states make future occurrence in Oregon seem imminent. Infestations are subject to eradication or intensive control when and where found.

"B" Designated Weeds are those of economic importance and regionally abundant, but which may have limited distribution in some counties. Control efforts are generally limited to intensive control at the state, county or regional level as determined on a site specific, case-by-case basis. Where implementation of a fully integrated statewide management plan is not feasible, biological control (when available) is the primary control method.

"T" Designated Weeds are priority noxious weeds designated by the Oregon State Weed Board as a target for which the ODA will develop and implement a statewide management plan. "T" designated noxious weeds are species selected from either the "A" or "B" list.

Common and Scientific Plant Names

Table A7-2. Common and Scientific Plant Names of Plants Potentially Requiring Management

Common Name	Scientific Name	Duration[1]	Growth Form	Family	Vegetation Type
African rue	*Peganum harmala*	P	forb	Zygophyllaceae	Noxious Weed
Alder	*Alnus*	P	shrub, tree	Betulaceae	Native Plant
Annual fescues	*Vulpia*	A	graminoid	Poaceae	Invasive Plant
Babysbreath	*Gypsophila paniculata*	P	forb	Caryophyllaceae	Invasive Plant
Bear's breeches	*Acanthus mollis*	P	forb	Acanthaceae	Invasive Plant
Biddy-biddy	*Acaena novae-zelandica*	P	shrub	Rosaceae	Noxious Weed
Big leaf maple	*Acer macrophyllum*	P	tree	Aceraceae	Native Plant
Big sagebrush	*Artemesia tridentata*	P	shrub	Asteraceae	Native Plant
Bird cherry	*Prunus avium*	P	tree	Rosaceae	Invasive Plant
Birdfoot trefoil	*Lotus corniculatus*	P	forb	Fabaceae	Invasive Plant
Black henbane	*Hyoscyamus niger*	A, B	forb	Solanaceae	Invasive Plant
Black locust	*Robinia pseudoacacia*	P	tree	Fabaceae	Invasive Plant
Blackberry, Evergreen	*Rubus laciniatus*	P	vine	Rosaceae	Invasive Plant
Blackberry, Himalayan	*Rubus armeniacus*	P	shrub	Rosaceae	Noxious Weed
Blackberry, Himalayan	*Rubus discolor*	P	shrub	Rosaceae	Noxious Weed
Blackgrass	*Alopecurus myosuroides*	A	graminoid	Poaceae	Invasive Plant
Blackthorn	*Prunus spinosa*	P	tree	Rosaceae	Invasive Plant
Bouncing bet	*Saponaria officinalis*	P	forb	Caryophyllaceae	Invasive Plant
Brazilian or S American waterweed	*Egeria densa*	P	aquatic forb	Hydrocharitaceae	Noxious Weed
Bristly dog's-tail	*Cynosurus echinatus*	A	graminoid	Poaceae	Invasive Plant
Broom, French	*Genista monspessulana*	P	shrub	Fabaceae	Noxious Weed
Broom, Portugese	*Cytisus striatus*	P	shrub	Fabaceae	Noxious Weed
Broom, Scotch	*Cytisus scoparius*	P	shrub	Fabaceae	Noxious Weed
Broom, Spanish	*Spartium junceum*	P	shrub	Fabaceae	Noxious Weed
Buffalobur	*Solanum rostratum*	A	forb	Solanaceae	Noxious Weed
Bur buttercup	*Ceratocephala testiculata*	A	forb	Ranunculaceae	Invasive Plant
Burdock, common	*Arctium minus*	B	forb	Asteraceae	Invasive Plant
Burnweed	*Erectites minima*	A, P	forb	Asteraceae	Invasive Plant
Butterfly bush	*Buddleja davidii*	P	shrub	Buddlejaceae	Noxious Weed
Camel thorn	*Alhagi maurorum*	P	shrub	Fabaceae	Noxious Weed
Cereal rye	*Secale cereal*	A	graminoid	Poaceae	Invasive Plant
Cheatgrass	*Bromus tectorum*	A	graminoid	Poaceae	Invasive Plant
Chicory	*Cichorium intybus*	B,P	forb	Asteraceae	Invasive Plant
Climbing nightshade	*Solanum dulcamara*	P	forb	Solanaceae	Invasive Plant
Clover spp	*Trifolium*	P	forb	Fabaceae	Invasive Plant
Cocklebur, rough	*Xanthium strumarium*	A	forb	Asteraceae	Invasive Plant
Cocklebur, spiny	*Xanthium spinosum*	A	forb	Asteraceae	Noxious Weed
Coltsfoot	*Tussilago farfara*	P	forb	Asteraceae	Noxious Weed
Common bugloss	*Anchusa officinalis*	P	forb	Boraginaceae	Noxious Weed
Common cruprina	*Crupina vulgaris*	A	forb	Asteraceae	Noxious Weed
Common knotweed	*Polygonum aviculare*	A,P	forb	Polygonaceae	Invasive Plant
Common reed	*Phragmites australis*	P	Graminoid	Poaceae	Noxious Weed
Common mullein	*Verbascum thapsus*	B	forb	Scrophulariaceae	Invasive Plant

Common Name	**Scientific Name**	**Duration**[1]	**Growth Form**	**Family**	**Vegetation Type**
Common Pear	*Pyrus communis*	P	tree	Rosaceae	Invasive Plant
Common velvet-grass	*Holcus lanatus*	P	graminoid	Poaceae	Invasive Plant
Conifers	various	P	tree	Pinaceae	Native Plant
Cordgrass, common	*Spartina anglica*	P	graminoid	Poaceae	Noxious Weed
Cordgrass, dense flower	*Spartina densiflora*	P	graminoid	Poaceae	Noxious Weed
Cordgrass, saltmeadow	*Spartina patens*	P	graminoid	Poaceae	Noxious Weed
Cordgrass, smooth	*Spartina alternifolia*	P	graminoid	Poaceae	Noxious Weed
Creeping buttercup	*Ranunculus repens*	P	forb	Ranunculaceae	Invasive Plant
Creeping yellow cress	*Rorippa sylvestris*	P	forb	Brassicaceae	Noxious Weed
Crested dog's-tail grass	*Cynosurus cristatus*	P	graminoid	Poaceae	Invasive Plant
Dandelion	*Taraxacum officinale*	P	forb	Asteraceae	Invasive Plant
Dense silkybent	*Apera interrupta*	A	graminoid	Poaceae	Invasive Plant
Dodder	*Cuscuta* spp.	A,B,P	forb	Cuscutaceae	Noxious Weed
Dyers woad	*Isatis tinctoria*	B, P	forb	Brassicaceae	Noxious Weed
Elecampane inula	*Inula helenium*	P	forb	Asteraceae	Invasive Plant
Elodea	*Elodea*	P	aquatic forb	Hydrocharitaceae	Invasive Plant
English holly	*Ilex aquifolium*	P	tree	Aquifoliaceae	Invasive Plant
English Ivy	*Hedera helix*	P	vine	Araliaceae	Noxious Weed
European beach grass	*Ammophila arenaria*	P	graminoid	Poaceae	Invasive Plant
European centaury	*Centaurium erythraea*	A, B	forb	Gentianaceae	Invasive Plant
European Water chestnut	*Trapa natans*	P	aquatic	Trapaceae	Noxious Weed
Evergreen huckleberry	*Vaccinium ovatum*	P	shrub	Ericaceae	Native Plant
Feverfew	*Tanacetum parthenium*	P	forb	Asteraceae	Invasive Plant
Field bindweed	*Convolvulus arvensis*	P	forb	Convolvulaceae	Noxious Weed
Field mustard	*Brassica rapa*	A,B	forb	Brassicaceae	Invasive Plant
Field sowthistle	*Sonchus arvensis*	P	forb	Asteraceae	Invasive Plant
False brome	*Brachypodium sylvaticum*	P	graminoid	Poaceae	Noxious Weed
Flowering rush	*Butomus umbellatus*	P	Forb	Butomaceae	Noxious Weed
Garden cornflower or bachelor buttons	*Centaurea cyanus*	A	forb	Asteraceae	Invasive Plant
Garden vetch	*Vicia sativa ssp. nigra*	A	vine	Fabaceae	Invasive Plant
Garlic mustard	*Alliaria petiolata*	A, B	forb	Brassicaceae	Noxious Weed
Geranium, Herb Robert	*Geranium robertianum*	A, B	Forb	Geraniaceae	Noxious Weed
Gerranium, Shinyleaf	*Geranium lucidum*	A, B	Forb	Geraniaceae	Noxious Weed
Giant Hogweed	*Heracleum mantegazzianum*	P	forb	Apiaceae	Noxious Weed
Goatgrass, Barbed	*Aegilops triuncialis*	A	graminoid	Poaceae	Noxious Weed
Goatgrass, Bulbed	*Aegilops ventricosa*	A	graminoid	Poaceae	Invasive Plant
Goatgrass, Jointed	*Aegilops cylindrica*	A	graminoid	Poaceae	Noxious Weed
Goatgrass, Ovate	*Aegilops ovata*	A	graminoid	Poaceae	Noxious Weed
Goatgrass, Tausch's	*Aegilops tauschii*	A	graminoid	Poaceae	Invasive Plant
Goatsrue	*Galea officinalis*	P	forb, subshrub	Fabaceae	Noxious Weed
Gorse	*Ulex europaeus*	P	shrub	Fabaceae	Noxious Weed
Grasses		A,P	graminoid	Poaceae	Native Plant
Grasses, escaped	Various	NA	graminoid	Poaceae	Invasive Plant
Halogeton	*Halogeton glomeratus*	A	forb	Chenopodiaceae	Noxious Weed
Harding grass	*Phalaris aquatica*	P	graminoid	Poaceae	Invasive Plant
Hawkweed, common	*Hieracium lachenallii*	P	forb	Asteraceae	Invasive Plant
Hawkweed, King-devil	*Hieracium piloselloides*	P	forb	Asteraceae	Noxious Weed

Common Name	Scientific Name	Duration[1]	Growth Form	Family	Vegetation Type
Hawkweed, Meadow	*Hieracium caespitosum*	P	forb	Asteraceae	Noxious Weed
Hawkweed, Mouse-eared	*Hieracium pilosella*	P	forb	Asteraceae	Noxious Weed
Hawkweed, Orange	*Hieracium aurantiacum*	P	forb	Asteraceae	Noxious Weed
Hawkweed, Yellow	*Hieracium fendleri*	P	forb	Asteraceae	Invasive Plant
Hawkweed, Yellow	*Hieracium floribundum*	P	forb	Asteraceae	Noxious Weed
Hawthorn, Oneseed	*Crataegus monogyna*	P	tree	Rosaceae	Invasive Plant
Hawthorn, Smooth	*Crataegus laevigata*	P	tree, shrub	Rosaceae	Invasive Plant
Hazel	*Corylus cornuta*	P	shrub	Betulaceae	Native Plant
Herb Robert	*Geranium robertianum*	A, B	forb	Geraniaceae	Invasive Plant
Horehound	*Marrubium vulgare*	P	forb	Lamiaceae	Invasive Plant
Horsetail, Giant	*Equisetum telmateia*	P	forb	Equisetaceae	Noxious Weed
Houndstongue	*Cynoglossum officinale*	B	forb	Boraginaceae	Noxious Weed
Hydrilla	*Hydrilla verticillata*	P	aquatic forb	Hydrocharitaceae	Noxious Weed
Italian ryegrass	*Lolium perenne ssp. multiflorum*	A,P	graminoid	Poaceae	Invasive Plant
Japanese dodder	*Cascuta japonica*	A	vine	Cuscutacea	Noxious Weed
Johnsongrass	*Sorghum halepense*	P	graminoid	Poaceae	Noxious Weed
Jubata grass (Purple Pampas grass)	*Cortaderia jubata*	P	graminoid	Poaceae	Noxious Weed
Knapweed, Diffuse	*Centaurea diffusa*	A, B, P	forb	Asteraceae	Noxious Weed
Knapweed, Meadow	*Centaurea debeauxii*	P	forb	Asteraceae	Noxious Weed
Knapweed, Russian	*Acroptilon repens*	P	forb	Asteraceae	Noxious Weed
Knapweed, spotted	*Centaurea stoebe*	B, P	forb	Asteraceae	Noxious Weed
Knapweed, Squarrose	*Centaurea triumfetti*	P	forb	Asteraceae	Noxious Weed
Knotweed, Bohemian	*Polygonum bohemicum*	P	forb	Polygonaceae	Invasive Plant
Knotweed, Giant	*Polygonum sachalinense*	P	forb	Polygonaceae	Noxious Weed
Knotweed, Himalayan	*Polygonum polystachyum*	P	forb	Polygonaceae	Noxious Weed
Knotweed, Japanese	*Polygonum cuspidatum*	P	forb	Polygonaceae	Noxious Weed
Kochia	*Kochia scoparia*	A	forb	Chenopodiaceae	Noxious Weed
Kudzu	*Pueraria montana* var *lobata*	P	vine	Fabaceae	Noxious Weed
Lepyrodiclis	*Lepyrodiclis holosteoides*	A	forb	Caryophyllaceae	Invasive Plant
Lesser celadine or fig buttercup	*Ranunculus ficaria*	P	forb	Ranunculaceae	Noxious Weed
Lesser hawkbit	*Leontodon taraxacoides*	A, B, P	forb	Asteraceae	Invasive Plant
Madrone	*Arbutus menziesii*	P	tree	Ericaceae	Native Plant
Marestail	*Conyza canadensis*	A, B	forb	Asteraceae	Invasive Plant
Matgrass	*Nardus stricta*	P	graminoid	Poaceae	Noxious Weed
Mediterranean sage	*Salvia aethiopis*	B	forb	Lamiaceae	Noxious Weed
Medusahead rye	*Taeniatherum caput-medusae*	A	graminoid	Poaceae	Noxious Weed
Mutiflora rose	*Rosa multiflora*	P	shrub	Rosaceae	Invasive Plant
Narrowleaf plantain	*Plantago lanceolata*	A,B,P	forb	Plantaginaceae	Invasive Plant
North Africa grass	*Ventenata dubia*	A	graminoid	Poaceae	Invasive Plant
Oblong spurge	*Euphorbia oblongata*	P	forb	Euphorbiaceae	Noxious Weed
Ocean spray	*Holodiscus discolor*	P	shrub	Rosaceae	Native Plant
Old man's beard	*Clematis vitalba*	P	vine	Ranunculaceae	Noxious Weed
Orchardgrass	*Dactylis glomerata*	P	graminoid	Poaceae	Invasive Plant
Oxeye daisy	*Leucanthemum vulgare*	P	forb	Asteraceae	Invasive Plant

Common Name	Scientific Name	Duration[1]	Growth Form	Family	Vegetation Type
Pacific Rhododendron	*Rhododendron macrophyllum*	P	shrub	Ericaceae	Native Plant
Pampas grass	*Cortaderia selloana*	P	graminoid	Poaceae	Invasive Plant
Parrot's feather	*Myriophyllum aquaticum*	P	aquatic forb	Haloragaceae	Noxious Weed
Paterson's curse	*Echium vulgare*	A, B, P	forb	Boraginaceae	Invasive Plant
Paterson's curse	*Echium plantagineum*	A,B	forb	Boraginaceae	Noxious Weed
Pennyroyal	*Mentha pulegium*	P	forb	Lamiaceae	Invasive Plant
Perennial peavine	*Lathyrus latifolius*	P	forb	Fabaceae	Noxious Weed
Perennial pepperweed	*Lepidium latifolium*	P	forb	Brassicaceae	Noxious Weed
Perennial ryegrass	*Lolium perenne* ssp. *perenne*	P	graminoid	Poaceae	Invasive Plant
Periwinkle	*Vinca major*	P	vine,forb	Apocynaceae	Invasive Plant
Poison hemlock	*Conium maculatum*	B	forb	Apiaceae	Noxious Weed
Poison ivy	*Toxicodendron rhydbergii*	P	shrub	Anacardiaceae	Native Plant
Poison Oak	*Toxicodendron diveralobum*	P	shrub, vine	Anacardiaceae	Native Plant
Policemans helmet	*Impatiens glandulifera*	A	forb	Balsaminaceae	Noxious Weed
Poverty brome	*Bromus sterilis*	A	graminoid	Poaceae	Invasive Plant
Prickly lettuce	*Lactuca serriola*	A,B	forb	Asteraceae	Invasive Plant
Prickly sowthistle	*Sonchus asper*	A	forb	Asteraceae	Invasive Plant
Puncturevine	*Tribulus terrestris*	A	forb	Zygophyllaceae	Noxious Weed
Purple foxglove	*Digitalis purpurea*	B	forb	Scrophulariaceae	Invasive Plant
Purple loosestrife	*Lythrum salicaria*	P	forb	Lythraceae	Noxious Weed
Purple Nutsedge	*Cyperus rotundus*	P	graminoid	Cyperaceae	Noxious Weed
Quackgrass	*Elymus repens*	P	graminoid	Poaceae	Noxious Weed
Rabbitbrush	*Ericameria* spp	P	shrub	Asteraceae	Native Plant
Ragweed	*Ambrosia artemisiifolia*	A	forb	Asteraceae	Noxious Weed
Red brome	*Bromus rubens*	A	graminoid	Poaceae	Invasive Plant
Reed canarygrass	*Phalaris arundinacea*	P	graminoid	Poaceae	Invasive Plant
Ripgut brome	*Bromus rigidus*	A,P	graminoid	Poaceae	Invasive Plant
Rush skeletonweed	*Chondrilla juncea*	P	forb	Asteraceae	Noxious Weed
Russian olive	*Elaeagnus angustifolia*	P	tree	Elaeagnaceae	Invasive Plant
Salmonberry	*Rubus spectablis*	P	shrub	Rosaceae	Native Plant
Saltcedar (tamarisk)	*Tamarix ramosissima*	P	tree	Tamaricaceae	Noxious Weed
Shining geranium	*Geranium lucidum*	A,B	forb	Geraniaceae	Invasive Plant
Silverleaf Nightshade	*Solanum elaegnifolium*	P	forb	Solanaceae	Noxious Weed
Skeletonleaf bursage	*Ambrosia tomentosa*	P	forb	Asteraceae	Noxious Weed
Slender oat	*Avena barbata*	A	graminoid	Poaceae	Invasive Plant
Small broomrape	*Orobanche minor*	A	forb	Orobanchaceae	Noxious Weed
Smalleaf periwinkle	*Vinca minor*	P	vine,forb	Apocynaceae	Invasive Plant
Soft brome	*Bromus hordeaceus* ssp. *hordeaceus*	A	graminoid	Poaceae	Invasive Plant
Spanish heath	*Erica lusitanica*	P	Shrub	Ericaceae	Noxious Weed
Spikeweed	*Hemizonia pungens*	A	forb	Asteraceae	Noxious Weed
Spotted Cat's ear	*Hypocheris radicata*	P	forb	Asteraceae	Invasive Plant
Spotted henbit	*Lamium maculatum*	P	forb	Lamiaceae	Invasive Plant
Spreading hedge-parsley	*Torilis arvensis*	A	forb	Apiaceae	Invasive Plant
Spurge laurel	*Daphne laureola*	P	shrub	Thymelaeaceae	Noxious Weed
Spurge, Leafy	*Euphorbia esula*	P	forb	Euphorbiaceae	Noxious Weed
Spurge, Myrtle	*Euphorbia myrsinites*	P	forb	Euphorbiaceae	Noxious Weed

Common Name	Scientific Name	Duration[1]	Growth Form	Family	Vegetation Type
St. Johnswort	*Hypericum perforatum*	P	forb	Hypericaceae	Noxious Weed
Starthistle, Iberian	*Centaurea iberica*	P	forb	Asteraceae	Noxious Weed
Starthistle, Malta	*Centaurea melitensis*	A, B	forb	Asteraceae	Invasive Plant
Starthistle, Purple	*Centaurea calcitrapa*	A, B, P	forb	Asteraceae	Noxious Weed
Starthistle, Yellow	*Centaurea solstitialis*	A, B	forb	Asteraceae	Noxious Weed
Sulfur cinquefoil	*Potentilla recta*	P	forb	Ranunculaceae	Noxious Weed
Swainsonpea	*Sphaerophysa salsula*	P	forb	Fabaceae	Noxious Weed
Sweet fennel	*Foeniculum vulgare*	B,P	forb	Apiaceae	Invasive Plant
Sweetclover, white	*Melilotus alba*	A, B, P	forb	Fabaceae	Invasive Plant
Sweetclover, yellow	*Melilotus oficinalis*	A, B, P	forb	Fabaceae	Invasive Plant
Syrian bean-caper	*Zygophyllum fabago*	P	forb	Zygophyllaceae	Noxious Weed
Tall fescue	*Schedonorus phoenix*	P	graminoid	Poaceae	Invasive Plant
Tanoak	*Lithocarpos densiflora*	P	tree	Fagaceae	Native Plant
Tansy ragwort	*Senecio jacobaea*	B, P	forb	Asteraceae	Noxious Weed
Tansy, Common	*Tanacetum vulgare*	P	forb	Asteraceae	Invasive Plant
Teasel, common	*Dipsacus fullonum*	B	forb	Dipsacaceae	Invasive Plant
Teasel, cutleaf	*Dipsacus laciniatus*	B	forb	Dipsacaceae	Noxious Weed
Texas blueweed	*Helianthus ciliaris*	P	forb	Asteraceae	Noxious Weed
Thimble berry	*Rubus parviflorus*	P	shrub	Rosaceae	Native Plant
Thistle, Bull	*Cirsium vulgare*	B, P	forb	Asteraceae	Noxious Weed
Thistle, Canada	*Cirsium arvense*	P	forb	Asteraceae	Noxious Weed
Thistle, Italian	*Carduus pycnocephalus*	A, B	forb	Asteraceae	Noxious Weed
Thistle, Milk	*Silybum marianum*	A, B	forb	Asteraceae	Noxious Weed
Thistle, Musk	*Carduus nutans*	B, P	forb	Asteraceae	Noxious Weed
Thistle, Plumeless	*Carduus acanthoides*	B	forb	Asteraceae	Noxious Weed
Thistle, Russian	*Salsola kali*	A	forb	Chenopodiaceae	Invasive Plant
Thistle, Scotch	*Onopordum acanthium*	B	forb	Asteraceae	Noxious Weed
Thistle, Slender flowered	*Carduus tenuiflorus*	P, A	forb	Asteraceae	Noxious Weed
Thistle, Smooth distaff	*Carthamus baeticus*	A	forb	Asteraceae	Noxious Weed
Thistle, Taurian or bull cottonthistle	*Onopordum tauricum*	B	forb	Asteraceae	Noxious Weed
Thistle, wavyleaf	*Cirsium undulatum*	B,P	forb	Asteraceae	Invasive Plant
Thistle, Whitestem distaff	*Carthamus leucocaulos*	A	forb	Asteraceae	Invasive Plant
Thistle, Wooly distaff	*Carthamus lanatus*	A	forb	Asteraceae	Noxious Weed
Toadflax, Dalmation	*Linaria dalmatica*	P	forb	Scrophulariaceae	Noxious Weed
Toadflax, Yellow	*Linaria vulgaris*	P	forb	Scrophulariaceae	Noxious Weed
Tree-of-heaven	*Ailanthus altissima*	P	tree	Simaroubaceae	Invasive Plant
Tumbleweed or Prickly Russian thistle	*Salsola tragus*	A	forb	Chenopodiaceae	Invasive Plant
Velvetleaf	*Abutilon theophrasti*	A	forb	Malvaceae	Noxious Weed
Vine maple	*Acer circinatum*	P	shrub	Aceraceae	Native Plant
Watermilfoil, Eurasian	*Myriophyllum spicatum*	P	aquatic forb	Haloragaceae	Noxious Weed
Western juniper	*Juniperus occidentalis*	P	tree	Cupressaceae	Native Plant
Western water hemlock	*Cicuta douglasii*	P	forb	Apiaceae	Native Plant
White Bryonia	*Byonia alba*	P	vine	Cucurbitaceae	Noxious Weed
Whitetop, (Hoary cress)	*Cardaria draba*	P	forb	Brassicaceae	Noxious Weed
Whitetop, Lens-podded	*Cardaria chalapensis*	P	shrub	Brassicaceae	Noxious Weed
Whitetop,Hairy	*Cardaria pubescens*	P	forb	Brassicaceae	Noxious Weed

Common Name	Scientific Name	Duration[1]	Growth Form	Family	Vegetation Type
Wild carrot	*Daucus carota*	B	forb	Apiaceae	Invasive Plant
Wild oat	*Avena fatua*	A	graminoid	Poaceae	Invasive Plant
Wild proso millet	*Panicum miliaceum*	A	graminoid	Poaceae	Invasive Plant
Wild safflower	*Carthamus oxyacantha*	A	forb	Asteraceae	Invasive Plant
Willow	*Salix*	P	shrub, tree	Salicaceae	Native Plant
Yellow Flag Iris	*Iris pseudacorus*	P	forb	Iridaceae	Noxious Weed
Yellow floating heart	*Nymphoides peltata*	P	aquatic forb	Menyanthaceae	Noxious Weed
Yellow glandweed	*Parentucellia viscosa*	A	forb	Scrophulariaceae	Invasive Plant
Yellow nutsedge	*Cyperus esculentus*	P	graminoid	Cyperaceae	Noxious Weed
Yellowtuft	*Alyssum murale*	A	Forb	Brassicaceae	Noxious Weed
Yellowtuft	*Alyssum corsicum*	A	Forb	Brassicaceae	Noxious Weed

[1] A = Annual B = Biennial P = Perennial

Noxious Weed Spread Rate References and Calculations

Source of Current Noxious Weed Spread Rate Estimate of 12 Percent.

The *Noxious Weed and Other Invasive Plants* section in Chapter 4 notes that the current 1.2 million acres of noxious weeds on BLM lands in Oregon is spreading at an estimated rate of 12 percent annually, or currently 144,000 acres per year. This estimate has been made after examining the following sources:

- The PEIS notes “a recent estimate of weed spread on all western federal lands is 10% to 15% annually (Asher and Dewey 2005 as cited in PEIS:3-27). Asher has indicated this estimate does not include cheatgrass (*Bromus tectorum*), and was made primarily by doing an acreage-weighted average of the common noxious weeds for which species-specific spread rates had been published (Asher, J. pers. comm.).[1]
- The 1998 BLM’s *National Strategy for Invasive Plant Management, Pulling Together,* says “experts estimate that invasive plants already infest well over 100 million acres and continue to increase by 8 to 20 percent annually” (USDI 1998).
- The 1999 Forest Service *Stemming the Invasive Tide: Forest Service Strategy for Noxious and Nonnative Invasive Plant Management* reports “on Federal lands in the Western United States, it is estimated that weeds occur on more than 17 million acres” (USDA 1999). Asher has calculated a 2,300 acres per day spread rate for BLM lands, and separately calculated a 2,300 acre per day spread rate for all other federal lands (Asher, J. pers. comm. and variously published). Applying the 4,600-acre per day sum of these estimates to the 17 million acres reported infested (above) results in an annual spread rate of 10.0 percent. However, the 17 million may include cheatgrass, which is not in J. Asher’s rate of spread estimate. If so, the actual percentage would be higher than 10.0 percent.

1 For example, the *Spartina alterniflora* infestation in Willapa Bay grew from 300 acres to 8,500 acres in the 19 years from 1984 to 2003 (19.5 percent) (see WA DNR 2008). Duncan and Clark (2005) report 950,000 acres of yellow starthistle in Oregon with a spread rate of 17 percent; perennial pepperweed spread at an average annual rate of 11 percent in Utah and 18 percent in Montana; dalmation toadflax has spread from introduction in 1908 to 32 states in 2002 at an annual rate of 11 percent; cheatgrass 14 percent; musk thistle 12-22 percent, diffuse knapweed 8-14 percent; and so forth.

- There are 1.2 million acres of noxious weeds on BLM lands in Oregon (combined district estimates 2007). An average compounded rate of spread necessary to reach 1.2 million acres is calculable if a starting date is known or assumed. It is known "weed invasions began a few centuries ago but primarily in the mid-1800s when weeds began arriving from other countries…." (Asher and Spurrier 1998), and even in the 1800s "about one hundred exotics per decade were establishing in the five northwest states" (Rice 1999). If we assume spread didn't become significant until 20 years after the 1849 gold rush, a 140 year compounded average spread rate of 8.7 percent would account for today's 1.2 million acres.
- The Forest Service Region 6 (Oregon and Washington) 2005 Invasive Plant EIS notes "Invasive plant populations increase in acreage at an estimated rate of 8-12 percent per year on Forest Service System land [nationwide] (USDA 1999[b])" cited in USDA 2005:3-2. "Using this range, if one estimates spread at 10 percent per year…." (USDA 2005).
- "From, 1985 to 1996, invasive plants quadrupled to 17 million acres on western federal lands (Asher 1998, Westbrooks 1998)" as cited in USDA 2005:3-2. To quadruple in 11 years requires a compound rate of 15.75 percent per year.

The Forest Service and even the BLM west of the Cascades probably has a lower spread rate than the BLM in Oregon as a whole (in the area of 10 percent). The primary agent of noxious weed spread is disturbance, and that is likely more prevalent on the open flat BLM lands east of the Cascades. Additionally, the generally higher, steeper, more vegetated landscape on the National Forests would be outside of the ecological amplitude of many Mediterranean species invading BLM lands; access to OHVs is more restricted both legally and geographically; and certain windborne species don't travel well on steeper more vegetated areas. Using the high end of the Forest Service's 8-12 percent range, and taking the other figures at face value, a reasonable estimate of the current annual spread rate of noxious weeds on BLM lands in Oregon is 12 percent. Because Oregon has been controlling noxious weeds aggressively under the same direction since 1987, this rate is assumed to correspond, or in part be the product of, the current direction or No Action Alternative 2. The acres that would result from an annual increase of noxious weed acres (from the current 1.2 million) at a 12 percent rate for the next 15 years is shown on the right-most column on Tables A7-4, 5, and 6 below.

The BLM Western Oregon Plan Revision (WOPR) FEIS (USDI 2008) identifies 61 noxious weeds and an additional 69 invasive plants in the WOPR planning area (p. 3-274), and predicts the increase in timber harvest activities under all of the action alternatives would increase the risk of spreading invasive plants (p. 4-628). The increased risk is not quantified using the same parameters as discussed here, so a direct comparison is not possible, but it does not appear that the described increase would equal a whole percentage point.

Scoping for the Vegetation Treatments EIS revealed a concern that roadside hazard tree and other salvage tree removal can result in a soil-disturbing piece of equipment traversing several miles of forest roads per day and potentially spreading any encountered noxious weeds over that larger area. This possibility is a part of the increased risk noted above. To some degree, such a risk should be mitigated by the BLM's policy of requiring the development of a Noxious Weed Risk Assessment that identifies actions to be taken and monitoring to be done whenever analysis of proposed ground disturbing activities determines the activity will have a moderate or high risk of spreading noxious weeds (BLM Manual 9015; USDI 1992).

Effective Treatments by Alternative

The treatment efficiency percentages and effectively treated acres by alternative shown on Table A7-3 below are from Table 4-3 and associated discussion in the *Noxious Weeds and Other Invasive Plants* section of Chapter 4. Gross treatment acres are from FEIS Table 3-3. This information is relevant to the calculations of weed spread rate in the following sections.

Table A7-3. Annual Acres of Effective Noxious Weed Control by Alternative

Alternative	Gross Treatment Acres	Efficiency Percentage	Tent. Effectively Treated Acres	25% ROW Treat Benefit	Total Effectively Treated Acres
Reference Analysis	42,100	.30	12,630	n/a	12,630
2	45,500	.60	27,300	n/a	27,300
3	57,700	.80	46,160	n/a	46,160
4	57,700	.80	46,160	2,350	48,510
5	57,700	.80	46,169	2,350	48,510

Alternative 3 Spread Rate

The increase in effective treatments under Alternative 3 when compared to No Action Alternative 2 is 18,860 acres (from Table A7-3). The reduction in the current 144,000 acre annual increase in noxious weeds the first year would be no more than this 18,860 acres. However, because treatments are targeted at populations in the introduction phase of the infestation, these treatments would prevent 10 times those acres (188,600 acres) over the next 15 year time period. For example, 100 acres of effective control treatments in 1980 are assumed to reduce noxious plants by 1000 acres by 1995. Because that gain comes from controlling acres early in the Invasion Lag Curve (Figure 4-2), the 188,600 acres of weeds prevented is spread along the same curve in the following percentages per year: 10, 5, 5, 5, 5, 5, 5, 5, 5, 5, 5, 10, 10, 10, 10 = 100%. Only 10 percent of the gain is achieved the first year, another 5 percent the next year, and so forth until the entire gain is achieved by the 15th year. Another 18,860 acres is treated the next year, and the gains are additive. Thus in year two, the reduction in infested acres is the 18,860 acres treated that year, and the 9,430 acres credit from the previous year's treatment. In decade 3, it's 18,860+9,430+9,430=37,7200, and so forth. These gains continue to add up, until after 15 years, the 18,860 acres annual treatment are decreasing weed infestation acres by 188,600 acres per year. At that point, there are 1.86 million fewer acres infested than under Alternative 2, and the annual spread rate is slowed to 7 percent (Table A7-4).

Table A7-4. Weed Spread of 12% Reduced by 10 Times 18,860 Acres of Effective Annual Control (Difference Between Alts 2 and 3), Distributed Over 15 Decades at 10, 5, 5, 5, 5, 5, 5, 5, 5, 5, 5, 10, 10, 10 and 10% ea Decade

Alternative 3							Alternative 2
Year	Begin Acreage	12 % Growth		Effective Control	End Acreage	% increase from prev.	12% annual increase
1	1,200,000	1.12	1,344,000	18,860	1,325,140		1,200,000
2	1,325,140	1.12	1,484,157	28,290	1,455,867	9.87%	1,344,000
3	1,455,867	1.12	1,630,571	37,720	1,592,851	9.41%	1,505,280
4	1,592,851	1.12	1,783,993	47,150	1,736,843	9.04%	1,685,913
5	1,736,843	1.12	1,945,264	56,580	1,888,684	8.74%	1,888,223
6	1,888,684	1.12	2,115,326	66,010	2,049,316	8.50%	2,114,810
7	2,049,316	1.12	2,295,234	75,440	2,219,794	8.32%	2,368,587
8	2,219,794	1.12	2,486,169	84,870	2,401,299	8.18%	2,652,818
9	2,401,299	1.12	2,689,455	94,300	2,595,155	8.07%	2,971,156
10	2,595,155	1.12	2,906,574	103,730	2,802,844	8.00%	3,327,694
11	2,802,844	1.12	3,139,185	113,160	3,026,025	7.96%	3,728,018
12	3,026,025	1.12	3,389,148	132,020	3,257,128	7.64%	4,174,260
13	3,257,128	1.12	3,647,984	150,880	3,497,104	7.37%	4,675,171
14	3,497,104	1.12	3,916,756	169,740	3,747,016	7.15%	5,236,192
15	3,747,016	1.12	4,196,658	188,600	4,008,058	6.97%	5,864,535

Reference Analysis Spread Rate

The decrease in effective treatments under the Reference Analysis when compared to No Action Alternative 2 is 14,670 acres. Implementation of the Reference Analysis would, it is predicted, increase the current 144,000 acre annual by 14,670 acres. This reduction in effective treatment acres is shown as a negative number under effective control (Table A7-5). The weed spread rate under the Reference Analysis increases to 14 percent immediately and stays there through the 15-year period. An additional 2.7 million acres would become infested when compared to Alternative 2.

Table A7-5. Weed Spread of 12% Increased by 10 Times the 14,670 Acres Less Effective Annual Control (Difference Between Alt 2 and the Reference Analysis, Shown as a Negative Number), Distributed over 15 Decades at 10, 5, 5, 5, 5, 5, 5, 5, 5, 5, 5, 10, 10, 10 and 10% ea Decade

Reference Analysis							Alternative 2
Year	Begin Acreage	12 % Growth		Effective Control	End Acreage	% increase from prev.	12% annual increase
1	1,200,000	1.12	1,344,000	-14,670	1,358,670		1,200,000
2	1,358,670	1.12	1,521,710	-22,005	1,543,715	13.62%	1,344,000
3	1,543,715	1.12	1,728,961	-29,340	1,758,301	13.90%	1,505,280
4	1,758,301	1.12	1,969,297	-36,675	2,005,972	14.09%	1,685,913
5	2,005,972	1.12	2,246,689	-44,010	2,290,699	14.19%	1,888,223
6	2,290,699	1.12	2,565,583	-51,345	2,616,928	14.24%	2,114,810
7	2,616,928	1.12	2,930,959	-58,680	2,989,639	14.24%	2,368,587
8	2,989,639	1.12	3,348,396	-66,015	3,414,411	14.21%	2,652,818
9	3,414,411	1.12	3,824,140	-73,350	3,897,490	14.15%	2,971,156
10	3,897,490	1.12	4,365,189	-80,685	4,445,874	14.07%	3,327,694
11	4,445,874	1.12	4,979,379	-88,020	5,067,399	13.98%	3,728,018
12	5,067,399	1.12	5,675,487	-102,690	5,778,177	14.03%	4,174,260
13	5,778,177	1.12	6,471,558	-117,360	6,588,918	14.03%	4,675,171
14	6,588,918	1.12	7,379,588	-132,030	7,511,618	14.00%	5,236,192
15	7,511,618	1.12	8,413,013	-146,700	8,559,713	**13.95%**	5,864,535

Alternatives 4 and 5 Spread Rate

The increase in effective treatments under Alternative 4 when compared to No Action Alternative 2 is 21,210 acres. Applying the calculations and assumptions described above, the rate of noxious weed spread by year 15 is reduced to 6 percent (compared to 7 percent in Alternative 3 and 2.2 million fewer acres are infested (Table A7-6).

Table A7-6. Weed Spread of 12% Reduced by 10 Times 21,210 Acres of Effective Annual Control (Difference Between Alts 2 and 4), Distributed Over 15 Decades at 10, 5, 5, 5, 5, 5, 5, 5, 5, 5, 5, 10, 10, 10 and 10% ea Decade

Alternatives 4 and 5							Alternative 2
Year	Begin Acreage	12 % Growth		Effective Control	End Acreage	% increase from prev.	12% annual increase
1	1,200,000	1.12	1,344,000	21,210	1,322,790		1,200,000
2	1,322,790	1.12	1,481,525	31,815	1,449,710	9.59%	1,344,000
3	1,449,710	1.12	1,623,675	42,420	1,581,255	9.07%	1,505,280
4	1,581,255	1.12	1,771,006	53,025	1,717,981	8.65%	1,685,913
5	1,717,981	1.12	1,924,138	63,630	1,860,508	8.30%	1,888,223
6	1,860,508	1.12	2,083,769	74,235	2,009,534	8.01%	2,114,810
7	2,009,534	1.12	2,250,678	84,840	2,165,838	7.78%	2,368,587
8	2,165,838	1.12	2,425,739	95,445	2,330,294	7.59%	2,652,818
9	2,330,294	1.12	2,609,929	106,050	2,503,879	7.45%	2,971,156
10	2,503,879	1.12	2,804,345	116,655	2,687,690	7.34%	3,327,694
11	2,687,690	1.12	3,010,212	127,260	2,882,952	7.27%	3,728,018
12	2,882,952	1.12	3,228,907	148,470	3,080,437	6.85%	4,174,260
13	3,080,437	1.12	3,450,089	169,680	3,280,409	6.49%	4,675,171
14	3,280,409	1.12	3,674,058	190,890	3,483,168	6.18%	5,236,192
15	3,483,168	1.12	3,901,148	212,100	3,689,048	**5.91%**	5,864,535

Additional Information about the Ecological Damage Caused by Invasive Plants

Invasive plants are non-native plants likely to cause economic or environmental harm or harm to human health (Executive Order 13112). They typically have biological traits that allow them to colonize new areas and successfully compete with native plants, and they are away from natural enemies or competitors that may have restricted growth in their native lands. Biological traits making them successful typically include one or more of the following characteristics: deep tap root systems and very little surface foliage, allowing them to grow later in the summer than most native rangeland plants; earlier growth and reproduction than most natives; long-lived seeds; adaptations for spreading long and short distances; production of many seeds from on plant; long lifespan; ability to delay flowering; ability to reproduce vegetatively; tolerance for a wide range of physical conditions; rapid growth; self pollination; ability to compete intensively for nutrients; thorns, poisons, or lack of palatability that keep them from being browsed; and production of toxic compounds that negatively affect neighboring plants (PEIS:3-26).

Many invasive plants also have characteristics that cause long-term physical damage to soils. The limited foliage and non-fibrous root do little to protect soil from rain-splash and overland flow; annual grasses cure early resulting in frequent high-intensity wildfires damaging soils and exposing them to wind and rain; they change nutrient recycling permitting important nutrients to be lost from the site; and many poison soils with their roots or shed leaves. Invasive plants impact water quality by increasing erosion, changing nutrient cycling, decreasing stream flows, making streams less habitable by fish and reducing water available for people. Invasive plants can also change the seral progression of a site to the extent that forestland loses the ability to produce trees. Invasive plants create monocultures and otherwise displace native plant communities. As native plants are displaced, animals that depend on them lose forage, nesting sites, hiding cover and other essentials necessary for their survival. Invasive plants create fire safety issues as highly flammable cheatgrass encroaches on the wildland-urban interface. The coastal town of Bandon was destroyed and 11 citizens killed in 1936 by a fire propagated by gorse, a highly flammable invasive plant (Simberloff 1996).

Invasive plants change ecosystems. Invasive plants compete with native plants for resources, thereby becoming dominant. More importantly they can outcompete plants that are food supplies for animals in the ecosystem. This may result in animals depending on nonnative plants for food or, if they are specialists, losing their food source entirely. Invasive plants normally lack predators and may more easily outcompete natives with their natural predators. Invasive plants are a problem because they alter the invaded ecosystem and species composition (Woods 1997) to such an extent that they threaten native flora and fauna. Invasive species capitalize on many techniques in order to invade ecosystems. There are three ways that biological invasions alter ecosystems according to D'Antonio and Vitousek (1992).

Invasive exotic plants alter rates of resource supply, trophic level relationships, and the disturbance regime. A highly disturbed ecosystem is susceptible to invasion (Hobbs and Huenneke 1992).

Selected citations from 2005 Region 6 Forest Service Invasive Plant EIS (USDA 2005:3-1 to 3-68)

- Spotted knapweed is an aggressive competitor and produces an allelopathic compound (pg.3-8).
- Yellow starthistle forms solid stands that dramatically reduce forage for livestock and wildlife. This species causes a fatal neurological disorder when ingested by horses called chewing disease (pg. 3-9).
- Soil erosion more than doubled in knapweed dominated areas compared to uninfested areas (pg 3-28).
- Invasion by purple loosestrife makes habitat unsuitable for numerous birds, reptiles and mammals (pg 3-49)

- Known effects of invasive plants to wildlife: embedded seeds leading to injury or death, scratches leading to infection, ingestion of plant parts leading to poisoning, cascading effect of direct or indirect mortality on other species (pg 3-49).

Trammel and Butler (1995) found that deer, elk, and bison avoided sites infested with leafy spurge. Tamarisk stands have fewer and less diverse populations of mammals, reptiles, and amphibians (Jakle and Gatz 1985, Olson 1999). Invasion by purple loosestrife makes habitat unsuitable for numerous birds, reptiles, and mammals (Kiviat 1996, Lor 1999, Rawinski 1982, Thompson et al. 1987, Weihe and Neely 1997, Weiher et al. 1996)

The rapid growth of many invasive plants allows them to out-compete native vegetation. This competitive advantage results in the loss of functional riparian communities, loss of rooting strength and protection against erosion, decreasing slope stability and increasing sediment introduction to streams, and impacts on water quality (Donaldson 1997).

Some invasive plants (such as knapweed) contain chemical compounds that make the plant unpalabtable to grazing animals. Chemical compounds in these invasive plants disrupt microbial activity in the rumen, or cause discomfort after being ingested, resulting in a reduced or avoided consumption of the invasive plant (Olson 1999).

Native plants with cultural significance, such as camas and bitterroot, are declining in number across the western landscape. This decrease is of great concern to many tribes, as traditional gathering areas have experienced a decline in productivity due to anthropogenic influences of the past century and the proliferation of invasive plant species - especially spotted knapweed and sulfur cinquefoil (Bonnicksen et al. 1998).

Numerous studies demonstrate reduced numbers and/or diversity in birds, reptiles, small mammals, and insects in stands of non-native plant species (Huenneke 1996). For example, kangaroo rat and ground squirrel populations were severely reduced or totally eliminated on sites infested with Russian knapweed in a study in Wyoming (Johnson et al. 1994).

Studies in Montana show that spotted knapweed invasions reduced available winter forage for elk between fifty and ninety percent (Duncan 1997).

Research shows that the total number of insects, total insect biomass and taxonomic richness of invertebrates associated with giant reed are significantly lower than that associated with native vegetation (Herrera 1997).

Giant reed uses about three times as much water as the native plants, introduces an unnatural fire cycle into the ecosystem, and it easily replaces entire plant communities (Iverson 1993, Reiger and Kreager 1989).

Knapweeds are the best regional (Pacific Northwest) symptom of desertification, the loss of the productive potential of the land (Roche 1988).

The severe level of deterioration in four desertification classes is described in part as follows: "Undesirable forbs and shrubs have replaced desirable grasses or have spread to such an extent that they dominate the flora" (Dregne 1977).

Aggressive foreign plants spread quickly into natural areas, monopolize resources, and push out native flora and fauna - including endangered species (Cheater 1992).

The simplest effect of some invasions is the displacement of native plant species, by simple crowding, by competition for resources, or by other mechanisms. Many invasive plants form broad-leaved rosettes or in some other way shade out neighbors (Huenneke 1996).

The impact of purple loosestrife on native vegetation has been disastrous, with more than 50 percent of the biomass of some wetland communities displaced. Monospecific blocks of this weed have maintained themselves for at least twenty years (Thompson et al. 1987).

In the absence of predators, immune systems or other biological control mechanisms adapted to counteract these species, populations of some exotics have exploded (Monnig 1992).

Infections in the eyes, mouth, and throat commonly occur in cattle and sheep feeding where medusahead is present (Bovey 1961, Hilken 1980).

Annual economic impacts of leafy spurge infestations on grazing and wildlands in Montana, North Dakota, South Dakota, and Wyoming are approximately $129,000,000 (Leitch 1994).

The reduction in wildlife-associated recreation expenditures due to current leafy spurge infestations on wildlands in North Dakota is estimated to be $2,900,000 (Wallace et al. 1992).

In Montana, knapweed infestations result in an estimated direct annual impact of $14,000,000 with total secondary impacts of about $42,000,000 per year which could support over 500 jobs in the state's economy (Hirsch and Leitch 1997).

Scotch broom has been identified as the noxious weeds causing the highest productivity losses of any of Oregon's noxious weeds, at $47 million annually (Radke and Davis 2000:19-20).

Many studies and repeated landowner experiences show that weeds commonly reduce livestock carrying capacity from thirty-five percent to ninety percent (Hilken 1980, Bucher 1984).

Runoff and sediment yield were fifty-six percent and 192 percent higher, respectively, for spotted knapweed than for bunch grass vegetation types (Lacey et al. 1989).

Salt cedar, a deep rooted shrub or small tree, uses an excessive amount of water. A mature salt cedar consumes as much as 800 liters of water per day -- 10 to 20 times the amount used by native species it tends to replace (Cooperrider 1995).

Tamarisk (also known as salt cedar) has been able to out compete willow and other riparian plants in many locations, greatly diminishing the quantity and quality of riparian habitat for migrant songbirds and vegetation dependent birds, like the endangered Yuma clapper rail at the Salton Sea and elsewhere (Dudley 1995).

Tamarisk dominated riparian areas have depauperate faunas, even in the native range of tamarisk (Lovich 1996).

A study by DeLoach (1991) in the Lower Colorado Valley showed that for the entire year, salt cedar had only fifty-nine percent of the mean density of birds as the cottonwood-willow, screwbean and western honey mesquite communities. During the winter, saltcedar had only thirty-nine percent of the density of birds as other vegetative communities. The leaf litter of salt cedar increases soil salinity so that large areas are unfit for native vegetation and the wildlife that depend on that vegetation.

Spotted knapweed has been found to reduce grass production from 60-90 percent (Harris and Cranston 1979, Bedunah and Carpenter 1989, Wright and Kelsey 1997) decreasing carrying capacity for livestock and lowering the quality of winter range habitat for wildlife (Rice et.al. 1997).

Spotted knapweed produces a chemical, called catechin, that causes native vegetation to die (Kahn 2003).

In some parts of Theodore Roosevelt National Park, leafy spruge diminished bison forage by 83 percent and deer and elk forage by 70 percent (Stalling 1998).

Each wildlife species has specific habitat requirements for feeding and cover – which are different for different animals. Therefore, instead of monocultures of weeds (or plant communities being pushed toward monocultures by weeds) the native vegetation must be diverse to support the full wildlife community (Asher 2000).

Lesser yellow legs and other shorebirds use shallow water areas in wetlands. They prefer habitats that are open, with low-profile vegetation and low plant cover, like flooded mud flats. Such areas are quickly invaded by reed canarygrass, which makes them unsuitable habitat for shorebirds. Foraging habitat for the 25 species of shorebirds, that use the Turnbull National Wildlife Refuge, in Washington, when migrating, has been substantially reduced by the weed (Rule 2004).

Shallow, flooded, seasonal wetlands are important habitat for the migration, pairing and brood rearing of many of the duck species, especially mallards, cinnamon and blue-winged teal, and green-winged teal, on the Turnbull Wildlife Refuge. Once invaded by reed canarygrass these areas have less diverse and less abundant food resources. The dense thatch layer that develops also restricts access to these food resources (Rule 2004).

Aspen-dominated riparian communities on the Turnbull Wildlife Refuge refuge are the most important Habitat for 65 species of land birds. Reed canarygrass invades the understory of many of these stands. This reduces structural and floral diversity by impeding the growth of native understory shrubs and forbs. It also impedes the regeneration of aspen. The result is a significant decline in habitat diversity, which may lead to as much as a 50-percent decrease in bird species diversity (Rule 2004).

The impact of purple loosestrife on native vegetation has been disastrous, with more than 50 percent of the biomass of some wetland communities displaced. Monospecific blocks of this weed have maintained themselves for at least twenty years (Thompson et al. 1987).

In its native habitat, purple loosestrife only comprises one to four percent of the native vegetation, but in North America densities of up to 80,000 stalks per acre have been recorded (Strefer 1996).

Purple loosestrife out competes native plant species and reduces biodiversity (Nyvall 1995).

Endangered, threatened, and rare birds completely avoided invasive Phragmites while utilizing neighboring short grass wetlands (Benoit and Askins 1997).

One study showed that when chukar partridge were given free access to all the medusahead caryopses (seed) they would eat, along with other dietary requirements, they suffered dramatic losses in body weight (Savage et al. 1969).

Research concerning chukar partridge habitat use and availability in the severely infested lower Salmon River Canyon of Idaho, revealed that chukars selected against (avoided) habitats with higher yellow starthistle ground cover (Lindbloom 1998).

The impact of (weed) invasions can be permanent when economic and environmental factors limit the ability of a managing agency to restore the ecosystem to a healthy state (NAS 2002)

Loss of wildlife habitat function would be irretrievable (PEIS:2-32).

In one research area in Colorado, dalmation toadflax recently increased 1,200 percent over a six year period (Beck 2009)

Weeds are spreading rapidly, and in some cases exponentially, in every cluster and sixty-six percent of the BLM/FS lands are susceptible to knapweeds and yellow starthistle (Quigley and Arbelbide 1997).

Like human populations, weeds typically increase exponentially beginning slowly, then doubling and redoubling (Kummerow 1992).

There were only minor populations of spotted knapweed in Montana in 1920. Today, there are about five million acres with another 29 million acres of highly susceptible land in that state alone (Duncan 1997).

Weed spread

Yellow starthistle was first reported near San Francisco and Seattle in the mid-1800's. Today it infests over 12 million acres in California and many millions of acres in Oregon, Washington, and Idaho.

In 1993, Jackson county in southern Oregon, and Umatilla county in north east Oregon both reported explosions of yellow starthistle with over 100,000 acres in Jackson county and 200,000 acres in Umatilla county. Now, both counties report that the populations have at least doubled.

In 1970, there was about thirty-two acres of leafy spurge in the Theodore Roosevelt National Park in North Dakota. The use of herbicides was not allowed and now leafy spurge dominates over 4,400 acres of the park (Andrascik 1997).

From just a few plants in western Idaho in 1954, rush skeletonweed now infests over four million acres as it continues to "leapfrog" to the east, now out beyond Shoshone, Idaho, and to the west into the Hells Canyon National Recreation Area in Oregon and Idaho.

References

Andrascik 1997	Andrascik, R. 1997. Leafy Spurge Newsletter 1(3):2-3
Cooperrider 1995	Cooperider, A., et. al. 1995. In, State of the Biome Uniqueness, Biodiversity, Threats and the Adequacy of Protection in the Sonoran Bioregion. The Wildland Project. March 1998,Tucson, Arizona
DeLoach 1991	DeLoach, J. 1991. Saltcedar, An Exotic Weed of Western North American RiparianAreas: A Review of Its Taxonomy, Biology, Harmful and Beneficial Values, and Its Potential for Biological Control. USDA Agriculture Research Service, Temple Tx.
Donaldson 1997	Donaldson, S.G. 1997. Flood-borne-noxious weeds: impacts on riparian areas and wetlands. California Exotic Pest Plant Council. 1997 Symposium Proceedings.
Dregne 1977	Dregne, H. 1977. Desertification of Arid Lands. Economic Geography 53 (4) 322-331.
Dudley 1995	Dudley, T., Collins, B. 1995. Biological Invasions in California Wetlands. Pacific Institute for Studies in Development, Environment, and Security. Oakland, Ca. p25.
Duncan 1997	Duncan, C. 1997. Techline pp 5-10
Harris and Cranston 1979	Harris, P., and R. Cranston. 1988. An economic evaluation of control methods for diffuse and spotted knapweed in western Canada. Canadian J. Plant Sci. 59:375-382.

Herrera 1997	Herrera, A.M. 1997. Invertebrate community reduction in response to *Arundo donax* invasion at Sonoma Creek. Pp. 94-105. In: Dudley, T., J. Reynolds & M. Poteet (eds). The science and policy of environmental impacts and recovery. Environmental Science Senior Research Seminar, Univ. of Calif., Berkeley.
Hirsch and Leitch 1997	Hirsch, S., J. Leitch. 1997. Economic Effect of Knapweed in Montana. Montana Weed Control Association Newsletter. 14:1. Winter 1997.
Huenneke 1996	Huneneke, L. 1996. Ecological impacts of invasive plants in natural areas. Proceedings: Western Society of Weed Science 49:119-121
Iverson 1993	Iverson, M. 1993. The impact of *Arundo donax* on water resources. *Arundo donax* Workshop Proceedings, Ontario, CA. November 19, 1993, pp. 19-26.
Jakl and Gatz 1985	Jakle, M.D., and Gatz, T.A. 1985. Herpetofaunal use of four habitats of the Middle Gila River drainage, Arizona. Paper presented at the North American Riparian Conference, April 16-18, 1985, Tucson, AZ
Kiviat 1996	Kiviat, E. 1996. Short Communications: American Goldfinch nests in purple loosestrife. Wilson Bulletin 108(1): p.182-6.
Lor 1999	Lor, S.K. 1999. Habitat use and population status of marsh birds in western New York. M.S. thesis. Department of Natural Resources, Cornell University, Ithaca New York. 135.
Rawinski 1982	Rawinski TJ. 1982. The ecology and management of purple loosestrife (*Lythrum salicaria* L.) in central New York. Cornell University, Ithaca, N.Y. ix:88.
Roche 1988	Roche, C. 1988. Knapweed Newsletter 2(4):1
Rule 2004	Rule, M. 2004. Invasive Plants: Winning the War on Weeds. 69th N. American Wildlife and Natual Resources Conference. Spokane, Wa., March 16, 2004. pg.19-20.
Trammel and Butler 1995	Trammell, M.A., and Butler, J.L. 1995. Effects of exotic plants on native ungulate use of habitat. Journal of Wildlife Management 59((4)): p.808-16.
USDA 1999	USDA Forest Service. 1999. Stemming the Invasive Tide: Forest Service Strategy for Noxious and Nonnative Invasive Plant Management.
USDA 2005	USDA Forest Service. 2005. Pacific Northwest Region Invasive Plant Program: Preventing and Managing Invasive Plants. Final Environmental Impact Statement. Available at http://www.fs.fed.us/r6/invasiveplant-eis/
USDI 1998	USDI Bureau of Land Management. 1998. National Strategy for Invasive Plant Management
WA DNR 2008	Washington Department of Natural Resources. 2008. Invasive Species - Spartina Eradication Project in Willapa Bay. Available at http://www.dnr.wa.gov/ResearchScience/Topics/AquaticHabitats/Pages/aqr_is_spartina_eradication_project.aspx
Weihe and Neely 1997	Weihe, P.E., and Neely, R.K. 1997. The effects of shading on competition between purple loosestrife and broad-leaved cattail. Aquatic Botany 59: p.127-38.
Weiher et al 1996	Weiher, E., Wisheu, I.C., Keddy, P.A., and Moore, D.R.J. 1996. Establishment, Persistence, and Management Implications of Experimental Wetland Plant Communities. Wetlands 16(2): p.208-18.

Appendix 8 –
Human Health and Ecological Risk Assessments

Risk Assessments

One of the *Purposes* identified in Chapter 1 of the Final EIS is: *6. Prevent herbicide control treatments from having unacceptable adverse effects to applicators and the public, to desirable flora and fauna, and to soil, air, and water.* To help address this *Purpose*, the EIS relies on BLM and/or Forest Service-prepared Human Health and Ecological Risk Assessments for the 18 herbicides analyzed in this EIS. The Risk Assessments are used to quantitatively evaluate the probability (i.e. risk) that herbicide use in wildland settings might pose harm to humans or other species in the environment. As such, they address many of the risks that would be faced by humans, plants, and animals, including special status species, from the use of the herbicides. The level of detail in the Risk Assessments for wildland use exceeds that normally found in EPA's registration examination.

Risk is defined as the likelihood that an effect (injury, disease, death, or environmental damage) may result from a specific set of circumstances. It can be expressed in quantitative or qualitative terms. While all human activities carry some degree of risk, some risks are known with a relatively high degree of accuracy because data have been collected on the historical occurrence of related problems (e.g. lung cancer caused by smoking, auto accidents caused by alcohol impairment, and fatalities resulting from airplane travel). For several reasons, risks associated with exposure to herbicides cannot be so readily determined. The Risk Assessments help evaluate the risks resulting from these situations.

Risks to non-target species associated with herbicide use are often approximated via the use of surrogate species, as toxicological data does not exist for most native non-target species. Survival, growth, reproduction, and other important sub-lethal processes of both terrestrial and aquatic non-target species were considered. Assessments considered acute and chronic toxicity data. Exposures of receptors[1] to direct spray, surface runoff, wind erosion, and accidental spills were analyzed.

Most of the Human Health and Ecological Risk Assessments were developed by the BLM for the 2007 PEIS, or by the Forest Service for the 2005 *Pacific Northwest Region Invasive Plant Program EIS* (see Table A8-1). Three Human Health Risk Assessments used in this EIS (bromacil, diuron, and tebuthiuron) were used in BLM's 1991 *Vegetation Treatment on BLM Lands in Thirteen Western States EIS* and more recent literature has been examined to ensure these Risk Assessments remain current. The Risk Assessments, for herbicides analyzed, total over 6,000 pages. The various sections of each Risk Assessment can be accessed on the web as described below, or obtained on compact disk by calling, emailing, or writing to the BLM at the contact points listed on the title page of this EIS.

The Risk Assessments, related separate analyses, and the EIS include analysis of inerts and degradates for which information is available and not constrained by confidential business information (CBI) restrictions. Preparing a risk assessment for every conceivable combination of herbicide, tank mix, surfactant, adjuvant, and other possible mixture is not feasible, as the BLM cannot prepare hundreds of risk assessments, and the cost would be exorbitant. To the degree a toxic substance is known to pose a significant human or ecological risk, the BLM has

1 An ecological entity such as a human, fish, plant, or slug.

undertaken analysis to assess its impacts through risk assessments. Additional information about uncertainty in risk assessments is included in Appendix 13.

When evaluating risks from the use of herbicides proposed in a NEPA planning document, reliance on EPA's pesticide registration process as the sole demonstration of safety is insufficient. The U.S. Forest Service and Bureau of Land Management were involved in court cases in the early 1980's that specifically addressed this question (principally Save Our Ecosystems v. Clark, 747 F.2d 1240, 1248 (9th Cir. 1984) and Southern Oregon Citizens v. Clark, 720 F. 2d 1475, 1480 (9th Cir. 1983)). These court decisions and others affirmed that although the BLM can use EPA toxicology data, it is still required to do an independent assessment of the safety of pesticides rather than relying on Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) registration alone. This Court also found that FIFRA does not require the same examination of impacts that the BLM is required to undertake under NEPA. Further, risk assessments consider data collected from both published scientific literature and data submitted to EPA to support FIFRA product registration, whereas EPA utilizes the latter data only. The EPA also considers many wildland pesticide uses to be minor. Thus, the project-specific application rates, spectrum of target and non-target organisms, and specialized exposure scenarios evaluated by the BLM are frequently not evaluated by EPA in its generalized registration assessments.

The Risk Assessments are the source for much of the individual herbicide information presented in each of the effects sections in the EIS, including the high-moderate-low risk ratings shown in tables at the end of Chapter 3 and referenced in Chapter 4. Individual Risk Assessment Tools (IRATs) are being, developed for each herbicide to assist field managers in translating risks to project design parameters. The use of these tools is explained in Chapter 3, *Use of Individual Risk Assessment Tools During Implementation*.

The component parts of the various Risk Assessments, and their origins, are shown on Table A8-1. Each part is available on the web via http://www.blm.gov/or/plans/vegtreatmentseis/riskassessments/index.php. At this address, each of the "X"s in the table are clickable links that access the respective section. The additional Risk Assessment information shown on Table A8-2 can be accessed at the above website as well.

Table A8-1. Risk Assessments

<table>
<tr><th rowspan="4">Herbicide</th><th colspan="7">Ecological Risk Assessments (ERA)</th><th colspan="8">Human Health Risk Assessments (HHRA)</th></tr>
<tr><th colspan="6">2007 BLM PEIS[1]</th><th colspan="2" rowspan="3">2005 FS EIS[2] Ecological & Human Health (and worksheet)</th><th colspan="6">2007 BLM PEIS[1]</th><th rowspan="3">1991 BLM EIS[3]</th></tr>
<tr><th rowspan="2">Risk Assessment</th><th colspan="5">Appendices[4]</th><th rowspan="2">Risk Assessment</th><th colspan="5">Appendices[5]</th></tr>
<tr><th>A</th><th>B</th><th>C</th><th>D</th><th>E</th><th>A</th><th>B</th><th>C</th><th>D</th><th>E</th></tr>
<tr><td>2,4-D[6]</td><td></td><td></td><td></td><td></td><td></td><td></td><td colspan="2">x (x)</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Bromacil</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td colspan="2"></td><td></td><td></td><td></td><td></td><td></td><td></td><td>x</td></tr>
<tr><td>Chlorsulfuron</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td></td><td>x (x)</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Clopyralid</td><td></td><td></td><td></td><td></td><td></td><td></td><td colspan="2">x (x)</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Dicamba</td><td></td><td></td><td></td><td></td><td></td><td></td><td>x (x)</td><td></td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td></td></tr>
<tr><td>Diquat</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td></td><td colspan="2"></td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td></td></tr>
<tr><td>Diuron</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td colspan="2"></td><td></td><td></td><td></td><td></td><td></td><td></td><td>x</td></tr>
<tr><td>Fluridone</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td></td><td colspan="2"></td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td></td></tr>
<tr><td>Glyphosate</td><td></td><td></td><td></td><td></td><td></td><td></td><td colspan="2">x (x)</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Hexazinone</td><td></td><td></td><td></td><td></td><td></td><td></td><td colspan="2">x (x)</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Imazapic</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td colspan="2"></td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td></td></tr>
<tr><td>Imazapyr</td><td></td><td></td><td></td><td></td><td></td><td></td><td colspan="2">x (x)</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Metsulfuron methyl</td><td></td><td></td><td></td><td></td><td></td><td></td><td colspan="2">x (x)</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Overdrive</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td></td><td colspan="2"></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Diflufenzopyr</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td colspan="2"></td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td></td></tr>
<tr><td>Picloram</td><td></td><td></td><td></td><td></td><td></td><td></td><td colspan="2">x (x)</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Sulfometuron methyl</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td colspan="2"></td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td></td></tr>
<tr><td>Tebuthiuron</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td></td><td colspan="2"></td><td></td><td></td><td></td><td></td><td></td><td></td><td>x</td></tr>
<tr><td>Triclopyr</td><td></td><td></td><td></td><td></td><td></td><td></td><td colspan="2">x (x)</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
</table>

1. 2007 PEIS: Risk Assessments developed for the 2007 *Vegetation Treatments Using Herbicides on Bureau of Land Management Lands in 17 Western States Programmatic Environmental Impact Statement*.
2. 2005 FS EIS: Risk Assessments developed for the 2005 *Pacific Northwest Region Invasive Plant Program Final Environmental Impact Statement*. These Risk Assessments are both human health and ecological. For chlorsulfuron and dicamba, the BLM has a more recent ERA and HHRA (respectively), so only the remaining part of the FS Risk Assessment was used
3. 1991 BLM EIS: Human Health Risk Assessments adopted with the 1991*Vegetation Treatments on BLM Lands Record of Decision*, and originally developed for the Forest Service's 1988 *Managing Competing and Unwanted Vegetation Final Environmental Impact Statement*. as part of a HHRA that covers 16 herbicides.
4. 2007 BLM PEIS Ecological Risk Assessment Appendices are as follows:
   A. Relevant Data B. ERA Worksheets C. Listed Species D. CBI Information E. Tank Mix Risk Quotients
5. 2007 BLM PEIS Human Health Risk Assessment Appendices are as follows:
   A. Herbicide Labels B. Spreadsheets C. AgDrift Modeling D. Gleams Modeling E. Public Uncertainty Analysis
6. The 2,4-D Risk Assessment was replaced in 2006.

Table A8-2: Additional Risk Assessment Information

2007 BLM PEIS ERA	2005 FS EIS ERA and HHRA	2007 BLM PEIS HHRA
Ecological Risk Assessment Protocol Appendix A: AgDrift Modeling Appendix B: Gleams Modeling	Preparation of Environmental Documentation and Risk Assessments Nonylphenol Polyethoxylate-based (NPE) Surfactants	Appendix B – Spreadsheets Occupational – All Public – General

Appendix 9 – Additional Information About the 18 Herbicides

Table of Contents

Herbicide Formulations Approved for BLM Lands

Table A9-1 shows herbicide trade names that could be approved (depending on the alternative selected) for use on BLM lands in Oregon in 2010. These herbicides are approved for use by the EPA, approved for use in Oregon, and approved for use on BLM lands. This list is subject to change annually; it is just informational. Label restrictions apply.

Table A9-1. Herbicide Formulations Approved for Use on BLM Lands Nationally as of November 2009 (This list is subject to change annually.)

Active Ingredient	Trade Name	Manufacturer	EPA Reg. Number
Bromacil	Bromacil 80DF	Alligare, LLC	81927-4
Bromacil	Hyvar X	DuPont	352-287
Bromacil	Hyvar XL	DuPont	352-346
Bromacil + Diuron	Bromacil/Diuron 40/40	Alligare, LLC	81927-3
Bromacil + Diuron	DiBro 2+2	Nufarm Americas Inc.	228-227
Bromacil + Diuron	DiBro 4+2	Nufarm Americas Inc.	228-386
Bromacil + Diuron	DiBro 4+4	Nufarm Americas Inc.	228-235
Bromacil + Diuron	Krovar I DF	DuPont	352-505
Bromacil + Diuron	Weed Blast 4G	SSI Maxim	34913-19
Bromacil + Diuron	Weed Blast Res. Weed Cont.	Loveland Products Inc.	34704-576
Chlorsulfuron	Chlorsulfuron E-Pro 75 WDG	Nufarm Americas Inc.	79676-72
Chlorsulfuron	NuFarm Chlorsulf Pro 75 WDG	Nufarm Americas Inc.	228-672
Chlorsulfuron	Telar DF	DuPont	352-522
Chlorsulfuron	Telar XP	DuPont	352-654
Clopyralid	CleanSlate	Nufarm Americas Inc.	228-491
Clopyralid	Clopyralid 3	Alligare, LLC	42750-94-81927
Clopyralid	Cody Herbicide	Alligare, LLC	81927-28
Clopyralid	Pyramid R&P	Albaugh, Inc.	42750-94
Clopyralid	Reclaim	Dow AgroSciences	62719-83

Active Ingredient	Trade Name	Manufacturer	EPA Reg. Number
Clopyralid	Spur	Albaugh, Inc.	42750-89
Clopyralid	Stinger	Dow AgroSciences	62719-73
Clopyralid	Transline	Dow AgroSciences	62719-259
Clopyralid + 2,4-D	Commando	Albaugh, Inc.	42750-92
Clopyralid + 2,4-D	Curtail	Dow AgroSciences	62719-48
Clopyralid + 2,4-D	Cutback	Nufarm Americas Inc.	71368-72
2,4-D	2,4-D 4# Amine Weed Killer	UAP-Platte Chem. Co.	34704-120
2,4-D	2,4-D Amine	Helena Chem. Co.	5905-72
2,4-D	2,4-D Amine	Setre (Helena)	5905-72
2,4-D	2,4-D Amine 4	Albaugh, Inc./Agri Star	42750-19
2,4-D	2,4-D LV 4	Albaugh, Inc./Agri Star	42750-15
2,4-D	2,4-D LV 6	Albaugh, Inc./Agri Star	42750-20
2,4-D	2,4-D LV 6 Ester	Nufarm Americas Inc.	228-95
2,4-D	2,4-D LV4	Setre (Helena)	5905-90
2,4-D	2,4-D LV6	Helena Chem. Co.	4275-20-5905
2,4-D	2,4-D LV6	Setre (Helena)	5905-93
2,4-D	Agrisolution 2,4-D Amine 4	Agriliance, L.L.C.	1381-103
2,4-D	Agrisolution 2,4-D Amine 4	Winfield Solutions, LLC	1381-103
2,4-D	Agrisolution 2,4-D LV4	Agriliance, L.L.C.	1381-102
2,4-D	Agrisolution 2,4-D LV4	Winfield Solutions, LLC	1381-102
2,4-D	Agrisolution 2,4-D LV6	Agriliance, L.L.C.	1381-101
2,4-D	Agrisolution 2,4-D LV6	Winflied Solutions, LLC	1381-101
2,4-D	Amine 4	Wilbur-Ellis Co.	2935-512
2,4-D	Amine 4CA 2,4-D Weed Killer	Loveland Products Inc.	34704-5
2,4-D	Aqua-Kleen	Nufarm Americas Inc.	71368-4
2,4-D	Aqua-Kleen	Nufarm Americas Inc.	228-378
2,4-D	Barrage HF	Helena	5905-529
2,4-D	Barrage LV Ester	Setre (Helena)	5905-504
2,4-D	Clean Amine	Loveland Products Inc.	34704-120
2,4-D	Clean Crop Amine 4	UAP-Platte Chem. Co.	34704-5 CA
2,4-D	Clean Crop Low Vol 6 Ester	UAP-Platte Chem. Co.	34704-125
2,4-D	Clean Crop LV-4 ES	UAP-Platte Chem. Co.	34704-124
2,4-D	Cornbelt 4 lb. Amine	Van Diest Supply Co.	11773-2
2,4-D	Cornbelt 4# LoVol Ester	Van Diest Supply Co.	11773-3
2,4-D	Cornbelt 6# LoVol Ester	Van Diest Supply Co.	11773-4
2,4-D	D-638	Albaugh, Inc./Agri Star	42750-36
2,4-D	Esteron 99C	Nufarm Americas Inc.	62719-9-71368
2,4-D	Five Star	Albaugh, Inc./Agri Star	42750-49
2,4-D	Formula 40	Nufarm Americas Inc.	228-357
2,4-D	HardBall	Helena	5905-549
2,4-D	Hi-Dep	PBI Gordon Corp.	2217-703

Active Ingredient	Trade Name	Manufacturer	EPA Reg. Number
2,4-D	Lo Vol-4	Wilbur-Ellis Co.	228-139-2935
2,4-D	Lo Vol-6 Ester	Wilbur-Ellis Co.	228-95-2935
2,4-D	Low Vol 4 Ester Weed Killer	Loveland Products Inc.	34704-124
2,4-D	Low Vol 6 Ester Weed Killer	Loveland Products Inc.	34704-125
2,4-D	LV-6 Ester Weed Killer	Loveland Products Inc.	34704-6
2,4-D	Opti-Amine	Helena Chem. Co.	5905-501
2,4-D	Platoon	Nufarm Americas Inc.	228-145
2,4-D	Saber	Loveland Products Inc.	34704-803
2,4-D	Saber CA	Loveland Products Inc.	34704-803
2,4-D	Salvo	Loveland Products Inc.	34704-609
2,4-D	Salvo LV Ester	UAP-Platte Chem. Co.	34704-609
2,4-D	Savage DF	Loveland Products Inc.	34704-606
2,4-D	Savage DF	UAP-Platte Chem. Co.	34704-606
2,4-D	Solve 2,4-D	Albaugh, Inc./Agri Star	42750-22
2,4-D	Unison	Helena	5905-542
2,4-D	Weedar 64	Nufarm Americas Inc.	71368-1
2,4-D	Weedone LV-4	Nufarm Americas Inc.	228-139-71368
2,4-D	Weedone LV-4 Solventless	Nufarm Americas Inc.	71368-14
2,4-D	Weedone LV-6	Nufarm Americas Inc.	71368-11
2,4-D	WEEDstroy AM-40	Nufarm Americas Inc.	228-145
Dicamba	Banvel	Arysta LifeScience N.A. Corp.	66330-276
Dicamba	Banvel	Micro Flo Company	51036-289
Dicamba	Clarity	BASF Ag. Products	7969-137
Dicamba	Cruise Control	Alligare, LLC	42750-40-81927
Dicamba	Diablo	Nufarm Americas Inc.	228-379
Dicamba	Dicamba DMA	Albaugh, Inc./Agri Star	42750-40
Dicamba	Rifle	Loveland Products Inc.	34704-861
Dicamba	Sterling Blue	Winfield Solutions, LLC	7969-137-1381
Dicamba	Vanquish	Syngenta	100-884
Dicamba	Vanquish Herbicide	Nufarm Americas Inc.	228-397
Dicamba	Vision	Albaugh, Inc.	42750-98
Dicamba + 2,4-D	Brash	Winfield Solutions, LLC	1381-202
Dicamba + 2,4-D	KambaMaster	Nufarm Americas Inc.	71368-34
Dicamba + 2,4-D	Outlaw	Albaugh, Inc./Agri Star	42750-68
Dicamba + 2,4-D	Range Star	Albaugh, Inc./Agri Star	42750-55
Dicamba + 2,4-D	Rifle-D	Loveland Products Inc.	34704-869
Dicamba + 2,4-D	Veteran 720	Nufarm Americas Inc.	228-295
Dicamba + 2,4-D	Weedmaster	BASF Ag. Products	7969-133
Dicamba + Diflufenzopyr	Distinct	BASF Ag. Products	7969-150
Dicamba + Diflufenzopyr	Overdrive	BASF Ag. Products	7969-150
Diquat	Diquat E-Pro 2L	Nufarm Americas Inc.	79676-75

Active Ingredient	Trade Name	Manufacturer	EPA Reg. Number
Diquat	Nufarm Diquat 2L Herbicide	Nufarm Americas Inc.	228-675
Diquat	NuFarm Diquat Pro 2L Herbicide	Nufarm Americas Inc.	228-675
Diquat	Reward	Syngenta Crop Prot., Inc.	100-1091
Diuron	Direx 4L	DuPont	352-678
Diuron	Direx 4L	Griffin Company	1812-257
Diuron	Direx 80DF	Griffin Company	1812-362
Diuron	Diuron 4L	Loveland Products Inc.	34704-854
Diuron	Diuron 4L	Makteshim Agan of N.A.	66222-54
Diuron	Diuron 80 WDG	Loveland Products Inc.	34704-648
Diuron	Diuron 80DF	Agriliance, L.L.C.	9779-318
Diuron	Diuron 80DF	Alligare, LLC	81927-12
Diuron	Diuron 80DF	Winfield Solutions, LLC	9779-318
Diuron	Diuron 80WDG	UAP-Platte Chem. Co.	34704-648
Diuron	Diuron-DF	Wilbur-Ellis	00352-00-508-02935
Diuron	Karmex DF	DuPont	352-692
Diuron	Karmex IWC	DuPont	352-692
Diuron	Karmex XP	DuPont	352-692
Diuron	Vegetation Man. Diuron 80 DF	Vegetation Man., LLC	66222-51-74477
Fluridone	Avast!	SePRO	67690-30
Fluridone	Sonar AS	SePRO	67690-4
Fluridone	Sonar Precision Release	SePRO	67690-12
Fluridone	Sonar Q	SePRO	67690-3
Fluridone	Sonar SRP	SePRO	67690-3
Glyphosate	Accord Concentrate	Dow AgroSciences	62719-324
Glyphosate	Accord SP	Dow AgroSciences	62719-322
Glyphosate	Accord XRT	Dow AgroSciences	62719-517
Glyphosate	Accord XRT II	Dow AgroSciences	62719-556
Glyphosate	Aqua Neat	Nufarm Americas Inc.	228-365
Glyphosate	Aqua Star	Albaugh, Inc./Agri Star	42750-59
Glyphosate	Aquamaster	Monsanto	524-343
Glyphosate	AquaPro Aquatic Herbicide	SePRO Corporation	62719-324-67690
Glyphosate	Buccaneer	Tenkoz	55467-10
Glyphosate	Buccaneer Plus	Tenkoz	55467-9
Glyphosate	ClearOut 41	Chem. Prod. Tech., LLC	70829-2
Glyphosate	ClearOut 41 Plus	Chem. Prod. Tech., LLC	70829-3
Glyphosate	Cornerstone	Winfield Solutions, LLC	1381-191
Glyphosate	Cornerstone Plus	Winfield Solutions, LLC	1381-192
Glyphosate	Credit Xtreme	Nufarm Americas Inc.	71368-81
Glyphosate	Forest Star	Albaugh, Inc./Agri Star	42570-61
Glyphosate	Foresters	Nufarm Americas Inc.	228-381
Glyphosate	Gly Star Original	Albaugh, Inc./Agri Star	42750-60

Active Ingredient	Trade Name	Manufacturer	EPA Reg. Number
Glyphosate	Gly Star Plus	Albaugh, Inc./Agri Star	42750-61
Glyphosate	Gly Star Pro	Albaugh, Inc./Agri Star	42750-61
Glyphosate	Glyfos	Cheminova	4787-31
Glyphosate	Glyfos Aquatic	Cheminova	4787-34
Glyphosate	Glyfos PRO	Cheminova	67760-57
Glyphosate	GlyphoMate 41	PBI Gordon Corp.	2217-847
Glyphosate	Glyphosate 4	Vegetation Man., LLC	73220-6-74477
Glyphosate	Glyphosate 4 PLUS	Alligare, LLC	81927-9
Glyphosate	Glyphosate 5.4	Alligare, LLC	81927-8
Glyphosate	Glypro	Dow AgroSciences	62719-324
Glyphosate	Glypro Plus	Dow AgroSciences	62719-322
Glyphosate	Honcho	Monsanto	524-445
Glyphosate	Honcho Plus	Monsanto	524-454
Glyphosate	Mirage	Loveland Products Inc.	34704-889
Glyphosate	Mirage Herbicide	UAP-Platte Chem. Co.	524-445-34704
Glyphosate	Mirage Plus	Loveland Products Inc.	34704-890
Glyphosate	Mirage Plus Herbicide	UAP-Platte Chem. Co.	524-454-34704
Glyphosate	Rascal	Winfield Solutions, LLC	1381-191
Glyphosate	Rascal Plus	Winfield Solutions, LLC	1381-192
Glyphosate	Rattler	Setre (Helena)	524-445-5905
Glyphosate	Razor	Nufarm Americas Inc.	228-366
Glyphosate	Razor Pro	Nufarm Americas Inc.	228-366
Glyphosate	Rodeo	Dow AgroSciences	62719-324
Glyphosate	Roundup Original	Monsanto	524-445
Glyphosate	Roundup Original II	Monsanto	524-454
Glyphosate	Roundup Original II CA	Monsanto	524-475
Glyphosate	Roundup PRO	Monsanto	524-475
Glyphosate	Roundup PRO Concentrate	Monsanto	524-529
Glyphosate	Roundup PRO Dry	Monsanto	524-505
Glyphosate	Roundup PROMAX	Monsanto	524-579
Glyphosate + 2,4-D	Campaign	Monsanto	524-351
Glyphosate + 2,4-D	Landmaster BW	Albaugh, Inc./Agri Star	42570-62
Glyphosate + 2,4-D	Landmaster BW	Monsanto	524-351
Glyphosate + Dicamba	Fallowmaster	Monsanto	524-507
Glyphosate + Dicamba	GlyKamba	Nufarm Americas Inc.	71368-30
Hexazinone	Pronone 10G	Pro-Serve	33560-21
Hexazinone	Pronone 25G	Pro-Serve	33560-45
Hexazinone	Pronone MG	Pro-Serve	33560-21
Hexazinone	Velpar DF	DuPont	352-581
Hexazinone	Velpar L	DuPont	352-392
Hexazinone	Velpar ULW	DuPont	352-450

Active Ingredient	Trade Name	Manufacturer	EPA Reg. Number
Hexazinone + Sulfometuron methyl	Oustar	DuPont Crop Protection	352-603
Hexazinone + Sulfometuron methyl	Westar	DuPont Crop Protection	352-626
Imazapic	Imazapic E 2 SL	Etigra, LLC	79676-65
Imazapic	Panoramic 2SL	Alligare, LLC	66222-141-81927
Imazapic	Plateau	BASF	241-365
Imazapic + Glyphosate	Journey	BASF	241-417
Imazapyr	Arsenal	BASF	241-346
Imazapyr	Arsenal Applicators Conc.	BASF	241-299
Imazapyr	Arsenal PowerLine	BASF	241-431
Imazapyr	Arsenal Railroad Herbicide	BASF	241-273
Imazapyr	Chopper	BASF	241-296
Imazapyr	Ecomazapyr 2 SL	Vegetation Man., LLC	74477-6
Imazapyr	Ecomazapyr 2SL	Alligare, LLC	81927-22
Imazapyr	Habitat	BASF	241-426
Imazapyr	Imazapyr 2 SL	Vegetation Man., LLC	74477-4
Imazapyr	Imazapyr 2SL	Alligare, LLC	81927-23
Imazapyr	Imazapyr 4 SL	Vegetation Man., LLC	74477-5
Imazapyr	Imazapyr 4SL	Alligare, LLC	81927-24
Imazapyr	Imazapyr E-Pro 2 - VM & Aquatic Herbicide	Etigra, LLC	81959-8
Imazapyr	Imazapyr E-Pro 2E - Site Prep & Basal	Etigra, LLC	81959-7
Imazapyr	Imazapyr E-Pro 4 - Forestry	Etigra, LLC	81959-9
Imazapyr	Polaris	Nufarm Americas Inc.	228-534
Imazapyr	Polaris AC	Nufarm Americas Inc.	241-299-228
Imazapyr	Polaris AC	Nufarm Americas Inc.	228-480
Imazapyr	Polaris AQ	Nufarm Americas Inc.	241-426-228
Imazapyr	Polaris Herbicide	Nufarm Americas Inc.	241-346-228
Imazapyr	Polaris RR	Nufarm Americas Inc.	241-273-228
Imazapyr	Polaris SP	Nufarm Americas Inc.	228-534
Imazapyr	Polaris SP	Nufarm Americas Inc.	241-296-228
Imazapyr	SSI Maxim Arsenal 0.5G	SSI Maxim Co., Inc.	34913-23
Imazapyr	Stalker	BASF	241-398
Imazapyr + Diuron	Imazuron E-Pro	Etigra, LLC	79676-54
Imazapyr + Diuron	Mojave 70 EG	Alligare, LLC	74477-9-81927
Imazapyr + Diuron	Sahara DG	BASF	241-372
Imazapyr + Diuron	SSI Maxim Topsite 2.5G	SSI Maxim Co., Inc.	34913-22
Imazapyr + Metsulfuron methyl	Lineage Clearstand	DuPont	352-766
Imazapyr + Sulfometuron methyl + Metsulfuron methyl	Lineage HWC	DuPont	352-765
Imazapyr + Sulfometuron methyl + Metsulfuron methyl	Lineage Prep	DuPont	352-767

Active Ingredient	Trade Name	Manufacturer	EPA Reg. Number
Metsulfuron methyl	Escort DF	DuPont	352-439
Metsulfuron methyl	Escort XP	DuPont	352-439
Metsulfuron methyl	Metsulfuron Methyl DF	Vegetation Man., L.L.C.	74477-2
Metsulfuron methyl	MSM 60	Alligare, LLC	81927-7
Metsulfuron methyl	MSM E-AG 60 EG Herbicide	Etigra, LLC	81959-14
Metsulfuron methyl	MSM E-Pro 60 EG Herbicide	Etigra, LLC	81959-14
Metsulfuron methyl	Patriot	Nufarm Americas Inc.	228-391
Metsulfuron methyl	PureStand	Nufarm Americas Inc.	71368-38
Metsulfuron methyl + Chlorsulfuron	Cimarron Extra	DuPont	352-669
Metsulfuron methyl + Chlorsulfuron	Cimarron Plus	DuPont	352-670
Metsulfuron methyl + Dicamba + 2,4-D	Cimarron MAX	DuPont	352-615
Picloram	Grazon PC	Dow AgroSciences	62719-181
Picloram	OutPost 22K	Dow AgroSciences	62719-6
Picloram	Picloram 22K	Alligare, LLC	42750-79-81927
Picloram	Picloram 22K	Alligare, LLC	81927-18
Picloram	Picloram K	Alligare, LLC	42750-81-81927
Picloram	Picloram K	Alligare, LLC	81927-17
Picloram	Tordon 22K	Dow AgroSciences	62719-6
Picloram	Tordon K	Dow AgroSciences	62719-17
Picloram	Triumph 22K	Albaugh, Inc.	42750-79
Picloram	Triumph K	Albaugh, Inc.	42750-81
Picloram	Trooper 22K	Nufarm Americas Inc.	228-535
Picloram + 2,4-D	Grazon P+D	Dow AgroSciences	62719-182
Picloram + 2,4-D	GunSlinger	Albaugh, Inc.	42750-80
Picloram + 2,4-D	HiredHand P+D	Dow AgroSciences	62719-182
Picloram + 2,4-D	Pathway	Dow AgroSciences	62719-31
Picloram + 2,4-D	Picloram + D	Alligare, LLC	42750-80-81927
Picloram + 2,4-D	Picloram + D	Alligare, LLC	81927-16
Picloram + 2,4-D	Tordon 101 R Forestry	Dow AgroSciences	62719-31
Picloram + 2,4-D	Tordon 101M	Dow AgroSciences	62719-5
Picloram + 2,4-D	Tordon RTU	Dow AgroSciences	62719-31
Picloram + 2,4-D	Trooper 101	Nufarm Americas Inc.	228-561
Picloram + 2,4-D	Trooper P + D	Nufarm Americas Inc.	228-530
Picloram + 2,4-D + Dicamba	Trooper Extra	Nufarm Americas Inc.	228-586
Sulfometuron methyl	Oust DF	DuPont	352-401
Sulfometuron methyl	Oust XP	DuPont	352-601
Sulfometuron methyl	SFM 75	Alligare, LLC	81927-26
Sulfometuron methyl	SFM 75	Vegetation Man., L.L.C.	72167-11-74477
Sulfometuron methyl	SFM E-Pro 75EG	Etigra, LLC	79676-16

Active Ingredient	Trade Name	Manufacturer	EPA Reg. Number
Sulfometuron methyl	Spyder	Nufarm Americas Inc.	228-408
Sulfometuron methyl + Chlorsulfuron	Landmark XP	DuPont	352-645
Sulfometuron methyl + Metsulfuron methyl	Oust Extra	DuPont	352-622
Tebuthiuron	Spike 20P	Dow AgroSciences	62719-121
Tebuthiuron	Spike 80DF	Dow AgroSciences	62719-107
Tebuthiuron	SpraKil S-5 Granules	SSI Maxim Co., Inc.	34913-10
Tebuthiuron + Diuron	SpraKil SK-13 Granular	SSI Maxim Co., Inc.	34913-15
Tebuthiuron + Diuron	SpraKil SK-26 Granular	SSI Maxim Co., Inc.	34913-16
Triclopyr	Ecotriclopyr 3 SL	Vegetation Man., LLC	72167-49-74477
Triclopyr	Element 3A	Dow AgroSciences	62719-37
Triclopyr	Element 4	Dow AgroSciences	62719-40
Triclopyr	Forestry Garlon XRT	Dow AgroSciences	62719-553
Triclopyr	Garlon 3A	Dow AgroSciences	62719-37
Triclopyr	Garlon 4	Dow AgroSciences	62719-40
Triclopyr	Garlon 4 Ultra	Dow AgroSciences	62719-527
Triclopyr	Pathfinder II	Dow AgroSciences	62719-176
Triclopyr	Relegate	Nufarm Americas Inc.	228-521
Triclopyr	Remedy	Dow AgroSciences	62719-70
Triclopyr	Remedy Ultra	Dow AgroSciences	62719-552
Triclopyr	Renovate 3	SePRO Corporation	62719-37-67690
Triclopyr	Renovate OTF	SePRO Corporation	67690-42
Triclopyr	Tahoe 3A	Nufarm Americas Inc.	228-384
Triclopyr	Tahoe 3A	Nufarm Americas Inc.	228-518
Triclopyr	Tahoe 3A	Nufarm Americas Inc.	228-520
Triclopyr	Tahoe 4E	Nufarm Americas Inc.	228-385
Triclopyr	Tahoe 4E Herbicide	Nufarm Americas Inc.	228-517
Triclopyr	Triclopry 4	Alligare, LLC	81927-11
Triclopyr	Triclopyr 3	Alligare, LLC	81927-13
Triclopyr	Triclopyr 3 SL	Vegetation Man., LLC	72167-53-74477
Triclopyr	Triclopyr 4EC	Alligare, LLC	72167-53-74477
Triclopyr + 2,4-D	Candor	Nufarm Americas Inc.	228-565
Triclopyr + 2,4-D	Crossbow	Dow AgroSciences	62719-260
Triclopyr + 2,4-D	Everett	Alligare, LLC	81927-29
Triclopyr + Clopyralid	Brazen	Nufarm Americas Inc.	228-564
Triclopyr + Clopyralid	Prescott Herbicide	Alligare, LLC	81927-30
Triclopyr + Clopyralid	Redeem R&P	Dow AgroSciences	62719-337

Target Species and Recommended Herbicide Controls

Table A9-2 shows which herbicides are recommended for what species. The information pertains primarily to established or larger infestations; small infestations of noxious or invasive weeds of many species may be effectively controlled with non-herbicide methods such as hand pulling or digging. Recommended herbicides are necessary for effective/cost effective control of difficult-to-control species. Public comments about additional invasive species and treatment recommendations were used to update the information in this table between the Draft EIS and the Final EIS.

Table A9-2. Target Species and Recommended Herbicide Controls

Non-herbicide methods effective[8]	Alternative where recommended herbicide available[1]	Common Name	2,4-D	Bromacil	Chlorsulfuron	Clopyralid	Dicamba	Diflufenzopyr+	Diquat	Diuron	Fluridone	Glyphosate	Hexazinone	Imazapic	Imazapyr	Metsulfuron	Picloram	Sulfometuron	Tebuthiuron	Triclopyr
Noxious Weeds																				
No	2	African rue										√	√		√	√				
No	2	Biddy-biddy					√													√
No	2	Blackberry, Himalayan	√[3]									√			√	√	√			√
No	3	Brazilian or S American waterweed							√		√									
Yes[5]	2	Broom, French	√[3]			√						√			√		√[3]			√
Yes[5]	2	Broom, Portugese	√[3]			√						√			√		√[3]			√
Yes[5]	2	Broom, Scotch	√[3]			√						√			√		√[3]			√
No	2	Broom, Spanish	√[3]			√						√			√		√[3]			√
Yes	2	Buffalobur				√						√					√			
No	2	Butterfly bush										√			√					
No	2	Camel thorn				√									√		√			√
Yes	2	Cocklebur, spiny	√	√		√	√					√								
No	3	Coltsfoot				√														
No	2	Common bugloss	√		√									√		√	√			
Yes[6]	2	Common cruprina	√[3]			√	√[3]										√			√
No	2	Common reed										√								
No	2	Cordgrass, common										√			√					
No	2	Cordgrass, dense flower										√			√					
No	2	Cordgrass, saltmeadow										√			√					
No	2	Cordgrass, smooth										√			√					
No	3	Creeping yellow cress													√					
No	None	Dodder																		
Yes	2	Dyers woad	√		√		√									√				
Yes[5]	2	English Ivy										√								√
Yes[6]	2	European Water chestnut	√																	
No	2	Field bindweed	√				√									√				
No	2	False brome										√								

Non-herbicide methods effective[8]	Alternative where recommended herbicide available[1]	Common Name	2,4-D	Bromacil	Chlorsulfuron	Clopyralid	Dicamba	Diflufenzopyr+	Diquat	Diuron	Fluridone	Glyphosate	Hexazinone	Imazapic	Imazapyr	Metsulfuron	Picloram	Sulfometuron	Tebuthiuron	Triclopyr
Yes[5]	3	Flowering rush													√					
Yes[6]	2	Garlic mustard										√								
Yes	2	Geranium, Herb Robert								√		√								
Yes[5]	2	Geranium, Shiny leaf								√		√								√
No	2	Giant Hogweed										√		√						
Yes[7]	2	Goatgrass, Barbed										√		√				√		
Yes[7]	2	Goatgrass, Jointed										√[2]		√				√		
Yes[7]	2	Goatgrass, Ovate										√		√				√		
Yes[7]	2	Goatsrue	√			√	√													
No	2	Gorse	√[3]				√					√				√	√[3]			√
Yes	2	Halogeton	√											√		√			√	
No	2	Hawkweed, King-devil	√[3]			√	√[3]										√			√[3]
No	2	Hawkweed, Meadow	√[3]			√	√[3]										√			√
No	2	Hawkweed, Mouse-eared	√[3]			√	√[3]										√			√[3]
No	2	Hawkweed, Orange	√[3]			√	√[3]										√			√
No	2	Hawkweed, Yellow	√[3]			√	√[3]										√			√
No	5	Horsetail, Giant			√															
Yes[5]	2	Houndstongue	√		√											√	√[2]			
No	3	Hydrilla							√		√									
No	None	Japanese dodder																		
No	2	Johnsongrass		√								√[2]		√	√			√		
Yes[5]	2	Jubata grass (Purple Pampas grass)										√			√					
Yes	2	Knapweed, Diffuse	√[2]														√[2]			√
Yes[9]	2	Knapweed, Meadow	√			√		√[3]				√		√			√[2]			√
No	2	Knapweed, Russian				√											√			√
No	2	Knapweed, spotted	√			√											√[2]			
No	2	Knapweed, Squarrose				√		√[3]				√		√			√			√
No	2	Knotweed, Giant				√	√					√			√					√
No	2	Knotweed, Himalayan				√	√					√			√					√
No	2	Knotweed, Japanese				√	√					√			√					√
No	2	Kochia	√[2]				√							√		√				
No	2	Kudzu				√						√								
No	2	Lesser celadine or fig buttercup										√								
No	2	Matgrass										√			√					
Yes[5]	2	Mediterranean sage	√			√											√			
No	3	Medusahead rye												√			√			
No	2	Oblong spurge	√		√		√					√		√			√			
No	2	Old man's beard										√								√
No	2	Parrot's feather	√						√											

Non-herbicide methods effective[8]	Alternative where recommended herbicide available[1]	Common Name	2,4-D	Bromacil	Chlorsulfuron	Clopyralid	Dicamba	Diflufenzopyr+	Diquat	Diuron	Fluridone	Glyphosate	Hexazinone	Imazapic	Imazapyr	Metsulfuron	Picloram	Sulfometuron	Tebuthiuron	Triclopyr
No	2	Paterson's curse	√		√									√		√	√			
No	3	Perennial peavine				√														
No	3	Perennial pepperweed	√[3]		√									√		√				
No	2	Poison hemlock	√				√					√				√	√			
Yes	2	Policemans helmet	√									√								√
Yes[5]	2	Puncturevine	√		√												√			
No	2	Purple loosestrife										√			√	√				√
No	2	Purple Nutsedge										√		√						
No	2	Quackgrass		√[3]						√[3]		√			√					
Yes	2	Ragweed	√[3]			√						√			√					
No	2	Rush skeletonweed	√			√	√										√[2]			
No	3	Saltcedar													√					√
No	2	Silverleaf Nightshade				√						√			√		√			
No	2	Skeletonleaf bursage	√[3]			√[3]						√								
No	None	Small broomrape																		
Yes	2	Spanish heath	√[3]														√[3]			√
No	3	Spikeweed				√														
Yes	3	Spurge laurel													√					
No	2	Spurge, Leafy			√									√			√			
No	2	Spurge, Myrtle	√		√		√							√			√			
No	2	St. Johnswort	√													√	√			
Yes[5]	2	Starthistle, Iberian	√[3]			√[3]	√										√			√
Yes[5]	2	Starthistle, Purple	√[3]			√[3]	√										√[3]			√
Yes	2	Starthistle, Yellow				√											√[2]			√
No	2	Sulfur cinquefoil	√				√[2]					√				√	√[2]			
No	2	Swainsonpea	√			√														
No	2	Syrian bean-caper	√	√[3]	√					√[3]				√						
Yes	2	Tansy ragwort	√				√									√	√			√
Yes	2	Teasel, cutleaf			√	√	√[3]	√[3]						√		√				√
No	3	Texas blueweed				√														
Yes[5]	2	Thistle, Bull	√[2]		√	√	√[2,3]	√[3]								√				√
No	2	Thistle, Canada			√	√											√[2]			√
Yes	2	Thistle, Italian	√			√	√										√			
Yes	2	Thistle, Milk	√		√	√	√[3]	√[3]				√				√				√
Yes	2	Thistle, Musk	√[2]			√		√[3]				√[2]					√			√
Yes	2	Thistle, Plumeless	√		√	√	√[3]	√[3]				√[2]				√	√			√
Yes	2	Thistle, Scotch	√[3]		√	√	√[3]									√	√			√
Yes	2	Thistle, Slender flowered	√			√	√										√			
Yes	2	Thistle, Smooth distaff				√											√			
Yes[5]	2	Thistle, Taurian or bull cottonthistle	√			√	√													

Non-herbicide methods effective[8]	Alternative where recommended herbicide available[1]	Common Name	2,4-D	Bromacil	Chlorsulfuron	Clopyralid	Dicamba	Diflufenzopyr+	Diquat	Diuron	Fluridone	Glyphosate	Hexazinone	Imazapic	Imazapyr	Metsulfuron	Picloram	Sulfometuron	Tebuthiuron	Triclopyr
Yes[5]	2	Thistle, Wooly distaff				√											√			
No	2	Toadflax, Dalmation	√		√		√										√			
No	2	Toadflax, Yellow			√												√			
Yes	2	Velvetleaf	√									√[2]					√			
No	3	Watermilfoil, Eurasian							√		√									
No	2	White Bryonia	√[3]				√					√					√			√[3]
No	2	Whitetop, (Hoary cress)	√		√		√					√		√	√	√				
No	2	whitetop, Lens-podded	√		√									√	√	√				
No	2	Whitetop,Hairy	√		√									√	√	√				
No	2	Yellow Flag Iris	√									√		√	√	√				
Yes	2	Yellow floating heart							√			√								
No	3	Yellow nutsedge												√						
No	2	Yellowtuft (2 sp)	√		√		√					√		√	√	√				
Invasive Plants																				
No	3	Annual fescues										√		√	√					
No	3	Babysbreath	√				√													
No	4	Bare ground		√						√									√	
No	3	Bear's breeches										√								
Yes	3	Bird cherry										√			√					
No	3	Birdfoot trefoil				√														
No	3	Black henbane				√	√					√				√	√			
No	3	Black locust				√						√			√					√
No	3	Blackberry, Evergreen	√[3]									√				√	√			√
No	3	Blackgrass										√			√					
No	3	Blackthorn													√					
No	5	Bouncing bet					√									√[3]		√[3]		
No	3	Bristly dog's-tail										√			√					
Yes	3	Bur buttercup	√				√					√			√			√		
Yes	3	Burdock, common	√[2]			√[3]	√[2]					√					√[2]			√[3]
Yes	3	Burnweed				√														
No	3	Cereal rye										√		√	√					
No	3	Cheatgrass												√	√					
No	3	Chicory	√			√	√[2]					√					√[2]			
No	3	Climbing nightshade				√														
No	3	Clover spp				√														
Yes	3	Cocklebur, rough				√						√								
No	3	Common knotweed				√						√			√					
Yes	3	Common or Wooly mullein			√		√					√		√			√[2]			
No	3	Common Pear										√			√					√
No	3	Common velvet-grass										√			√					

Non-herbicide methods effective[8]	Alternative where recommended herbicide available[1]	Common Name	2,4-D	Bromacil	Chlorsulfuron	Clopyralid	Dicamba	Diflufenzopyr+	Diquat	Diuron	Fluridone	Glyphosate	Hexazinone	Imazapic	Imazapyr	Metsulfuron	Picloram	Sulfometuron	Tebuthiuron	Triclopyr
No	3	Creeping buttercup	√																	
No	3	Crested dog's-tail grass										√			√					
No	3	Dandelion				√														
No	3	Dense silkybent										√			√					
No	3	Elecampane inula				√														
No	3	Elodea							√		√									
No	3	English holly													√					√
NA	3	escaped ornamental grasses										√			√					
No	3	European beach grass										√			√					
Yes	3	European centaury	√				√													
No	3	False indigo	√				√										√			
No	3	Feverfew			√	√	√									√	√			
Yes	3	Field mustard	√		√													√		
No	3	Field sowthistle	√			√											√			
Yes	3	Garden cornflower or bachelor buttons	√			√		√[3]				√		√			√			√
No	3	Garden vetch	√			√						√								√
Yes	3	Goatgrass, Bulbed										√		√				√		
Yes	3	Goatgrass, Tausch's										√		√	√					
No	3	Harding grass										√			√					
No	3	Hawkweed, common	√			√	√										√			√
No	3	Hawkweed, Yellow	√			√	√										√			√
No	3	Hawthorn, Oneseed													√					
No	3	Hawthorn, Smooth													√					
Yes	3	Herb Robert										√								
No	3	Horehound	√	√[3]						√[3]										√
No	3	Italian ryegrass										√		√		√				
No	3	Knotweed, Bohemian				√	√					√			√					
Yes[5]	None	Lepyrodiclis																		
Yes	3	Lesser hawkbit				√														
No	3	Marestail				√														
No	3	Mutiflora rose	√[3]									√					√[3]			√
Yes	3	narrowleaf plantain	√				√					√								
No	3	North Africa grass										√		√	√					
No	3	Orchardgrass										√			√					
No	3	Oxeye daisy				√	√								√		√[2]			
Yes	3	Pampas grass, Uruguayan										√			√					
No	3	Paterson's curse	√		√									√		√	√			
No	3	Pennyroyal										√								
No	3	Perennial ryegrass										√			√					

Non-herbicide methods effective[8]	Alternative where recommended herbicide available[1]	Common Name	2,4-D	Bromacil	Chlorsulfuron	Clopyralid	Dicamba	Diflufenzopyr+	Diquat	Diuron	Fluridone	Glyphosate	Hexazinone	Imazapic	Imazapyr	Metsulfuron	Picloram	Sulfometuron	Tebuthiuron	Triclopyr
No	3	Periwinkle										√								√
No	3	Poverty brome										√			√					
Yes	3	Prickly lettuce				√														
No	3	Prickly sowthistle	√			√											√			
Yes	3	Purple foxglove	√		√		√							√			√			
No	3	Red brome										√			√					
No	3	Reed canarygrass										√						√		
No	3	Ripgut brome										√			√					
No	3	Russian olive										√			√					
No	3	Shining geranium										√			√					√
No	3	slender oat										√			√					
No	3	smalleaf periwinkle										√								√
No	3	soft brome										√			√					
No	3	Spotted Cat's ear				√														
No	3	spotted henbit										√				√				
No	3	Spreading hedge-parsley			√							√		√						√
Yes	3	Starthistle, Malta				√	√[3]	√[3]									√			√
No	3	sweet fennel	√														√			
Yes	3	sweetclover, white				√														
Yes	3	sweetclover, yellow				√														
No	3	tall fescue										√		√						
No	3	Tansy, Common			√	√	√					√[2]				√	√[2]			
Yes	3	Teasel, common	√		√	√	√[3]	√[3]						√		√				√
Yes	3	Thistle, Russian	√											√		√				
No	3	Thistle, wavyleaf	√		√	√	√[3]	√[3]				√				√				√
Yes	3	Thistle, Whitestem distaff				√											√			
No	3	Tree-of-heaven	√[3]				√[3]					√			√	√	√			√
Yes	3	Tumbleweed or Prickly Russian thistle	√				√					√		√		√	√			
No	3	Wild carrot			√											√				
Yes	3	Wild oat										√			√					
No	2	Wild proso millet										√		√	√					
Yes	3	Wild safflower				√											√			
No	2	Yellow archangel																		√
No	3	Yellow glandweed	√		√		√							√			√			
Native and Other Non-Invasive Vegetation[8]																				
No	4	Alder													√		√			√
No	4	Big leaf maple													√					√
Yes	4	Big sagebrush	√			√									√				√	
Yes	4	Conifers													√	√	√			
No	4	Evergreen huckleberry																		

Non-herbicide methods effective[8]	Alternative where recommended herbicide available[1]	Common Name	2,4-D	Bromacil	Chlorsulfuron	Clopyralid	Dicamba	Diflufenzopyr+	Diquat	Diuron	Fluridone	Glyphosate	Hexazinone	Imazapic	Imazapyr	Metsulfuron	Picloram	Sulfometuron	Tebuthiuron	Triclopyr
No	4	Grasses										√	√		√			√		
No	4	Hazel										√[2]			√					√[2]
No	4	Madrone	√									√			√		√			
No	4	Ocean spray													√					
No	4	Pacific Rhododendron																		
No	4	Poison ivy	√[3]									√			√					√[3]
No	4	Poison Oak	√[3]									√			√		√			√[3]
Yes	4	Rabbitbrush	√												√		√			
No	4	salmonberry										√			√	√		√		
No	3[4]	Tanoak										√			√	√	√			√
No	4	Thimble berry										√			√	√				
No	4	Vine maple										√			√		√			√
Yes	4	Western juniper													√					
No	4	Western water hemlock	√																	
No	4	Willow	√			√									√	√	√			√

[1] Based on the experience of District Weed Specialists and various references, primarily the Pacific Northwest Weed Management Handbook (OSU 2009), the Weed Control Methods Handbook (Tu et al. 2001), Weeds of California and other Western States (DiTomaso and Healy. 2007), Biology and Management of Noxious Rangeland Weeds (Sheley and Petroff 1999), The Nature Conservancy Element Stewardship Abstracts (TNC 2009). Other herbicides may be effective. Some of the herbicides may be effective only under certain conditions.

[2] Excellent control, recommended from multiple sources.

[3] Used in combination with another herbicide (tank mix)

[4] To control Sudden Oak Death, allowed under Alternative 3.

[5] Effective on small or new infestations (manual/mechanical methods kill plants) but not feasible on larger or more established infestations.

[6] Infestations require repeat visits for effective control –Manual/mechanical kill most plants, sprouts and germinating seeds require additional treatment. For larger infestations, herbicide use is recommended.

[7] Some cropping systems and fallow are effective. These techniques are not likely to be compatible with wildland management.

[8] Native and other non-invasive vegetation is included on this table because a) it is important to know what native and other non-invasive species might be collaterally damaged by particular herbicides, and b) Alternatives 4 and 5 permit the use of herbicides for the control of native and other non-invasive species under certain circumstances.

[9] The Institute of Applied Ecology found that hand pulling was the only non-herbicide control effective on meadow knapweed, although it was expensive.

References:

DiTomaso, J.M. and E.A. Healy. 2007. Weeds of California and other Western States. UC DANR Publ. #3488. 1808 pp.

Oregon State University. 2009. Pacific Northwest Weed Management Handbook. Editor: Ed Peachey. Available at http://weeds.ippc.orst.edu/pnw/weeds?01W_INTR06.dat

Sheley, Roger L, and Janet K. Petroff. 1999. Biology and Management of Noxious Rangeland Weeds. Oregon State University Press. Corvallis, Oregon.

The Nature Conservancy. 2009. The Nature Conservancy Element Stewardship Abstracts. Available at http://www.imapinvasives.org/GIST/ESA/index.html

Tu, M., C. Hurd, and J. M. Randall. 2001. Weed Control Methods Handbook: Tools & Techniques for Natural Areas. The Nature Conservancy, http://www.invasive.org/gist/handbook.html. June 2001.

Adjuvants Approved for Use on BLM Lands Nationally

Table A9-3. Adjuvants Approved for Use on BLM Lands Nationally as of November 2009 (This list is subject to change annually.)

Adjuvant Type	Trade Name	Manufacturer
Surfactants		
Non-ionic	Actamaster Soluble Spray Adj.	Loveland Products Inc.
Non-ionic	Actamaster Spray Adjuvant	Loveland Products Inc.
Non-ionic	Activator 90	Loveland Products Inc.
Non-ionic	Agripharm 90	Walco International
Non-ionic	Agrisolutions Preference	Agriliance, LLC.
Non-ionic	Agrisolutions Preference	Winfield Solutions, LLC
Non-ionic	Aqufact	Aqumix, Inc.
Non-ionic	Baron	Crown (Estes Incorporated)
Non-ionic	Brewer 90-10	Brewer International
Non-ionic	Cornbelt Premier 90	Van Diest Supply Co.
Non-ionic	Induce	Setre (Helena)
Non-ionic	LI-700	Loveland Products Inc.
Non-ionic	N.I.S. 80	Estes Incorporated
Non-ionic	Optima	Helena
Non-ionic	R-900	Wilbur-Ellis
Non-ionic	Red River 90	Red River Specialties, Inc.
Non-ionic	Spec 90/10	Helena
Non-ionic	Spray Activator 85	Van Diest Supply Co.
Non-ionic	Spreader 90	Loveland Products Inc.
Non-ionic	Super Spread 7000	Wilbur-Ellis
Non-ionic	Super Spread 90	Wilbur-Ellis
Non-ionic	UAP Surfactant 80/20	Loveland Products Inc.
Non-ionic	X-77	Loveland Products Inc.
Spreader/Sticker	Agri-Trend Spreader	Agri-Trend
Spreader/Sticker	Attach	Loveland Products Inc.
Spreader/Sticker	Bind-It	Estes Incorporated
Spreader/Sticker	Bond	Loveland Products Inc.
Spreader/Sticker	Cohere	Helena

Adjuvant Type	Trade Name	Manufacturer
Spreader/Sticker	CWC 90	CWC Chemical, Inc.
Spreader/Sticker	Insist 90	Wilbur-Ellis
Spreader/Sticker	Lastick	Setre (Helena)
Spreader/Sticker	Nu-Film-IR	Miller Chem. & Fert. Corp.
Spreader/Sticker	R-56	Wilbur-Ellis
Spreader/Sticker	Surf-King PLUS	Crown (Estes Incorporated)
Spreader/Sticker	Tactic	Loveland Products Inc.
Spreader/Sticker	TopFilm	Biosorb, Inc.
Silicone-based	Aero Dyne-Amic	Helena
Silicone-based	Bind-It MAX	Estes Incorporated
Silicone-based	Dyne-Amic	Helena
Silicone-based	Freeway	Loveland Products Inc.
Silicone-based	Kinetic	Setre (Helena)
Silicone-based	Phase	Loveland Products Inc.
Silicone-based	Phase II	Loveland Products Inc.
Silicone-based	SilEnergy	Brewer International
Silicone-based	Silnet 200	Brewer International
Silicone-based	Silwet L-77	Loveland Products Inc.
Silicone-based	Sun Spreader	Red River Specialties, Inc.
Silicone-based	Sylgard 309	Wilbur-Ellis
Silicone-based	Syl-Tac	Wilbur-Ellis
Silicone-based	Thoroughbred	Estes Incorporated
Oil-based		
Crop Oil Concentrate	Agri-Dex	Helena
Crop Oil Concentrate	Brewer 83-17	Brewer International
Crop Oil Concentrate	Crop Oil Concentrate	Helena
Crop Oil Concentrate	Crop Oil Concentrate	Loveland Products Inc.
Crop Oil Concentrate	Herbimax	Loveland Products Inc.
Crop Oil Concentrate	Majestic	Crown (Estes Incorporated)
Crop Oil Concentrate	Mor-Act	Wilbur-Ellis
Crop Oil Concentrate	R.O.C. Rigo Oil Conc.	Wilbur-Ellis
Crop Oil Concentrate	Red River Forestry Oil	Red River Specialties, Inc.
Methylated Seed Oil	Hasten	Wilbur-Ellis
Methylated Seed Oil	Methylated Spray Oil Conc.	Helena
Methylated Seed Oil	MSO Concentrate	Loveland Products Inc.
Methylated Seed Oil	Red River Supreme	Red River Specialties, Inc.
Methylated Seed Oil	Sun Wet	Brewer International
Methylated Seed Oil	Sunburn	Red River Specialties, Inc.
Methylated Seed Oil	SunEnergy	Brewer International
Methylated Seed Oil	Sunset	Red River Specialties, Inc.
Methylated Seed Oil	Super Spread MSO	Wilbur-Ellis
Methylated Seed Oil + Organosilicone	Inergy	Crown (Estes Incorporated)
Vegetable Oil	Amigo	Loveland Products Inc.
Vegetable Oil	Competitor	Wilbur-Ellis
Vegetable Oil	Noble	Estes Incorporated
Fertilizer-based		
Nitrogen-based	Bronc	Wilbur-Ellis
Nitrogen-based	Bronc Max	Wilbur-Ellis
Nitrogen-based	Bronc Max EDT	Wilbur-Ellis
Nitrogen-based	Bronc Plus Dry EDT	Wilbur-Ellis

Adjuvant Type	Trade Name	Manufacturer
Nitrogen-based	Bronc Total	Wilbur-Ellis
Nitrogen-based	Cayuse Plus	Wilbur-Ellis
Nitrogen-based	Dispatch	Loveland Products Inc.
Nitrogen-based	Dispatch 111	Loveland Products Inc.
Nitrogen-based	Dispatch 2N	Loveland Products Inc.
Nitrogen-based	Dispatch AMS	Loveland Products Inc.
Nitrogen-based	Flame	Loveland Products Inc.
Nitrogen-based	Quest	Setre (Helena)
Special Purpose or Utility		
Buffering Agent	Buffers P.S.	Helena
Buffering Agent	Oblique	Red River Specialties, Inc.
Buffering Agent	Spray-Aide	Miller Chem. & Fert. Corp.
Buffering Agent	Tri-Fol	Wilbur-Ellis
Colorants	BullsEye	Milliken Chemical
Colorants	Hi-Light	Becker-Underwood
Colorants	Hi-Light WSP	Becker-Underwood
Colorants	Marker Dye	Loveland Products Inc.
Colorants	Signal	Precision
Compatibility/ Suspension Agent	Blendex VHC	Setre (Helena)
Compatibility/ Suspension Agent	E Z MIX	Loveland Products Inc.
Compatibility/ Suspension Agent	Support	Loveland Products Inc.
Deposition Aid	Agripharm Drift Control	Walco International
Deposition Aid	Bivert	Wilbur-Ellis
Deposition Aid	Compadre	Loveland Products Inc.
Deposition Aid	Coverage G-20	Wilbur-Ellis
Deposition Aid	CWC Sharpshooter	CWC Chemical, Inc.
Deposition Aid	Cygnet Plus	Brewer International
Deposition Aid	EDT Concentrate	Wilbur-Ellis
Deposition Aid	Intac Plus	Loveland Products Inc.
Deposition Aid	Liberate	Loveland Products Inc.
Deposition Aid	Mist-Control	Miller Chem. & Fert. Corp.
Deposition Aid	Pointblank	Helena
Deposition Aid	Poly Control 2	Brewer International
Deposition Aid	ProMate Impel	Helena
Deposition Aid	Reign	Loveland Products Inc.
Deposition Aid	Secure Ultra	Red River Specialties, Inc.
Deposition Aid	Sta Put	Setre (Helena)
Deposition Aid	Strike Zone DF	Helena
Deposition Aid	Weather Gard	Loveland Products Inc.
Defoaming Agent	Cornbelt Defoamer	Van Diest Supply Co
Defoaming Agent	Defoamer	Brewer International
Defoaming Agent	Fighter-F 10	Loveland Products Inc.
Defoaming Agent	Fighter-F Dry	Loveland Products Inc.
Defoaming Agent	Foam Buster	Setre (Helena)
Defoaming Agent	Foam Fighter	Miller Chem. & Fert. Corp.
Defoaming Agent	No Foam	Wilbur-Ellis
Diluent/Deposition Agent	Hy-Grade EC	CWC Chemical, Inc
Diluent/Deposition Agent	Hy-Grade I	CWC Chemical, Inc
Diluent/Deposition Agent	Improved JLB Oil Plus	Brewer International
Diluent/Deposition Agent	JLB Oil Plus	Brewer International

Adjuvant Type	Trade Name	Manufacturer
Diluent/Deposition Agent	Red River Basal Oil	Red River Specialties, Inc.
Foam Marker	Align	Helena
Foam Marker	R-160	Wilbur-Ellis
Invert Emulsion Agent	Redi-vert II	Wilbur-Ellis
Tank Cleaner	All Clear	Loveland Products Inc.
Tank Cleaner	Cornbelt Tank-Aid	Van Diest Supply Co.
Tank Cleaner	Kutter	Wilbur-Ellis
Tank Cleaner	Neutral-Clean	Wilbur-Ellis
Tank Cleaner	Tank and Equipment Cleaner	Loveland Products Inc.
Tank Cleaner	Wipe Out	Helena
Water Conditioning	Blendmaster	Loveland Products Inc.
Water Conditioning	Choice	Loveland Products Inc.
Water Conditioning	Choice Weather Master	Loveland Products Inc.
Water Conditioning	Choice Xtra	Loveland Products Inc.
Water Conditioning	Cut-Rate	Wilbur-Ellis
Water Conditioning	Rush	Crown (Estes Incorporated)

Individual Herbicide Summaries

The following information about each of the 18 herbicides has been compiled for reference from information within the EIS. More information, including comparisons with other herbicides, can be found at the following locations:

- Examples of product names used on BLM lands can be found in this Appendix (Appendix 9);
- Species that an herbicide is effective on is contained in Appendix 7;
- Estimated Annual Treatment Acres is from Table 3-3 (Chapter 3);
- Selected Risk Categories includes data from Table 3-12 through 3-21 (Chapter 3), which summarizes the Risk Assessment information in (uncirculated) Appendix 8. H (High), M (Moderate), L (Low), and 0 (no risk) risk categories are defined in the Chapter 3 tables;
- Leaching, persistence and half-life information can be found in:
    - Table 3-1 (*The 18 Herbicides* section in Chapter 3)
    - Table 4-14 (*Soil Resources* section in Chapter 4)
    - Table 4-17 (*Water Resources* section in Chapter 4)
    - Table 4-20 (*Wetlands and Riparian Areas* section);
- PEIS Mitigation Measures and Standard Operating Procedures can be found in Appendix 2; and,
- All other information can be found in the *The 18 Herbicides* section in Chapter 3.

2,4-D

2,4-D is a post emergent foliar applied herbicide that is selective to broadleaf plants.

Species that it is effective on: 2,4-D is effective on about half of the Oregon-listed noxious weeds (see Table A9-2).

Examples of Product Names used on BLM lands: Many (see Table A9-1).
Commercial formulations with other active ingredients: Many. Commercial formulations currently available to the BLM include mixtures with clopyralid, dicamba, glyphosate, metsulfuron methyl, picloram, and triclopyr.

Estimated Annual Treatment Acres	East of the Cascades	West of the Cascades	Total
Noxious Weeds **Alternative 2 (No Action) total**	**6,700**	**1,800**	**8,500**
Invasive Plants and Pests and Diseases **Alternative 3 total**	**1,900**	**2,100**	**4,000**
ROWs, Admin, Recreation Sites	700	200	900
Habitat Improvement	600	100	700
Alternative 4 (Proposed Action) total	**3,100**	**2,300**	**5,400**
Additional allowed under Alt 5	2,100	100	2,200
Alternative 5 total	**5,200**	**2,300**	**7,500**

Annual Application Rates
(lbs/acre)
Typical: 1
Maximum: 1.9
(*PEIS Mitigation Measures limit 2,4-D to typical application rates where feasible*)

Why is the Oregon BLM considering the use of this herbicide? 2,4-D is effective on a wide range of broadleaf weeds while protecting most grasses. While having additional herbicides available can allow for more target specific control, having one herbicide that controls a vast range of vegetation could reduce operator error that can occur while mixing and applying herbicides. The Oregon BLM has used 2,4-D without incident to human health for 23 years. In addition, adding a small amount of 2,4-D to a tank mix can improve the effectiveness of the other herbicides and reduce the likelihood of weed resistance. Additional information about 2,4-D can be found in Appendix 12. 2,4-D is available under the No Action Alternative (Alternative 2); use of 2,4-D drops statewide under all of the action alternatives.

Registered for use:

Rangeland	Forestland	Riparian & Aquatic
Oil, Gas, & Minerals	Right-of-way	Recreation & Cultural

Selected Risk Categories

	Terrestrial Vegetation			Macrophytes		Worker		Public	
								Consumption of Contaminated Water	
	Direct Spray	Off-site Drift Low boom	Surface Runoff	Accidental Spill	Chronic Exposure	Wearing soiled gloves	General Exposure Boom spray	Acute / Accidental	Chronic / Long-term
Typical	H	0	0	L	L	M	L	M	0
Maximum	H	0	0	M	L	M	M	M	0

	Small mammal			Bird		Fish	
		Consumption of Contaminated vegetation		Consumption of Contaminated vegetation			
	Direct Spray	Acute / Accidental	Chronic / Long-term	Acute / Accidental	Chronic / Long-term	Accidental spill	Chronic exposure
Typical	0	L	0	L	0	M	0
Maximum	L	L	0	L	0	M	0

Leaching, Persistence, and Half-life

K_{oc}	Solubility	SPISP II Rating – Leaching Potential			Persistence		Half life in soils (days)	
		PLP Leaching	PSRP Solution Runoff	PARP Adsorbed Particle Runoff	Water	Soils	Aerobic	Anaerobic
20-100	33,900	Intermediate	Intermediate	Low	Moderate	Low	10	333

PEIS Mitigation Measures and Standard Operating Procedures specific to this herbicide

- Minimize the size of application areas, where practical, when applying 2,4-D to limit impacts to wildlife, particularly through contamination of food items. (*MM*)
- Do not apply 2,4-D across large application areas, where feasible, to limit impacts to livestock, particularly through contamination of food items. (*MM*)
- Consider the size of the application area when making applications of 2,4-D in order to reduce potential impacts to wild horses and burros. (*MM*)
- Do not apply 2,4-D in HMAs during the peak foaling season (March through June, and especially in May and June). (*MM*)
- Do not exceed the typical application rate when applying 2,4-D in known traditional use areas. (*MM*)
- Use the typical application rate, where feasible, when applying 2,4-D to reduce risk to workers and the public. (*MM*)

Bromacil

Bromacil is pre and post emergent soil applied herbicide that is not selective.

Species that it is effective on: spiny Cocklebur, Johnsongrass, Quackgrass, Syrian bean-caper, Horehound. *Used for bare ground*

Examples of Product Names used on BLM lands: Hyvar X and Hyvar XL
Commercial formulations with other active ingredients: Bromacil + Diuron is sold as Kroval I DF, Weed Blast Res., Weed Cont., DiBro 2+2, DiBro 4+2, and Weed Blast 4G

Species that it is effective on: spiny Cocklebur, Johnsongrass, Quackgrass, Syrian bean-caper, Horehound. *Used for bare ground*

Estimated Annual Treatment Acres	East of the Cascades	West of the Cascades	Total
Noxious Weeds	**NA**	**NA**	**NA**
Alternative 2 (No Action) total			
Invasive Plants and Pests and Diseases	**NA**	**NA**	**NA**
Alternative 3 total			
ROWs, Admin, Recreation Sites	700	**NA**	700
Habitat Improvement	0		0
Alternative 4 (Proposed Action) total	**900**		**900**
Additional allowed under Alt 5	0	100	100
Alternative 5 total	**900**	**100**	**1,000**

Annual Application Rates
(lbs/acre)
Typical: 4
Maximum: 12
(*PEIS Mitigation Measures limit bromacil to typical application rates where feasible*)

Why is the Oregon BLM considering the use of this herbicide? Bromacil, like diuron, is a non-selective herbicide that kills all vegetation. The primary use for bromacil would be in communications sites such as cell phone, radio, television tower sites, electrical substations, or similar facilities where complete vegetation control is desired to reduce fire risk and maintenance costs.

Registered for use:

~~Rangeland~~	~~Forestland~~	~~Riparian & Aquatic~~
Oil, Gas, & Minerals	Right-of-way	Recreation & Cultural

Selected Risk Categories

	Terrestrial Vegetation			Macrophytes		Worker		Public	
	Direct Spray	Off-site Drift Low boom	Surface Runoff	Accidental Spill	Chronic Exposure	Wearing soiled gloves	General Exposure Boom spray	Consumption of Contaminated Water: Acute / Accidental	Consumption of Contaminated Water: Chronic / Long-term
Typical	H	M	0	NE	NE	S, R, C	0	0	NE
Maximum	H	M	0	H	NE	NE	S, R	0	NE

	Small mammal			Bird		Fish	
	Direct Spray	Consumption of Contaminated vegetation: Acute / Accidental	Consumption of Contaminated vegetation: Chronic / Long-term	Consumption of Contaminated vegetation: Acute / Accidental	Consumption of Contaminated vegetation: Chronic / Long-term	Accidental spill	Chronic exposure
Typical	0	0	0	0	0	NE	NE
Maximum	0	L	L	0	L	M	NE

Leaching, Persistence, and Half-life

K_{oc}	Solubility	SPISP II Rating – Leaching Potential			Persistence		Half life in soils	
		PLP Leaching	PSRP Solution Runoff	PARP Adsorbed Particle Runoff	Water	Soils	Aerobic	Anaerobic
32	700	High	High	Intermediate	Moderate	Moderate / High	60-240	144-198

PEIS Mitigation Measures and Standard Operating Procedures specific to this herbicide:

- Minimize the use of bromacil in watersheds with downgradient ponds and streams if potential impacts to aquatic plants are identified. (*MM*)
- Minimize the size of application areas, where practical, when applying bromacil to limit impacts to wildlife, particularly through contamination of food items. (*MM*)
- Do not apply bromacil in rangelands, and use appropriate buffer zones (Tables A2-1 and 2) to limit contamination of off-site vegetation, which may serve as forage for wildlife. (*MM*)
- Do not apply bromacil across large application areas, where feasible, to limit impacts to livestock, particularly through contamination of food items. (*MM*)
- Do not apply bromacil in rangelands, and use appropriate buffer zones (Tables A2-1 and 2) to limit contamination of off-site vegetation, which may serve as forage for wildlife. (*MM*)
- Consider the size of the application area when making applications of bromacil in order to reduce potential impacts to wild horses and burros. (*MM*)
- Do not apply bromacil in grazing lands within herd management areas (HMAs), and use appropriate buffer zones identified in Tables A2-1 and 2 to limit contamination of vegetation in off-site foraging areas. (*MM*)
- Do not apply bromacil in HMAs during the peak foaling season (March through June, and especially in May and June) (*MM*)
- Do not exceed the typical application rate when applying bromacil in known traditional use areas. (*MM*)
- Avoid applying bromacil or tebuthiuron aerially in known traditional use areas. (*MM*)
- Use the typical application rate, where feasible, when applying bromacil to reduce risk to workers and the public. (*MM*)
- Avoid applying bromacil aerially. (*MM*)

Chlorsulfuron

Chlorsulfuron is a pre and early post emergent soil and foliar applied herbicide that is selective to broadleaf plants. It is effective on Common bugloss, Dyers woad, Giant Horsetail, Houndstongue, Oblong spurge, Paterson's curse, Perennial pepperweed, Puncturevine, Leafy Spurge, Myrtle Spurge, Syrian bean-caper, cutleaf Teasel, Bull Thistle, Canada Thistle, Milk Thistle, Plumeless Thistle, Scotch Thistle, Dalmation Toadflax, Yellow Toadflax, Whitetop (Hoary cress), Lens-podded whitetop, Hairy Whitetop, Common or Wooly mullein, Feverfew, Field mustard, Paterson's curse, Purple foxglove, Spreading hedge-parsley, Common Tansy, common Teasel, Thistle, wavyleaf, Wild carrot, and Yellow glandweed

Examples of Product Names used on BLM lands: Telar DF and Telar XP.
Commercial formulations with other active ingredients: Metsulfuron methyl + Chlorsulfuron is sold as Cimarron Extra and Cimarron Plus; Sulfometuron methyl + Chlorsulfuron is sold as Landmark XP.

Estimated Annual Treatment Acres	East of the Cascades	West of the Cascades	Total
Noxious Weeds	**NA**	**NA**	**NA**
Alternative 2 (No Action) total			
Invasive Plants and Pests and Diseases	**3,300**	**NA**	**3,300**
Alternative 3 total			
ROWs, Admin, Recreation Sites	900	**NA**	900
Habitat Improvement	0		0
Alternative 4 (Proposed Action) total	**4,100**		**4,100**
Additional allowed under Alt 5	0	100	100
Alternative 5 total	**4,100**	**100**	**4,200**

Annual Application Rates
(lbs/acre)
Typical: 0.047
Maximum: 0.141

Why is the Oregon BLM considering the use of this herbicide?
Chlorsulfuron is an ALS-inhibitor that is effective against grasses and broadleaf plants such as whitetop, perennial pepperweed, Mediterranean sage, and thistles. It is often mixed with 2,4-D to reduce the likelihood of developing plant resistance and to produces more immediately visible results. It can also be used on toadflax and knapweeds.

Registered for use:

Rangeland	~~Forestland~~	~~Riparian & Aquatic~~
Oil, Gas, & Minerals	Right-of-way	Recreation & Cultural

Selected Risk Categories

	Terrestrial Vegetation			**Macrophytes**		**Worker**		**Public**	
								Consumption of Contaminated Water	
	Direct Spray	Off-site Drift Low boom	Surface Runoff	Accidental Spill	Chronic Exposure	Wearing soiled gloves	General Exposure Boom spray	Acute / Accidental	Chronic / Long-term
Typical	H	M	0	NE	NE	0	0	0	0
Maximum	H	M	0	H	NE	0	L	0	0

	Small mammal			**Bird**		**Fish**	
		Consumption of Contaminated vegetation		Consumption of Contaminated vegetation			
	Direct Spray	Acute / Accidental	Chronic / Long-term	Acute / Accidental	Chronic / Long-term	Accidental spill	Chronic exposure
Typical	0	0	0	0	0	NE	NE
Maximum	0	0	0	0	0	0	NE

Leaching, Persistence, and Half-life

K_{oc}	Solubility	SPISP II Rating – Leaching Potential			Persistence		Half life in soils	
		PLP Leaching	PSRP Solution Runoff	PARP Adsorbed Particle Runoff	Water	Soils	Aerobic	Anaerobic
40	7,000	High	High	Intermediate	Moderate	Moderate	40	109-263

PEIS Mitigation Measures and Standard Operating Procedures specific to this herbicide:

- Limit the aerial application of chlorsulfuron to areas with difficult land access, where no other means of application are possible. (*MM*)
- Limit application of chlorsulfuron via ground broadcast applications at the maximum application rate. (*MM*)

Clopyralid

Clopyralid is a post emergent foliar applied herbicide that is selective to broadleaf plants.

Species that it is effective on: Many (see Table A9-2).

Examples of Product Names used on BLM lands: Spur, Pyramid R&P, Clopyralid 3, Stinger, and Transline.
Commercial formulations with other active ingredients: Clopyralid + 2,4-D is sold as Curtail and Commando. Triclopyr + Clopyralid is sold as Redeem R&P.

Species that it is effective on: Many.

Estimated Annual Treatment Acres	East of the Cascades	West of the Cascades	Total
Noxious Weeds	**NA**	**NA**	**NA**
Alternative 2 (No Action) total			
Invasive Plants and Pests and Diseases	**1,400**	**300**	**1,700**
Alternative 3 total			
ROWs, Admin, Recreation Sites	700	0	700
Habitat Improvement	0	100	100
Alternative 4 (Proposed Action) total	**2,000**	**300**	**2,300**
Additional allowed under Alt 5	0	0	0
Alternative 5 total	**2,000**	**300**	**2,300**

Annual Application Rates
(lbs/acre)
Typical: 0.35
Maximum: 0.5

Why is the Oregon BLM considering the use of this herbicide? Clopyralid would target many of the same species as picloram, but is more selective. It is effective on knapweeds and Canada thistle, while minimizing risk to surrounding desirable brush, grass, and trees.

Registered for use:

Rangeland	Forestland	~~Riparian & Aquatic~~
Oil, Gas, & Minerals	Right-of-way	Recreation & Cultural

Selected Risk Categories:

	Terrestrial Vegetation			Macrophytes	Worker			Public	
	Direct Spray	Off-site Drift Low boom	Surface Runoff	Accidental Spill	Chronic Exposure	Wearing soiled gloves	General Exposure Boom spray	Consumption of Contaminated Water: Acute / Accidental	Consumption of Contaminated Water: Chronic / Long-term
Typical	0	0	0	H	0	0	0	0	0
Maximum	L	0	0	H	0	0	0	0	0

	Small mammal			Bird		Fish	
	Direct Spray	Consumption of Contaminated vegetation: Acute / Accidental	Consumption of Contaminated vegetation: Chronic / Long-term	Consumption of Contaminated vegetation: Acute / Accidental	Consumption of Contaminated vegetation: Chronic / Long-term	Accidental spill	Chronic exposure
Typical	0	L	0	L	0	M	0
Maximum	0	L	0	L	0	M	0

Leaching, Persistence, and Half-life:

K_{oc}	Solubility	SPISP II Rating – Leaching Potential			Persistence		Half life in soils	
		PLP Leaching	PSRP Solution Runoff	PARP Adsorbed Particle Runoff	Water	Soils	Aerobic	Anaerobic
2	1,000	High	Intermediate	Low	Moderate	Moderate	40	>1,000

PEIS Mitigation Measures and Standard Operating Procedures specific to this herbicide: *None*

Dicamba

Dicamba is a pre and post emergent foliar applied herbicide that is selective to broadleaf and woody plants (see Table A9-2).

Examples of Product Names used on BLM lands: Dicamba DMA, Vision, Banvel, Clarity, Rifle, Banvel, Diablo, and Vanquish
Commercial formulations with other active ingredients: Dicamba + 2,4-D is sold as Outlaw, Range Star, Weedmaster, Rifle-D, KambaMaster, and Veteran 720

Estimated Annual Treatment Acres	East of the Cascades	West of the Cascades	Total
Noxious Weeds **Alternative 2 (No Action) total**	**4,500**	**100**	**4,600**
Invasive Plants and Pests and Diseases **Alternative 3 total**	**800**	**200**	**1,000**
ROWs, Admin, Recreation Sites	600	100	700
Habitat Improvement	100	0	100
Alternative 4 (Proposed Action) total	**1,400**	**200**	**1,600**
Additional allowed under Alt 5	100	0	100
Alternative 5 total	**1,400**	**200**	**1,600**

Annual Application Rates
(lbs/acre)
Typical: 0.25
Maximum: 2
(*PEIS Mitigation Measures limit 2,4-D to typical application rates where feasible*)

Why is the Oregon BLM considering the use of this herbicide?
Dicamba has been used extensively on thistles and perennial pepperweed; in combination with 2,4-D on mustards and knapweeds; and, in combination with picloram for rush skeletonweed. Use would drop under the action alternatives, and chlorsulfuron and metsulfuron methyl would be used for many of these treatments. However, dicamba provides good burn-down right up to seed set, which extends the treatment window.

Registered for use:

Rangeland	~~Forestland~~	~~Riparian & Aquatic~~
Oil, Gas, & Minerals	Right-of-way	Recreation & Cultural

Selected Risk Categories:

	Terrestrial Vegetation			Macrophytes		Worker		Public	
								Consumption of Contaminated Water	
	Direct Spray	Off-site Drift Low boom	Surface Runoff	Accidental Spill	Chronic Exposure	Wearing soiled gloves	General Exposure Boom spray	Acute / Accidental	Chronic / Long-term
Typical	H	0	0	NE	NE	0	0	0	0
Maximum	H	0	0	NE	NE	0	L	L	0

	Small mammal			Bird		Fish	
		Consumption of Contaminated vegetation		Consumption of Contaminated vegetation			
	Direct Spray	Acute / Accidental	Chronic / Long-term	Acute / Accidental	Chronic / Long-term	Accidental spill	Chronic exposure
Typical	0	0	0	L	0	0	0
Maximum	0	L	0	M	0	0	0

Leaching, Persistence, and Half-life:

K_{oc}	Solubility	SPISP II Rating – Leaching Potential			Persistence		Half life in soils	
		PLP Leaching	PSRP Solution Runoff	PARP Adsorbed Particle Runoff	Water	Soils	Aerobic	Anaerobic
2	400,000	High	Intermediate	Low	Moderate	Low	14	>1,000

PEIS Mitigation Measures and Standard Operating Procedures specific to this herbicide:

- To minimize risks to terrestrial wildlife, do not exceed the typical application rate for applications of dicamba where feasible. (*MM*)
- Do not apply dicamba across large application areas, where feasible, to limit impacts to livestock, particularly through contamination of food items. (*MM*)
- Consider the size of the application area when making applications of dicamba in order to reduce potential impacts to wild horses and burros. (*MM*)

Diflufenzopyr + dicamba

Diflufenzopyr + Dicamba is a post emergent soil applied herbicide that is selective to broadleaf plants

Species that it is effective on: Meadow Knapweed, Squarrose Knapweed, cutleaf Teasel, Bull Thistle, Milk Thistle, Musk Thistle, Plumeless Thistle, Garden cornflower or bachelor buttons, Malta Starthistle, common Teasel, and wavyleaf Thistle,

Examples of Product Names used on BLM lands: Overdrive, Distinct

Species that it is effective on: Meadow Knapweed, Squarrose Knapweed, cutleaf Teasel, Bull Thistle, Milk Thistle, Musk Thistle, Plumeless Thistle, Garden cornflower or bachelor buttons, Malta Starthistle, common Teasel, and wavyleaf Thistle,

Estimated Annual Treatment Acres	East of the Cascades	West of the Cascades	Total
Noxious Weeds	**NA**	**NA**	**NA**
Alternative 2 (No Action) total			
Invasive Plants and Pests and Diseases	**NA**	**NA**	**NA**
Alternative 3 total			
ROWs, Admin, Recreation Sites	NA	NA	NA
Habitat Improvement	NA	NA	NA
Alternative 4 (Proposed Action) total	**NA**	**NA**	**NA**
Additional allowed under Alt 5	NA	NA	NA
Alternative 5 total	**100**	**100**	**200**

Annual Application Rates
(lbs/acre)
Typical: 0.2625
Maximum: 0.4375 on oil, gas, and mineral sites. Maximum rate on rangeland: 0.35

Why is the Oregon BLM considering the use of this herbicide? Diflufenzopyr + Dicamba is included only in Alternative 5. It would be used for many of the same species as dicamba. It can be used in a mixture with picloram, triclopyr, and clopyralid, allowing for a reduced rate of these chemicals.

Registered for use:		
Rangeland	~~Forestland~~	~~Riparian & Aquatic~~
Oil, Gas, & Minerals	Right-of-way	Recreation & Cultural

Selected Risk Categories:

	Terrestrial Vegetation			**Macrophytes**		**Worker**		**Public**	
								Consumption of Contaminated Water	
	Direct Spray	Off-site Drift Low boom	Surface Runoff	Accidental Spill	Chronic Exposure	Wearing soiled gloves	General Exposure Boom spray	Acute / Accidental	Chronic / Long-term
Typical	M	0	0	NE	NE	NE			
Maximum	H	0	0	M	NE				

	Small mammal			**Bird**		**Fish**	
		Consumption of Contaminated vegetation		Consumption of Contaminated vegetation			
	Direct Spray	Acute / Accidental	Chronic / Long-term	Acute / Accidental	Chronic / Long-term	Accidental spill	Chronic exposure
Typical	0	0	0	0	0	NE	NE
Maximum	0	0	0	0	0	0	NE

PEIS Mitigation Measures and Standard Operating Procedures specific to this herbicide:

- Minimize the size of application areas, where practical, when applying to limit impacts to wildlife, particularly through contamination of food items. (*MM*)
- Do not apply across large application areas, where feasible, to limit impacts to livestock, particularly through contamination of food items. (*MM*)
- Consider the size of the application area when making applications in order to reduce potential impacts to wild horses and burros. (*MM*)
- Do not exceed the typical application rate in HMAs during the peak foaling season in areas where foaling is known to take place. (*MM*)

Diquat

Diquat is a post-emergent aquatic non-selective herbicide. It is effective on Brazilian or South American waterweed, Hydrilla, Parrot's feather, Eurasian Watermilfoil, Yellow floating heart, and Elodea

Examples of Product Names used on BLM lands (*see Table A9-1*): Reward

Estimated Annual Treatment Acres	East of the Cascades	West of the Cascades	Total
Noxious Weeds	**NA**	**NA**	**NA**
Alternative 2 (No Action) total			
Invasive Plants and Pests and Diseases	**NA**	**NA**	**NA**
Alternative 3 total			
ROWs, Admin, Recreation Sites	**NA**	**NA**	**NA**
Habitat Improvement			
Alternative 4 (Proposed Action) total			
Additional allowed under Alt 5	**100**	**100**	**200**
Alternative 5 total			

Annual Application Rates
(lbs/acre)
Typical: 1
Maximum: 4
(*PEIS Mitigation Measures limit diquat to typical application rates where feasible*)

Why is the Oregon BLM considering the use of this herbicide? Diquat is an aquatic herbicide that is included only in Alternative 5. Of the 18 herbicides analyzed in the PEIS, this is the only herbicide that can control giant salvinia, which has not been found in Oregon.

Areas where BLM could use:

~~Rangeland~~	~~Forestland~~	Riparian & Aquatic
~~Oil, Gas, & Minerals~~	~~Right-of-way~~	~~Recreation & Cultural~~

Selected Risk Categories:

	Terrestrial Vegetation			**Macrophytes**		**Worker**		**Public**	
								Consumption of Contaminated Water	
	Direct Spray	Off-site Drift Low boom	Surface Runoff	Accidental Spill	Chronic Exposure	Wearing soiled gloves	General Exposure Boom spray	Acute / Accidental	Chronic / Long-term
Typical	H	L	NE	NE	NE	NE	L	L	NE
Maximum	H	M	NE	H	NE	NE	M	L	NE

	Small mammal			**Bird**		**Fish**	
	Direct Spray	Consumption of Contaminated vegetation		Consumption of Contaminated vegetation		Accidental spill	Chronic exposure
		Acute / Accidental	Chronic / Long-term	Acute / Accidental	Chronic / Long-term		
Typical	0	0	L	0	L	NE	NE
Maximum	0	L	M	L	H	H	NE

Leaching, Persistence, and Half-life:

K_{oc}	Solubility	SPISP II Rating – Leaching Potential			Persistence		Half life in soils (days)	
		PLP Leaching	PSRP Solution Runoff	PARP Adsorbed Particle Runoff	Water	Soils	Aerobic	Anaerobic
1,000,000	718,000	Very Low	Low	High	High	High	1,000	>1,000

PEIS Mitigation Measures and Standard Operating Procedures specific to this herbicide (see Appendix 2):

- Limit the use of diquat in water bodies that have native fish and aquatic resources. (*MM*)
- Do not aerially apply diquat directly to wetlands or riparian areas . (*MM*)
- Avoid use of diquat in riparian pasture while pasture is being used by livestock. *(SOP)*
- Do not exceed the typical application rate when applying 2,4-D, bromacil, diquat, diuron, fluridone, hexazinone, tebuthiuron, and triclopyr in known traditional use areas. (*MM*)
- Limit diquat applications to areas away from high residential and traditional use areas to reduce risks to Native Americans. (*MM*)
- Use the typical application rate, where feasible, when applying 2,4-D, bromacil, diquat, diuron, fluridone, hexazinone, tebuthiuron, and triclopyr to reduce risk to workers and the public. (*MM*)
- Limit diquat application to ATV, truck spraying, and boat applications to reduce risks to workers; limit diquat applications to areas away from high residential and subsistence use to reduce risks to the public. (*MM*)

Diuron

Diuron is a pre-emergent herbicide applied to the soil.

Species that it is effective on: Herb Robert Geranium, Shiny leaf Geranium, Quackgrass, Syrian bean-caper, Horehound. *Used for bare ground*

Examples of Product Names used on BLM lands: Karmex DF, Karmex XP, Karmex IWC, Direx 4L, Direx 80DF, Diuron 4L, Diuron 80 DF, Diuron 80 WDG

Commercial formulations with other active ingredients:
Tebuthiuron + Diuron sold as SpraKil SK-13 Granular and SpraKil SK-26 Granular
Imazapyr + Diuron sold as Mojave 70 EG, Sahara DG, Imazuron E-Pro, and SSI Maxim Topsite 2.5G
Bromacil + Diuron sold as Kroval I DF, Weed Blast Res. Weed Cont, DiBro 2+2, DiBro 4+2, and Weed Blast 4G

Estimated Annual Treatment Acres	East of the Cascades	West of the Cascades	Total
Noxious Weeds	**NA**	**NA**	**NA**
Alternative 2 (No Action) total			
Invasive Plants and Pests and Diseases	**NA**	**NA**	**NA**
Alternative 3 total			
ROWs, Admin, Recreation Sites	1200	100	1200
Habitat Improvement	0	0	0
Alternative 4 (Proposed Action) total	**1200**	**100**	**1300**
Additional allowed under Alt 5	0	0	0
Alternative 5 total	**1200**	**100**	**1300**

Annual Application Rates
(lbs/acre)
Typical: 6
Maximum: 20
(*PEIS Mitigation Measures limit diuron to typical application rates where feasible*)

Why is the Oregon BLM considering the use of this herbicide? The primary use for diuron would be in communications sites such as cell phone, radio, television tower sites, electrical substations, or similar facilities where no vegetation is desired. A bare ground herbicide would permit treatments of these sites every 2-3 years (see the Administrative Sites, Roads, and Rights-of-Way section in Chapter 4). It also has use as a site-preparation tool for nursery beds.

Registered for use:

~~Rangeland~~	~~Forestland~~	~~Riparian & Aquatic~~
Oil, Gas, & Minerals	Right-of-way	Recreation & Cultural

Selected Risk Categories:

	Terrestrial Vegetation			**Macrophytes**		**Worker**		**Public**	
	Direct Spray	Off-site Drift Low boom	Surface Runoff	Accidental Spill	Chronic Exposure	Wearing soiled gloves	General Exposure Boom spray	Consumption of Contaminated Water: Acute / Accidental	Consumption of Contaminated Water: Chronic / Long-term
Typical	M	0	0	NE	NE	S, R	S	S, R, C	NE
Maximum	H	L	0	H	NE		S, R		

	Small mammal			**Bird**		**Fish**	
	Direct Spray	Consumption of Contaminated vegetation: Acute / Accidental	Consumption of Contaminated vegetation: Chronic / Long-term	Consumption of Contaminated vegetation: Acute / Accidental	Consumption of Contaminated vegetation: Chronic / Long-term	Accidental spill	Chronic exposure
Typical	0	0	M	0	0	NE	NE
Maximum	0	L	H	L	M	H	NE

Leaching, Persistence, and Half-life:

K_{oc}	Solubility	SPISP II Rating – Leaching Potential			Persistence		Half life in soils	
		PLP Leaching	PSRP Solution Runoff	PARP Adsorbed Particle Runoff	Water	Soils	Aerobic	Anaerobic
480	42	Intermediate	High	Intermediate	Moderate	Moderate	90	5-100

PEIS Mitigation Measures and Standard Operating Procedures specific to this herbicide:

- To minimize risks to workers and the public, terrestrial wildlife, wild horses, burros, and livestock, do not exceed the typical application rate for applications of diuron where feasible. (*MM*)
- Avoid applying diuron aerially. (*MM*)
- Minimize the use of diuron in watersheds with downgradient ponds and streams if potential impacts to aquatic plants are identified. (*MM*)
- Limit the use of diuron in watersheds with characteristics suitable for potential surface runoff that have fish-bearing streams during periods when fish are in life stages most sensitive to the herbicide(s) used. (*MM*)
- Minimize the size of application areas, where practical, when applying diuron to limit impacts to wildlife, particularly through contamination of food items. (*MM*)
- Do not apply diuron in rangelands and use appropriate buffer zones (Tables A2-1 and 2) to limit contamination of off-site vegetation, which may serve as forage for wildlife. (*MM*)
- Do not apply diuron across large application areas, where feasible, to limit impacts to livestock, particularly through contamination of food items. (*MM*)
- Consider the size of the application area when making applications of diuron in order to reduce potential impacts to wild horses and burros. (*MM*)
- Do not apply diuron in grazing lands within herd management areas (HMAs), and use appropriate buffer zones identified in Tables A2-1 and 2 to limit contamination of vegetation in off-site foraging areas. (*MM*)
- Do not apply diuron in HMAs during the peak foaling season (March through June, and especially in May and June) (*MM*)
- Evaluate diuron applications on a site-by-site basis to avoid risks to humans. There appear to be few scenarios where diuron can be applied without risk to workers. (*MM*)

Fluridone

Fluridone is a post emergent aquatic herbicide that is effective on submersed plants.

Species that it is effective on: South American waterweed, Elodea, Hydrilla, and Watermilfoil

Examples of Product Names used on BLM lands: Avast!, Sonar AS, Sonar Precision Release, and Sonar Q, and Sonar SRP

Species that it is effective on: South American waterweed, Elodea, Hydrilla, and Watermilfoil

Estimated Annual Treatment Acres	East of the Cascades	West of the Cascades	Total
Noxious Weeds	**NA**	**NA**	**NA**
Alternative 2 (No Action) total			
Invasive Plants and Pests and Diseases	**100**	**200**	**300**
Alternative 3 total			
ROWs, Admin, Recreation Sites	0	0	0
Habitat Improvement	0	0	0
Alternative 4 (Proposed Action) total	**100**	**200**	**300**
Additional allowed under Alt 5	0	0	0
Alternative 5 total	**100**	**200**	**300**

Annual Application Rates
(lbs/acre)
Typical: 0.15
Maximum: 1.3
(*PEIS Mitigation Measures limit fluridone to typical application rates where feasible*)

Why is the Oregon BLM considering the use of this herbicide? Fluridone is an aquatic herbicide that requires prolonged plant contact, so it can only be used on aquatic plants in still water. It would be used primarily on Brazilian waterweed, elodea, hydrilla, and watermilfoil.

Registered for use:

~~Rangeland~~	~~Forestland~~	Riparian & Aquatic
~~Oil, Gas, & Minerals~~	~~Right-of-way~~	~~Recreation & Cultural~~

Selected Risk Categories:

	Terrestrial Vegetation			**Macrophytes**		**Worker**		**Public** Consumption of Contaminated Water	
	Direct Spray	Off-site Drift Low boom	Surface Runoff	Accidental Spill	Chronic Exposure	Wearing soiled gloves	General Exposure Boom spray	Acute / Accidental	Chronic / Long-term
Typical	NE	NE	NE	NE	NE	NE	0	0	NE
Maximum	NE	NE	NE	L	NE	NE	0	0	NE

	Small mammal			**Bird**		**Fish**	
	Direct Spray	Consumption of Contaminated vegetation: Acute / Accidental	Consumption of Contaminated vegetation: Chronic / Long-term	Consumption of Contaminated vegetation: Acute / Accidental	Consumption of Contaminated vegetation: Chronic / Long-term	Accidental spill	Chronic exposure
Typical	0	0	0	0	0	NE	NE
Maximum	0	0	0	0	0	M	NE

Leaching, Persistence, and Half-life:

K_{oc}	Solubility	SPISP II Rating – Leaching Potential: PLP Leaching	PSRP Solution Runoff	PARP Adsorbed Particle Runoff	Persistence: Water	Persistence: Soils	Half life in soils: Aerobic	Half life in soils: Anaerobic
1000	10	Low	Intermediate	Intermediate	Low	Low	21	4-270

PEIS Mitigation Measures and Standard Operating Procedures specific to this herbicide:

- Do not exceed the typical application rate when applying fluridone in known traditional use areas. (*MM*)
- Use the typical application rate, where feasible, when applying fluridone to reduce risk to workers and the public. (*MM*)

Glyphosate

Glyphosate is a post emergent soil or foliar applied herbicide that is non-selective. It is effective on about two thirds of the State-listed noxious weeds (see Table A9-2).

Examples of Product Names used on BLM lands: Many (see Table A9-1).
Commercial formulations with other active ingredients: Glyphosate is sold in combination with 2,4-D Dicamba and Imazapic.

Estimated Annual Treatment Acres	East of the Cascades	West of the Cascades	Total
Noxious Weeds			
Alternative 2 (No Action) total	**700**	**5,200**	**5,900**
Invasive Plants and Pests and Diseases			
Alternative 3 total	**400**	**2,300**	**2,700**
ROWs, Admin, Recreation Sites	1,000	300	1,300
Habitat Improvement	100	200	300
Alternative 4 (Proposed Action) total	**1,300**	**2,700**	**4,000**
Additional allowed under Alt 5	100	100	200
Alternative 5 total	**1,300**	**2,700**	**4,000**

Annual Application Rates
(lbs/acre)
Typical: 2
Maximum: 7
(*PEIS Mitigation Measures limit 2,4-D to typical application rates where feasible*)

Why is the Oregon BLM considering the use of this herbicide? In addition to being used on broadleaf weeds and woody species, glyphosate has been used to treat medusahead in eastern Oregon. However, it is a non-selective herbicide and can harm desirable plants, so use has been limited to areas where this is an acceptable treatment. Glyphosate could be used on administrative sites, rights-of-way, and recreation sites under the Proposed Action (Alternative 4). Glyphosate and 2,4-D have been the only two aquatic herbicides available to the BLM for the past 23 years, and use would decrease as more aquatic herbicides became available.

Registered for use:

Rangeland	Forestland	Riparian & Aquatic
Oil, Gas, & Minerals	Right-of-way	Recreation & Cultural

Selected Risk Categories:

	Terrestrial Vegetation			**Macrophytes**		**Worker**		**Public**	
								Consumption of Contaminated Water	
	Direct Spray	Off-site Drift Low boom	Surface Runoff	Accidental Spill	Chronic Exposure	Wearing soiled gloves	General Exposure Boom spray	Acute / Accidental	Chronic / Long-term
Typical	L	0	0	M	0	0	0	0	0
Maximum	M	0	0	M	0	0	0	L	0

	Small mammal			**Bird**		**Fish**	
		Consumption of Contaminated vegetation		Consumption of Contaminated vegetation			
	Direct Spray	Acute / Accidental	Chronic / Long-term	Acute / Accidental	Chronic / Long-term	Accidental spill	Chronic exposure
Typical	0	0	0	L	0	H	0
Maximum	0	L	0	L	0	H	0

Leaching, Persistence, and Half-life:

K_{oc}	Solubility	SPISP II Rating – Leaching Potential			Persistence		Half life in soils	
		PLP Leaching	PSRP Solution Runoff	PARP Adsorbed Particle Runoff	Water	Soils	Aerobic	Anaerobic
24,000	900,000	Very Low	High	High	Moderate	Moderate	47	12-70

PEIS Mitigation Measures and Standard Operating Procedures specific to this herbicide:

- Minimize potential risks to terrestrial wildlife, livestock, wild horses, and burros by applying glyphosate at the typical application rate where feasible. (*MM*)
- Where practical, limit glyphosate to spot applications in grazing land and wildlife habitat areas to avoid contamination of wildlife food items. (*MM*)
- Either avoid using glyphosate formulations containing POEA, or seek to use formulations with the least amount of POEA, to reduce risks to amphibians. (*MM*)
- Where feasible, limit glyphosate to spot applications in rangeland. (*MM*)

Hexazinone

Hexazinone is a pre and post emergent soil and foliar applied herbicide that is effective on grasses, broadleaf, and woody plants. It is effective on African rue and grasses.

Examples of Product Names used on BLM lands: Velpar ULW, Velpar L, and Velpar DF
Commercial formulations with other active ingredients: Hexazinone + Sulfometuron methyl is sold as Westar

Estimated Annual Treatment Acres	East of the Cascades	West of the Cascades	Total
Noxious Weeds **Alternative 2 (No Action) total**	**NA**	**NA**	**NA**
Invasive Plants and Pests and Diseases **Alternative 3 total**	**100**	**100**	**200**
ROWs, Admin, Recreation Sites	100	200	300
Habitat Improvement	0	100	100
Alternative 4 (Proposed Action) total	**100**	**200**	**300**
Additional allowed under Alt 5	0	100	100
Alternative 5 total	**100**	**200**	**300**

Annual Application Rates
(lbs/acre)
Typical: 2
Maximum: 4
(*PEIS Mitigation Measures limit hexazinone to typical application rates where feasible*)

Why is the Oregon BLM considering the use of this herbicide? Hexazinone would be primarily used in administrative sites, utility and road rights-of-way, and along the deer exclosure fence lines at the seed orchards where vegetation must be removed to facilitate maintenance. It could also be used on African rue, a bushy invasive perennial that is toxic to people and livestock.

Registered for use:

Rangeland	Forestland	~~Riparian & Aquatic~~
Oil, Gas, & Minerals	Right-of-way	Recreation & Cultural

Selected Risk Categories:

	Terrestrial Vegetation			**Macrophytes**		**Worker**		**Public**	
	Direct Spray	Off-site Drift Low boom	Surface Runoff	Accidental Spill	Chronic Exposure	Wearing soiled gloves	General Exposure Boom spray	Consumption of Contaminated Water: Acute / Accidental	Consumption of Contaminated Water: Chronic / Long-term
Typical	M	0	0	H	M	0	0	0	0
Maximum	M	0	0	H	M	0	L		

	Small mammal			**Bird**		**Fish**	
	Direct Spray	Consumption of Contaminated vegetation: Acute / Accidental	Consumption of Contaminated vegetation: Chronic / Long-term	Consumption of Contaminated vegetation: Acute / Accidental	Consumption of Contaminated vegetation: Chronic / Long-term	Accidental spill	Chronic exposure
Typical	0	0	0	L	0	0	0
Maximum	L	0	0	L	0	L	0

Leaching, Persistence, and Half-life:

K_{oc}	Solubility	SPISP II Rating – Leaching Potential			Persistence		Half life in soils	
		PLP Leaching	PSRP Solution Runoff	PARP Adsorbed Particle Runoff	Water	Soils	Aerobic	Anaerobic
54	33,000	High	High	Intermediate	High	Moderate to High	90	30-180

PEIS Mitigation Measures and Standard Operating Procedures specific to this herbicide:

- To minimize risks, do not exceed the typical application rate for applications of hexazinone where feasible. (*MM*)
- Do not exceed the typical application rate of hexazinone in HMAs during the peak foaling season in areas where foaling is known to take place. (*MM*)
- Do not exceed the typical application rate when applying 2,4-D, bromacil, diquat, diuron, fluridone, hexazinone, tebuthiuron, and triclopyr in known traditional use areas. (*MM*)
- Where practical, limit hexazinone to spot applications in grazing land and wildlife habitat areas to avoid contamination of wildlife food items. (*MM*)
- Where feasible, limit glyphosate and hexazinone to spot applications in rangeland. (*MM*)
- Do not apply hexazinone with an over-the-shoulder broadcast applicator (backpack sprayer). (*MM*)

Imazapic

Imazapic is a pre and post emergent soil applied herbicide that is selective to some broadleaf plants and grasses.

Species that it is effective on: Common bugloss, Giant Hogweed, Barbed Goatgrass, Jointed Goatgrass, Ovate Goatgrass, Halogeton, Johnsongrass, Meadow Knapweed, Squarrose Knapweed, Kochia, Medusahead rye, Oblong spurge, Paterson's curse, Purple Nutsedge, Spurge, Leafy, Spurge, Myrtle Syrian bean-caper, cutleaf Teasel, Whitetop (Hoary cress), Lens-podded whitetop, Hairy Whitetop, Wild proso millet, Yellow Flag Iris, Yellow nutsedge, Annual fescues, Cereal rye, Cheatgrass, Common or Wooly mullein, Garden cornflower or bachelor buttons, Bulbed Goatgrass, Tausch's Goatgrass, Italian ryegrass, North Africa grass, Paterson's curse, Purple foxglove, Spreading hedge-parsley, tall fescue, Common Teasel, Russian Thistle, Tumbleweed or Prickly Russian thistle, and Yellow glandweed

Examples of Product Names used on BLM lands: Plateau and Panoramic 2SL
Commercial formulations with other active ingredients: Imazapic + Glyphosate is sold as Journey

Estimated Annual Treatment Acres	East of the Cascades	West of the Cascades	Total
Noxious Weeds			
Alternative 2 (No Action) total	**NA**	**NA**	**NA**
Invasive Plants and Pests and Diseases			
Alternative 3 total	**11,000**	**500**	**11,500**
ROWs, Admin, Recreation Sites	400	100	500
Habitat Improvement	2,300	100	2,400
Alternative 4 (Proposed Action) total	**13,500**	**500**	**14,000**
Additional allowed under Alt 5	2,100	100	2,200
Alternative 5 total	**15,500**	**500**	**16,000**

Annual Application Rates
(lbs/acre)
Typical: 0.0313
Maximum: 0.1875

Why is the Oregon BLM considering the use of this herbicide? Imazapic, an ALS-inhibitor, is especially effective against the invasive annual grasses such as cheatgrass and medusahead, which infest more than 5 million acres in eastern Oregon. At low rates, it is selective for these grasses, leaving the perennial herbaceous species critical for restoration. The BLM does not currently have an effective method of treating these fire-prone invasive annual grasses.

Registered for use:

Rangeland	Forestland	~~Riparian & Aquatic~~
Oil, Gas, & Minerals	Right-of-way	Recreation & Cultural

Selected Risk Categories:

	Terrestrial Vegetation			Macrophytes		Worker		Public	
	Direct Spray	Off-site Drift Low boom	Surface Runoff	Accidental Spill	Chronic Exposure	Wearing soiled gloves	General Exposure Boom spray	Consumption of Contaminated Water: Acute / Accidental	Consumption of Contaminated Water: Chronic / Long-term
Typical	L	0	0	NE	NE	NE	0	NE	NE
Maximum	M	0	0	H	NE	NE	0	NE	NE

	Small mammal			Bird		Fish	
	Direct Spray	Consumption of Contaminated vegetation: Acute / Accidental	Consumption of Contaminated vegetation: Chronic / Long-term	Consumption of Contaminated vegetation: Acute / Accidental	Consumption of Contaminated vegetation: Chronic / Long-term	Accidental spill	Chronic exposure
Typical	0	0	0	0	0	NE	NE
Maximum	0	0	0	0	0	0	NE

Leaching, Persistence, and Half-life:

K_{oc}	Solubility	SPISP II Rating – Leaching Potential: PLP Leaching	SPISP II Rating – Leaching Potential: PSRP Solution Runoff	SPISP II Rating – Leaching Potential: PARP Adsorbed Particle Runoff	Persistence: Water	Persistence: Soils	Half life in soils (days): Aerobic	Half life in soils (days): Anaerobic
137	2,200	High	High	Intermediate	High	Moderate	120-140	>1,000

PEIS Mitigation Measures and Standard Operating Procedures specific to this herbicide: *None.*

Imazapyr

Imazapyr is a pre and post emergent soil and foliar applied herbicide that is non-selective. It is effective on many species (see Table A9-2).

Examples of Product Names used on BLM lands (*see Table A9-1*): Arsenal, Arsenal Applicators Conc., Arsenal PowerLine, Arsenal Railroad Herbicide, Chopper, Ecomazapyr 2 SL, Habitat, Imazapyr 2 SL, Imazapyr 4 SL, Imazapyr E-Pro 2 - VM & Aquatic Herbicide, Imazapyr E-Pro 2E - Site Prep & Basal, Imazapyr E-Pro 4 – Forestry, Polaris, Polaris AC, Polaris AQ, Polaris Herbicide, Polaris RR, Polaris SP, SSI Maxim Arsenal 0.5G, and Stalker

Commercial formulations with other active ingredients:

Imazapyr + Diuron is sold as Imazuron E-Pro, Mojave 70 EG, Sahara DG, and SSI Maxim Topsite 2.5G

Imazapyr + Metsulfuron methyl is sold as Lineage Clearstand and Lineage HWC

Imazapyr + Sulfometuron methyl + Metsulfuron methyl is sold as Lineage Prep

Estimated Annual Treatment Acres	East of the Cascades	West of the Cascades	Total
Noxious Weeds **Alternative 2 (No Action) total**	**NA**	**NA**	**NA**
Invasive Plants and Pests and Diseases **Alternative 3 total**	**300**	**1,200**	**1,500**
ROWs, Admin, Recreation Sites	100	500	600
Habitat Improvement	600	100	700
Alternative 4 (Proposed Action) total	**1,000**	**1,600**	**2,600**
Additional allowed under Alt 5	100	100	200
Alternative 5 total	**1,100**	**1,600**	**2,700**

Annual Application Rates

(lbs/acre)

Typical: 0.45

Maximum: 1.25

Why is the Oregon BLM considering the use of this herbicide? Imazapyr is an ALS-inhibitor that is effective against brushy and woody species such as saltcedar and Russian olive. It would also be used on tanoak to control sudden oak death. At high doses, it is an effective bare ground herbicide that could be used in areas other bare ground herbicides are not registered for. It is used to treat African rue, Japanese knotweed, and leafy spurge.

Registered for use:

Rangeland	Forestland	Riparian & Aquatic
Oil, Gas, & Minerals	Right-of-way	Recreation & Cultural

Selected Risk Categories:

	Terrestrial Vegetation			Macrophytes		Worker		Public	
	Direct Spray	Off-site Drift Low boom	Surface Runoff	Accidental Spill	Chronic Exposure	Wearing soiled gloves	General Exposure Boom spray	Consumption of Contaminated Water: Acute / Accidental	Consumption of Contaminated Water: Chronic / Long-term
Typical	M	0	0	H	0	0	0	0	0
Maximum	M	0	0	H	0				

	Small mammal			Bird		Fish	
	Direct Spray	Consumption of Contaminated vegetation: Acute / Accidental	Consumption of Contaminated vegetation: Chronic / Long-term	Consumption of Contaminated vegetation: Acute / Accidental	Consumption of Contaminated vegetation: Chronic / Long-term	Accidental spill	Chronic exposure
Typical	0	0	0	0	0	0	0
Maximum	0	0	0	L	0	L	0

Leaching, Persistence, and Half-life:

K_{oc}	Solubility	SPISP II Rating – Leaching Potential: PLP Leaching	PSRP Solution Runoff	PARP Adsorbed Particle Runoff	Persistence: Water	Persistence: Soils	Half life in soils: Aerobic	Half life in soils: Anaerobic
100	>11,000	High	High	Intermediate	Moderate	Moderate to High	25-141	>500

PEIS Mitigation Measures and Standard Operating Procedures specific to this herbicide: *None*

Metsulfuron methyl

Metsulfuron methyl is a post emigrant soil or foliar applied herbicide that is selective to broadleaf or woody plants. It is effective on African rue, Himalayan Blackberry, Common bugloss, Dyers woad, Field bindweed, Gorse, Halogeton, Houndstongue, Kochia, Paterson's curse, Poison hemlock, Purple loosestrife, St. Johnswort, Sulfur cinquefoil, Tansy ragwort, cutleaf Teasel, Bull Thistle, Milk Thistle, Plumeless Thistle, Thistle, Scotch, Whitetop,(Hoary cress), Lens-podded whitetop, Hairy Whitetop, Yellow Flag Iris, Black henbane, Evergreen Blackberry, Bouncing bet, Feverfew, Italian ryegrass, Paterson's curse, spotted henbit, Common Tansy, common Teasel, Russian Thistle, wavyleaf Thistle, Tree-of-heaven, Tumbleweed or Prickly Russian, thistle, Wild carrot, Conifers, Salmonberry, Tanoak, Thimble berry, Willow

Examples of Product Names used on BLM lands (*see Table A9-1*): Escort DF, Escort XP, Metsulfuron Methyl DF, MSM 60, MSM E-AG 60 EG Herbicide, MSM E-Pro 60 EG Herbicide, Patriot, and PureStand
Commercial formulations with other active ingredients:
Sulfometuron methyl + Metsulfuron methyl is sold as Oust Extra
Metsulfuron methyl + Chlorsulfuron is sold as Cimarron Extra and Cimarron Plus
Metsulfuron methyl + Dicamba + 2,4-D is sold as Cimarron MAX
Imazapyr + Metsulfuron methyl is sold as Lineage Clearstand
Imazapyr + Sulfometuron methyl + Metsulfuron methyl is sold as Lineage HWC and Lineage Prep

Estimated Annual Treatment Acres	East of the Cascades	West of the Cascades	Total
Noxious Weeds			
Alternative 2 (No Action) total	**NA**	**NA**	**NA**
Invasive Plants and Pests and Diseases			
Alternative 3 total	**2000**	**500**	**2500**
ROWs, Admin, Recreation Sites	400	100	500
Habitat Improvement	100	0	100
Alternative 4 (Proposed Action) total	**2300**	**600**	**2900**
Additional allowed under Alt 5	100	0	100
Alternative 5 total	**2300**	**600**	**2900**

Annual Application Rates
(lbs/acre)
Typical: 0.03
Maximum: 0.15

Why is the Oregon BLM considering the use of this herbicide? Metsulfuron methyl has similar targets and effects as chlorsulfuron, but can cause more harm to desired meadow grasses. It could be used on perennial pepperweed, whitetop and other mustards, and blackberries. It can also be used to control conifer trees under power lines.

Registered for use:

Rangeland	Forestland	~~Riparian & Aquatic~~
Oil, Gas, & Minerals	Right-of-way	Recreation & Cultural

Selected Risk Categories

	Terrestrial Vegetation			Macrophytes		Worker		Public	
	Direct Spray	Off-site Drift Low boom	Surface Runoff	Accidental Spill	Chronic Exposure	Wearing soiled gloves	General Exposure Boom spray	Consumption of Contaminated Water: Acute / Accidental	Consumption of Contaminated Water: Chronic / Long-term
Typical	L	0	0	H	0	0	0	0	-
Maximum	M	0	0	H	0				

	Small mammal			Bird		Fish	
	Direct Spray	Consumption of Contaminated vegetation: Acute / Accidental	Consumption of Contaminated vegetation: Chronic / Long-term	Consumption of Contaminated vegetation: Acute / Accidental	Consumption of Contaminated vegetation: Chronic / Long-term	Accidental spill	Chronic exposure
Typical	0	0	0	0	0	0	0
Maximum	0	0	0	0	0	0	0

Leaching, Persistence, and Half-life

K_{oc}	Solubility	SPISP II Rating – Leaching Potential			Persistence		Half life in soils	
		PLP Leaching	PSRP Solution Runoff	PARP Adsorbed Particle Runoff	Water	Soils	Aerobic	Anaerobic
35	9,500	High	High	Intermediate	Moderate	Low	30	338

PEIS Mitigation Measures and Standard Operating Procedures specific to this herbicide (see Appendix 2):

- Limit the aerial application of metsulfuron methyl to areas with difficult land access, where no other means of application are possible. (*MM*)

Picloram

Picloram is a pre and post emergent foliar applied herbicde that is selective to broadleaf and Woody plants. It is effective on many species (see Table A9-2).

Examples of Product Names used on BLM lands: Grazon PC, OutPost 22K, Picloram 22K, Picloram K, Tordon 22K, Tordon K, Triumph 22K, Triumph K, Trooper 22K
Commercial formulations with other active ingredients:
Picloram + 2,4-D is sold as Grazon P+D, GunSlinger, HiredHand P+D, Pathway, Picloram + D, Tordon 101 R Forestry, Tordon 101M, Tordon RTU, Trooper 101, and Trooper P + D
Picloram + 2,4-D + Dicamba is sold as Trooper Extra

Estimated Annual Treatment Acres	East of the Cascades	West of the Cascades	Total
Noxious Weeds **Alternative 2 (No Action) total**	**3,600**	**200**	**3,800**
Invasive Plants and Pests and Diseases **Alternative 3 total**	**1,100**	**400**	**1,500**
ROWs, Admin, Recreation Sites	200	100	300
Habitat Improvement	1,300	0	1,300
Alternative 4 (Proposed Action) total	**2,500**	**500**	**3,000**
Additional allowed under Alt 5	100	0	100
Alternative 5 total	**2,500**	**500**	**3,000**

Annual Application Rates
(lbs/acre)
Typical: 0.35
Maximum: 1

Why is the Oregon BLM considering the use of this herbicide? Picloram has been used on rush skeletonweed, knapweeds, toadflax, and thistles, and provides good residual control. Use would decrease under any of the action alternatives, and clopyralid, which is more selective, would likely be used instead. However, it is also effective on western juniper and could be used to improve sage grouse habitat.

Registered for use:

Rangeland	Forestland	~~Riparian & Aquatic~~
Oil, Gas, & Minerals	Right-of-way	Recreation & Cultural

Selected Risk Categories:

	Terrestrial Vegetation			Macrophytes		Worker		Public	
								Consumption of Contaminated Water	
	Direct Spray	Off-site Drift Low boom	Surface Runoff	Accidental Spill	Chronic Exposure	Wearing soiled gloves	General Exposure Boom spray	Acute / Accidental	Chronic / Long-term
Typical	L	0	0	0	0	0	0	0	0
Maximum	M	0	0	0	0			L	

	Small mammal			Bird		Fish	
		Consumption of Contaminated vegetation		Consumption of Contaminated vegetation			
	Direct Spray	Acute / Accidental	Chronic / Long-term	Acute / Accidental	Chronic / Long-term	Accidental spill	Chronic exposure
Typical	0	0	0	0	0	L	0
Maximum	0	0	0	0	0	L	0

Leaching, Persistence, and Half-life:

K_{oc}	Solubility	SPISP II Rating – Leaching Potential			Persistence		Half life in soils	
		PLP Leaching	PSRP Solution Runoff	PARP Adsorbed Particle Runoff	Water	Soils	Aerobic	Anaerobic
16	200,000	High	High	Intermediate	Moderate	Moderate/ High	20-300	>500

PEIS Mitigation Measures and Standard Operating Procedures specific to this herbicide:
- Do not apply picloram across large application areas, where feasible, to limit impacts to livestock, particularly through contamination of food items. (*MM*)
- Consider the size of the application area when making applications of picloram in order to reduce potential impacts to wild horses and burros. (*MM*)

Sulfometuron methyl

Sulfometuron methyl is a pre and post emergent soil or foliar applied herbicide that is not selective. It is effective on Bouncing bet, Bur buttercup, Field mustard, Barbed Goatgrass, Bulbed Goatgrass, Jointed Goatgrass, Ovate Goatgrass, Grasses, Johnsongrass, Reed canarygrass, and salmonberry

Examples of Product Names used on BLM lands: Oust DF, Oust XP, SFM 75, SFM E-Pro 75EG, and Spyder
Commercial formulations with other active ingredients:
Sulfometuron methyl + Chlorsulfuron sold as Landmark XP
Sulfometuron methyl + Metsulfuron methyl sold as Oust Extra
Hexazinone + Sulfometuron methyl sold as Oustar and Westar
Imazapyr + Sulfometuron methyl + Metsulfuron methyl sold as Lineage HWC an d Lineage Prep

Estimated Annual Treatment Acres	East of the Cascades	West of the Cascades	Total
Noxious Weeds **Alternative 2 (No Action) total**	**NA**	**NA**	**NA**
Invasive Plants and Pests and Diseases **Alternative 3 total**	**400**	**100**	**500**
ROWs, Admin, Recreation Sites	500	0	500
Habitat Improvement	100	100	200
Alternative 4 (Proposed Action) total	**900**	**100**	**1,000**
Additional allowed under Alt 5	100	100	200
Alternative 5 total	**900**	**200**	**1,100**

Annual Application Rates
(lbs/acre)
Typical: 0.14
Maximum: 0.38

Why is the Oregon BLM considering the use of this herbicide? Like imazapic, sulfometuron methyl (an ALS-inhibitor) is effective against cheatgrass and medusahead. It has a shorter half-life than imazapic, which speeds restoration efforts. However, sulfometuron methyl is not applied aerially, and is not registered for use in rangeland, and a current EPA proposal would limit its use in drier areas (see Chapter 1). This would limit its use on grasses to invasive grasses occurring in woodlands and forest openings. In addition, sulfometuron methyl is effective on mustards and can harm desirable forb species. In high doses, it would be used on road rights-of-way as a bare ground herbicide.

Registered for use:

~~Rangeland~~	Forestland	~~Riparian & Aquatic~~
Oil, Gas, & Minerals	Right-of-way	Recreation & Cultural

Selected Risk Categories:

	Terrestrial Vegetation			Macrophytes		Worker		Public	
	Direct Spray	Off-site Drift Low boom	Surface Runoff	Accidental Spill	Chronic Exposure	Wearing soiled gloves	General Exposure Boom spray	Consumption of Contaminated Water: Acute / Accidental	Consumption of Contaminated Water: Chronic / Long-term
Typical	0	0	0	NE	NE	NE	0	NE	NE
Maximum	L	0	0	H	NE				

	Small mammal			Bird		Fish	
	Direct Spray	Consumption of Contaminated vegetation: Acute / Accidental	Consumption of Contaminated vegetation: Chronic / Long-term	Consumption of Contaminated vegetation: Acute / Accidental	Consumption of Contaminated vegetation: Chronic / Long-term	Accidental spill	Chronic exposure
Typical	0	0	0	0	0	NE	NE
Maximum	0	0	0	0	0	0	NE

Leaching, Persistence, and Half-life:

K_{oc}	Solubility	SPISP II Rating – Leaching Potential			Persistence		Half life in soils	
		PLP Leaching	PSRP Solution Runoff	PARP Adsorbed Particle Runoff	Water	Soils	Aerobic	Anaerobic
78	70	Intermediate	High	Low	Low	Low	20	60

PEIS Mitigation Measures and Standard Operating Procedures specific to this herbicide:
- Do not apply sulfometuron methyl aerially. (*MM*)
- Minimize the use of sulfometuron methyl in watersheds with downgradient ponds and streams if potential impacts to aquatic plants are identified. (*MM*)

Tebuthiuron

Tebuthiuron is a pre and post emergent soil applied herbicide that is selective to broadleaf and woody plants

Species that it is effective on: Halogeton and sagebrush

Examples of Product Names used on BLM lands: Spike 20P, Spike 80DF, and SpraKil S-5 Granules
Commercial formulations with other active ingredients: Tebuthiuron + Diuron is sold as SpraKil SK-13 Granular and SpraKil SK-26 Granular

Estimated Annual Treatment Acres	East of the Cascades	West of the Cascades	Total
Noxious Weeds	NA	NA	NA
Alternative 2 (No Action) total			
Invasive Plants and Pests and Diseases	NA	NA	NA
Alternative 3 total			
ROWs, Admin, Recreation Sites	100	NA	100
Habitat Improvement	300		300
Alternative 4 (Proposed Action) total	**300**		**300**
Additional allowed under Alt 5	500	100	600
Alternative 5 total	**800**	**100**	**900**

Annual Application Rates
(lbs/acre)
Typical: 0.5
Maximum: 4
(*PEIS Mitigation Measures limit tebuthiuron to typical application rates where feasible*)

Why is the Oregon BLM considering the use of this herbicide? Tebuthiuron would primarily be used at low rates to thin sagebrush to improve habitat for sage grouse and other species. It could also be used at high rates as a bare ground herbicide.

Registered for use:

Rangeland	~~Forestland~~	~~Riparian & Aquatic~~
Oil, Gas, & Minerals	Right-of-way	Recreation & Cultural

Selected Risk Categories:

	Terrestrial Vegetation			**Macrophytes**		**Worker**		**Public**	
								Consumption of Contaminated Water	
	Direct Spray	Off-site Drift Low boom	Surface Runoff	Accidental Spill	Chronic Exposure	Wearing soiled gloves	General Exposure Boom spray	Acute / Accidental	Chronic / Long-term
Typical	M	0	0	NE	NE	NE	0	R	NE
Maximum	H	0	0	H	NE	SR	SR		

	Small mammal			**Bird**		**Fish**	
		Consumption of Contaminated vegetation		Consumption of Contaminated vegetation			
	Direct Spray	Acute / Accidental	Chronic / Long-term	Acute / Accidental	Chronic / Long-term	Accidental spill	Chronic exposure
Typical	0	0	0	0	0	NE	NE
Maximum	0	0	L	0	0	L	NE

Leaching, Persistence, and Half-life:

K_{oc}	Solubility	SPISP II Rating – Leaching Potential			Persistence		Half life in soils	
		PLP Leaching	PSRP Solution Runoff	PARP Adsorbed Particle Runoff	Water	Soils	Aerobic	Anaerobic
80	2,500	High	High	Intermediate	High	High	360	unknown

PEIS Mitigation Measures and Standard Operating Procedures specific to this herbicide:

- To minimize risks to the public and workers, terrestrial wildlife, livestock, wild horses, and burros, do not exceed the typical application rate, where feasible. (*MM*)
- Do not exceed the typical application rate when applying in known traditional use areas. (*MM*)
- Avoid applying tebuthiuron aerially in known traditional use areas. (*MM*)

Triclopyr

Triclopyr is a post emergent foliar applied herbicide that is selective to broadleaf and woody plants. It is effective on many species (see Table A9-2).

Examples of Product Names used on BLM lands: Triclopyr 4EC, Element 3A, Element 4, Forestry Garlon XRT, Garlon 3A, Garlon 4, Garlon 4 Ultra, Remedy Ultra, Pathfinder II, Tahoe 3A, Tahoe 3A, Tahoe 4E, Renovate 3, Renovate OTF, Ecotriclopyr 3 SL, and Triclopyr 3 SL
Commercial formulations with other active ingredients: Triclopyr + 2,4-D is sold as Crossbow; Triclopyr + Clopyralid is sold as Redeem R&P

Estimated Annual Treatment Acres	East of the Cascades	West of the Cascades	Total
Noxious Weeds **Alternative 2 (No Action) total**	**NA**	**NA**	**NA**
Invasive Plants and Pests and Diseases **Alternative 3 total**	**700**	**1,500**	**2,200**
ROWs, Admin, Recreation Sites	600	800	1,400
Habitat Improvement	700	100	800
Alternative 4 (Proposed Action) total	**1,900**	**2,200**	**4,100**
Additional allowed under Alt 5	300	100	400
Alternative 5 total	**2,200**	**2,300**	**4,500**

Annual Application Rates
(lbs/acre)
Typical: 1
Maximum: 10
(*PEIS Mitigation Measures limit triclopyr to typical application rates where feasible*)

Why is the Oregon BLM considering the use of this herbicide? Triclopyr is effective on woody plants, and would be used on saltcedar, Russian olive, blackberries, brooms, and other shrubs. It is the preferred treatment for purple loosestrife, and could be used to control woody species in recreation sites.

Registered for use:

Rangeland	Forestland	Riparian & Aquatic
Oil, Gas, & Minerals	Right-of-way	Recreation & Cultural

Selected Risk Categories:

	Terrestrial Vegetation (Susceptible)			**Macrophytes (Susceptible)**		**Worker**		**Public**	
								Consumption of Contaminated Water	
	Direct Spray	Off-site Drift Low boom	Surface Runoff	Accidental Spill	Chronic Exposure	Wearing soiled gloves	General Exposure Boom spray	Acute / Accidental	Chronic / Long-term
Typical	H	L	M	H	0	0	0	0	0
Maximum	H	M	H	H	L	L	L	L	0

	Small mammal			**Bird**		**Fish**	
		Consumption of Contaminated vegetation		Consumption of Contaminated vegetation			
	Direct Spray	Acute / Accidental	Chronic / Long-term	Acute / Accidental	Chronic / Long-term	Accidental spill	Chronic exposure
Typical	L	0	0	L	L	NE	0
Maximum	M	0	0	M	M	NE	0

Leaching, Persistence, and Half-life:

K_{oc}	Solubility	SPISP II Rating – Leaching Potential			Persistence		Half life in soils	
		PLP Leaching	PSRP Solution Runoff	PARP Adsorbed Particle Runoff	Water	Soils	Aerobic	Anaerobic
20 (salt) 780 (ester)	435	High	High	Intermediate	Moderate	Moderate	46	<1

PEIS Mitigation Measures and Standard Operating Procedures specific to this herbicide:

- To minimize risks to workers and the public, terrestrial wildlife, livestock, wild horses, and burros do not exceed the typical application rate, where feasible, for applications of triclopyr. (*MM*)
- Do not apply triclopyr across large application areas, where feasible, to limit impacts to livestock, particularly through contamination of food items. (*MM*)
- Consider the size of the application area when making applications of triclopyr in order to reduce potential impacts to wild horses and burros. (*MM*)

Appendix 10 - Response to Public Comments on the September 2009 Draft EIS

Table of Contents

Response to Public Comments on the September 2009 Draft EIS

Introduction

The public comment period for the *Vegetation Treatments using Herbicides on BLM Lands in Oregon Draft Environmental Impact Statement* (Draft EIS) began on October 2 and ran through December 1, 2009. Agencies, officials, and the public were invited to comment of the Draft EIS. During the 60-day public comment period, 803 communications were received in the form of letters, postcards, and emails (collectively referred to as letters). The BLM continued to accept and process letters received between December 2 and the completion of public comment analysis on January 6, 2010. During this time, the BLM processed an additional 240 letters.

Letters were received from a variety of interests including individuals, organizations (including watershed councils), businesses, and Federal, State, and local (including soil and water conservation districts) government agencies. Letters were received from 10 of the 50 states, as well as from India, but the majority of letters originated from Oregon. The letters are part of the public record on the EIS and are available for public inspection. Individuals or organizations who submitted comment letters (including form letters) have been added to the EIS distribution list, and will receive, unless otherwise requested, a CD-ROM containing the Final EIS.

All of the letters received between October 2, 2009 and January 6, 2010 were processed by a public comment coding team who identified over 500 substantive comments and passed them along to the EIS resource specialist for consideration and response. Resource specialists created comment statements, responses, and made resultant corrections or additions to the Final EIS. Comment statements are summary statements that identify and describe specific concerns with the analysis or the alternatives considered. Unique concerns generated their own comment statement and similar concerns voiced in multiple letters were grouped into one comment statement (40 C.F.R. 1503.4(b)). Letters were not treated as votes; all letters were treated equally and were not given weight by the number received, organizational affiliation, or other status of the respondents. All substantive comments have responses presented in this appendix, and many resulted in improvements to the analysis presented in the Final EIS. We very much appreciate the public's review and participation.

Six letters were received between January 7 and April 1, 2010. Four of these were duplicative form letters, but the remaining two letters were reviewed by the BLM. Issues identified by the authors of these letter were not included in this appendix, though several points were incorporated into the Final EIS and some of the other points had been made by previous respondents.

Organization of this Appendix

This appendix contains the comment statements and responses, organized to follow the order of the Final EIS. The comments and responses are intended to be explanatory in nature; if there are any inadvertent contradictions between this Appendix and the text in the Final EIS, the Final EIS prevails.

Letters received from Federal, State, and local governments are responded to in this Appendix, and displayed in their entirety in Appendix 11.

Summary

1. Comment: The *Summary* should include costs and benefits, or refer the reader to specific pages in the Environmental Impact Statement (EIS) where these are discussed.

Response: The Final EIS *Summary* now includes page references to the EIS for items discussed. However, there are elements of the analysis that may not be in the *Summary.* CEQ regulations at C.F.R. 1502.12 state, "Each environmental impact statement shall contain a summary which adequately and accurately summarizes the statement. The summary shall stress the major conclusions, areas of controversy (including issues raised by agencies and the public), and the issues to be resolved (including the choice among alternatives). The summary will normally not exceed 15 pages."

2. Comment: There are value-laden sentences heavily biased toward the Proposed Action (Alternative 4). Using the term "some" risk trivializes both the scope and severity of potential risks while the conclusion that slowing noxious weed spread "more than compensates for the risks incurred" is totally unsubstantiated.

Response: The statement regarding "more than compensates for the risks incurred" in the *Summary* has been edited to clarify that it only applies to resource values, not to the potential for worker and public health effects. Otherwise, the statement summarizes the general conclusions in the individual resource sections in Chapter 4 that, across the range of alternatives, the spread of invasive weeds will be more likely to degrade resource values than the herbicides proposed for use.

3. Comment: The *Summary* does not indicate how long the various herbicides remain toxic in the environment.

Response: Half-lives vary depending upon whether the herbicide is exposed to sunlight, in the soil, or in water, and whether conditions are aerobic or anaerobic. In addition, degradates can be variously toxic. These subjects are addressed in the *Water Resources* and *Soil Resources* sections in Chapter 4, and do not lend themselves to easy compilation in the *Summary*. The term "toxic" is a relative term that does not represent a single point, since different herbicides can have potential effects to different portions of the environment (e.g. fish, non-target plants, or human health).

4. Comment: The *Summary* does not indicate how the health effects of herbicide use have been factored into the analysis of the cost-effectiveness of herbicide use.

Response: The EIS includes, and the *Summary* summarizes, the potential risks from both herbicides and invasive plants to human health and the environment. These discussions, particularly the effects of invasive plants on the environment, are often qualitative; the financial value of a healthy ecosystem is difficult to quantify, and no numerical comparison of environmental risk versus benefit is possible. Individual Risk Assessment Tools currently being prepared by the BLM National office for each herbicide will help site-specific plans evaluate any human and environmental health risks associated with proposed and alternative treatments. No human health effects are factored into a cost-effectiveness equation because no increase in health care or other health costs are associated with herbicide use described by the alternatives.

5. Comment: The *Summary* discussion of herbicide use along rights-of-way and recreation sites dwells on the positive without mentioning that the additional herbicides would negatively affect soil, air, water, native plants, wildlife, and humans.

Response: The *Summary* does not include such a discussion because the EIS analysis indicated that the proposed uses, with implementation of Standard Operating Procedures and PEIS Mitigation Measures, presented very little risk to the environment. However, the *Summary* has been combined with the rest of the EIS, and a reference to the *Comparison of the Effects of the Alternatives* section in Chapter 2 has been added to the *What are the Effects of the Alternatives* section in the *Summary*.

Chapter 1 – Purpose and Need

6. Comment: The *Need* and *Purposes* are so narrowly construed as to preclude consideration of the various impacts of individual herbicides, application methods, or treatment objectives as a factor in decision-making.

Response: The *Need* narrowly focuses on herbicides because other elements of weed prevention and control are currently available and being implemented to the maximum extent practicable. Twenty-five years of being limited to four herbicides, and those being only available for noxious weed control, has assured development and heavy reliance on prevention, early detection, and control using non-herbicide methods.

Regarding consideration of the individual herbicides, the alternatives are structured to display different mixes of herbicides and treatment objectives. The objectives of Alternative 3 are all included in Alternative 4 (the Proposed Action) and Alternative 5, but Alternatives 4 and 5 each add additional treatment objectives and additional herbicides. In addition, Alternative 5 permits aerial application west of the Cascades, while Alternatives 3 and 4 do not. A discussion of the potential for each herbicide to have adverse effects on each resource is included in most of the resource sections; a 2,4-D discussion has been added as Appendix 12 and additional information about the specific uses of each herbicide has been added to Chapter 3 to supplement information already included on the "Herbicide Information" table at the start of Chapter 3, Table A9-2, and elsewhere. This information will allow the decision-maker to consider individual herbicides, treatments, and region of the State, with respect to environmental risk. The *Decision to be Made* section in Chapter 1 notes the decision-maker can add or delete individual herbicides from the selected alternative in the Record of Decision.

The only area where the analysis does not describe the effects of dropping individual herbicides is in the calculation of weed spread. Table A9-2 provides information about which herbicides control which target plant, and several of the potential target plants are susceptible to only one of the available herbicides. Beyond this, the implications of dropping a single herbicide are discussed more qualitatively. The EIS did not attempt to identify the high-priority control species and then analyze the implications of excluding individual herbicides from Alternative 3 because: a) priorities will likely change over the 15-year life of the EIS; b) there is no complete inventory of all invasive plant populations, so priorities and emphasis might change with additional information; c) the needs and priorities of the Oregon Department of Agriculture, cooperators, and adjacent landowners will vary by geographic area and time; and, d) with the possible exception of 2,4-D (see Appendix 12), the estimate of future noxious weed spread rate under Alternative 3 is too gross to reveal the implications of eliminating individual herbicides. A discussion of this analysis weakness in this area has been added to the *Incomplete and Unavailable Information* section early in Chapter 4.

Within the constraints of the existing data, the BLM considered having additional alternatives between Alternative 2 (the No Action Alternative) and Alternative 3, to examine the implications of removing specific herbicides from Alternative 3. The BLM determined there would be little discernable detectable difference between such alternatives (not already made clear by the individual herbicide discussions), in part because Standard Operating Procedures, PEIS Mitigation Measures, site-specific planning, and other measures minimize the likelihood of adverse effects to resources regardless of the alternative, and in part because resultant differences in weed spread could not be reasonably estimated.

7. Comment: The *Need* and *Purposes* seem to be narrowly construed to allow for, and promote the increased use of, herbicides, rather than to effectively prevent and control the spread of invasive plants, which is more in the public interest.

Response: Chapters 1 and 2 have both been edited to clarify that the alternatives are all set in the context of the existing vegetation management program, where the prevention and early detection of noxious weeds and other invasive plants has, and will continue to have, primary emphasis. Those elements of the program are common to all alternatives, and are already authorized or assumed in existing Land and Resource Management Plans (Appendix 6) and district weed management Environmental Assessment documents.

Increases in the acres treated with herbicides under the action alternatives are predicted in part because the four herbicides currently available (and acres treated with non-herbicide methods) are not effectively controlling the spread of invasive plants.

8. Comment: The scope of the EIS is too broad; herbicide use beyond noxious weed control requires greater analysis and public input. The EIS proposes that additional herbicides would be used to, "treat any vegetation to meet safety and operation objectives in administrative sites" [including schools and parks], and to "…treat any vegetation as needed to control pests and diseases," and to, "…treat any vegetation to achieve habitat goals specified in approved Recovery Plans…" The BLM must specifically state what is covered and what is not. The scope is wide open and would allow all types of actions outside of the main intent to control high priority plants. A program of this magnitude requires a detailed analysis of environmental impacts that cannot be deferred until a later time.

Response: The EIS is not a vegetation management plan; the need to manage vegetation is well established in Land and Resource Management Plans and other plans, law, policy, existing district Environmental Assessments, and by State and National policy. The EIS also does not analyze projects. The acres in the analysis are simply annual estimates of the types of projects that would be identified and analyzed at the district level. The EIS is primarily a cumulative effects analysis of a proposal to, consistent with the PEIS selected alternative, permit the use of additional herbicides as one tool to meet existing vegetation management objectives.

Herbicide uses proposed in Alternative 3 are similar to Alternative 2 (No Action), adding relatively minor herbicide use for non-noxious invasive plants and pest and disease control to an otherwise existing program. Alternative 3 would reduce (when compared to Alternative 2) the total pounds of herbicides that would be applied and would reduce the number of acres treated annually with herbicides having a moderate public and worker health risk category (the EIS does not propose to add any herbicides in the high risk category). This portion of the analysis addresses the use of *different* herbicides in a portion of the vegetation management program that is already using herbicides. The scope of the analysis, therefore, is limited to an examination of herbicides and related effects. The potential for these herbicides to slow the spread of invasive weeds, and the environmental advantages of that slowing, are also considered.

The comment suggests that adding herbicides for rights-of-ways and other uses in Alternative 4 (Proposed Action) and Alternative 5 are a whole new program area for herbicides and warrants a more detailed analysis and program justification than presented in the EIS. The EIS suggests, however, that the uses proposed in Alternatives 4 and 5 are not so different from those suggested by Alternative 3. The BLM is already managing vegetation in these areas, and BLM cooperators are already using herbicides to meet their safety and maintenance responsibilities on adjacent lands. Most of the estimated herbicide treatment acres would replace, acre for acre, vegetation treatments that are already taking place using mowers and other non-herbicide methods. (The remainder, at least under Alternative 4 (the Proposed Action), would be for Conservation Strategy-specified, but currently undone, habitat improvements for Special Status species[1].) Herbicides would only be used for a small percentage of these currently ongoing vegetation treatments. Each of these Alternative 4 (the Proposed Action) and 5 objectives would be subject to their own site-specific Environmental Assessment or EIS analysis; district weed control Environmental Assessments would only address invasive plant control. Since this EIS examines the cumulative effects of herbicide use on BLM lands in Oregon, it is correct that it should also cover the future estimated level of these additional uses. The *Need* and *Purposes* recognize, at the programmatic scale, the BLM's obligation to manage vegetation. The alternatives correctly propose making additional tools available. The information available about risks, as well as the Standard Operating Procedures and PEIS Mitigation Measures, all comport to these additional uses. The analysis considers the nature of these uses from an herbicide effects standpoint. The resultant estimated level of use is adequate for the examination of cumulative effects, but it is not a commitment or approval for specific projects.

It should be noted that the analysis carefully separates the invasive plant control objective from the administrative sites and habitat improvement objectives, taking care not to justify one with the other (although the likelihood of some incidental invasive plant control from native vegetation roadside herbicide treatments is identified). The conclusions in most resource sections that invasive plants will cause more adverse effects than the proposed herbicides, for example, applies only to the invasive plant control portion of the proposal. Any decision to adopt the additional administrative areas and habitat improvement treatments would need to be based upon EIS-described risks and benefits specifically related to those objectives.

The *Comparison of the Effects of the Alternatives* section in Chapter 2 has been edited to more clearly separate and display the effects of invasive plant control versus the effects of the administrative sites and habitat improvement objectives added in Alternatives 4 and 5. The Record of Decision will also address these two aspects of the decision separately.

9. Comment: The 1.2 and 5 million acre figure for current noxious weed and invasive plant infestations seems purposefully alarmist when it is admitted in the small print footnotes that an undisclosed number of these acres may only contain a few invasive plants per acre.

Response: The sentence states, "About 1.2 million of the 15.7 million acres of BLM lands in Oregon are currently infested <u>at some level</u> with noxious weeds…" (emphasis added), and then footnotes that "some level" ranges from monocultures to a few plants per acre. Given that most invasive plants spread exponentially once they have become established, the BLM is rightfully concerned that there are noxious weeds on 1.2 million acres. While some of these acres may never become fully occupied, in part because biological controls help limit population densities of some weeds, native species and other environmental values are compromised. Other areas have become monocultures, with most or all native plants totally excluded. The five million acre figure was derived from satellite imagery, and on those acres, invasive annual grasses are dominant. A map of these acres east of the Cascades is included in the *Fire and Fuels* section in Chapter 4.

There is no estimate of net acres occupied with noxious weeds on BLM lands. One study of 21 noxious weeds in Oregon estimated that 32 million infested acres represented 6.5 million net acres or about 20 percent (Radke and Davis 2000)(see *Noxious Weeds and Other Invasive Plants* in Chapter 4). Assuming that ratio applied to BLM lands and all noxious weeds, the current 12 percent annual noxious weed spread rate would result in 1.2 million net acres, and 6 million infested acres, in about 15 years.

1 The Special Status Species Program includes species listed as Threatened or Endangered, proposed for listing, as well as Bureau Sensitive species

10. Comment: The *Purposes* do not present compelling needs for herbicide use. *Purpose* 3 fails to acknowledge natural cycles of western juniper expansion; *Purposes* 3 and 4 suggest herbicides can cure problems caused by livestock grazing, off-highway vehicles (OHVs), roading, and other invasive plant pathways; *Purpose* 5 suggests the BLM should adversely impact the environment because their neighbors are doing it; regarding *Purpose* 6, having more herbicides will not reduce wildlife effects unless the more toxic herbicides are dropped; and so forth.

Response: The *Purpose* statements are not required to present a compelling need. The statements are broad management objectives or issues that the *Need* and scoping comments identified as desirable, and thus are extensions or clarifications of the *Need*. The general discussions under each *Purpose*, however, are suppositions for how the alternatives might help. Whether or not the alternatives *actually* help meet the *Purposes* and whether adverse effects result from the process, are the subject of the analysis in Chapter 4. Thus, the truth, significance, and importance of the discussion under each *Purpose* is to be confirmed or rejected by the subsequent analysis in the remainder of the document. The decision-maker will determine which alternative best meets the *Need* and *Purposes* by examining the analysis described in Chapters 2 and 4.

11. Comment: Regarding *Purpose* 2, there is no compelling need to spray native vegetation with herbicides. Spraying along roads and within recreation sites will expose my family to herbicides.

Response: The *Purposes* represent issues or subdivisions of the *Need* for analysis purposes. The analysis in Chapter 4 (and summarized in Chapter 2) will be used by the decision-maker to determine the degree to which this and other *Purposes* are met, including *Purpose* 6, “prevent herbicide control treatments from having unacceptable adverse effects to applicators and the public,…” Reasons for using herbicides in these areas include: control of invasive plants too small to be detected by invasive plant control crews; control of native plants injurious or fatal to recreation site users like poison oak and water hemlock; cost savings of about $1 million per year that could be transferred to other maintenance budgets or returned to utility subscribers; fire protection around communication sites, transmission poles, and other improvements; reduced worker injury from non-herbicide methods – particularly those from chainsaw use on steep slopes under power lines; and, reduced site-disturbance. The *Human Health and Safety* section shows that herbicide applications following label and Standard Operating Procedure requirements will present an extremely low risk to public travel, recreation, and even consuming sprayed forest products like berries and mushrooms. Sprayed areas would be signed for hours to days as required by the herbicide label and Standard Operating Procedures. The decision-maker will weigh these and other points to determine whether the benefits support selection of this portion of the Proposed Action (Alternative 4).

12. Comment: What is the target species for the habitat improvement suggested by *Purpose* 3 and permitted in Alternatives 4 and 5? Many birds and amphibians are particularly susceptible to herbicides, and many animals depend upon plants to survive.

Response: Habitat improvement treatments under Alternative 4 (the Proposed Action) would be those directly accomplishing needs identified in Conservation Strategies or plans identified in Endangered Species Act recovery or delisting plans. For example, imazapic might be used to control medusahead invading the North Bank Habitat Management Area, an important habitat area near Roseburg at the core of the southern population of the recently delisted Columbian white-tailed deer. Maintenance of habitat in this area is identified in the *Post-Delisting Monitoring Plan for the Douglas County Distinct Population Segment of the Columbian White-tailed Deer* (USDI 2006d) as critical to continued recovery of the white-tailed deer. Any herbicide use would be subject to site-specific analysis that would help identify the potential for harm to other species in the area. Many of the proposed habitat improvement treatments under Alternative 5 would benefit sage grouse, and would be subject to site-specific analyses.

Proposed Action

13. Comment: The massive escalation in herbicide-affected acreage, and the sudden inclusion of up to 14 additional herbicides, means that the past policies of the BLM have failed. It is evident that the BLM is trying to remedy its past failure by sudden remedial measures.

Response: The number and acreage of invasive plants in Oregon continues to increase in all land use allocations. In general, this increase is driven by increased human mobility, international trade, increased recreational use of wildlands, and many other factors. The BLM in Oregon has been restricted to using only four herbicides since a 1984/87 court injunction. An increase in the number of herbicides, needed for some time and now proposed by this EIS, is made possible in part by the recent completion of herbicide Risk Assessments. Additionally, several of the proposed herbicides have been developed since the BLM's last (USDI 1989) EIS addressing herbicide use in Oregon.

Of the predicted 13,600-acre increase in herbicide treatments of invasive plants under the action alternatives (when compared to the No Action Alternative), 11,500 acres would be with imazapic. Almost all of this would go to controlling medusahead east of the Cascades, an invasive annual grass not well controlled by the four herbicides currently available and therefore spreading relatively unrestrained. Treatment of the remaining 2,100 additional acres generally represents opportunities for controlling invasive plants not reasonably controllable with the four herbicides currently available, or by non-herbicide methods. Examples include perennial pepperweed and saltcedar. With this acreage increase, total pounds of herbicides used for invasive plants would decrease 35 percent when compared to the No Action Alternative.

Additional herbicide acres are proposed for administrative sites and habitat improvement under Alternatives 4 and 5, but these are not related to invasive weed spread.

Alternatives to the Proposed Action

14. Comment: The EIS only fully considered alternatives that would lessen protections for BLM forests and watersheds. These would fail to meet BLM's obligations to protect Federally Listed species and provide for recovery, protect clean water, provide for recreation, and protect clean water and wildlife habitat.

Response: None of the alternatives would "lessen protections" for BLM forests and watersheds. Alternative 3 would lessen the total pounds of herbicides applied per year when compared to Alternative 2 (No Action). Alternatives 3 and 4 would decrease the average pounds per acre applied, and decrease the acres treated with high and moderate-risk herbicides, when compared to Alternative 2. The analysis relies on a large body of evidence and experience when it determines that invasive plants are adversely affecting virtually all resource values. An increase in the number of herbicides available would increase the likelihood that local managers would be able to select an herbicide that would control problem weeds while also protecting non-target resources. The analysis indicates water, fish, wildlife, and other resource values are at little risk from the herbicides, herbicide use levels, and applications examined in the EIS. The EIS, and subsequent site-specific projects, are subject to Endangered Species Act consultation.

15. Comment: There needs to be an alternative focused on prevention, particularly in view of the need to avoid adding to the anthropogenic causes of climate change.

Response: Prevention is already the BLM's first priority for invasive weed control (see *Integrated Vegetation Management* in Chapter 3). The EIS analysis does not support the position that an increase in the number of herbicides available for use would change the BLM's contribution to climate change. The *Air Quality* section in Chapter 4, for example, found the Proposed Action (Alternative 4) would result in the lowest levels of particulate matter of any alternative. Total pounds of herbicide used specifically for invasive plant control would decrease under the action alternatives when compared to Alternative 2 (No Action), and the additional herbicide use proposed for administrative sites, recreation sites, and rights-of-way would simply replace treatments currently done with non-herbicide methods. The *Implications of the Alternatives on Climate Change* section in Chapter 4 indicates plant community changes could have both positive and negative effects on climate change.

16. Comment: Effective cultural, mechanical and biological treatments should be considered in all situations and utilized when they are likely to be as effective as chemical treatments. The alternative should limit herbicide use to rare cases in small areas where absolutely no other alternative exists, or as a last resort when other options have proven to be inadequate, ineffective, or inefficient.

Response: Existing policy may not be significantly different from that suggested in the comment. The BLM's Integrated Vegetation Management policies, described in Chapter 3, require BLM to accomplish pest management through cost-effective means that pose the least risk to humans, natural and cultural resources, and to the environment. Additional information describing the BLM's treatment method selection process has been added to this section. The process strikes a balance between providing adequate tools for managing vegetation and protecting the environment, while assuring protection of the environment from those tools themselves. Non-herbicide treatment methods are not always gentler on the environment and human health.

17. Comment: If the "additional, generally newer, herbicides are more target-specific, can be used in lower doses, and are generally less likely to adversely affect non-target plants and animals than the four herbicides currently in use," why is there no alternative that would drop the current four in favor of the new ones?

Response: The statement is a general one, and use of the currently available four herbicides would decrease even under Alternative 4, where total acres and treatment objectives are substantially increased. However, because most of the newer herbicides are more target-specific, an alternative completely without the current four herbicides would effectively control fewer of the noxious weeds than the No Action Alternative (see Table A9-2).

18. Comment: Weeds are spreading at an estimated 144,000 acres per year, but the Proposed Action (Alternative 4) would only treat 58,400 acres annually (all methods). The EIS should include an alternative that treats more than 144,000 acres per year.

Response: The EIS does not fully examine the size of the Oregon BLM invasive plant control program, but considers options within current budget trend constraint. Within that budget constraint, the *Need* indicates additional or more effective tools are necessary. The only additional efficiencies known beyond those already available to the BLM in Oregon is the availability of additional herbicides. The treatment acres estimated for each alternative are estimated only for effects purposes, are limited by the current budget trends assumption, and are not goals in themselves.

An examination of the size of the overall invasive plant control program is beyond the scope of this analysis. Such an examination would need to consider the specific effects and practicality of control for specific weeds or groups of weeds. Several noxious weeds, such as Himalayan blackberry, occupy more than one million acres statewide (all ownerships). Well-established, widespread weeds are often treated in specific locations such as in critical habitats, or in newly infested areas, but remaining areas are generally treated with biological controls or not at all. While biological controls seldom eliminate a weed, they can reduce their dominance and allow restoration of some portion of normal ecosystem function. These acres are not reflected in the estimated annual treatment acres under each alternative; biological control numbers on Table 3-3 are "releases." See *Noxious Weeds and Other Invasive Plants* in Chapter 4 for additional information.

Non-BLM Actions Potentially Affecting the Use of Herbicides on BLM Lands in Oregon

19. Comment: The National Marine Fisheries Service is examining the effects of 37 pesticides, including 2,4-D, diuron, and triclopyr BEE, on protected salmon and steelhead. The BLM states that they will stop using these chemicals when and if the Environmental Protection Agency (EPA) and/or National Marine Fisheries Service find them to be harmful. Rather than using these chemicals until they are found to be lethal or detrimental to the environment or human health, the BLM should stop using them until they have been found to be safe for fish and humans.

Response: The National Marine Fisheries Service is completing Endangered Species Act consultation on 37 pesticides the EPA determined "may affect" anadromous fish. As part of that consultation, the National Marine Fisheries Service would determine if protective measures for these fish are needed and what they would be. Their review is not expected to address other elements of the environment, nor human health. The alternatives include Standard Operating Procedures and PEIS Mitigation Measures that limit risks to non-target species (Appendix 2), and even stricter Conservation Measures near water containing Threatened, Endangered, and Proposed species (see Appendix 5). The BLM would also follow whatever protection measures result from the EPA/National Marine Fisheries Service consultation. These protection measures could include banning some or all of these pesticides, but it would be premature to assume that they would.

20. Comment: In the Northwest Coalition for Alternatives to Pesticides / National Marine Fisheries Service Settlement Agreement to Examine 37 Pesticides, the EIS states that the proposed use of 2,4-D, triclopyr BEE, and diuron is not likely to substantially contribute to anadromous fish effects. The BLM should not make this assumption before the studies are completed, and the BLM should not use any herbicides until studies are complete.

Response: The BLM has done extensive analysis to study the effects of all of the proposed herbicides, and has adopted Standard Operating Procedures and PEIS Mitigation Measures to limit effects to non-target species. These include maintaining buffer distances from bodies of water, using spot treatments, and minimizing use near fish-bearing water bodies. The BLM estimated uses would be less than 1% of the 2,4-D in the State, less than 2% of the diuron, and less than 4% of the triclopyr (*Cumulative Impacts,* Chapter 4), the analysis documented in the *Fish* section in Chapter 4 indicates the BLM is unlikely to substantially contribute to anadromous fish effects.

21. Comment: As described near the beginning of Chapter 4 in the Draft EIS, the Natural Resources Defense Council has petitioned the EPA to revoke all food and water residue tolerances and cancel all registrations for 2,4-D. The BLM should suspend any consideration of 2,4-D until the EPA has completed its review and issued final guidance on its permissible uses.

Response: The description mentioned in the comment has been moved to the end of Chapter 1, to a new section called *Non-BLM Actions Potentially Affecting the Use of Herbicides on BLM Lands in Oregon.* It is the BLM's understanding that the EPA is currently seeking comments on the Natural Resources Defense Council petition, not conducting a 2,4-D "review." The BLM is following current EPA guidance on permissible uses. The EPA completed a Reregistration Eligibility Decision of 2,4-D in 2005, and the Forest Service completed a new Risk Assessment for 2,4-D in 2006.

22. Comment: As a result of a lawsuit filed against the EPA by the Washington Toxics Coalition in 2002, a Federal judge ordered (in 2004) that "buffer zones" be placed around salmon bearing streams for the application of several pesticides including 2,4-D, diuron, and triclopyr BEE. The buffers include a 20 yard no application zone adjacent to salmon bearing waters when specific pesticides are being applied by ground methods and a 100-yard buffer during aerial applications to protect Threatened and Endangered salmon species. The stream buffers of 10, 25, and 100 feet for hand, broadcast, and aerial spray should be revised for 2,4-D, diuron, and triclopyr BEE to meet that Federal Court order.

Response: A subsection addressing this issue has been added to the *Non-BLM Actions Potentially Affecting the Use of Herbicides on BLM Lands in Oregon* section in Chapter 1. The court order stems from a finding that the EPA had not completed consultation with the National Marine Fisheries Service on registration labels permitting pesticide applications near certain salmon-bearing streams. Since the original issue was consultation, the order setting larger stream buffers contains an exception for agency programs subject to National Marine Fisheries Service consultation. Because the BLM consulted with the National Marine Fisheries Service on the PEIS, is consulting on this EIS, and will consult again on site-specific projects, the herbicide use proposed in this EIS fully meets the provisions of this exception.

23. Comment: Directed by the State legislature, the Oregon Department of Environmental Quality has developed a comprehensive list of toxic pollutants related to surface waters in an attempt to protect human health and the environment. The BLM's proposed use of herbicides runs counter to Oregon Department of Environmental Quality's and the State Legislature's intent to reduce such herbicide use.

Response: The Oregon Department of Environmental Quality's list of toxic pollutants includes 118 water pollutants, including mercury, DDT, and PCBs. The list does not include any of the 18 herbicides analyzed in this EIS.

24. Comment: The Draft EIS does not discuss the draft Oregon Department of Environmental Quality Priority Toxics Focus List that indentifies diuron, glyphosate, and 2,4-D as toxics warranting analysis for reduction.

Response: A subsection discussing this issue has been added to the *Non-BLM Actions Potentially Affecting the Use of Herbicides on BLM Lands in Oregon* section in Chapter 1. The draft list identifies State of Oregon program priorities for these three herbicides. All three will be analyzed for their effects to land quality as a household hazardous waste, and to water quality because they are Pesticides of Interest (see the *Water Resources* section in Chapter 4 for more information) and are on the Willamette Toxics Monitoring Program Analyte List. In addition, diuron is on the Drinking Water Source Monitoring Program Contaminant List.

The Proposed Action (Alternative 4) would reduce the use of 2,4-D and glyphosate when compared to the No Action Alterative (Alternative 2). Standard Operating Procedures and PEIS Mitigation Measures do not allow the use of diuron anywhere near water. If these herbicides were identified as toxics needing further reduction, the BLM would follow any applicable, resulting regulations for these herbicides.

25. Comment: The EPA has only just begun reviewing herbicides for endocrine disruption, so the EPA and BLM don't really know which herbicides are endocrine disruptors..

Response: Presented with evidence that some materials could be endocrine disruptors, Congress instructed the EPA to initiate an endocrine disruptor screening program to screen pesticide chemicals and environmental contaminants for their potential to affect the endocrine systems of humans and wildlife. The EPA has identified an initial list of 67 "Tier 1" pesticides for screening, but have announced that "nothing in the approach for generating the initial list provides a basis to infer that any of the chemicals selected interfere with or are suspected to interfere with the endocrine systems of humans or other species" (EPA 2010). A discussion of this screening has been added to Chapter 1. The BLM conducted its own review of endocrine disrupting potential for the 18 herbicides addressed in this EIS (see *Potential Endocrine Disrupting Chemicals* in the *Human Health and Safety* section in Chapter 4). None of the herbicides have any mention in the literature of having endocrine disruption effects with the exception of diuron and 2,4-D, and evidence is inconclusive for these two herbicides.

Chapter 2 – The Alternatives

26. Comment: The alternatives are weighted in favor of herbicide use and are hence unfairly stacked.

Response: The BLM has a need to manage, protect, and restore vegetation. Some of this need arises from the variety of uses that take place on BLM lands, and some arises from the intrusion of invasive plants, and wildfire. The BLM is already managing vegetation in a variety of ways to meet this need, and a full range of management tools is available, authorized, and being used - with the exception of herbicides. Since all of the districts' Land and Resource Management Plans already consider and prescribe noxious weed and other vegetation management, the EIS was designed primarily to examine the cumulative effects (statewide) of making additional herbicides available as additional tools available for use on BLM lands in Oregon to meet existing management priorities.

27. Comment: The Draft EIS pretends to offer five alternatives but admits Alternatives 1 and 2 are only for comparison. In reality, the range of alternatives represented by Alternatives 3 through 5 is too narrow. There should be an alternative that eliminates the most toxic herbicides.

Response: The Draft EIS noted that only Alternatives 3, 4, and 5 would meet the *Need*. Nevertheless, the inclusion of a non-herbicide reference analysis as "Alternative 1" was confusing. The Final EIS keeps the analysis, but clearly labels it as a "Reference Analysis." It is included to help provide a baseline from which herbicide and weed spread effects can be measured or described. The other alternatives retain their Alternatives 2, 3, 4, and 5 Draft EIS designations to avoid confusion between alternatives in the Draft and Final EIS. The No Action Alternative (Alternative 2) is required by National Environmental Policy Act (NEPA) regulations.

This EIS tiers to, and incorporates the analysis in, the 2007 PEIS, which examined several other alternatives. In this EIS, an action alternative that allowed for fewer than 11 herbicides was not developed because the Standard Operating Procedures, PEIS Mitigation Measures, site-specific planning, and other requirements address concerns about the toxicity of individual herbicides proposed in Alternative 3. A shorter list of herbicides available would be less likely to meet the need for action, but would not result in less harmful herbicide exposure. However, the decision-maker could decide to remove one or more herbicide active ingredients in the final decision as explained in the *Decision to be Made* section in Chapter 1.

28. Comment: In the description of Alternatives in Chapter 2 of the Draft EIS, the no herbicides alternative is discounted with no analysis or explanation.

Response: Since every element of Alternative 1 is currently available to, and being used by, the BLM in Oregon now as part of the current direction, and since the discussion of the *Need* indicates the current direction is not adequate, Alternative 1 by definition does not meet the *Need*. For this reason, it was incorrect to include it as an Action Alternative in the Draft EIS. However, since the analysis of this alternative did provide a valuable benchmark from which to measure the effects of using herbicides, even at current levels, it has been retained in the Final EIS as a "Reference Analysis." Preliminary analysis indicates if this remained an "alternative" and was selected, it would have a negative effect on the accomplishment of the *Need* and most, if not all, of the eight *Purposes*, when compared with the No Action Alternative (Alternative 2).

29. Comment: The potential success of a no herbicide alternative was underestimated because it did not consider the potential for American Reinvestment and Recovery Act (ARRA) funds to provide weed control jobs.

Response: The EIS used a current budget trends assumption. The BLM requested and received economic stimulus funds for weed control. However, it would be hard to quantify how this temporary funding increase might disproportionately affect a no herbicides alternative (the Reference Analysis in the Final EIS) because all alternatives include non-herbicide treatments. Since the weed control need exceeds the potential funding and workforce, it is likely stimulus moneys would have been used for all kinds of treatments, not as a substitute for herbicides. Stimulus funds are not long-term; recent federal budget predictions indicate BLM funding will be declining for the next three years.

30. Comment: The EIS does not acknowledge that the "no herbicides" policy used by the Eugene District, rather than failing to manage weeds, has put forth a concerted effort to employ nontoxic weed control methods already proven effective. The creation of green jobs is supposedly a high priority for the government, and manual removal of weeds is an ideal opportunity to employ rural residents in economically struggling communities.

Response: On the Eugene District, the use of both manual and mechanical control methods has been a cost effective way to get invasive plant control work done mainly because of the Secure Rural Schools Act funding, which has provided inmate and youth workforces. This funding source is not expected to continue. With a decrease of funding, treatments will need to be cost-effective. Manual and mechanical control has been successful primarily on small populations of target species and where multiple years of treatment have finally exhausted plant resources. Both mechanical and manual control work are expected to continue in selected areas on target species. Certain species or certain sizes of infestations, however, cannot be effectively controlled without the use of herbicides. The current practice of cutting or mowing these areas annually to reduce seed production, never actually eradicates the weeds. Because of that, the BLM in the Eugene area has not been able to increase control efforts beyond a set of selected sites, thus limiting the progress made on invasive plant eradication on a landscape scale. In addition, restoration efforts for critically Endangered and Threatened plant species and other susceptible habitats that are currently being invaded cannot be effectively recovered without herbicide treatments. Infestations of new species will require a rapid response and effective treatment, which manual and mechanical treatments may not provide.

31. Comment: What is the current policy for herbicide use on BLM lands in Oregon? Is it permissible to spray any "native vegetation," or only vegetation that has been declared a noxious weed?

Response: With a minor exception for glyphosate use to control Sudden Oak Death in 2009-2010, and European beach grass control in Curry County 2009-2011, only 2,4-D, dicamba, picloram, and glyphosate may be used, and these may only be applied to county, State, or Federally Listed noxious weeds. Oregon State's June 2010 list of 120 noxious weeds is shown on Table A7-1 in Appendix 7. The current policy is represented by Alternative 2 (No Action) in the EIS.

32. Comment: The EIS does not make it clear if spraying of regeneration harvest units would be allowed under any alternative, and if aerial spraying of regeneration harvests is allowed under the No Action Alternative (Alternative 2) and Alternative 5.

Response: Spraying within harvest units would be allowed, but not because they are harvest units. The herbicide uses that would be permitted under each alternative including the No Action Alternative (Alternative 2) are described in *The Alternatives* section in Chapter 2. The alternatives exclude herbicide use "specifically for livestock forage or timber production." However, noxious weed control could occur in harvest units under Alternative 2 (No Action), and invasive weed control could occur in harvest units under any of the action alternatives, either to control a new infestation or as part of a broader attempt to control an invasive plant population in a geographic area. Aerial application could be used west of the Cascades in Alternatives 2 (as it is now) and 5, but its use would be rare. These treatments would not target native plants, even if they were competing with planted trees. The first two paragraphs in the *Timber* section in Chapter 4 provides additional detail.

33. Comment: Applying six different herbicides in lakes and streams is too many.

Response: As noted in Chapter 1, Purpose 6, having more herbicides available generally increases the opportunity to control the target species while minimizing the effects to non-target plants and other organisms. Having additional herbicides registered for aquatic use available increases the likelihood of having an herbicide available that will meet specific control objectives while minimizing environmental risk. The aquatic herbicide diquat is not included in the Proposed Action (Alternative 4). Normally only one of these herbicides would be used at any given time or place. Aquatic applications normally involve considerable need and interagency planning.

34. Comment: The Draft EIS states in Chapter 1 that it "does not propose the use of herbicides specifically for commodity production such as projects to improve timber growth or livestock forage." This statement is not reflected in the rest of the EIS. Throughout the EIS, the BLM describes how vegetation affects commodities and economics, and bases the need to remove weeds on commodity production. For instance, the EIS describes how ranching and logging on lands adjacent to BLM will commercially benefit by the BLM using herbicides; how herbicides will be used to control Sudden Oak Death because the BLM needs to protect the local nursery industry, and how herbicides are needed to protect tree-plantations from undesirable weeds that "slow regeneration and tree seedling growth." There is an entire section on the environmental consequences on timber production.

In fact, everything from roadside spraying to facilitate log truck passage, to maintenance of utility rights-of-way, to cheatgrass spraying to increase cattle grazing, is aimed at greater commercial production and higher economic return. The BLM misspoke when claiming commodity production has nothing to do with their proposal to use additional herbicides.

Response: The term "commodity production" was broader than the EIS intended, and this term has been replaced with "specifically for livestock forage or timber production" to better describe the limits intended in the analysis. Herbicide use specifically for livestock forage or timber production is not included under any of the alternatives. As noted in the comment, however, herbicide uses proposed in the EIS would have economic benefits.

35. Comment: Aerial spraying west of the Cascades should be an option in all alternatives. In many cases, helicopters are actually more of a necessity west of the Cascades because of the steep terrain. Limiting vegetation treatments to ground methods on steep terrain presents both safety issues for individual ground applicators and unnecessarily high costs. Western Oregon has many remote areas away from people, population centers, and water, and the risk to humans or any resource is low to negligible. These areas would qualify for treatment with helicopters and their use should be considered on a case-by-case basis.

Helicopter application technology has advanced in the past few years allowing applications to be done with safety and precision. The use of shape files with a Satloc® navigation system and half-boom applications along streams and property lines are several recent and well-used techniques. A National Spray Drift Task Team has concluded, "With good drift management practices, drift can be practically reduced to zero."

Because helicopters can be more productive, treatments that are more effective would be realized when small "windows" of treatment opportunities exist due to weather, weed development, or other factors. Effective weed treatments would therefore reduce the need for re-treatments and reduce the overall use of herbicides. For most herbicides, including 2,4-D, potential exposure to applicators is less when applied by helicopter. Eliminating aerial application from Alternatives 3 and 4 (the Proposed Action) needlessly constrains attainment of the *Purposes* and *Need*.

Response: Aerial application is proposed to remain a tool east of the Cascades under all alternatives, and west of the Cascades in Alternatives 2 and 5. Aerial application is excluded from Alternatives 3 and 4 west of the Cascades in part because of a lack of need, and formalizing that point in the EIS simplifies the analysis and more clearly defines (for the public and the resource effects descriptions in the EIS) the range of treatments that could be expected. No districts west of the Cascades are currently using aerial methods for the control of noxious weeds, even though aerial methods are permitted under the No Action Alternative (Alternative 2). Potential needs for aerial applications under Alternatives 3 and 4 (the Proposed Action) were considered. These included the possibility of treating large expanses of invasive annual grasses in oak savannah types in the southern part of the State or in the North Bank Habitat Management Area near Roseburg; treating Portuguese broom within its relatively small infested area near Roseburg; and, treating transmission corridors, particularly those with pipelines or other improvements permitting relatively low application height. The likelihood these treatments would be proposed, and that their objectives could not be reasonably met using non-aerial methods, was small compared with the benefits of simply excluding these treatments from Alternatives 3 and 4.

36. Comment: The BLM does not currently do aerial application of the four herbicides currently used. Therefore, Alternative 2 should also prohibit aerial spraying to be a true No Action Alternative.

Response: There is currently no prohibition against aerial herbicide applications in Alternative 2. Chapter 3 *Treatment Methods* shows about seven percent of the herbicides currently used by the BLM in Oregon against noxious weeds are applied aerially, all east of the Cascades. No aerial applications have been done west of the Cascades in recent memory, but the spread of noxious weeds such as medusahead rye in oak savannah habitats could conceivably lead to such proposals. Alternatives 3 and 4 (the Proposed Action) exclude aerial application west of the Cascades.

37. Comment: Alternative 4 (the Proposed Action) should not include 2,4-D, given this herbicide's potential for adverse health effects in humans, fish, birds, invertebrates, and wildlife in general.

Response: Concerns with 2,4-D were raised during scoping and again during the public comment period on the Draft EIS. At each of these steps, the BLM has carefully considered its risks, available mitigation measures, and its potential role in meeting the *Need* to decide whether to continue to keep it in one or more of the action alternatives. A summary of information reviewed after the public comment period on the Draft EIS is included in Appendix 12. In short, reasons for keeping it in the action alternatives in the Final EIS include:

1) The districts have considerable experience with this herbicide and its effects on target and non-target vegetation, and have been using it without incident since 1987;
2) the total statewide use under the Proposed Action is projected to decrease by one-third when compared to the No Action Alternative (Alternative 2);
3) approximately half of the 2,4-D acres would be treated with ounces per acre as a part of tank mixes (although it is acknowledged the Risk Assessment does not find that this necessarily reduces risks), and;
4) 2,4-D remains an effective, selective herbicide that is often the best choice for many situations and is thus crucial for meeting the *Need*.

Site-specific herbicide selection would continue to be guided by BLM policy that requires weed control "through cost-effective means that pose the least risk to humans, natural and cultural resources, and the environment" (USDI 2007e).

For any herbicide or use, the decision-maker may modify the selected alternative to remove an herbicide or modify its use, if the environmental effects of such a change are reasonably clear. A discussion of this possibility has been added to the *Decision to be Made* section in Chapter 1. Additional information about the uses and need for each specific herbicide has been added to Appendix 9.

38. Comment: 2,4-D should not be used on public lands because it can vaporize and cause effects miles from the application site, particularly to ultra-susceptible crops like wine grapes.

Response: The *Native and Other Non-Invasive Vegetation* section in Chapter 4 has been edited to note that grapes can be ultra-susceptible to 2,4-D and can be damaged for a considerable distance downwind of application sites. This sensitivity is also mentioned on 2,4-D product labels, and would be a consideration in site-specific analysis. All of the action alternatives would result in a decrease in the use of 2,4-D when compared with the No Action Alternative (Alternative 2). Alternatives 3 and 4 (the Proposed Action) would not permit aerial applications west of the Cascades. When herbicides are used Standard Operating Procedures (Appendix 2) help protect adjacent crops by requiring the use of drift prevention measures such as: no spraying when wind is above 10 miles per hour or precipitation is imminent; use of large herbicide droplets and drift reduction agents where appropriate; use of low volatile formulations; use of low pressure equipment; use of herbicide free buffer strips where appropriate; and notification of adjacent landowners.

39. Comment: It appears Alternative 4 (the Proposed Action) would expand BLM's authority to spray all vegetation including at schools on leased BLM lands, campgrounds, and picnic areas.

Response: Yes, the Proposed Action would permit the BLM to use herbicides to meet safety and maintenance objectives along roads and around other developments including campgrounds. It would also allow holders of rights-of-way, permits, and public purpose leases (such as schools, fire stations, airports, transfer stations, and other municipal or non-profit group-owned improvements) to use herbicides to meet safety and maintenance objectives around their improvements. The BLM would not require owners of these improvements to use herbicides; Alternatives 4 and 5 would simply permit their use.

40. Comment: Alternative 4's (the Proposed Action) "recreation sites" are poorly defined. Would undesignated OHV trails be sprayed? Would BLM roads be sprayed even though there is no public access?

Response: Invasive plants might be sprayed anywhere on BLM lands under Alternatives 3 through 5, the same as noxious weeds are currently treated under the No Action Alternative (Alternative 2). Under Alternative 4 (the Proposed Action) and Alternative 5, native and other non-invasive vegetation on designated and undesignated OHV trails would not be sprayed; they are not included or inferred by the list of administrative sites, recreation sites, and rights-of-way listed for Alternative 4 (the Proposed Action) in Chapter 2. Regarding BLM roads without public access, the *Administrative Sites, Recreations Sites, and Rights-of-Way* section in Chapter 4 notes that generally only noxious weed and other invasive plant management is anticipated for non-system roads, even under Alternative 4 (the Proposed Action) and Alternative 5.

41. Comment: It is unclear if Alternative 4 (the Proposed Action) includes the ability to preventatively remove host species of the invasive pathogen Sudden Oak Death (*Phythophthora ramorum*) outside of infested sites.

Response: Alternatives 4 and 5 are additive; each includes all treatments and herbicides included in the next lower alternative. The three action alternatives would permit and anticipate herbicide treatments of native species serving as pest hosts in State-designated control areas. This includes the preventative removal of host species of Sudden Oak Death surrounding infestations. The EIS does not address specific projects however; a site-specific Environmental Assessment or EIS would be part of the site-specific decision-making regarding treatment methods.

42. Comment: Alternative 5's lack of specificity as to how and where herbicides would be used "for a fairly unspecified group of projects" (*Summary of the Major Effects of Each Alternative* in Chapter 2) is both unacceptable and probably illegal.

Response: The EIS primarily examines, at the programmatic scale, the cumulative human health and environmental effects of using additional herbicides on BLM lands in Oregon. To conduct this analysis, the BLM asked vegetation management personnel on the nine districts in Oregon to estimate, for each of the alternatives, annual herbicide use levels, treatment types, and general treatment locations for the next 15 years. Alternative 5 would permit herbicide uses for all vegetation management needs except livestock forage production and timber production. Additional uses permitted by Alternative 5 are estimated (in the EIS) to be mostly habitat improvement projects east of the Cascades, mostly involving imazapic or 2,4-D. The effects described in the EIS are based on those estimates. The BLM would periodically examine actual use to determine if the analysis in the EIS is still adequate.

The EIS does not set weed treatment priorities or approve projects. Specific treatment needs and resource protection priorities are identified in district Land and Resource Management Plans, district weed management Environmental Assessments, and other site-specific plans. Prior to any specific herbicide treatment, site-specific analyses would be conducted, with the opportunity for public comment. These site-specific analyses would identify the potential effects of specific herbicide treatments. Deferring site-specific analysis of actual herbicide treatment proposals is consistent with NEPA, since without the ability to identify, among other things, the specific location of an undetermined treatment, it is impossible to identify what the potential site-specific effects of such a project might be. Nothing in NEPA, FLPMA, or the Land and Resource Management Plans requires the BLM to propose an actual herbicide activity plan or site-specific proposals at this time; site-specific vegetation management proposals that include an herbicide component will be developed at a later date based on the alternative selected from this EIS. The acreage and herbicide application figures used for analysis purposes in this EIS were gross estimates only, made for the purposes of describing potential statewide risks and effects.

The *Summary of the Major Effects of Each Alternative* section no longer appears in Chapter 2; it has been replaced with Table 2-5, Comparison of the Effects of the Alternatives. The *Summary of the Major Effects of Each Alternative* still appears in the *Summary* however.

43. Comment: In the table "Selected Parameters for Each Alternative…," why are there no differences in the number of acres of herbicide versus non-herbicide control between Alternatives 3 through 5? Why is there no alternative examining various levels of non-herbicide control?

Response: Alternatives 3 through 5 all would permit the use of herbicides to control invasive plants. Thus, the invasive plant portion of these three alternatives is essentially the same. Alternative 4 (the Proposed Action) and Alternative 5 would *also* permit the use of herbicides for objectives outside of invasive plant control. Those additional treatment acres are shown on the same table, but on the line titled Native Plant Herbicide Annual Treatment Acres.

An examination of various levels of non-herbicide treatments is outside the scope of the analysis because such treatments are already available and being used by policy to the extent practicable. The EIS includes a no herbicide Reference Analysis ("Alternative 1" in the Draft EIS) to provide a benchmark of the implications of using no herbicides.

Alternatives Eliminated From Detailed Study

44. Comment: In order to find the most ecologically effective alternative, the BLM should fully develop and analyze all of the alternatives eliminated from detailed study, except the use of household chemicals (we know what saltlicks do to soils).

Response: The reasons for the rejection of each of these alternatives are explained for each in Chapter 2. Most are outside the scope of this analysis because the treatments they include are already permitted and being used; are legally required to be accomplished some other way; or were already analyzed in the PEIS to which this EIS tiers and which is incorporated as Appendix 1.

45. Comment: In the *Alternatives Eliminated from Detailed Study* section of Chapter 2, the EIS justifies keeping ALS-inhibiting herbicides in part by explaining they are needed for effective control of perennial pepperweed, hoary cress, and to a lesser extent, saltcedar. Just how big of a problem are these three species? What do they affect, and how seriously. What is their current extent in Oregon? What non-chemical measures can be used to control them?

Response: According to Table A7-1, these are all State-listed Category B noxious weeds, which are by definition invasive, likely to cause significant environmental or economic harm. Perennial pepperweed occupies more than 100,000 acres in the State (all ownerships), occurs in about half of Oregon counties, and is abundant in a quarter of them. The *Wetlands and Riparian Areas* section says the Warner Wetlands near Hart Mountain in Lake County, for example, is critical to nesting waterfowl and other wildlife, and is infested with perennial pepperweed. It is BLM's biggest cooperative weed control project with Oregon Department of Agriculture. Annual nesting success of ducks in this wetland has been positively correlated with the success of perennial pepperweed control. Saltcedar and perennial pepperweed are known to extract salts from deep in the soil and deposit it on the surface making the site unsuitable for native plants. Saltcedar is in the 1,000 to 10,000 acre abundance category, and is found in 11 Oregon counties, 1 abundantly. It is an efficient riparian area competitor east of the Cascades, displacing native plants and adversely affecting all riparian functions including. The *Water Resources* section says a mature saltcedar consumes as much as 800 liters of water per day, 10 to 20 times the amount used by native species it tends to replace (Cooperrider 1995). Hoary cress is in the 10,000 to 100,000 acre abundance category, and similarly overruns riparian habitats. None of these three noxious weeds can be effectively controlled without herbicides.

All of the above information is drawn from tables in Appendix 7 or 9, and from examples included in the EIS for effects comparison purposes. The EIS does not set weed treatment priorities or approve projects. Specific treatment needs and resource protection priorities are identified in district's Resource Management Plans, and in district weed management Environmental Assessments and other site-specific plans.

46. Comment: The EIS needs to evaluate the impact of eliminating or reducing the root causes of noxious weed infestations in order to prevent new infestations. Grazing, mining, logging, and vehicle use all contribute to the spread of weeds and the BLM needs to consider whether noxious weeds and other invasive plants can be better controlled by increasing the use of herbicides or decreasing these root causes.

Response: A wide variety of management activities including grazing, timber harvest, mining, and public recreation are mandated by the FLPMA, the O&C Act, and other policy and direction. These activities do contribute to the spread of weeds, and it is the role of each district's Land and Resource Management Plan to identify an appropriate mix of uses and practices consistent with land capability, long-term productivity, and ecosystem health. The potential for an activity to contribute to resource degradation (such as the spread of noxious weeds and other invasive plants) is one consideration in determining appropriate uses. An alternative proposing to reduce various management activities implicated in weed spread, and the reasons for its elimination, is included in the *Alternatives Eliminated From Detailed Study* section of Chapter 2. Such proposals are outside the scope of this EIS because a reconsideration of the mix of land uses is the specific purview of the land management planning process described in the FLPMA.

47. Comment: Using herbicides to control weeds spread by livestock grazing and timber harvest only benefits ranchers and loggers, at the expense of the public and the environment. The EIS should consider an alternative that addresses grazing, timber harvest, road construction, OHV use, prescribed fire, and other management activities implicated in the spread of invasive weeds. Decrease or modify these activities and weed spread will decline.

Response: Livestock grazing, timber harvest, OHV use, camping, hiking, wildfire control, boating, and all other activities on or near BLM lands variously contribute to the spread of invasive weeds. However, as noted in the *Background* section in Chapter 1, the FLPMA and O&C Act both specify that the BLM will provide for various land uses and outputs, and accommodate various developments for the public good. It is the role of various levels of planning, beginning with each district's Land and Resource Management Plan, to identify the appropriate mix of uses consistent with land capability, long-term productivity and ecosystem health, and compatibility with other uses. The potential for an activity to contribute to resource degradation (such as the spread of noxious weeds and other invasive plants) is one consideration in determining appropriate uses. Activity plans tiered to the Land and Resource Management Plan (such as allotment management plans) similarly consider implications on noxious weed spread. At the project scale, BLM policy requires that when a proposed management activity (such as a timber sale or road construction) has a moderate or high risk for establishing noxious weeds, BLM must prescribe follow-up monitoring as well as identify project actions that need to be taken in order to reduce or prevent the spread of noxious weeds (USDI 1992b).

The *Reduce Management Activities Implicated in Weed Spread* alternative in the *Alternatives Eliminated From Detailed Study* section of Chapter 2 addresses this issue.

48. Comment: Studies indicate that vinegar herbicides can perform as well or better than chemical herbicides (Cornell University 2008).

Response: Risk assessments are necessary to support BLM use of herbicides, even for common items like vinegar (see the *Risk Assessments* section in Chapter 3). So far, there in not enough evidence that vinegar would provide effective target species control while protecting ecosystem values. Thus, the BLM has not completed a risk assessment for vinegar used as an herbicide.

49. Comment: The EIS should include an alternative that minimizes the use of herbicides and increases the use of volunteers, inmates, and other crews using hand tools, herds of goats, and so forth. People could adopt an acre, road, or developed site and remove noxious weeds. These may be more expensive, but not when human and environmental health is considered. The jobs would benefit the economy. Without a rigorous look at these alternatives, the EIS does not satisfy NEPA.

Response: The BLM already uses volunteers and other groups to the extent they are available. However, it has been difficult to recruit volunteers for difficult jobs or remote locations. Other crews (inmates, contract crews) are used, but complete reliance involves logistical considerations that can increase costs and personnel needs over other methods. The State of Oregon added noxious weed control to its Adopt-A-Highway program in 2009. Having groups adopt popular recreation sites might be a good place to start with BLM. This kind of experimentation is already encouraged by BLM policies, and could be done using volunteer agreements. The BLM's current invasive plant control program already makes use of non-herbicide methods to the extent practical, and nothing in the Proposed Action (Alternative 4) suggests decreasing these efforts. As stated in Chapter 1, the *Need* is for more effective control measures, meaning a greater suite of herbicides available and an increase in the acres treated with herbicides annually. Issues related to herbicide use are addressed in part through Standard Operating Procedures, PEIS Mitigation Measures, and site-specific analysis.

50. Comment: The EIS should include an alternative that uses the same budget costs to create manual labor jobs.

Response: The *Implementation Costs* section in Chapter 4 shows that the Reference Analysis for no herbicide use would cost $600,000 more than the No Action Alternative (Alternative 2), while treating 3,400 fewer acres per year. The *Noxious Weeds and Other Invasive Plants* section in Chapter 4 estimates such an approach would be about half as effective at controlling treated noxious weed infestations as Alternative 2. (Increased cost estimates for Alternative 3 come in part from cooperator and other project funds that would become available if the program were more effective at controlling weeds.)

51. Comment: It is disingenuous to reject the *Increase Funding to Pay for Additional Non-Herbicide Control Treatments* Alternative because of "adverse environmental effects" associated with non-herbicide methods, or because it would require asking for more funding.

Response: The discussion under this alternative has been rewritten to explain that since the weed control need exceeds funding, expecting and using increased funding to pay for the current level of activity at an increased cost would be inappropriate. The *Need* seeks to improve the effectiveness of the current program. A current budget trends assumption for all alternatives permits a realistic comparison of their relative effectiveness at accomplishing the *Need*. Future budget increases, if any, could be applied to the selected alternatives to further reduce the spread of weeds.

52. Comment: Given that other apparently less toxic and persistent herbicides are now available for use, the BLM should include an alternative that prohibits the use of the most toxic, persistent, mobile, and non-selective herbicides, including 2,4-D, picloram, dicamba, glyphosate with POEA surfactant, triclopyr BEE, bromacil, diuron, hexazinone, and tebuthiuron. Just as the Forest Service Region 6 has dropped the use of 2,4-D and dicamba and is not even considering use of the very toxic diquat, diuron, bromacil, and tebuthiuron, so too can the BLM drop the planned use of the most toxic herbicides listed above, in addition to picloram. Based on an examination of Table A9-2, such an alternative would control most of the invasive weeds. Some of the others have commercial value (like St. John's wort), so permits could be issued for complete collection.

Response: In general, the availability of a broader range of herbicides permits selection of the one that would best accomplish the control objective while minimizing site-specific adverse effects. In addition, having more than one herbicide to control a plant helps avoid having weed populations develop resistance. Exclusion of the "most toxic" herbicides is relative; the BLM already excludes use of more than 80 other herbicides registered for use in Oregon, often *because* they are more toxic. A discussion of the uses and considerations for each herbicide has been added to the EIS in Appendix 9, and additional information about 2,4-D had been added in Appendix 12.

Regarding the Forest Service herbicides, bromacil, diuron, and tebuthiuron are included in Alternative 4 to meet developed site management or habitat improvement objectives outside of the scope of the Forest Service analysis. 2,4-D and dicamba are retained because they control many species and provide a good burn-down right up to seed-set, important qualities when a small weed control staff is covering districts larger than a million acres. Glyphosate with POEA and triclopyr BEE are more toxic to fish and certain other organisms than glyphosate without POEA or triclopyr. The risk categories shown in the EIS are for the more toxic formulations, which would not be used near water.

Collection and sale of noxious weeds is illegal in Oregon, so proposing to control those with medicinal value by colleting would not a be a valid control strategy.

53. Comment: The EIS should consider the approach described in the Restoring Native Ecosystems Alternative, which focuses on prevention and restoration. The alternative is displayed in Appendix I of the PEIS. Important parts of the alternative were deemed outside the scope and excluded from consideration in the PEIS, but it should be included in the Oregon EIS. The native ecosystems alternative meets the purpose and need better than any of the other alternatives because it avoids the causal actions that would perpetuate the 12 percent annual increase in invasive species.

Response: The Restoring Native Ecosystems Alternative displayed in PEIS Appendix I was reviewed for its applicability to the Oregon EIS *Need* and *Purposes*, in its entirety, and in parts. The 2002 policy analysis conducted by the BLM's Technology Center in Denver, Colorado (also in Appendix I) was reviewed as well, as was PEIS Alternative E, which presented some elements of the proposal. The policy analysis findings appear to be wholly applicable to the Oregon EIS; elements of the proposed alternative are either similar to existing policy, contrary to legal direction, or outside the scope of this analysis. The reasons for not selecting Alternative E at the west-wide level apply to Oregon. The Oregon EIS action alternatives fit completely within the selected PEIS Alternative in order to comply with National direction.

54. Comment: The EIS should include examination of the Natural Selection Alternative presented during scoping and previously presented to the South Deer Landscape Management Project on the Medford District. Preventative and passive vegetation management as prescribed in the Natural Selection Alternative are proactive treatments for controlling invasive species, restoring native vegetation, and reducing fire fuel density on public land. The EIS should not avoid analyzing these techniques simply because they do not meet a traditional definition of vegetation "treatments." The analysis needs to examine the Natural Selection Alternative's contribution to all ecosystem values, services, products, and uses including purification of air and water, nutrient cycling, pollination, herbs and medicinal, recreation and tourism, healthy working environment, chemical drift, cumulative effects, the eminent and lethal threat to salmon and aquatic systems, carbon sequestration, and use of fossil fuels, just to name a few.

Response: The Natural Selection Alternative, as presented by the Deer Creek Valley Natural Resource Conservation Association, was analyzed in the South Deer Landscape Management Project Environmental Analysis on the Medford District (USDI 2005g). The alternative presents itself as emphasizing natural succession and maintenance of fully stocked natural stands. Management disturbances are minimized; timber harvest comes from trees about to be naturally shaded out; and the use of prescribed natural fire is minimized. Invasions of non-native species are preempted by canopy coverage, minimal soil disturbance, and minimal prescribed or wild fire. Weed control is accomplished with physical removal, manual application of least toxic effective chemicals, and weed prevention protocols and eradication, in accordance with the Medford District's Integrated Weed Management plan and programmatic EIS. Grazing, recreation, and other potential disturbances do not appear to be specifically addressed.

The Natural Selection Alternative proposal is a land management alternative more appropriately considered in the FLPMA-required land and resource management planning process, or in project specific landscape management plans such as South Deer, and as such is outside the scope of this EIS and not responsive to its *Purpose* and *Need*. The invasive plant control portion of the Natural Selection Alternative is not significantly different from the Integrated Vegetation Management approach already used by the BLM and a part of the action alternatives, as evidenced by the Natural Selection Alternative's stated reliance on/consistency with the Medford District's Integrated Weed Management Plan. The Natural Selection Alternative emphasis on prevention is also consistent with existing BLM direction applicable to all of the action alternatives. The suggestions for how to accomplish that are outside the scope of the EIS because the EIS is not examining the full range of existing prevention and treatment options.

55. Comment: Instead of structuring the EIS to develop a range of alternatives centered around the need to intensively alter and treat still relatively intact native vegetation and spray weeds everywhere, the BLM should consider a range of alternatives that focus on restoring cheatgrass-infested lands and protecting native vegetation as much as possible. Expansion of cheatgrass pushes communities across thresholds from which natural recovery is difficult - if even possible.

Response: The BLM's vegetation management program includes restoring cheatgrass-infested lands and protecting native vegetation. Much of the acreage increase between No Action (Alternative 2) and Alternative 3 would be the use of a new herbicide, imazapic, that would effectively control cheatgrass and medusahead to facilitate restoration of the sage-forb communities on the east side of Oregon.

56. Comment: The alternatives should allow the use of herbicides for the full range of multiple uses including timber and livestock forage production. The O&C Act requires timber production. BLM policy ensures only appropriate uses would go forward. Limiting herbicides to non-commodity objectives is a waste of public resources and an abrogation of management responsibilities.

Response: The BLM has chosen to limit the scope of the Proposed Action (Alternative 4) in order to simplify the analysis. This does not preclude the BLM from proposing and analyzing additional herbicide uses in the future.

Comparison of the Effects of the Alternatives

57. Comment: The *Additional Effects by Resource* subsection in chapter 2 is heavily biased toward herbicide use, sometimes with no mention of impacts of increased herbicide use with very toxic herbicides.

Response: The summary resource effects paragraphs in the Draft EIS have been replaced with an effects comparison table in the Final EIS to contrast, rather than summarize, the effects of the alternatives. Then to help ensure this section accurately reflects the analysis in Chapter 4, the comparison table has been reviewed and edited by the Chapter 4 resource specialists with instructions to include significant effects and inform the decision-maker about the important points revealed by their analysis. However, the section focuses on herbicide use because the alternatives are about adding herbicides. The analysis is clear that with the Standard Operating Procedures and PEIS Mitigation Measures, human and environmental risks are low or minimized, and there are substantial environmental benefits to their use. Reporting on this important analysis conclusion is not a "bias." The potential for toxic herbicide effects is discussed in the resource effects sections in Chapter 4 and displayed on the effects comparison tables in Chapter 2.

58. Comment: The *Visual Resource* section's statement in Chapter 2 that "long-term benefits of protecting native plant communities would outweigh any short-term adverse effects of herbicide treatments" seems to be an unsubstantiated ideological mantra used to override any legitimate objections from the public.

Response: This statement in Chapter 2 was an oversimplification of the effects reported in more detail in the *Visual Resources* section in Chapter 4. Invasive weed monocultures are assumed less visually desirable than more diverse native vegetation. The visual effect of using herbicides to treat vegetation varies depending on which herbicide is applied and how it is applied. When herbicides are applied directly to an invasive plant using a backpack sprayer or wicking method, the short-term visual impact is browned and dead vegetation mixed with green native vegetation. When non-selective herbicides are applied aerially or with a boom sprayer, the resulting short-term visual effect is one of an open, browned landscape. Long-term benefits of protecting native plant communities would outweigh any short-term visual adverse effect of herbicide treatments.

59. Comment: There seems to be an automatic assumption in the *Comparison of the Effects of the Alternatives* section that non-herbicide control is always more expensive regardless of plant type, the availability of volunteer crews, etc, because the analysis ignores the hidden costs of herbicides to water quality, fisheries, edible plants, cultural native plants, human health, and so forth.

Response: The necessarily undetailed summary comparison sections in Chapter 2 reflect the conclusions of the more detailed resource sections in Chapter 4. The Chapter 4 *Implementation Costs* section compares the implementation costs of the various alternatives, and does not attempt an overall cost/benefit analysis. Regarding natural resource values, the resource specialists preparing the individual resource sections of the EIS compared the degradation expected from invasive plants with the risks of using herbicides, and generally concluded the risks from herbicides was low, while the risks from invasive plants was substantially higher. While both sides of this comparison include qualitative judgments, various estimates of the economic impact of invasive plants, and the quantitative risk calculations made in the Risk Assessments and reflected on the "Risk Categories" tables at the end of Chapter 3, tend to support this conclusion.

60. Comment: The *Comparison of the Effects of the Alternatives* section concludes that herbicide risks would be "negligible." What does negligible mean in the real world? What context and severity of impacts would occur to what values and which species? This term fails the accurate science and disclosure test of quantification and qualification.

Response: The supporting context, severity, and quantification are in the more detailed sections in Chapter 4. Those sections report on the potential for herbicides to cause various adverse effects, but also note that implementation of the Standard Operating Procedures and PEIS Mitigation Measures would, by design[2] and when coupled with site-specific analysis and project design, reduce risk to the point where significant adverse effects at the programmatic scale would be unlikely. This conclusion is consistent with the BLM's experience with herbicides over the past 25 years.

A section on the relationship between the *Standard Operating Procedures, PEIS Mitigation Measures, and the Potential for Adverse Effects* is presented at the end of Chapter 3. This section summarizes the finding from the resource discussions in Chapter 4, that these measures "should make the potential for adverse effects negligible, de minimus, or at worst, "minimized"."

Potential Mitigation

61. Comment: Identified mitigation measures should be mandatory unless other means are fully justified as meeting the mitigation need, not just rejected because of cost or presumed less effectiveness. Otherwise, the public and decision-maker cannot assume essential protection from serious impacts, since the EIS relies on mitigation as foundational to Risk Assessment conclusions.

2 Adverse effects identified in the 2007 PEIS, to which the Oregon EIS tiers, resulted in the preparation of corresponding mitigation measures. The 2007 PEIS Record of Decision adopted ALL of these mitigation measures. Thus, by definition, the potential for adverse effects when viewed at the west-wide programmatic scale should be minimized when PEIS Mitigation Measures are implemented.

Response: Risk Assessments are analytical examinations of the potential for adverse effects given modeled and described exposures and doses. There is no assumption in the Risk Assessments about Standard Operating Procedures or PEIS Mitigation Measures. Standard Operating Procedures and PEIS Mitigation Measures are the BLM's way of insuring that the adverse risks identified in the Risk Assessments are avoided.

The analysis of effects in the EIS assumes application of all Standard Operating Procedures and PEIS Mitigation Measures, listed in Appendix 2, (unless, as the comment suggests, site-specific analysis indicates their objectives can be met some other way.) The Standard Operating Procedures reflect various BLM policies. The PEIS Mitigation Measures were selected by the 2007 PEIS Record of Decision and apply to all herbicide use on BLM lands in the 17 western states, and are a part of all alternatives in the Oregon EIS.

Potential Mitigation measures in Chapter 2 of the Oregon EIS are in addition to the PEIS Mitigation Measures. NEPA requires identification of mitigation measures, if possible and within limits, for all adverse effects identified in the analysis. The Oregon EIS analysis identifies the potential for adverse effects (in spite of the application of all Standard Operating Procedures and PEIS Mitigation Measures), and thus identifies Oregon-specific potential mitigation measures (Chapter 2). This is no surprise; programmatic or site-specific analysis below the west-wide scale of the PEIS would be expected to identify more site-specific adverse effects. To the degree that any of the EIS-identified potential mitigation measures are necessary to avoid contributing to listing or meeting any other legal requirements, they would be adopted. Potential mitigation measures based on other adverse effects, however, will be examined by the decision-maker to determine if the described adverse effects, and the degree to which they would mitigate an identified adverse effect, is significant enough to justify the investment and/or constrain the proposal. Upon consideration of potential mitigation measures, there is no substantive requirement to mitigate all adverse effects (40 C.F.R. 1505.2).

62. Comment: The NEPA requirement that in the Record of Decision, the decision-maker must state whether all practicable means to avoid or minimize environmental harm from the selected alternative have been adopted, and if not, state why not, implies the need to seriously consider and analyze in detail a variety of less harmful alternatives including most of those suggested by the public and not analyzed in detail. This NEPA requirement does not seem to have been met by the EIS.

Response: NEPA does not require that proposed actions or decisions have no significant adverse effects. Similarly, the requirement to identify whether or not adverse effects can be mitigated does not infer the EIS must include alternatives that are outside the scope or would not meet the *Need* simply to avoid such effects. The EIS includes a range of alternatives that would meet the *Need*. The EIS also addresses (in Chapter 2 and/or in this section) all public proposals for additional alternatives with a potential to meet the *Need*, as well as public-suggested mitigation measures.

63. Comment: The BLM should take an active role in having a forb component in native seed mixtures to accurately reflect the plant communities on BLM lands.

Response: The BLM has an existing policy to use native seed in restoration (USDI 1992a; USDI 2008a). Non-native seed may be used following NEPA analysis that documents the need for other than native seed primarily to protect the soil resource and future site potential. Restoration is already an element of Integrated Vegetation Management and other vegetation management direction, and reconsideration of, or a change in, BLM native seed policies and direction is outside the scope of this EIS.

64. Comment: How are 100 and 200-foot buffers determined for wells and springs? Are these adequate? There should be no herbicide spraying in or near hydrological-connected ditches and roads (wet or dry). Mitigations should also prohibit herbicide sprays near water and restrict herbicide use in dry riparian buffers to the winter hibernation or aestivation period to more fully protect amphibians and susceptible mollusks – or (preferable) use non-herbicide control methods. Not using herbicides on native plants would help reduce risk to ungulates and other wildlife. Herbicide impacts to Federally Listed and other Special Status species should be completely avoided. Maximum application rates should be prohibited.

Response: Most of the points suggested by this comment are already required by the Standard Operating Procedures, PEIS Mitigation Measures, or other laws and policies. Since most of the potential for adverse effects was identified in the PEIS, few additional potential adverse effects are identified in the Oregon EIS. Some of the measures suggested by the comment are not PEIS Mitigation Measures, but no adverse effect has been identified that would indicate their being needed. Determination of spring and well minimum buffers is based on the potential for drift, the potential for herbicides to be carried to water intakes by rain events, and the potential for adverse human health effects. Most existing treatments are spot sprays or daubs with little potential for long-distance drift.

65. Comment: Herbicides should not be broadcast sprayed in riparian areas.

Response: Standard Operating Procedures for Wetlands and Riparian Areas specify the use of wick or backpack sprayer.

66. Comment: Herbicides should not be sprayed on amphibian habitat.

Response: Such a prohibition would effectively eliminate many treatment projects in riparian/wetland habitats. In addition to site-specific planning that would consider important amphibian habitat, Standard Operating Procedures and PEIS Mitigation Measures (Appendix 2) require avoidance of POEA-containing glyphosate; avoidance of critical wildlife breeding or staging periods; the use of water buffer zones for herbicides not labeled for aquatic use; and others. The analysis in the *Wildlife Resources* section in Chapter 4 indicates some of the herbicides are toxic to amphibians, some are not, and some are unknown. The analysis also points out that the two aquatic herbicides currently available to the BLM in Oregon (2,4-D and glyphosate) are toxic to amphibians, while some of those that would be added by Alternative 3 are not. Amphibians included in the Special Status Species Program or Survey and Manage would be specifically considered during site-specific analysis to meet the requirements of those programs.

67. Comment: As moths and butterflies are among the larger group of pollinators, the EIS should specify the following:

1. Maintain herbicide free buffer zones around patches of important pollinator nectar and pollen sources.
2. Maintain herbicide free buffer zones around patches of important pollinator nesting habitat (called host plants for Lepidoptera) and hibernacula (pupa and cocoons).
3. Make special note of pollinators that have single host plant species and minimize herbicide spraying on those plants and in their habitats.

Response: These recommendations are already within the Standard Operating Procedures for pollinators listed in Appendix 2. The effects analysis in this EIS assumes Standard Operating Procedures would be followed or that a site-specific determination is made that they are unnecessary to achieve the intended protection or objective.

68. Comment: Some herbicides are highly persistent and should not be used. For example, in areas with edible and medicinal plants and fungus, the theoretical "safe time" to enter the area and use these plants may be one-to-three years after application, or longer with repeated applications, making prevention of adverse human health effects by posting unlikely.

Response: Some of the more persistent herbicides (diuron, bromacil) included in the analysis are soil-applied and would not result in human exposures for people gathering food and medicinal plants. Herbicides on vegetation, exposed to moisture and sunlight, break down far more quickly. Site posting requirements are specified accordingly. The potential for herbicides to adversely affect persons actively engaged in food collection is examined in the Risk Assessments and discussed in the *Human Health and Safety* section in Chapter 4.

69. Comment: The alternatives need to include guidelines that protect edible wild mushrooms and medicinal plants. This particularly applies to Alternative 4 (the Proposed Action) and Alternative 5's proposal for broadcast treatments of native plants along roadsides and other areas.

Response: The Risk Assessments summarized at the end of Chapter 3 and discussed in the *Human Health and Safety* section in Chapter 4 indicate the amount of these herbicides likely reaching, then being ingested or contacted by, collectors and end users of mushrooms and other forest products presents a very low risk of harm. Both of these products are recognized as valuable wildland resources and products. Standard Operating Procedures and required signing would reduce direct user exposure. Herbicide treatments potentially affecting these two products would be subject to site-specific analysis. That analysis should recognize and consider the potential for herbicide applications to affect both populations of, and users of, mushrooms and other forest products.

Chapter 3 – Background and Assumptions for Effects Analysis

The 18 Herbicides

70. Comment: The EIS did not include an analysis of the inert ingredients. The BLM needs to fully disclose the active and so-called inert ingredients of all of the approved herbicides, and fully describe their ecological and health effects, both individually and in combination. Inert ingredients can be toxic to target and non-target species and they can persist in soil and water. Inert ingredients - especially in combination with other pesticides - can be more toxic to humans and fish than the listed ingredients.

We acknowledge that the BLM attributes the analysis deficiency to current law that permits pesticide makers to hide the identity of the inert ingredients by claiming trade secrets. However, without revealing this information, the BLM does not comply with NEPA requirements to disclose effects.

Response: The BLM recognizes that certain inert ingredients can be toxic to target and non-target species. It is the manufacturer's intention that they enhance toxicity or exposure to target species. BLM evaluated inert compounds to assess affect on non-target species. Many inert compounds are naturally occurring substances. Some, such as nontoxic mineral compounds, do persist in soil. The BLM and Forest Service evaluated inert ingredients and two surfactants, POEA and R-11, are specifically addressed in Appendix D of the PEIS. R-11 is no longer used by the BLM, and POEA in glyphosate is reflected in the risk category for glyphosate shown in Chapter 3 and discussed in the various resource effects sections in Chapter 4. The *Adjuvants, Impurities, and Other Ingredients* section in Chapter 3 has been expanded to better describe the BLM analysis of inerts. Potential effects are discussed in the *Fish, Wildlife Resources*, and *Human Health and Safety* sections in Chapter 4. Additional information about uncertainty related to these materials in included in Appendix 13.

Pesticide manufacturers usually disclose their inert ingredients only to the EPA and the BLM. The BLM is prohibited by law from disclosing the actual inert ingredients because they are considered proprietary. In response to petitions asking the EPA to require that these ingredients be identified on the labels of products that include them in their formulations, the EPA has initiated rulemaking to increase public availability of the identities of the inert ingredients in pesticide products. A 60-day public comment period began December 23, 2009, and was extended an additional 60 days. The EPA has not yet reported on the results. Any new information about herbicide toxicity will be incorporated into subsequent site-specific analyses. A description of this rule-making effort is included in Chapter 1.

71. Comment: The EIS needs to identify toxic active ingredients, adjuvants, and exact formulas and analyze impacts of formulas and tank mixes.

Response: Active ingredients were identified for all herbicides. Common names are typically used in discussing herbicides rather than chemical formulas, as they are long, technical, and generally not understood except by organic chemists. Formulas are available at many locations; see for instance the Herbicide Handbook (Vencill et al. 2002). EPA licensing and Risk Assessments are conducted with the herbicides as formulated, so any risks are included in the risk categories. For example, the EIS points out that adverse effects to fish attributed to glyphosate may be more attributable to the surfactant POEA rather than the active ingredient itself. The BLM evaluated inert ingredients, degradates, adjuvants and tank (combined) mixes in the Risk Assessments, and results are described in Chapter 3 and in the *Fish, Wildlife Resources*, and *Human Health and Safety* sections in Chapter 4. A detailed discussion of uncertainty in the Risk Assessments (relative to those materials) is included in Appendix 13. The Risk Assessments considered repeated use within the same areas; maximum label rates are per year. An additional description of the analysis of these materials done by the BLM has been added to Chapter 3.

72. Comment: In the *Fish* section of the EIS, the BLM is assuming that inert ingredients would not represent a substantial part of the herbicide product. This may or may not be true, and should not be assumed to be.

Response: The comment mischaracterizes the statement in the *Fish* section in Chapter 4. The *Fish* section states that *toxic* inerts would not represent a substantial part of the herbicide product (emphasis added). The EPA ranks inerts based on their toxicity, and few of the herbicide products that would be used on BLM lands have toxic inerts. More information about inerts and toxicity can be found in Chapter 3. A list of herbicide products that could be approved for use on BLM lands is shown in Appendix 9. This list includes products screened by the BLM for the absence of toxic inerts and adjuvants identified by the EPA, Risk Assessments, and additional available information. The BLM's list of approved products changes annually as new information is acquired.

73. Comment: The statement that differences in the number of herbicides available east and west of the Cascades is based on differences in native vegetation types and invasive plant occurrence is contrary to earlier statements about population density and public acceptance.

Response: Differences in population density and public acceptance did not influence the selection of herbicides for the various alternatives. The incorrect text in the *Comparison of the Effects of the Alternatives* section in Chapter 2 has been deleted. The differences in herbicides east and west of the Cascades are based on differences in vegetation and weed spread, registered uses, objectives, and environmental conditions such as fire risk or the prevalence of watercourses. For example, a persistent, soil-applied herbicide could be used along roadsides east of the Cascades to remove fire-prone dry grasses, while the same herbicide would not be used west of the Cascades because the risk of roadside grass fires is low, bare ground in roadside ditches would erode, and roadside-applied persistent herbicides might end up in nearby streams.

The *Differences in the Number of Herbicides Proposed East and West of the Cascades* section in Chapter 3 has been edited to better reflect these reasons.

74. Comment: There needs to be a process for making new herbicides available for use by the BLM in Oregon as more effective, less persistent herbicides become available. For example, aminopyralid should be added to the herbicides included in Alternative 4 (the Proposed Action).

Response: The process for adding additional herbicides is prescribed by the BLM national office. The process is described in Appendix 4, and it includes the preparation of Ecological and Human Health Risk Assessments followed by NEPA analysis. Such analysis is expensive, and is undertaken only after a significant need is identified. Aminopyralid is being considered for this process. The BLM does not rely on the EPA registration alone to determine if an herbicide is appropriate for use on wildlands. The process is slow, but helps minimize the potential for adverse public or ecosystem effects.

This issue is addressed further in the *Alternatives Eliminated From Detailed Study* section in Chapter 2, under an alternative named *Consider the Use of Different Herbicides Other than the 18 Being Considered*.

75. Comment: The Proposed Action (Alternative 4) would increase the use of 2,4-D and diuron, both of which have been shown to have adverse effects to human health.

Response: The Proposed Action (Alternative 4) proposes to increase the number of herbicides available so that herbicides that are more effective on certain plants or in certain areas can be used. Hence, the Proposed Action would actually decrease the use of 2,4-D statewide by one-third. Potential effects to human health are described in the *Human Health and Safety* section in Chapter 4, and 2,4-D information is summarized in Appendix 12. Diuron is one of the new herbicides that would become available under the Proposed Action. Diuron is a non-selective herbicide that would be used to kill all vegetation in areas such as along pavement edges or around communication towers, electrical substations, and other non-public use areas where vegetation would degrade pavement, harm structures, or spread fire. Most use would be east of the Cascades; use of diuron is estimated at 100 acres annually west of the Cascades. Summaries about each herbicide, including explanations of what each herbicide would be used for, have been added to the Final EIS in Appendix 9. Potential health effects are addressed in the *Human Health and Safety* section in Chapter 4.

76. Comment: Diuron is long-lived, contaminates water, is harmful to fish, has harmful effects on people, and is a risk to all susceptible wildlife. Why would it be considered for use west of the Cascades?

Response: Diuron's persistence and non-selectivity make it useful for complete vegetation control within seldom-visited enclosed communication sites to reduce maintenance costs and prevent wildfire damage. It is also useful within a foot or two of pavement edges to prevent plants from encroaching on and damaging road edges. It would not normally be used within the roadside ditches west of the Cascades because the ditches connect to streams, because grass or other low vegetation is often desirable to stabilize drainage structures, and for other environmental reasons cited in the comment. Because of the concerns noted, use is estimated at 100 acres per year west of the Cascades and would occur only where unacceptable adverse environmental effects could be avoided. A potential mitigation measure has been added to Chapter 2, requiring consideration of the roadside ditch connection in all project analyses for roadside treatments.

Although the Draft EIS described how administrative sites and roads would benefit from Alternative 4 (the Proposed Action), benefits were generally not attributed to specific herbicides. Additional information about the specific uses and risks has been added to the EIS for each herbicide in Chapter 3. In addition, the *Administrative*

Sites, Roads, and Rights-of-Way section in Chapter 4 now specifically describes the benefits of the persistent herbicides (diuron, bromacil, tebuthiuron) added by Alternative 4.

Assumptions and Information about Treatment Acres

77. Comment: The EIS does not have an alternative that would deal with any sort of integrated weed management nor does it provide a protocol for determining the best or most appropriate treatments. The BLM should have a process for examining other methods before it resorts to herbicides.

Response: All of these suggestions are requirements of the BLM's Integrated Vegetation Management policy (USDI 2008a, USDI 2007e, and others). The alternatives propose to add additional herbicides to the BLM's existing noxious weed and other vegetation management programs. Other elements of Integrated Vegetation Management and BLM policies for determining the best or most appropriate treatments are already in place and apply to all alternatives. Prevention, followed by early detection and rapid response, would remain the BLM's highest priority weed control strategies, for example. The description of Integrated Vegetation Management in Chapter 3 is intended to set the context for the alternatives. The introduction to the *Need* in Chapter 1, and the *Introduction* in Chapter 2, both state that the alternatives would only add additional herbicides to the existing Integrated Vegetation Management program. The *Integrated Vegetation Management* section in Chapter 3 has been supplemented with a discussion of how, following BLM policies, vegetation treatment methods are selected.

78. Comment: The EIS defers reconsideration of ground-disturbing management activities by, in part, saying planning of management activities must consider and mitigate their role in noxious weed spread. Since weeds are spreading at 12 percent in part because of management activities, there is little evidence the policy is being followed.

Response: The discussion under the *Reduce Ground-Disturbing Activities* alternative in Chapter 2 has been rewritten to place the emphasis where it belongs, that being that reconsideration of other management activities is more correctly the purview of the resource management planning process required by the FLPMA and outside the scope of this analysis.

Risk and other discussions throughout the EIS analysis assume compliance with existing BLM policies. For the preparation of project NEPA documents, it is customary for districts and field offices to maintain a policy checklist. Such lists would be expected to include the policy of considering and mitigating each projects role in noxious weed spread. In consideration of this comment, however, three random timber sale Environmental Assessments were selected from each of the Coos Bay and Roseburg District websites. The control of noxious weeds was displayed prominently in each, and the control of noxious weeds was a specific project objective in one. Based on these points, various EIS references to this BLM policy do not appear to be overstated.

79. Comment: The EIS should explain how the risks associated with ground disturbing activities proposed by BLM are documented and implemented.

Response: All NEPA planning processes for ground disturbing projects and projects that have the potential to alter plant communities must include a noxious weed risk assessment when it is determined that a proposed action may introduce or spread noxious weeds. If the risk assessment determines there is a moderate to high risk of spreading noxious weeds, then actions must be taken to reduce or prevent the spread of noxious weeds. Example actions include modifying the project to include seeding the disturbed area with native species, controlling existing infestations of noxious weeds prior to project implementation and incorporating prevention measures into the project design or as contract stipulations. Results of the risk assessment are filed in the appropriate NEPA project file (USDI 1992b). This policy in mentioned in the *Integrated Vegetation Management* section in Chapter 3 of the EIS, and explained in more detail in Appendix 3, in the *Existing Monitoring* section.

80. Comment: Given that certain BLM vegetation management projects are treated as categorical exclusions and not analyzed under environmental impact statements, the EIS should address invasive plant concerns for categorical exclusion projects. Management activities proposed as categorical exclusion projects should be assessed in light of their effects upon invasive plant prevention.

Response: The potential for a vegetation management project to spread invasive plants is a consideration in deciding whether a categorical exclusion is appropriate. However, the use of a categorical exclusion would not nullify the policy requirement to conduct a noxious weed risk assessment and include mitigation, a control strategy, and monitoring if the risk of spreading noxious weeds is moderate or high.

81. Comment: The EIS is flawed because it is based on the projected spread of invasive plants without addressing prevention. Education should be a key component of weed prevention and the EIS should address specific plans for outreach for public participation in weed prevention and eradication efforts.

Response: The Integrated Vegetation Management discussion in Chapter 3 notes that prevention, including education, remain the BLM's highest priority strategy for weed control. This and other elements of Integrated Vegetation Management are in place, are common to all alternatives, and take precedence over herbicide use.

82. Comment: The EIS needs to clearly describe the decision-making process and risk considerations for selecting between herbicide and non-herbicide methods at the site-specific scale.

Response: Department of the Interior integrated pest management policy states that "Bureaus will accomplish pest management through cost-effective means that pose the least risk to humans, natural and cultural resources, and the environment" and requires bureaus to "[e]stablish site management objectives and then choose the lowest risk, most effective approach that is feasible for each pest management project" (USDI 2007e). A list of parameters that affect how vegetation treatment methods are selected has been added to *Integrated Vegetation Management* section of Chapter 3. These parameters include potential impacts to humans, fish, and wildlife; opportunities to conserve native vegetation; and, proximity of the treatment area to susceptible areas, such as wetlands, streams, or habitat for species of concern.

83. Comment: To avoid loss of habitat and food for wildlife, the BLM should be extremely careful not to harm beneficial plants and trees.

Response: In treating invasive vegetation with both herbicide and non-herbicide methods, the BLM tries to avoid harm to non-target species. Invasive weeds, herbicides, and non-herbicide methods to remove plants all have the potential to harm beneficial plants and trees. Integrated Vegetation Management, Standard Operating Procedures, and PEIS Mitigation Measures all serve to help avoid damage to non-target species. Descriptions of these can be found in Chapter 3 and Appendix 2. When working with invasive plants, it is usually beneficial to minimize disturbance to adjacent native plants 1) so they can help restore the treatment area, and 2) so invasive plants do not invade disturbed sites.

84. Comment: The EIS does not adequately disclose and consider the fact that using herbicides is less effective than other alternatives because it kills not only the target plant but also often kills the non-target plant, which reduces the cover of desired native vegetation and creates more opportunities for weedy plants to invade treated areas. Hand pulling and carefully targeting just the invasive plants leaves more of the native plants in place to reoccupy the site and prevent future establishment of weeds.

Response: Herbicide use would be done in the context of Integrated Vegetation Management, where the best tool (or tools) for the job would be selected. Typically, invasive species would be targeted, retaining native plants to reoccupy the site regardless of the treatment method used. In many instances, carefully targeting the invasive plant with herbicides (using spot treatments) is far more effective than hand pulling. Some species break apart and spread when pulled, some infestations are too large to be effectively controlled by hand, and many times hand pulling has to be repeated many times in order to be effective, which can cause trampling of nearby vegetation and disturb wildlife. The soil disturbance associated with many non-herbicide methods is more conducive to reinfestation than spot herbicide treatments. When necessary, planting and reseeding would be done in areas where monocultures of invasive weeds have reduced the likelihood of natural revegetation with native species. More than 80% of the estimated herbicide use under the Proposed Action (Alternative 4) would be with herbicides that are selective to specific types of plants (e.g. grasses, broadleaf, etc). Additionally, Standard Operating Procedures and PEIS Mitigation Measures help prevent or minimize damage to non-native plants.

85. Comment: Opportunities should be explored to provide washing stations to prevent the spread of weeds by vehicles.

Response: Washing stations have been considered, as have discounts at local existing washing facilities. Signing at OHV staging areas and boat landings warn of the dangers of invasive weeds and direct users to existing facilities. Liability, cost, vandalism, water contamination, and other issues affect consideration of washing stations. Consideration of washing stations, however, is an existing element of Integrated Vegetation Management, and a reconsideration or change of emphasis regarding this issue is outside the scope of this EIS.

86. Comment: Restoration and monitoring plans must be drafted and funds allotted at the same time as control measures are implemented.

Response: There are restoration and monitoring requirements that apply to each invasive plant control treatment. Many of those specifically addressing herbicide use are described in the *Integrated Vegetation Management* section in Chapter 3, or in Appendix 3. General project implementation monitoring is also conducted to ensure consistency with NEPA and Land and Resource Management Plan decisions.

87. Comment: No apparent scientific methodology was applied to come up with the estimates of annual herbicide use; they appear to be over-exaggerations.

Response: The estimates of annual herbicide use were developed by the district vegetation managers with knowledge of the existing district needs and management direction. District weed coordinators with many years of experience coordinating, and planning the current Integrated Vegetation Management program related to noxious weeds helped prepare these estimates. Estimates are based in part on past use, which is reported annually by the district and state offices to the National office and the EPA. However, the EIS is clear that these numbers are estimates for cumulative effects analysis purposes only, and are not decisions to manage vegetation. Actual herbicide use could vary based on many factors including new and/or previously unknown infestations of weeds. Site-specific analysis would be used to determine and confirm the need to treat vegetation, and examine site-specific effects. If actual herbicide use is less than these estimates, then the EIS-described herbicide risks would be reduced.

88. Comment: The "Estimated Annual Acres Treated in Rights-of-Way, Administrative Sites, and Recreation Sites" table in Chapter 3 shows such a wide range of acres that may be treated that the information is meaningless. It makes it impossible to estimate the potential impacts.

Response: In the Draft EIS, the estimated annual acreages of treatments shown in a table in Chapter 3 and used throughout the document for Alternatives 4 and 5 were partially based on weighted averages of ranges shown in this table. For the Final EIS, district experts were asked to re-estimate the acreages based on the herbicide, rather than use the multiple herbicides by project type approach that was used in the Draft EIS. This provided a more meaningful estimate of the acreages to be displayed in the Final EIS. However, the weighted averages used in the Draft EIS and the estimated acres used in the Final EIS are similar.

89. Comment: The BLM should follow the Forest Service in prohibiting maximum application rates.

Response: The 2005 Region 6 Forest Service Record of Decision does not prohibit the use of maximum application rates shown in the Forest Service EIS (USDA 2005:4-2) and adopted by its Record of Decision. The Forest Service typical and maximum rates are similar to those being considered in this EIS.

90. Comment: The EIS should recognize that herbicides have to be used repeatedly because one application will not be effective. Noxious weeds are hard to destroy, so herbicides will have to be used repeatedly because one application will not be enough to be effective. Most herbicide use requires multiple applications each year for three to five years.

Response: Noxious weeds are often hard to destroy, and for those situations needing herbicides, it is best to find the right herbicide for the control objectives. The four currently available herbicides are not very effective on some weeds (e.g. whitetop), but have been used multiple times to suppress these weeds to prevent flowering and thus slow weed spread. The additional herbicides proposed in Alternative 3 would greatly increase the likelihood that the right herbicide would be available, so one application could kill plants that would otherwise need years of pulling or other treatments. If one area is treated more than once in a year, it is usually to find missed areas or plants. In such cases, maximum and typical *annual* rates would still apply. That is, an herbicide would not be applied more, within that entire year, than then permitted by the maximum annual rates shown on Table 3-1 in Chapter 3. For invasive weed populations treated in consecutive years, the amount of herbicide used should decrease as control objectives are met. Weed treatments are frequently evaluated for effectiveness (see Appendix 3), and the BLM would not want to treat vegetation, year after year, with a method that was ineffective.

91. Comment: The BLM should make a specific measurable commitment to reducing or eliminating its reliance on herbicides over time.

Response: Nothing in the noxious weed spread calculations, or in advances in alternative control methods, indicates that the need for herbicides will significantly decline in the 15-year planning horizon considered in this EIS. New weed infestations will continue to be discovered, and resource values will continue to benefit from their effective control. However, the herbicide application acres in the EIS are only estimates for analysis purposes. They are neither minimums nor maximums, and no treatments are authorized by this EIS. If there were a reduced need for herbicides in the future, it would be reflected in site-specific decisions.

92. Comment: The EIS should restrict herbicide use to a last resort, and acknowledge the research done by Rinella et al (2009) which indicates herbicide use can exacerbate invasive weed problems.

Response: Rinella et al. (2009) documents the 16th year examination of native forb species responses when an herbicide, in this case enough picloram to remain soil active for some months, was applied once to a grass/forb area infested with leafy spurge in an effort to improve livestock forage on a ranch in Montana. Both the forbs and the invasive leafy spurge were substantially reduced by the spray (but not the grass), and reinvasion of leafy spurge subsequently occupied those sites, locally extirpating some of the forb species. The paper acknowledges the initial reduction in forb species was to blame, and contrasts the study with a similar one where the forb component was retained, and post-treatment reinvasions did not reduce the forb community.

The results of this study do not contradict the analysis in this EIS. The studied herbicide application scenario, however, has little resemblance to those described in this EIS. For example, the *Wildlife Resources* section in Chapter 4 states "few broad-scale treatments of native vegetation are anticipated to be conducted under any of the alternatives unless they are specifically designed to benefit wildlife habitat (Chapter 3, *Assumptions about Herbicide Treatments*). Invasive plant treatments are generally directed only at noxious weeds and other invasive plants either by treating only the invasive plant or by using a selective herbicide. The objective of those treatments is to remove weeds and restore native (or other non-invasive) vegetation. Treatments are designed to reduce damage to native vegetation and reduce unnecessary site disturbance that favors reinvasion by the invasive plants." As noted in the quote, there is similar language in the *Assumptions about Application Methods* section in Chapter 3. One broad-scale herbicide use estimated to occur in the EIS under Alternative 3 is imazapic applications on areas infested by medusahead rye, or recently burned areas likely to become heavily infested with this invasive annual grass. Current medusahead treatments using glyphosate can kill desirable forbs, but imazapic at low rates is selective for annual grasses. Imazapic would be available for medusahead control under the action alternatives, and is desired specifically to decrease the likelihood of having the adverse effects of using glyphosate described in Rinella et al. (2009).

The treatment described in the article involved a one-time treatment to improve livestock forage. No such treatments are envisioned from this EIS. Invasive plant treatments are usually targeted just at the invasive plants, and require monitoring within two years. The *Noxious Weeds and Other Invasive Plant* section in Chapter 4 describes noxious weed treatments under Alternatives 3-5 as being about 80 percent effective, meaning a return to the site is usually necessary to spot treat missed and newly emerging plants. Weed control staff are aware that a lack of follow-up will often result in failure to achieve control.

93. Comment: The adverse impacts of methods and scale of herbicide applications are not addressed.

Response: Chapter 3 (*Background and Assumptions for Effects Analysis*) provides an explanation as to the methods and scale of herbicide applications; Chapter 4 (*Affected Environment and Environmental Consequences*) shows the impacts (adverse and beneficial) of the herbicide applications described in Chapter 3.

94. Comment: The EIS fails to adequately consider the detrimental impacts of aerial spraying thousands of acres of clear-cut forests.

Response: The EIS does not propose or imply that thousands of acres of clear-cut forests would be sprayed with herbicides. All alternatives exclude the use of herbicides for timber production; most herbicide use after timber harvest would be to keep invasive plants from spreading or gaining a foothold. Aerial spraying would not be allowed west of the Cascades under Alternatives 3 and 4 (the Proposed Action) and would occur rarely (if at all) under Alternative 2 (the No Action Alternative) and Alternative 5. Aerial spraying would occur more often east of the Cascades, but BLM's dry forests east of the Cascades are managed to promote forest stand health. Timber volume production is not an objective, and treatments are generally thinning (and not clear-cuts). Aerial application of herbicides east of the Cascades would be used primarily to control monocultures of invasive weeds like yellow starthistle and medusahead or where ground access is difficult.

95. Comment: The authority to apply herbicides aerially as described in the EIS is excessively broad. Aerial application of herbicides should be subject to NEPA analysis on a project-by-project basis.

Response: As noted in Chapter 3, about seven percent of the noxious weed herbicide treatments currently being conducted by the BLM in Oregon are done with planes (two percent) or helicopters (five percent). These applications follow project-level site-specific analysis. Any future applications conducted pursuant to this EIS would be similarly subject to NEPA analysis at the site-specific scale. The aerial applications levels described in Chapter 3 are the assumptions under which the EIS's cumulative effects analysis is based, and are not decisions to conduct projects. Alternatives 3 and 4 (the Proposed Action) would not allow aerial herbicide application west of the Cascades.

96. Comment: The BLM should be cautious about dousing post-wildfire landscapes with imazapic as proposed. What would be the effects to other plants and wildlife re-colonizing the areas or surviving the fire?

Response: The BLM exercises the caution suggested in the comment; the brief statement about expected imazapic use the *Comparison of the Effects of the Alternatives* section in Chapter 2 does not include a discussion of all the caution and considerations that would go into site-specific planning for such use. Chapter 3 states that imazapic is selective for "some broadleaf and grasses." It would be used primarily to control monocultures of invasive annual grasses such as cheatgrass and medusahead while retaining native forbs to help with restoration, and some would be used to prevent invasive grass reinvasion after major fires prior to seeding. The *Native and Other Non-Invasive Vegetatio*n section notes the estimated 11,000 acres annually of imazapic east of the Cascades would be used to control monocultures of invasive annual grasses, and that imazapic has a low-to-moderate risk of harming non-target plants. These treatments would result in a corresponding 5,000-acre increase in native seeding because the invasive grasses could be controlled. Both the *Fish* and *Wildlife Resources* sections note that imazapic is one of the lowest risk herbicides to these two resources of any of the herbicides proposed for use. In any event, the potential for damage to remaining native vegetation critical to habitat and restoration, or to on-site fauna, would be reconsidered at the site-specific scale.

The statement about using imazapic to prevent grass reinvasion and prepare restoration sites, while true, was incorrectly included in the *Fire and Fuels* section of the *Comparison of the Effects of the Alternatives* section in Chapter 2 of the Draft EIS; restoration has not been identified in the EIS as a "fire and fuels" objective. This point has been moved to the *Native and Other Non-Invasive Vegetation* subsection in this same section of Chapter 2.

Risk Assessments

97. Comment: There is not enough research on potential damage to fish and wildlife.

Response: The EPA requires pre-market multiple toxicity, persistence, and environmental fate tests prior to registration. The toxicity tests include mammals, fish, plants, and other taxa. Prior to registration, in an effort to evaluate risk to fish and wildlife, the EPA also examines ecological risks to fish and wildlife including Threatened and Endangered species. The Forest Service and the BLM have conducted additional Risk Assessments of the herbicides analyzed in this EIS, to examine the available literature relating to fish and wildlife toxicity. The resource effects sections in Chapter 4 further cite relevant literature published since development of the Risk Assessments. Herbicides are heavily studied. There is enough information available for the decision-maker to understand the potential for significant environmental effects at the programmatic scale. Additional analysis will occur when site-specific projects are proposed.

An overview of the EPA and Risk Assessment processes, including a discussion of the types of information they each consider, has been added to the Final EIS as Appendix 13.

98. Comment: In some cases, herbicides may seem less toxic because they are newer and we know less about them.

Response: Much has been learned about the effects of pesticides and other chemicals in our environment in the past few decades, and more is known about groups of herbicides, adjuvants, and other materials. The development of newer herbicides has been informed by studies on older herbicides. Use of chemicals in society is regulated by various entities; pesticides are regulated by the EPA. The EPA requires toxicity, persistence, and environmental fate tests prior to registration. The EPA has registered each of the herbicides for specific uses identified in the EIS. Herbicide labels are required by the EPA to contain a section on health hazard information for workers and users. The BLM and Forest Service have also completed Risk Assessments for the herbicides in this EIS that examine plausible exposure scenarios specific to wildland uses. The Risk Assessments acknowledge and quantify risks. These identified risks are the reason for the Standard Operating Procedures and PEIS Mitigation Measures (see *Standard Operating Procedures, PEIS Mitigation Measures, and the Potential for Adverse Effects* at the end of Chapter 3), and serve as the basis for the effects (risk) discussions in Chapter 4.

99. Comment: The alternatives should include all EPA-tested and approved herbicides.

Response: As noted in the *Risk Assessments* section in Chapter 3, the United States Court of Appeals for the Ninth Circuit has found the EPA registration procedures to be inadequate to meet the wildland applications hard look requirements of NEPA. Risk Assessments build upon the EPA registration information by adding information from the scientific literature, and considering applications in wildland settings that appeared to be "minor" in the EPA registration process. Risk assessments are not completed for other herbicides because the cost is high compared to need, or preliminary indications are that the BLM would not want to use them. The BLM nationally maintains a list of Risk Assessments it considers to adequately cover wildland use, and periodically conducts literature searches to check the accuracy of less recent Risk Assessments. The BLM also maintains a list of approved adjuvants, selected based on absence of known toxicity (see Table A9-3 in Appendix 9). From these two sources, the BLM maintains a list of specific products known to contain only approved herbicides and adjuvants. The list of approved herbicides and formulations is updated annually. Those approved in 2009 are shown in Appendix 9, Table A9-2. There are over 80 additional herbicides registered for use in Oregon that the BLM has not approved for use on BLM lands. Use of other herbicides is limited to experimental uses. The process for adding herbicides to the BLM National list is described in Appendix 4.

100. Comment: The EIS failed to consider the impact of pesticides even if labels are followed. Labels often do not consider the latest scientific findings, such as new information on impacts to amphibians and long-term impacts to human health.

Response: The EPA updates label requirements regularly as new information is compiled. The BLM did not rely solely on herbicide label information for the Risk Assessments. Risk Assessments include the EPA registration data for toxicity studies, fate and transport studies, chemical physical properties and other information. Literature searches were also conducted. The herbicides discussed in the EIS include only those having been subject to acceptable Risk Assessments and approved by the BLM nationally. It should be noted that Standard Operating Procedures and PEIS Mitigation Measures are applied after, and in response to, risks identified for Risk Assessment scenarios. Thus, actual risk from BLM use envisioned in this analysis is typically very low.

101. Comment: Despite a considerable body of data on acute exposure effects from the proposed list of herbicides, it is important to recognize that the chronic and sublethal risks are not yet well characterized. The historical record of pesticide toxicology reveals many cases of serious and unexpected adverse effects associated with pesticides that were not predictable from standard acute toxicity tests. Because of these unknown risks, we encourage use of non-chemical alternatives with known risks wherever feasible.

Response: Besides acute toxicity testing, the EPA does require extensive chronic toxicity testing. Information about the types of data used during the EPA's registration process has been added to the Final EIS in Appendix 13. Chronic and sub-lethal effects are discussed in the Risk Assessments, and risk categories summarized on the "Risk Categories" tables at the end of Chapter 3, and discussed in the resource sections in Chapter 4, include risk categories for chronic exposure.

102. Comment: The EIS fails to analyze short-term effects on plants and wildlife during and directly following the application of herbicides. Since long-term effects are the focus of BLM's analysis, it is unclear how many plants and animals will be killed or harmed during applications, and how that immediate contact might contaminate future generations. Given that many plants and animals might perish, the cumulative effect could be devastating.

Response: Risk Assessments examine plausible individual acute and chronic exposure scenarios, and resultant identified risks have been the basis for development of Standard Operating Procedures and PEIS Mitigation Measures, which minimize risk. Then, assuming the Standard Operating Procedures and PEIS Mitigation Measures are applied, and considering the generally limited scope of BLM herbicide uses, the potential for adverse effects to individual resources are addressed within Chapter 4. Many of those sections identify little or no risk in both the short and long-term, even at the very site-specific scale. The *Fish, Wildlife Resources*, and particularly the *Native and Other Non-Invasive Vegetation* section, however, identify risks to certain individuals from certain herbicides. For example, glyphosate with POEA is identified as toxic to directly sprayed amphibians away from riparian areas. (Glyphosate with POEA would not normally be used within riparian areas.) Most of the herbicides are toxic to non-target plants if they are sprayed. These resource sections point out, however, that these adverse effects would be at the scale of the individual organism, and no long-term effect from herbicides is anticipated at the population scale. For Special Status species, those species' assumed sensitivity and the requirement for pre-project clearances reduces the likelihood of adverse effects even at the scale of the individual organism.

Many of the resource sections in Chapter 4 *do* identify a likely long-term adverse effect from the continued spread of noxious weeds and other invasive plants.

103. Comment: The safety of most of these chemicals has not been determined using modern analytical methods in double blind tests. Most of the safety literature has been developed by those most in a position to profit. The government has no business releasing these agents for widespread use when their effects are so poorly known.

Response: The EPA requires extensive toxicological testing in multiple plant and animal species prior to registration using modern analytical methods. A certain portion of the testing is funded by the manufacturer, but it is conducted in independent laboratories using scientific methods approved by the EPA. The BLM does not rely only on this testing however; Risk Assessments are prepared, further examining the available literature to determine the implications of using the pesticides in wildland settings. Overviews of the EPA registration and reregistration processes, and of the BLM and Forest Service's Human Health and Ecological Risk Assessment processes, have been added as Appendix 13.

104. Comment: How many hazardous chemicals have been tested in situations where winds blow cattle-trampled and de-stabilized herbicide-encrusted soils into waters or onto migratory birds eggs or into pygmy rabbit burrows as well as on the vegetation that pygmy rabbits eat?

Response: The Risk Assessments test maximum plausible exposure scenarios. Exposure to lesser quantities by less direct methods would simply have less effect (lower risk); testing these specific scenarios is not needed to understand risks. Dust transport of herbicides on soils into water was specifically addressed in the *Water Resources* section in Chapter 4. Most of the herbicides considered in the EIS are applied to foliage, not soil, so the scenarios described in the comment would be limited.

Toxicity testing is performed on concentrated active ingredients. In the environment, herbicides are transformed by hydrolysis, photolysis, sorption, and biodegradation to less normally less toxic compounds and various degradates, each at lower concentration. The Ecological Risk Assessment scenarios addressed consumption of contaminated vegetation, and the *Soils Resources* section addressed effects on soil organisms. Many herbicides are rapidly degraded in soils, waters, and plant surfaces (see *Soil Resources* and *Native and Other Non-Invasive Vegetation* sections).

105. Comment: A full analysis of the adverse effects of all herbicides and their associated chemicals, including where multiple chemicals may be used, must be conducted under real-world degraded wild lands situations. Increased weather extremes under climate change scenarios must be incorporated into these Risk Assessments.

Response: Risk Assessments are performed using herbicide application type and rate information, exposure pathways including fate and transport models of migration through soil, water, and air, and multiple human and non-target species' categories, to estimate risk as comprehensively as possible. The reason many wild lands are degraded is because of invasive species; there is no reason to believe that the risk models would not be applicable to degraded wild lands. Nor is there reason to believe climate change would affect herbicide exposures.

106. Comment: 1) BLM exposure scenarios were not as inclusive for the public as Forest Service exposure scenarios. 2) Failure to include water and food consumption could understate risk. 3) The exact methodology for assigning risk categories is not transparent.

Response: 1 and 2) The BLM exposure scenarios were equally or more inclusive than Forest Service scenarios and included exposure to berry pickers, anglers, swimmers, ingestion of water, berries, and fish (see *Human Health Risk Assessment Methodology* in the *Human Health and Safety* section in Chapter 4). 3) The risk category methodology is almost identical between the two Federal Agencies. Appendix 13 has been added to the Final EIS to make information about the BLM and Forest Service Risk Assessment processes more available.

107. Comment: The EIS does not clearly explain what the term "moderate toxicity" means.

Response: As discussed in the *High, Moderate, and Low Risk in BLM and Forest Service Risk Assessments* section of Chapter 3, the Risk Assessments for each herbicide evaluated in this EIS established a Risk Quotient (RQ) for each herbicide evaluated by BLM and a HQ (hazard quotient) for herbicides evaluated by the Forest Service. The EPA identifies a Level of Concern (LOC) for herbicides, which is the dose of the herbicide above which effects would be expected. In absence of information indicating otherwise, the LOC is generally 1/10 of the Lowest Observed Adverse Effect Level (LOAEL); or, the lowest dose level where there was a statistically significant increase in frequency or severity of lethal or sublethal adverse effects to the test organism. The RQ is calculated by dividing the Estimated Exposure Concentration (ECC) by the Toxicity Reference Value (TRV). The ECC is the dose that an organism would be exposed to under the test scenario (a cow eating only sprayed grass for a day, for example) and the TRV is the toxicity of the herbicide - usually the No Observed Adverse Effect Level (NOAEL) or the LOAEL. When the RQ is equal to 10 to 100 times the most conservative LOC for an herbicide (generally equal to the LOAEL to 10 times the LOAEL), BLM determined it to be a "moderate risk."

108. Comment: How do risk categories translate in real term effects? Are RfDs (Reference Dose) and TIs Toxicity Index) or TRVs (Toxicity Reference Value) expressed in comparable units of measurement and do the calculations of dividing EECs (Estimated Exposure Concentration) by TRVs really express the hazard? It seems that low or moderate risk categories could result in mortality or severe effects to the most vulnerable species.

Response: Computed environmental exposure concentrations were divided by toxicity reference values to derive risk quotients. Values greater than 1.0 indicate a level of risk that increases with the numerical value, but the relationship between dose and response may not always be linear. Because of this uncertainty and because of the thousands of exposure scenarios evaluated, a category system was used. The category schemes described in the *Risk Assessments* section of Chapter 3 reflect the severity of risk.

The RfDs and TRVs use the same units of measurement (e.g. mg/kg body weight/day). The calculations are used by toxicologists to express the hazard.

Regarding the "real term effects," the *High, Moderate, and Low Risk in BLM and Forest Service Risk Assessments* section in Chapter 3 attempts to put the risk categories in useable terms. The lower range for the L, or low, risk category is theoretically the level at which an effect began to be discernable in testing or modeling. The minimum identified effect may have been skin or eye irritation, leaf damage, and so forth. The lower range is not usually the level at which effects were actually notices, because uncertainty factors are added to address hypersensitive individuals, or accommodate uncertainties in the measurements, such as inferring effects to one species based on actual tests on other species. Uncertainty factors are typically multiples of 10, so the assumed Lowest Observable Effects dose could have been inflated 10, 100, or even 1,000 times for uncertainties. Thus, exposure of the average individual to the dose identified as having an effect probably would not have an effect. Nevertheless, the L or low category indicates risks start at that point. The moderate risk category indicates risk starts at doses one-tenth those of the low categories; high is one-hundredth of the testing scenario dose. Testing scenarios are severe (e.g. soaking the test animal), so Standard Operating Procedures and PEIS Mitigation Measures such as buffers, wind speed limits, and so forth, as well as required safety equipment, limit exposure to substantially less than tested doses. For herbicides with moderate and high risk categories for a particular species, special cautions are implemented. For example, buffers for Special Status plant species are set at the shortest tested distance where no effect was discernable or predicted. Some are as large as 1,500 feet for some herbicides (Table A2-1). The low, moderate, or high human health risk categories shown on the "Risk Categories" tables at the end of Chapter 3 are more conservative than the EPA risk categories (Caution, Warning, or Danger/Poison) used on herbicide labels.

109. Comment: The increase in application and addition of new herbicides pose significant risks to the environment. In particular, the Proposed Action (Alternative 4) increases the risk of contamination of Oregon's water, further threatens already imperiled species, and may endanger the health of local residents and those who use public lands.

Response: Nothing in the analysis indicates the current or proposed use of herbicides would pose a significant risk to the environment; the analysis seems to indicate not. The risk categories for each herbicide are based on scenarios plausible before the application of the Standard Operating Procedures and PEIS Mitigation Measures. Using the risk categories from the Risk Assessments and summarized on tables at the end of Chapter 3, and the estimated herbicide treatment acres for each alternative shown on Table 3-3, the Comparison of the Effects of the Alternatives table in Chapter 2 (Table 2-5) shows that the Proposed Action (Alternative 4) would treat fewer acres with moderate or high-risk herbicides than the No Action Alternative (Alternative 2), even though total acres treated with herbicides would nearly triple. The Proposed Action would use additional herbicides that have generally been chosen because they are less toxic than the four currently allowed on BLM lands. The risks to different organism groups are not related– e.g. an herbicide that is moderately toxic to birds may have no toxicity to fish. However, the *Human Health and Safety* section shows that herbicides that have a moderate risk to humans (the EIS does not propose using any herbicides that have a high risk to humans) are used on an estimated 1,200 less acres annually under Alternative 4 (the Proposed Action) than under Alternative 2 (the No Action Alternative). All wildlife risk decreases between Alternative 2 and 3; herbicides that have moderate or high risk decrease between an estimated 800 acres annually (insects) to 8,900 acres (birds). Risks from herbicides between Alternatives 3 and 4 go up as risks from non-herbicide methods go down. Alternative 4 (the Proposed Action) would allow herbicide treatments in rights-of-way, administrative sites, and recreation sites; methods currently used are usually mechanical (mowing and chainsaws) which have their own set of risks.

In addition, a larger number of available herbicides allows the most appropriate herbicide to be used. For example: one herbicide might be more effective at killing a weed and has less risk to non-target plants than another herbicide, but the first herbicide poses more risk to fish. If the herbicide application does not occur near a body of water, then risk to fish – an important consideration – might be completely irrelevant.

110. Comment: The EIS fails to adequately consider the harm from drift.

Response: Various drift scenarios are addressed on the "Risk Categories" tables at the end of Chapter 3, and considered and discussed under applicable herbicides in the various resource sections throughout Chapter 4. The discussions of drift in the *Water Resources* section includes a table of drift distances by droplet size; the AgDrift model is discussed in the *Fish* section; and Appendix 2 includes tables of buffer distances to avoid drift damage to Special Status species. In addition to drift, post-application off-site movement is addressed. Because most of the risks discussed in the EIS result from drift (as most non-target species would not be directly sprayed), addressing drift is an important component of the EIS.

111. Comment: In 2001, the EPA changed the legal definition of pesticide 'drift' to 'the movement of liquid droplets.' Previously, the definition included the movement of vapor. Vaporization occurs when the pesticides/herbicides interact with the sun. It is a known fact that pesticides/herbicides drift much farther when vaporized than they do as liquid droplets. The current EIS refers to drift of droplets but never once mentions the more far-reaching drift by vaporization. Elimination of vapor as a drift exposure to adjacent lands appears to be a loophole to not be responsible for herbicide pollution.

Response: Herbicide labels include restrictions against "drift," so the EPA defines what that term means when it is on a label. In 2001, the EPA proposed to define drift as:

> Spray or dust drift is the physical movement of pesticide droplets or particles through the air at the time of pesticide application or soon thereafter from the target site to any non- or off-target site. Spray drift shall not include movement of pesticides to non- or off-target sites caused by erosion, migration, volatility, or windblown soil particles that occurs after application or application of fumigants unless specifically addressed on the product label with respect to drift control requirements (EPA 2001).

The 2001 EPA notice also said the EPA's "drift" focus is "within relatively short distances (up to 1/2 mile)", that "under certain circumstances lower levels of pesticides may drift considerably farther", and that "pesticide vapor and the off-target movement of pesticides by other means…can nevertheless present substantial risks to humans and the environment. The EPA generally addresses these routes of exposure and associated risk at the individual pesticide level through its regulatory programs." In short, the definition applies to an application term, but in no way presumes to set geographic limits on the area of potential effect. A discussion of the EPA action has been added to Chapter 1.

The BLM and Forest Service Risk Assessments consider the effects of herbicide contact, and do not distinguish whether that contact is from liquid, droplets, vapor, on blowing dust, in waters, or from other mechanisms in or out of the EPA's drift definition. A background discussion about drift has been added to the *Risk Assessments* section in Chapter 3.

Herbicides have very low vapor pressures. One study showed that with more volatile insecticides, little or no vapor drift was detected 9-27 meters downwind for insecticides with vapor pressures less than 1×10^{-4} mm Hg (Woodward et al. 1997). All of the herbicides covered by the EIS have very low vapor pressures (maximum is 4×10^{-6} mm Hg and they range to as low as 5.5×10^{-16} mm Hg; Vencill et al. 2002).

112. Comment: The AgDrift model may be inadequate for forest and range settings, which are more complex than agricultural fields.

Response: For the past 25 years, the Forest Service has evaluated AgDrift and their similar version (AgDisp) to develop accurate, validated models that predict the behavior of pesticides applied by aerial application above forests. An extensive field study and model validation effort confirmed the predictive capability of the computational engine that drives the near-wake solution scheme in both AgDisp and AgDrift (Thistle 2005). The range settings would not differ significantly from those used for agriculture, because topography and application heights would be similar.

113. Comment: Even if the BLM aerially applies herbicides in compliance with the labels, it runs the risk of acting in a negligent manner by failing to designate a sufficiently large buffer zone around navigable waters. Considering the high density of adjacent waters to some of the area where aerial application is proposed, the probability of herbicide drift entering navigable waters increases significantly under the BLM's Proposed Action (Alternative 4).

Response: A subsection addressing drift has been added to the *Risk Assessments* section of Chapter 3. Identification of water bodies during site-specific planning, constantly improving drift reduction agents, and improving technology regarding spray equipment including instant, pinpoint navigational equipment on aircraft, continues to reduce the likelihood of aerially applied herbicides reaching water bodies. The Proposed Action (Alternative 4) does not include aerial applications west of the Cascades in part because of numerous, sometimes hard to detect even from the ground, water bodies there. Standard Operating Procedure-prescribed buffers often exceed label requirements, and Special Status species' buffers can exceed a thousand feet (Table A2-1 in Appendix 2). "Drift" is a primary exposure scenario addressed in the risk categories and discussed in the resource sections in Chapter 4, so any risk is well considered and displayed for consideration by the decision-maker and during subsequent site-specific analysis. This EIS does not propose projects. There is no basis for the claim that buffers would be too small or that subsequent treatments would be negligent.

Most of the projected increase in aerially applied herbicides under the Proposed Action (Alternative 4) is for imazapic east of the Cascades. The "Risk Categories" tables at the end of Chapter 3 show imazapic to have no risk to the public or any element of the environment except plants, at every examined scenario including spills into water bodies.

114. Comment: The BLM's inability to prepare a Risk Assessment for all combinations of herbicide mixes, and for all adjuvants and inerts, suggests the need for a precautionary approach, including the avoidance of the more toxic herbicides and prohibiting boom sprays.

Response: Uncertainty factors used to set apparent No Observable Effect Levels, and the doses assumed by the Risk Assessments when setting risk categories, are precautionary in nature. Additionally, the BLM uses buffers and other Standard Operating Procedures and PEIS Mitigation Measures that often exceed label requirements. When using tank mixes, risks are considered additive, not proportionate to the amount of each herbicide in the mix (as a precaution against unforeseen synergistic effects). Special Status species' risk categories were based, generally, on an assumption they are ten times more susceptible than non-Special Status species. These and other factors are part of the precautionary approach used with BLM herbicide applications.

115. Comment: Synergistic effects of multiple herbicides and tank mixes have not been adequately analyzed. In addition, what is meant by the statement, "BLM generally does not tank mix diquat, fluridone, and tebuthiuron?"

Response: BLM assessed commonly used tank mixes in the Ecological Risk Assessments by adding, not proportioning, risk quotients for each component in part to allow for unforeseen synergistic effects. Like results for separate active ingredients, results varied from no risk to elevated risk to wildlife, and aquatic and terrestrial plants. PEIS Mitigation Measures apply to components in tank mixes as well as single active ingredients. Numerous tank mixes are addressed in the Risk Assessments and results suggest some synergistic effects occur with some mixes, but that the risk increase is too small to change the risk categories.

Tank Mix Risk Quotient Risk Assessment appendices (Appendix 8) were not prepared for diquat, fluridone, and tebuthiuron because the BLM generally does not use these in tank mixes.

116. Comment: 2,4-D: 1) is persistent in streams, rivers, and wells; 2) residue has been found by the CDC in 25% of Americans; 3) is found in 60% of air samples; and, 4) involved in many incidents.

Response: According to the EPA's 2005 Reregistration Eligibility Decision Document: 1) The degradation of 2,4-D was rapid (half-life= 6.2 days) in aerobic mineral soils. The half-life of 2,4-D in aerobic aquatic environments was 15 days. Monitoring data considered in the EPA's assessment were the USGS National Water Quality Assessment Program (NAWQA) groundwater and surface water database, USGS/EPA reservoir monitoring database, National Drinking Water Contaminant Occurrence Database (NCOD), and EPA's Storage and Retrieval environmental data system (STORET). Review of these databases was conducted to provide peak and median concentrations. Additionally, the quality of data was evaluated for targeting pesticide use areas, detection limits, and analytical recoveries. The monitoring data indicate that 2,4-D is detected in groundwater and surface water. In addition, 2,4-D is detected in finished drinking water. Maximum concentrations of 2,4-D in surface source water and ambient groundwater are 58 ug/L and 14.8 ug/L, respectively. The median 2,4-D concentration of 1.18 ug/L was derived from finished water samples in the NCOD database. The highest time weighted annual mean (TWAM) concentration was 1.45 ug/L from the NAWQA database containing non-targeted data reflecting pesticide concentrations in flowing water as opposed to more stationary bodies of water such as ponds, lakes, and reservoirs. 2) BLM could find no published information on this part of the comment. 3) BLM could find no find no published information on this part of the comment. 4) Drift is a concern for all herbicide spray formulations. Label instructions and PEIS Mitigation Measures are intended to minimize drift. Typical application rates showed no risk to terrestrial plants and most aquatic plants. Appendix 13 provides additional information specifically about 2,4-D.

117. Comment: The EIS does not reveal that 2,4-D is linked with bladder cancer and testicular problems in dogs.

Response: The EPA Reregistration Eligibility Decision document for 2,4-D does not mention any types of cancers or testicular effects in canines (EPA 2005a). The Reregistration Eligibility Decision process is described in Appendix 13. Health Canada's 2,4-D reregistration announcement addressed the cancer question as follows:

> Based on re-examination of the data, various scientists and workgroups have concluded that there is no relationship between 2,4-D use and canine malignant lymphoma (CML). Although a 1991 article by the National Cancer Institute (NCI) indicated a link between dogs with CML and dog-owners that applied 2,4-D to their lawn, a 1991-1992 independent panel concluded that the NCI study design was severely flawed and, in fact, did not show an association between CML and 2,4-D use. In 1999, scientists at Michigan State University re-examined the NCI data and also concluded that there was no relationship between 2,4-D use and CML (Health Canada 2009).

118. Comment: According to the Journal of Pesticide Reform, glyphosate: 1) is carcinogenic to humans causing non-Hodgkin's lymphoma, miscarriages, causes reduction of male reproductive capacity; 2) affects plants that birds use; 3) affects fish immune systems, causes genetic damage to amphibians; 4) is persistent into the fall harvest season; and, 5) has been found in streams in King County (JPR 2004).

Response: 1) The BLM has reviewed Hardell (1999), which was cited in this journal article; the authors do not show glyphosate causes Non-Hodgkin's lymphoma (NHL), nor was the sample size sufficient to report a significant association. Recent work by De Roos et al. (2005) with a larger sample size and improved epidemiologic techniques failed to show any link with NHL, all cancers or cancers by target organ, with the exception of a "suggested" association with multiple myeloma (although sample size is again small). Neither the EPA, nor the consensus of the scientific community conclude glyphosate is carcinogenic and the EPA Reregistration Eligibility Decision for Glyphosate (EPA 1993) does not mention any form of cancer or male reproductive effect. The glyphosate Risk Assessment discusses the referenced miscarriages documents and finds a) that the 95 percent confidence interval included 1.0 (no effect), and b) that the apparent effect evaporated when the data was correlated with the known maternal age risk factor.

2) Any herbicide will affect plants for which it is designed to kill, including plants that birds use for forage; however, much of the Proposed Action (Alternative 4) is targeted at invasive plants that would not be essential to native bird species.

3) Glyphosate formulations with adjuvant POEA have been found toxic to fish and amphibians, however glyphosate minus POEA is of much lower toxicity. BLM will restrict use of POEA near aquatic habitats as a PEIS Mitigation Measure.

4) Glyphosate is moderately persistent in soil and has low potential to leach to groundwater (see the *Soil Resources* and *Water Resources* sections in Chapter 4). The citation's "into the fall harvest season" indicates the study is from agriculture use, which is far different from the uses proposed by the BLM.

5) It is not surprising glyphosate would be found in urban streams in and around Seattle; glyphosate is widely used and readily available at home and garden centers.

119. Comment: A Human Health Risk Assessment should have been completed for Overdrive (diflufenzopyr + dicamba).

Response: Human Health Risk Assessments were done for both diflufenzopyr and for dicamba (dicamba is proposed specifically to be used in combination with diflufenzopyr). The combination of these herbicides in a tank mix or commercial product would result in an additive impact to human health (hazard index), depending on the concentration and application rate of each ingredient, thus a specific Human Health Risk Assessment for the combination is not necessary. The mixture of the two ingredients changes the risk to vegetation compared to each used separately, thus an Ecological Risk Assessment was prepared for the combination.

120. Comment: The EPA did not accept staff recommendations that picloram registration not be continued. In addition, according to the Journal of Pesticide Reform of Spring, 1998: 1) picloram causes damage to internal organs and is contaminated with hexachlorobenzene, which causes cancer of internal organs; 2) picloram is toxic to fish, persistent, and mobile in soil; and, 3) runoff has damaged crops (JPR 1998)

Response: The BLM cannot address internal EPA (deliberative) communications. Picloram is still registered by the EPA. 1) Picloram is rated by the EPA as being only slightly toxic to humans via ingestion. Picloram is contaminated with <100 ppm hexachlorobenzene (HCB). The EPA's 1995 Reregistration Eligibility Decision Fact Sheet for picloram rated the carcinogenic risk from the trace contaminant HCB in picloram to the general public as being negligible and the risk for workers mixing picloram as "not-unacceptable," (see detail in the *Human Health and Safety* section in Chapter 4). 2) Picloram is moderately persistent and mobile in soil (see the *Soil Resources* section in Chapter 4). The Risk Assessments show it is highly toxic to susceptible fish under a spill scenario, and low to non-toxic under all other scenarios ("Risk Categories" tables at the end of Chapter 3). 3) Any herbicide runoff has potential to damage non-target vegetation. Standard Operating Procedures for application and PEIS Mitigation Measures (including buffer distances) are intended to prevent such occurrences. The risks described here are acknowledged in the Risk Assessment and reflected in the risk categories and use recommendations.

121. Comment: According to the Risk Assessments, sulfometuron methyl causes various health effects, has been found in surface waters, persists in soils, drift has caused crop damage, and it causes cancer and developmental toxicity.

Response: Sulfometuron methyl was identified in the EIS as having moderate potential for leaching, is moderately persistent in soil, and is rarely found in surface water (see the "Herbicide Information" table near the beginning of Chapter 3 and the *Soil Resources* and *Water Resources* sections in Chapter 4). The EPA Reregistration Eligibility Decision document for Sulfometuron Methyl found no credible information that sulfometuron methyl causes cancer or developmental toxicity (EPA 2008b). The Risk Assessment says "The EPA (2003b) states that the carcinogenicity of sulfometuron methyl is not yet evaluated. However, no carcinogenic effects have been detected in either rats or mice exposed to sulfometuron methyl (EPA 1990 as cited in Extoxnet 1996b). Therefore, it is reasonable to assume that sulfometuron methyl would not be classified as a likely carcinogen" (ENSR 2005j). A crop damage incident is described in the EIS. Standard Operating Procedures and PEIS Mitigation Measures preclude similar (aerial) applications.

122. Comment: The Human Health Risk Assessments used for bromacil, diuron, and tebuthiuron were completed in 1991. Information that is more current is available, and should have been considered in the EIS.

Response: As noted in the *Risk Assessments* section in Chapter 3, these Human Health Risk Assessments were used in BLM's 1991 Vegetation Treatment on BLM Lands in Thirteen Western States EIS, and literature that is more recent has been examined to ensure that these Risk Assessments remain current. Additional new information is published all the time; however, no new information has been found thus far that changes the findings in these 1991 Risk Assessments. The BLM completed Risk Assessments for all herbicides where literature searches indicated new findings.

Methodology for Assessing Effects

123. Comment: In general, in the EIS, the risks of non-herbicide control are over-stated and the risks of herbicide use are downplayed. The EIS discusses the threat of invasive plants to various resources, but fails to give equal attention to the numerous threats posed by herbicides to water quality, soils, wildlife, air quality, humans, recreation, Wilderness, Special Status species, etc.

Response: The primary focus of the analysis in Chapter 4 and the Risk Assessments regards the use of herbicides and their potential to affect on the resources listed in the comment. PEIS Mitigation Measures and Standard Operating Procedures limit many of the risks. Non-herbicide methods are also addressed because it is easy to forget that substitute non-herbicide methods are not benign. The effects of non-herbicide methods are poorly quantified, however, so it is difficult to see how they are "over-stated." Non-herbicide methods also have standard operating procedures and mitigation measures, but they (like herbicides), would still have some risk. Chapter 3 explains the assumptions that the resource specialists worked from. Chapter 4 explains the environmental consequences of the alternatives (including the effects of herbicides, non-herbicide methods, and untreated invasive plants). Appendix 2 includes the PEIS Mitigation Measures and Standard Operating Procedures common to all alternatives in this EIS for the use of herbicides. Appendix 8 has detailed Risk Assessments for each proposed herbicide. All of the assumptions and discussion of the relative risks are presented in detail.

124. Comment: The use of herbicides trades one harm for another. While the EIS correctly states invasive plants are upsetting the natural balance, it also acknowledges that human activities have been to blame. Now humans propose to introduce herbicides, affecting the balance in ways that may surpass the effects of invasive species. The BLM should take a conservative approach until further research conclusively demonstrates that the introduction of new herbicides is safe and will not have unintended consequences.

Response: EPA registration, Risk Assessments, and the EIS have taken a hard look at the potential for the proposed herbicides to do environmental harm, and information in these documents reasonably demonstrates that the herbicides are unlikely to have significant unintended adverse effects when used as proposed. Standard Operating Procedures and PEIS Mitigation Measures are designed to virtually eliminate the potential for significant adverse effects, and the effects discussions in the resource sections in Chapter 4 assume their application. However, as noted near the start of Chapter 4, resource management is uncertain and always will be. Not using herbicides is also a management decision with implications (see Reference Analysis). The BLM uses herbicides conservatively, following site-specific analysis and appropriate Endangered Species Act consultation.

Chapter 4 – Affected Environment and Environmental Consequences

Incomplete and Unavailable Information

125. Comment: Despite stating the CEQ requirements for how to proceed with an EIS with incomplete or unavailable information, the EIS section on this does not appear to supply the information required by CEQ points 3 (a summary of existing credible scientific evidence which is relevant to evaluating the reasonably foreseeable significant adverse impacts on the human environment), or 4 (the agency's evaluation of such impacts based upon theoretical approaches or research methods generally accepted in the scientific community).

Response: The *Incomplete and Unavailable Information* section in Chapter 4 explains how the Risk Assessments deal with each of these points. Resultant conservative risk categories are carried into the specific resource effects and the *Human Health and Safety* sections in Chapter 4. Adjuvants and inerts are also discussed in the Risk Assessments, and recommendations for avoiding adverse effects are presented. The Final EIS, in Chapter 3 and in the *Fish* section in Chapter 4, includes additional information about adjuvants and inerts.

126. Comment: The EIS fails to address synergistic effects of multiple herbicides.

Response: The EIS acknowledges that there is a high degree of uncertainty surrounding potential effects from multiple complex mixtures and multiple exposures (*Incomplete and Unavailable Information* early in Chapter 4). To address concerns over herbicide use the BLM and Forest Service have supplemented the EPA herbicide registration information with over 6,000 Pages of Environmental and Human Health Risk Assessments (Appendix 8). These assessments address the potential for synergistic effects. Where applicable, those risks have been noted. For example, the increased potency of 2,4-D tank mixes is addressed. The EIS notes that tank mix risk quotients are added, not proportioned, in part to account for the potential for synergistic effects.

127. Comment: The EIS failed to adequately consider the impact of mistakes on water quality, wildlife, and human health. Mistakes will happen and herbicides will be applied in places and at times that are not allowed. The EIS should not assume that herbicides would always be used according to the label. Humans are fallible.

Some people who may apply herbicides on BLM lands may not be able to read and understand what is written on the labels. The analysis needs to conduct a Risk Assessment that accounts for the high likelihood of chemical accidents and misuse.

Response: The *Risk Assessments* section in Chapter 3 notes that risk categories were developed for exposures to direct spray, surface runoff, wind erosion, and accidental spills through the Risk Assessment process. A summary of these risk categories are displayed on the "Risk Categories" tables at the end of Chapter 3, and are used in the various resource sections in Chapter 4. The *Incomplete and Unavailable Information* section notes "Risk Assessments test or model a range of plausible scenarios including spills and direct applications on non-target organisms, but exposure beyond those modeled is possible," and goes on to describe a recent example. The *Accidental Spill or Misapplication* section describes various spill scenarios, as well as the acknowledgement that misapplications will occur, a likelihood potentially increased when new herbicides are being used for the first time. Reducing such incidents is one objective of some of the existing and potential implementation monitoring described in Appendix 3. There is no evidence of a human health incident having occurred with a BLM herbicide application in Oregon in the past 25 years.

The potential impacts of spills are specifically addressed in the *Native and Other Non-Invasive Vegetation* section both generally and for specific herbicides; in the *Water Resources* section where it is specifically addressed in both the *Direct Application* and *Leaching* sections; in the *Wetlands and Riparian Areas* section both generally and for most of the herbicides specifically; in the *Fish* section generally and under a specific heading of *Water Contamination from Accidental Spills,* under most of the specific herbicide discussions, and under the discussion of each alternative; variously in the *Wildlife Resources* section; in the *Environmental Justice* section; and, in the *Human Health and Safety* section. Impacts from misapplications are the same as those for spills (at a much smaller scale) or for collateral damage, addressed in all sections.

Accidental applications at the wrong sites, or with the wrong materials, would usually adversely affect the treated plants and, potentially, susceptible species that were to be avoided. Other effects would generally be as assessed in the analysis since applications would still be at rates specified on the label. Applicators must have state licenses, and part of the written test for that license requires reading labels. In cases where direct supervision fails, post-project monitoring can find errors. Districts generally already select a certain percentage of implemented projects for on-the-ground review, to insure agreements made during the planning (NEPA) process were implemented as intended. Appendix 3 in this EIS suggests, under *Potential Monitoring*, that some minimum number of high-profile herbicide projects be selected on each district annually for similar post-project monitoring by a group that includes weed control and herbicide experts.

The comment does not suggest why the analysis is not adequate, or identify what additional information would make it so.

Cumulative Impacts

128. Comment: The *Cumulative Impacts* section fails to discuss the cumulative impacts of the herbicides that the BLM wants to use at a statewide scale.

Response: This EIS is a programmatic EIS discussing - at the statewide scale - the effects of the BLM's use of herbicides to various resources, including human health, native vegetation, and wildlife. Since the entire programmatic analysis is essentially a cumulative effects analysis, miscellaneous information applicable to more than one section was presented early in Chapter 4 to help provide context to individual sections, particularly as some of those sections refer to those actions. Some of the ongoing actions described in the Draft EIS in the *Cumulative Impacts* section, however, are not impacts. These have been moved to the *Non-BLM Actions Potentially Affecting the Use of Herbicides on BLM Lands in Oregon* section in Chapter 1.

129. Comment: In the *Cumulative Impacts* section, the Draft EIS states that the Oregon Department of Agriculture's Pesticide Usage Reporting System 2008 report did not include households. This is not true.

Response: The Oregon Department of Agriculture required businesses to report their pesticide use, but did not require households to do the same. However, the 2008 report does include a household component. The Gilmore Research Group conducted a Household Pesticide Use Survey in 2008, which asked about 2,000 households in Oregon to track their pesticide use. Response and reporting consistency were so poor that the Oregon Department of Agriculture did not extrapolate that information out to make any conclusions about other households in the State. This has been clarified and further described in the *Cumulative Impacts* section early in Chapter 4.

130. Comment: The Draft EIS does not disclose the cumulative impacts of their past spray actions.

Response: A section addressing past spray actions has been added to the *Cumulative Impacts* section early in Chapter 4.

Being limited to four herbicides has contributed to the spread of invasive plants because of restrictions and/or limitations on the plants that can be controlled by these herbicides, and the places that they can be used. Limiting the number of herbicides can also contribute to some invasive plants becoming resistant to certain herbicides. These issues are discussed in the *Noxious Weeds and Other Invasive Plants* section.

131. Comment: Private timber companies are aerially spraying the lands that surround and are intermixed with the O&C lands. The BLM is proposing to use herbicides on these checkerboard lands, and thus will double the amount of herbicides that are already being sprayed over neighboring children, houses, food, and animals. The EIS needs to consider the cumulative impacts of spraying additional herbicides in the same area where private industrial timber companies are already spraying thousands of acres.

Response: Timber companies that are using herbicides to grow timber would be using herbicides in a different manner, and in greater quantities, than proposed by the BLM. The BLM currently uses herbicides on noxious weeds on O&C lands. While the number of herbicides available under the Proposed Action (Alternative 4) would increase, and the types of vegetation that could be sprayed would change, the estimated annual pounds of herbicides applied west of the Cascades, and the acres sprayed with herbicides rated in the EIS as having a moderate or high risk to the environment or human health, would decrease under the Proposed Action (Tables 3-4 and 2-6). The number of acres sprayed under Alternative 4 (the Proposed Action) would increase, but application methods are primarily methods that target distinct vegetation, and PEIS Mitigation Measures and Standard Operating Procedures would limit impacts to non-target species. (Aerial spray would not be permitted on BLM lands west of the Cascades under Alternative 4.) Therefore, cumulative effects from the Proposed Action on O&C lands would be expected to differ little from the No Action Alternative (Alternative 2). It is unknown how much herbicide is used on the private portion of checkerboard lands, but the BLM's contribution to Oregon State totals is shown in the *Cumulative Impacts* section. A public comment letter from industry suggested that better invasive plant control on BLM lands, whether because of increased availability of herbicides or incidentally during rights-of-way maintenance, would likely reduce the invasive plant treatments required on industry lands. A subsection addressing this potential effect has been added to the *Cumulative Impacts* section.

132. Comment: The EIS should note that better control of invasive plants would reduce the need for neighboring landowners to use herbicides on their lands.

Response: Although the Draft EIS noted many times that adjacent non-BLM land resources would benefit from better control of BLM weeds, the implication that cross-boundary resources might benefit from a reduced overall need to treat non-BLM lands was only touched on in the Draft EIS at one point. In the *Native and Other Non-Invasive Vegetation* section, the Draft EIS noted "Other native ecosystems on BLM lands may also suffer when invasive plants spread from BLM lands. Adjacent landowners may control these weeds with less environmentally friendly methods or products. Collateral damage may occur near property lines, and landscape-scale values such as watershed or wildlife values may be degraded by these well intended treatments, particularly west of the Cascades where the checkerboard ownership often means the BLM manages no more than 50 percent of any watershed."

A subsection addressing this topic has also been added to the *Cumulative Impacts* section early in Chapter 4.

133. Comment: It is generally believed that rangeland degradation exacerbates populations of grasshoppers and Mormon crickets, so as more areas of BLM lands become overrun with cheatgrass, more acres will be sprayed with insecticides Moreover, in the past two years, there has been a large increase in lands sprayed for West Nile virus. The Draft EIS does not evaluate this co-occurrence, or overlap, of lands likely to be sprayed for weeds and with insecticides.

Response: Most insecticide treatments on BLM lands in Oregon are likely to be spatially or temporally separated from most herbicide treatments proposed in this EIS, so virtually few organisms except, conceivably, plants, would be expected to have active doses of both materials at the same time. Any overlaps of concern should be identified in site-specific analyses; ongoing invasive plant treatments would be a consideration during insecticide spray planning, in part, because of the widespread use of noxious weed biological controls. Of 157,000 acres of Oregon grasshoppers sprayed statewide by the Animal and Plant Health Inspection Service and/or the Oregon Department of Agriculture in 2009, about 34,000 acres were on BLM lands. No BLM acres were sprayed for Mormon cricket (Brown 2009).

Cumulative adverse effects to humans or other elements of the environment are most likely when two pesticides share a common mechanism of toxicity. That is, they both affect an organism the same way. Cumulative effects assessments conducted by the EPA typically *begin* by grouping pesticides by mechanism of toxicity (EPA 2002). Because insecticides and herbicides work so differently, even a concurrent application would be unlikely to result in significant additive environmental effects when both products are applied within label limits. Synergism is not impossible however; the 2,4-D Risk Assessment reports that 2,4-D induced cytochrome P450 (a natural animal enzyme that processes toxins) in the southern armyworm (*Spodoptera eridania*) and caused synergistic effects on insecticide toxicity (Kao et al. 1995). In addition, exposure to 2,4-D caused decreased carbaryl and permethrin insecticide toxicity. This discussion has been added to the *Cumulative Impacts* section.

134. Comment: The EIS did not adequately consider the proposed increase in the number of proposed wind and geothermal energy sites, transmission lines, and gas pipelines that will result in large-scale disturbance, which will allow for significant inroads to be made by invasive species, which will prompt the BLM to douse public lands with herbicides.

Response: The EIS took into account new energy projects in the State. District experts were asked to estimate herbicide use for the next 10-20 years, and were specifically asked to consider current and future developments under each administrative site, recreation site, and right-of-way category listed under Alternative 4 in Chapter 2. These include geothermal facilities, wind energy facilities, utility distribution, and pipelines.

New permits require mitigation measures and restoration plans for disturbed sites. The analysis for such projects follows BLM policy described in Chapter 3 and Appendix 3, that proposals with a moderate or high risk for establishing noxious weeds require follow-up monitoring as well as identification of project actions that need to be taken in order to reduce or prevent the spread of noxious weeds.

135. Comment: The EIS must assess the levels and degree of desertification that have occurred across the Oregon EIS area. This is necessary to understand the likelihood of soil erosion, accelerated runoff, and other forms of drift, and to understand the amounts of chemicals likely to be applied over time. This is necessary to understand the capability and suitability of these lands for livestock grazing, the productivity and carrying capacity of these lands for grazing, the current or likely future extent of cheatgrass and other hazardous fuels problems linked to desertification and livestock or other degradation, the need for treatments, and the type of treatments that may best be applied, the risks associated with treatments, and the likely effectiveness or success of any treatments undertaken under the EIS. The effects of alternatives, their ability to meet any objectives, and the ability of actions under the EIS to maintain, enhance, or restore habitats and populations of Special Status and other important species and native plant communities depend on the current environmental conditions of the lands where they would be applied.

Response: As noted in Chapter 1, the underlying need to which the alternatives respond is for more effective vegetation control measures to better meet the BLM's existing noxious weed and other vegetation management responsibilities. Actual use of new herbicides made available by the selection of one of the action alternatives would be for meeting objectives identified in existing Land and Resource Management Plans, Conservation Strategies, Facilities Maintenance Plans, health and safety responsibilities, or other plans and direction. Differences in activity levels between alternatives in this EIS are estimates to help quantify the potential for adverse effects using herbicides (and to put them in context with other effects), and are not decisions to conduct vegetation management activities. The selected alternative would not authorize any activities.

An understanding of the capability of lands for grazing, or a detailed study of the implications of cheatgrass on fire danger or habitat decline, thus, is outside the scope of this analysis and unnecessary for an understanding of cumulative adverse effects of the proposed level of herbicide use and the alternatives. The descriptions of the biomes early in Chapter 4, and the *Affected Environment* sections in the specific resource sections (also in Chapter 4), are adequate to support the analysis of the differences between the alternatives. This is a programmatic EIS; the degree to which herbicides might adversely affect described resources are themselves cumulative impacts. Further, the activities expected to be conducted with any new herbicides are nearly all aimed at improving vegetation conditions and/or restoring native ecosystems, and thus are not expected to significantly contribute to adverse effects that may be resulting from other activities on BLM and adjacent lands. Exceptions to this generalization include water quality, air quality, and fish effects. The potential for herbicides to affect these resources is cumulative to other factors degrading these resources. Such cumulative effects are described in those specific sections.

136. Comment: The EIS does not adequately examine the direct, indirect, synergistic, and cumulative effects of the use of herbicides in the context of ecological problems associated with continued disturbances such as livestock grazing. There is an inadequate assessment of the current environmental setting, including the degree of severity of desertification and degradation of watersheds; disturbance across land ownership boundaries; fuels treatments; chronic livestock and grazing management impacts; and baseline information on wildlife species (including many Special Status and other declining species) focused on habitat loss and fragmentation of habitats and populations across native vegetation communities targeted by the EIS for large-scale treatment. There is no analysis of the Fundamentals of Rangeland Health (FRH) assessments or current Ecological Site Inventory (ESI) that is necessary to provide a baseline of current land condition and thus understanding of risk of weed expansion/dominance and amount of herbicide use that may be occurring. ESI and other information are necessary to understand the current ecological condition and health of the lands, and the adverse effects of livestock grazing disturbance on them. Unless the environmental setting in which the herbicide use and continued land use disturbances such as grazing and vegetation treatments would occur are fully revealed and assessed based on sound ecological and Best Available Science, the BLM cannot develop a reasonable range of alternatives, nor apply adequate analysis of impacts of the Proposed Action (Alternative 4) or alternatives.

Response: As noted in Chapter 1, the underlying need to which the alternatives respond is for more effective vegetation control measures to better meet the BLM's *existing* noxious weed and other vegetation management responsibilities. The alternatives in the EIS are not weed or vegetation management plans, which is a much broader topic. Actual use of new herbicides made available by the selection of one of the action alternatives would be for meeting objectives identified in existing Land and Resource Management Plans, Conservation Strategies, Facilities Maintenance Plans, health and safety responsibilities, grazing allotment management plans, or other plans and direction. Differences in activity levels between alternatives are district estimates, made to help quantify the potential for adverse and positive effects using herbicides (and to put them in context with other effects). These estimates are not decisions to conduct vegetation management activities. Site-specific conditions and applicable management direction would be considered at the project scale before actual treatments are authorized.

The inventories and assessments referenced in the comment contributed to the descriptions of the biomes early in Chapter 4, and to the *Affected Environment* subsections in several of the specific resource sections, also in Chapter 4. Those descriptions are adequate to support the analysis of the environmental effects of the alternatives, and the alternatives are set in the context of existing vegetation-related management and activities. The potential effects of grazing on climate change or desertification, or even on weed spread, are outside the scope of this EIS and more correctly left to Land and Resource Management Planning and allotment and grazing management plans.

Environmental Setting

137. Comment: There appears to be no information in the Oregon EIS on the current ecological conditions of the affected lands with respect to cheatgrass, or mapping and analysis of areas of Oregon public lands that are vulnerable to cheatgrass and other weed spread with continued livestock grazing disturbance, etc. The EIS fails to provide criteria and alternatives that would "manage" and "treat" areas with small amounts of cheatgrass or that are at great risk of its expansion by removing grazing or other intensive disturbances.

Response: Cheatgrass and other annual grasses are identified in the *Noxious Weeds and Other Invasive Plants* section in Chapter 4 as an issue on approximately five million acres. These grasses are described as a threat to native ecosystems by displacing native plant communities, displacing wildlife habitat communities for species such as sage grouse, and increasing fire incidence, which affects sagebrush communities and can create a fire hazard in the wildland-urban interface. This information provides a context and basis for the estimates of annual herbicide use under each alternative, and helps set the context for the analysis of effects. However, estimated treatment acres are for analysis of effects at the programmatic scale, and do not represent plans or commitments of resources.

A complete discussion of the management of cheatgrass, or an examination of land uses and their effects on the spread of cheatgrass and other invasive plants, is outside the scope of this analysis. The alternatives simply examine the effects of adding additional herbicides to the BLM's existing vegetation management programs in Oregon, with an emphasis on examining the environmental and human health risks at the programmatic scale. The resource descriptions in the *Biomes*, *Noxious Weeds and Other Invasive Plants*, and various other resource sections in Chapter 4 is sufficient to understand the differences in effects between the programmatic alternatives, three of which include imazapic and other selective herbicides effective on annual grasses. Consideration of various land uses, their sustainability, and their effects on other ecosystem components is more correctly left to the Land and Resource Management Planning process required and defined by the FLPMA.

Site-specific decisions to alter grazing or change other management practices to avoid spreading small populations of invasive plants are always an option; stopping weed populations while they are small is a management priority. These and other Integrated Vegetation Management actions would remain available under all alternatives.

Noxious Weeds and Other Invasive Plants

138. Comment: Missing from the EIS is an unbiased examination of the ultimate causes of the asserted epidemic of invasive species or the full-range of options to deal with that problem.

Response: A discussion of the spread of invasive plants is included in the *Noxious Weeds and Other Invasive Plants* section, particularly under the subheading *Mechanisms of Invasion*. The full range of available control treatments is discussed, for background purposes, in Chapter 3 under *Assumptions and Information about Treatment Acres*. A consideration of the weed spread implications of various resource management practices, and the adoption of noxious weed control as a management emphasis, is included in the Land and Resource Management Plan for each BLM district (see Appendix 6). Reconsideration of management plan decisions is outside the scope of this EIS; the EIS proposes simply to make additional herbicides available to the BLM's existing vegetation management programs.

139. Comment: Weeds spread geometrically and logarithmically, not linearly. The longer the delay to treat weeds, the higher the costs to resources, as well as operation and maintenance costs.

Response: The Invasion Lag Curve in the *Noxious Weeds and Other Invasive Plants* section shows a geometric relationship for individual weed infestations. Costs are higher (or impractical) if weeds spread before control is attempted. Thus, as the *Noxious Weeds and Other Invasive Plants* section in Chapter 4 points out, control efforts are generally focused on new weeds, new populations, and edges of larger populations. However, the noxious weeds in Oregon are now at various positions on the Lag Curve. The twelve percent weed spread rate estimate described in this section averages all of the noxious weeds on BLM lands in Oregon, and all populations, and provides a representation of the problem and how the Alternatives could make a difference in the long-term (15 years).

140. Comment: There is no basis offered for the conclusion that two-thirds of the noxious weeds cannot be controlled with non-herbicide methods. Table A7-1 lists them, but there is no explanation for the basis. In addition, Table A7-1 makes it clear that Alternative 4 (the Proposed Action) and Alternative 5 are not necessary.

Response: The Alternatives 2 through 5 species that cannot be effectively controlled with non-herbicide methods listed on Table A7-1 are those receiving a "no" in the "Non-herbicide methods effective" column on Table A9-2, but there was little documentation on either table in the Draft EIS indicating the basis for those decisions. They are based on the experience of district weed coordinators and various references, primarily the Pacific Northwest Weed Management Handbook (OSU 2009); the Weed Control Methods Handbook (Tu et al. 2001), Weeds of California and other Western States (DiTomaso and Healy 2007); Biology and Management of Noxious Rangeland Weeds (Sheley and Petroff 1999); and The Nature Conservancy Element Stewardship Abstracts (TNC 2009). A footnote has been added to Tables A7-1 and A9-2 to this effect.

Alternatives 4 and 5 add additional herbicides and objectives for controlling native vegetation to meet maintenance and safety objectives around developments, to conduct certain habitat improvement projects, and (in the case of Alternative 5) meet other objectives. The noxious weed list on Table A7-1 has little bearing on these Alternative 4 (the Proposed Action) and Alternative 5 objectives.

141. Comment: Many of the "weeds" you propose to target have medicinal values and are of great value.

Response: In the discussion of non-native plants early in the *Noxious Weeds and Other Invasive Plants* section, "medicinal" has been added to the list of reasons why plants may have been moved into Oregon. There is no doubt many of the State listed noxious weeds and other invasive plants continue to have value at some level; that is the reason many of these plants were introduced into Oregon in the first place. Noxious weeds, however, are those that are too successful, have departed from their limited intended purpose, or were successful but management objectives have changed. Invasive plant control efforts could make some medicinally important plants more difficult to find at the local scale. BLM control efforts are not likely, however, to make medicinally important plants unavailable to those who need them. However, State law makes it illegal to own or sell State-listed noxious weeds, so the BLM refrains from issuing collection permits for them, regardless of their "value" or intended uses.

142. Comment: The EIS fails to consider a reasonable degree of tolerance. With invasive plants having become dominant across so much of the landscape, and the economy in decline, it is preposterous to presume an ability to gain control over the invasive situation. Eradication is not a sane strategy, and, generally, we have more important battles to wager than the one on invasives plants. Invasive weed control must be carefully targeted to protect the most threatened native organisms at least cost.

Response: Most of this comment reflects BLM's current weed control strategies. The BLM coordinates weed control efforts with the Oregon Department of Agriculture, as well as with local weed control districts and neighboring landowners and managers. None of these landowners or agencies have the resources to remove all invasive plants. Therefore the State has classified their 120 listed noxious weeds into two categories based on priority for control, with that priority being influenced heavily by how widely spread a weed already is. "A" list weeds are those of known economic importance which occurs in small enough infestations to make eradication or containment possible; or is not known to occur, but its presence in neighboring states make future occurrence in Oregon seem imminent. Management direction for these is normally eradication or intensive control when and where found. Remaining weeds are on the "B" list (at least locally common). Species from either list may also be assigned to a "T" list (special management plan needed). The assignments for each weed, and the description of the three categories, are shown on Table A7-1. BLM treatments may not follow the State priorities exactly because of local resource protection issues. Protecting a Special Status species' habitat or uninfested watershed, for example, may be a priority regardless of how well established the weed is elsewhere in the State or what list it is on. With noxious weeds spreading on BLM lands at an estimated 144,000 acres per year, some degree of tolerance is required. Biological controls are being used (when available and after Oregon Department of Agriculture approval) to reduce the impact of many of the most widespread weeds.

143. Comment: The EIS missed an opportunity to conduct a real analysis of the risks of weed spread and the futility of treatments, if livestock grazing continues at or near current levels.

Response: As noted in this appendix under *Alternatives Eliminated From Detailed Study*, a reconsideration of grazing capacity is outside the scope of this EIS and is more correctly left to planning implementing the FLPMA, Taylor Grazing Act, and other direction.

144. Comment: The invasive plant "problem" is an invention of the herbicide industry in order to sell more herbicides.

Response: Economic and ecological effects have been documented by numerous experts. Independent estimates of financial losses exceed $100 million for single species within single states (e.g. Radke and Davis 2000; the

Global Invasive Species Information Network; and others). Global impacts from invasive species including invasive plants have been estimated to be five percent of the world's gross national product (Simpson 2004). The International Union for the Conservation of Nature notes that a significant proportion of species now considered extinct were driven to extinction by invasive species (IUCN 2008). The United States Invasive Species Council has a budget of $1.2 billion and is chaired by the Secretaries of Commerce, Interior, and Agriculture (NISC 2006). The Council estimates invasive species (including plants) cost the U.S. Economy over $100 billion per year, and they are the second biggest cause (after habitat loss) for species becoming Federally Listed as Threatened or Endangered. There are also several Federal and State laws requiring the BLM to actively prevent and suppress noxious weeds (see *Background* section in Chapter 1).

145. Comment: The EIS should consider the information in the book *Invasion Biology: Critique of a Pseudoscience*, by David Theodoropoulos (2003).

Response: Information from the book *Invasion Biology: Critique of a Pseudoscience* was considered in the development of this EIS. The book states that not all non-native species are bad; species move from place to place and have historically done so; native ecosystems are not inherently weak and prone to invasion; and, non-native species are not inherently competitively inherently superior to the natives. Analysis in this EIS does not contradict these points. However, the book also refutes science that shows that invasion is a major threat to Endangered species; evidence that economic costs of invasions are in the hundreds of billions of dollars; and, asserts there are connections between invasion biology and the pesticide industry. These assertions are contrary to the majority of invasive plant research examined in the creation of this EIS and/or are beyond the scope of this analysis.

Native and Other Non-Invasive Vegetation

146. Comment: Please explain why desirable non-native plants are considered "native vegetation."

Response: This definition of native vegetation has been removed, and the phrase "native and other non-invasive vegetation" has been used in the text where such a distinction is needed. Lumping desirable non-native plants with native plants was intended to be shorthand for a class of vegetation that might only be treated with herbicides in Alternative 4 (the Proposed Action) and Alternative 5, but the combination not only caused confusion, but also conflicted with referenced policy to use only "native species" in restoration treatments.

147. Comment: The EIS views the expansion of native western juniper as a problem, when it is really just a natural and expected result of climate change, livestock grazing, and altered fire regimes. The BLM should not expect to change the course of western juniper expansion until these other factors are reversed. Western juniper can live to be 1600 years old, and provides important wildlife habitat (e.g. ash-throated flycatcher, black-throated gray warbler, roosting cavities for bats, and nesting for raptors) and forest watershed function. Control of western juniper is resulting in hotter, drier sites more prone to weed invasion.

Response: Western juniper is an important source of shelter and food for a variety of animal species. It is a native species in Oregon and performs important ecological functions. However, for a variety of reasons (including a reduction of fire frequency), there has been a several fold expansion of western juniper. This expansion adversely affects other native shrubs, forbs, bunchgrasses and habitats of the sagebrush steppe, and threatens the Eastern Forest Biome ponderosa pine forests at lower elevations. Western juniper invasion results in reduced shrub abundance and reduced ground water, and contributes to loss of riparian plant species (Bedell et al. 1993). The BLM is currently controlling some western juniper by using chaining, mowing, prescribed fire, and cutting and burning. If herbicides were available, they would be used primarily where western juniper a few feet high can be controlled with spot treatments.

However, decisions about how much western juniper to control and where, are outside of the scope of this EIS. The EIS attempts to describe why and how herbicides would be used under Alternative 4 (the Proposed Action) and 5 only so that likely herbicide uses can be understood in a multi-resource analysis context, and a reasonable cumulative effects analysis of the use of herbicides can be prepared. District personnel familiar with local land management plans and existing vegetation management priorities made the estimates. A complete discussion of the reasons for vegetation management including the control of certain western juniper in certain areas is outside the scope of this analysis and would be duplicative of district-level management plans, Conservation Strategies, and other analyses.

148. Comment: There is inadequate analysis of herbicide impact to Federally Listed and other Special Status plants growing on roadsides.

Response: Proposed roadside herbicide use would require a site-specific analysis that includes a review by the area botanist, wildlife biologist, and fish biologist per BLM's Special Status Species Program policy as discussed in the subsection *Endangered, Threatened and other Special Status Plant Species* in Chapter 4. Where these species are known or their habitat is suspected, the resource specialists would conduct surveys and/or prescribe appropriate mitigation measures to avoid impact to Special Status species. The wording in the EIS has been edited to indicate these surveys and resultant protection measures would likely eliminate most of the risks to these species.

149. Comment: The EIS suggests habitat improvement under Alternative 4 (the Proposed Action) and Alternative 5 could have risk to non-target plants. The EIS does not discuss whether inadvertent spraying of Special Status species, contamination of their food or prey, and accidental spills would harm these species. Simply listing these species in an appendix is not adequate.

Response: Potential effects to Special Status wildlife or fish species, and to the soils and waters within their habitats, are addressed in those respective sections in Chapter 4. Those discussions reference the "Risk Categories" tables at the end of Chapter 3, which include risk categories for sensitive/susceptible species. The potential to adversely affect the Federally Listed or other Special Status species for which each Conservation Strategy is written would also be considered in the site-specific analysis for the project. These analyses would normally be done on a site-by-site basis; habitat improvement projects would not be included in each district's weed management Environmental Assessment. Conservation Measures for Federally Listed species, Standard Operating Procedures, PEIS Mitigation Measures, and BLM policies for Special Status species would substantially reduce the likelihood that treatments would directly affect these species.

The EIS statement that habitat improvement treatments "could have risk to non-target plants [although] applications would be specifically designed to improve overall habitat conditions" is in reference to non-Special Status native plants making up the habitat for Special Status fish or wildlife. Some collateral damage might be acceptable in the interest of long-term habitat improvement. However, if the Special Status species in question were a plant, herbicides would likely not be used nearby if any damage were anticipated

150. Comment: The EIS should address whether or not plants affected by herbicides could grow back mutated, and whether this would harm wildlife.

Response: Herbicide effects on plants vary based on the type of herbicide. In general, plants affected by herbicides will exhibit symptoms of abnormal growth or dieback of tissues. Symptoms appear hours to weeks following exposure and include wilt, yellowing, loss of pigment, dieback, twisted leaves or stems and malformed leaves. Herbicide injury may also result in reduced flowering and seed production. There is no reason to believe future generations would be mutated, or if they were, that such mutations would affect wildlife.

151. Comment: The EIS should explain how many non-target species would be eliminated by herbicide use.

Response: No non-target species would be eliminated by herbicide use. While some individuals may be harmed, the impact to a particular species would not threaten its continued existence. On all herbicide treatments, site-specific analysis would consider various local factors and apply Standard Operating Procedures and PEIS Mitigation Measures that would minimize impact to non-targets. Special Status species would get additional protections.

152. Comment: The EIS should more thoroughly consider the special concerns of the Sulfonylurea (SU) herbicides. These herbicides are capable of interfering with reproduction of plants even at exposure levels that show no damage to plants. A rare or susceptible native annual plant may be unintentionally damaged if is unable to properly reproduce due to exposure to a SU. A lawsuit resulted from a BLM application of sulfometuron methyl in Idaho over damage to nearby crops

Response: The sulfonylureas (chlorsulfuron, metsulfuron methyl, and sulfometuron methyl) and the similarly acting imidazolinones (imazapic and imazapyr) work by inhibiting the plant enzyme acetolactate synthase (ALS). An alternative eliminating the use of these five ALS inhibiting herbicides was suggested during scoping and was eliminated from detailed study (Chapter 2). The PEIS analyzed the special concerns associated with ALS inhibitors and considered an alternative without them. They have been retained in the alternatives in part because they are potentially less harmful to plants, animals, and humans than other herbicide active ingredients proposed, and some of the most problematic weeds are best controlled with them. ALS-specific Standard Operating Procedures were designed to prevent adverse effects from these herbicides outside the area of application. Additional information about the potential for these herbicides to affect non-target plants, including Special Status species, has been added to Chapter 4 in the Final EIS.

The sulfometuron methyl crop damage incident is discussed under *Spills* in the *Cumulative Impacts* section in Chapter 4. Standard Operating Procedures now preclude BLM application of this herbicide aerially. In November 2008, the EPA announced that its sulfometuron methyl Reregistration Eligibility Decision was available for review and comment. In the Reregistration Eligibility Decision, the EPA proposes to prohibit application of sulfometuron methyl in counties with an annual rainfall of less than 10 inches and the use on powdery dry soil or light sandy soil when it is predicted that there is less than a 60 percent chance of rainfall within 48 hours. A final decision from the EPA has not been issued. Information about this EPA action is included in the Final EIS near the end of Chapter 1.

153. Comment: The EIS should address the potential for herbicides to drift onto adjacent organic farmlands.

Response: Although the various resource sections in Chapter 4 are intended to discuss effects of BLM actions across ownership boundaries, and site-specific analyses would consider potential effects to adjacent lands, the Draft EIS did not specifically identify adjacent and/or ultra- susceptible plants on adjacent private lands. A discussion of this risk has been added to the *Native and Other Non-Invasive Vegetation* section in Chapter 4. In addition to site-specific analysis and ensuring herbicide labels are followed, existing Standard Operating Procedures help protect adjacent land uses by requiring the use of drift prevention measures such as no spraying when wind is above 10 miles per hour or precipitation is imminent; use of large herbicide droplets and drift reduction agents where appropriate; use of low volatile formulations; use of low pressure equipment; use of herbicide free buffer strips where appropriate; and notification of adjacent landowners. When aerial application is considered, spraying near agricultural lands is limited; application can only occur when wind speed is below 6 mph; application is avoided during periods of adverse weather conditions (snow or rain imminent, fog or air turbulence); and, height and speed of application are limited by type of aircraft.

154. Comment: The EIS should consider the effects of herbicides to wild edible mushrooms (e.g. chanterelles, matsutakes, and porcinis) as a commercial resource and not just in the *Environmental Justice* section.

Response: The *Native and Other Non-Invasive Vegetation* section in Chapter 4 reports on the findings from the few studies found pertaining to herbicide impact on fungi. In laboratory tests at herbicide levels much higher than would occur in actual use, growth of fungi was inhibited. In studies using rates similar to amounts used in vegetation treatments, fungi seem relatively unaffected by herbicides (Busse et al. 2003, Houston et al. 1998). No studies were found regarding these specific ectomychorrhizal species. The risk of herbicide contamination of wild edible mushrooms of the forest is expected to be limited because most herbicide applications would be directed treatments on invasive plant infestations, and in rights-of–ways, rather than within healthy forests where these conifer root-dependent species are found.

155. Comment: The EIS needs to recognize some plants on the target list might also be collected for human use as medicinal plants.

Response: The Risk Assessments evaluated human subsistence populations (Native American) who gather and use large amounts of range and forest products and generally found no risk (see "Risk Categories" tables at the end of Chapter 3). When herbicides are used, the site of spraying would be posted to inform the public that an herbicide has been used in the area. If medicinal plants are noxious weeds (see Table A7-1), Oregon law does not permit their sale, purchase, propagation, or transport. The BLM does not issue permits for the collection of noxious weeds such as milk thistle and St. John's wort, even if they have medicinal uses.

156. Comment: The EIS says herbicides are designed to kill plants, so they will kill non-target plants if they contact them. The EIS should discuss the effects to rare plants and fungi from the increased use of glyphosate and imazapyr to treat Sudden Oak Death in Curry County.

Response: The addition of herbicides to existing treatments is not expected to have additional impact on rare plant populations. Glyphosate would be used to target individual tanoak trees by direct application to the cambium of tanoak or backpack spray to re-sprouting foliage. The risk for offsite movement of this herbicide from these treatments is very low. Risk from imazapic would be higher but would also be mitigated by Standard Operating Procedures, PEIS Mitigation Measures, and (for Federally Listed species) Conservation Measures. Chapter 4 discusses the risks of these herbicides to non-target plants. Currently there are no Special Status or Survey and Manage plants known in the Sudden Oak Death control area. Additionally, proposals for herbicide use are subject to site-specific analysis. At that time, pre-project clearances would determine the presence of Special Status species and their habitat. When Special Status species are present, mitigation measures are added to conserve and or recover Federally Listed species, or to reduce or eliminate threats to proposed or Bureau Sensitive species.

157. Comment: Although the EIS emphasizes targeting noxious weeds, the door is left open for any type of use the BLM feels is convenient or necessary.

Response: All of the action alternatives would target invasive plants, a slightly larger category of non-natives than State listed noxious weeds. They would also target native vegetation as needed to control pests and diseases in State-identified control areas (the Sudden Oak Death control area being the only current example). Alternative 4 (the Proposed Action) would also target native vegetation in very specific areas for very specific objectives – safety and maintenance treatments around developments and for achieving habitat goals specified in Conservation Strategies for Federally Listed and other Special Status species. Alternative 5 would indeed permit the use of herbicides for any vegetation management except livestock forage and timber production. In all these cases, however, the estimated acres included in the analysis are an important indicator of what the BLM might "feel is convenient or necessary." For example, 5,000 acres per year have been estimated for Alternative 5 objectives. All but 200 acres of this is east of the Cascades, and most would be for additional habitat improvement projects. In addition, fuels treatment would be allowed under Alternative 5 but "is unlikely to occur" (*Fire and Fuels*, Chapter 4). There are 250 acres per year estimated for Sudden Oak Death control, 9,300 estimated for rights-of-way, administrative sites, and recreation sites (much of which would be used by permit holders and cooperators), and 5,700 estimated for habitat improvement under Alternative 4 (the Proposed Action). While these are estimates for analysis, not absolute caps, they nevertheless are de facto reasonable representations of the level and type of treatments intended by the provisions of each alternative.

158. Comment: The effects of herbicide use on rights-of-way and administrative sites have not been adequately addressed. What native plants and wildlife would be hurt, and to what extent?

Response: Currently mowing, cutting, and chipping are the primary methods of control of vegetation encroaching on roads, utility corridors, and administrative sites. Some of these treatments could be replaced with herbicides. Any native plants occurring within the normal clearing limits of those sites might be damaged or killed. On utility corridors, vegetation may be removed or managed at a height that does not interfere with power or pipelines. Typically, tall trees would be removed and grasses, forbs, and shrubs would be encouraged. Trees that resprout after cutting like alder and maple would be the primary target for herbicides. On some administrative sites or rights-of-way, all vegetation is removed, especially if it represents an unacceptable fire hazard. The risks of collateral damage to off-site plants are addressed in the *Native and Other Non-Invasive Vegetation* section, and risks that herbicides on plants would be ingested by wildlife are discussed in the *Wildlife Resources* section.

159. Comment: The EIS does not explain what native vegetation would be targeted for "habitat improvement." What native species would benefit? Is this just a disguise for livestock forage increases?

Response: Habitat improvements under Alternative 4 (the Proposed Action) could treat any native or non-native vegetation to achieve habitat goals specified in (usually interagency) Conservation Strategies for Federally Listed or other Special Status species. An example might be sagebrush thinning to improve habitat for sage grouse, if called for in an established Conservation Strategy document. Under Alternative 5, "habitat improvement" is a broader term that could include habitat for fish, wildlife, and plants. An example might be reducing western juniper to improve water availability for native plants such as aspen, wildlife such as mule deer, and aquatic species. Identification of specific vegetation to be controlled or favored would depend upon the objectives of the particular project, and be subject to site-specific analysis. All of the alternatives in this EIS exclude herbicide use specifically for livestock forage production.

Pests and Diseases (Sudden Oak Death)

160. Comment: The *Comparison of Effects By Alternative* section of Chapter 2 states, "There are essentially no negative environmental [effects] associated with the 250 acres per year of herbicide applications expected to occur under Alternatives 3-5 for Sudden Oak Death." Maybe this statement reflects some kind of unstated weighting of impacts, but this is not appropriate NEPA analysis. Both the beneficial and adverse impacts must be fully disclosed and weighted in the open daylight of public discourse.

Response: This summary statement was indeed too encompassing. It would be more correct to say that the use of herbicides to control pest and disease spread represents less than one percent of the total herbicide use proposed under the action alternatives, and no significant adverse impacts specifically attributable to Sudden Oak Death related herbicide applications are discernable in this programmatic EIS. The text was removed from Chapter 2 when the *Comparison of the Effects of the Alternatives* section was changed to be a comparison table.

The statement did not intend to suggest there might not be adverse effects requiring mitigation, or conceivably an EIS, at the project-specific scale. This EIS focuses on cumulative effects of herbicide application statewide and does not authorize any treatments. Use of herbicides on BLM lands to help control Sudden Oak Death would be examined in a project-specific Environmental Assessment or EIS.

161. Comment: The initial control area for Sudden Oak Death was 9 square miles in 2001, and 160 square miles in 2008. The EIS indicates that if the infestation continues to spread, these [250 acres of tanoak treatments per year] would be expected to increase. The EIS does not establish a threshold to trigger reconsideration of the scale, methods, or species to be treated as the spatial scale and intensity of Sudden Oak Death treatments expands.

Response: The EIS estimates the herbicide use that would result from adoption of one of the alternatives, and examines the cumulative effect of that use at the programmatic scale. The acres are estimates for analysis purposes, and no treatments would be authorized by the Record of Decision. When actual treatments exceed or differ from those analyzed in programmatic NEPA documents in potentially significant ways, the BLM examines the adequacy of existing NEPA analysis. The examination primarily considers the likelihood of having a significant level of effects not identified and considered in the original Record of Decision. A doubling of the acres treated for Sudden Oak Death, but not exceeding the total glyphosate use west of the Cascades examined is the EIS (for example), could still fall within the programmatic effects analyzed in this EIS. Actual treatment decisions would be made with site-specific analyses that would tier, in whole or in part, to this EIS. Those site-specific analyses themselves would consider the continued applicability of the EIS analysis. Finally, actual Sudden Oak Death control is examined with site-specific analysis. If Sudden Oak Death control work expands significantly, a separate EIS examining all Sudden Oak Death control activities by Federal Agencies might be needed, even if herbicide use remains within the estimates of this EIS. In either case, a decision to use herbicides on oaks or other species would be looked at in one of those analyses. This EIS does not examine the Sudden Oak Death control program, but only examines the cumulative effects of the herbicide portion of that and other vegetation management programs.

162. Comment: If the Sudden Oak Death outbreak remains small, it probably can and should be dealt with using non-chemical methods. If the Sudden Oak Death outbreak greatly expands, then the effects of large-scale "scorched-earth" vegetation treatments may become very significant especially if it is accomplished with chemicals. The *Pests and Diseases* section of the EIS says, "If the infestation continues to spread, these [treatment] acres would be expected to increase." There is a point at which the treatment of the disease may be worse than the disease itself. The EIS does not establish adequate safeguards or thresholds to trigger reconsideration of the scale and methods of treatment as the spatial scale and intensity of Sudden Oak Death treatments expand.

Response: The effects of managing Sudden Oak Death without the use of herbicides on BLM lands are described under Alternative 2 (No Action) and the Reference Analysis; the infestation continues to spread and the suboptimal tanoak control on BLM lands is believed to be contributing to that spread. Regarding a maximum level of treatments, effects in the EIS are based on estimates of average annual acres to be treated. These are not guaranteed minimums or maximums; the acres are only estimates for analysis purposes. If future use significantly exceeds estimates at the programmatic scale, a review of NEPA adequacy would determine if the EIS still applies. Since Sudden Oak Death control would be subject to site-specific analysis, the adequacy question relative to this EIS might be limited to the continued adequacy of the EIS analysis for cumulative effects. Increases in Sudden Oak Death treatments alone would not necessarily violate the analysis assumptions.

163. Comment: The EIS says it is not precisely known how much more effective herbicides are when compared to non-herbicide treatments to corral Sudden Oak Death-hosting tanoak, with the opinion of pathologists being that non-herbicide methods are 15 to 30 percent less effective. While we are concerned about the loss of oaks, increasing herbicide use for this purpose is not safe or proven to be effective.

Response: The estimated 250 acres per year herbicide use on tanoaks to control Sudden Oak Death on BLM lands within the State-identified Sudden Oak Death control area is included in the herbicide use estimates for Alternatives 3 through 5. No specific adverse effect attributable to this specific use was identified at the programmatic scale. Herbicide applications on National Forest System lands within the control area are currently made with aquatic-formula glyphosate in compliance with existing Fish and Wildlife Service Biological Opinion (USDI 2008b). The potential for adverse effects from glyphosate control of tanoaks to control Sudden Oak Death was examined at the project scale in an Environmental Assessment completed by the Coos Bay BLM District in May, 2010. No significant effects were identified.

Regarding the effectiveness of treatments, the EIS stated "…it is not precisely known how much more effective; data are currently being gathered and is expected to be available in 2009. The opinion of pathologists is that the approach currently used by BLM without herbicide use is 15 to 30 percent less effective than the herbicide approach" (*Pests and Diseases* section). The promised 2009 data is now available and has been incorporated into the Final EIS. Pathologists established 119 plots (2008-2009) around the stumps of the known-infected tanoak trees that had been cut, and examined all host vegetation remaining on the sites. Six percent of the 106 plots on private lands had infected tanoak re-sprouts (post-treatment) using herbicide in some form (injected, stump-top application or sprout spray). Thirty-eight percent of 13 plots on BLM lands where herbicide was not used had infected tanoak re-sprouts (post-treatment). While the small non-herbicide sample size reduces the statistical strength of the apparent trend, the data nevertheless supports the pathologist's earlier impressions that herbicide use reduces the number of infected sprouts post treatment, thus reducing the potential for continued spread of the disease.

However, as with other treatments described in this EIS, the selection of treatment methods is outside the scope of this EIS. The 250-acre per year estimate included in this EIS is for cumulative effects analysis purposes only, and does not represent a commitment to a particular treatment method. Treatment decisions would be made following site-specific analysis.

164. Comment: It is not clear in the discussion of Sudden Oak Death that aquatic-labeled glyphosate would be used to protect fish, or that stream buffers would apply. Why not use imazapyr since it is less toxic to fish?

Response: The EIS section discussing Sudden Oak Death indicates glyphosate and/or imazapyr might be used. As with other herbicide use by the BLM in Oregon, the Standard Operating Procedures and PEIS Mitigation Measures would apply. These include requirements for stream buffers, and the use of glyphosate with low or no POEA near streams. Certain formulations of glyphosate and imazapyr are labeled for riparian and aquatic use. A final decision about if, how, and which herbicide to apply is subject to site-specific analysis. Aquatic-labeled glyphosate is being used on adjacent National Forest System lands, in accordance with a Biological Opinion (USDI 2008b) from the Fish and Wildlife Service.

Climate Trends, Projections, and Implications

165. Comment: The EIS claims manual methods of weed control are not desirable because those methods use fossil fuels, but never admits that herbicides are made from fossil fuels, and their application uses fossil fuels, equating to likely far greater fossil fuel use than manual methods.

Response: This discussion, from Chapter 1, simply notes non-herbicide methods also have adverse effects, and includes the use of fossil fuels as one of those. No comparative analysis is made here or elsewhere in Chapter 1. The emissions estimates in the *Air Quality* section *do* indicate that exhaust from control treatments would be much higher for non-herbicide treatments than for herbicide treatments. Exhaust is created by mechanical (not manual) equipment. Mechanical control methods typically require more trips to the site (lower production rates) and use more fossil-fuel burning equipment than herbicide treatments. Some fossil fuels would be used in the manufacture of herbicides (as they would be refining fossil fuels for use in mechanical equipment) and for some packaging. Some, but not all, herbicide formulations may have their origin in fossil fuels. However, the quantity of herbicides applied at typical rates ranges from two pounds (glyphosate) to less than one ounce (several) per acre (see the "Estimated Annual Pounds of Herbicide..." table in Chapter 3). The active ingredients in powder or concentrate form are typically mixed with several gallons of water to make the spray mix; the BLM no longer permits the use of petroleum products as carriers. Thus, there is no reason to believe that spraying a roadside, for example, would use any more fossil fuel than mowing the same road.

166. Comment: The *Comparison of the Effects of the Alternatives* section in Chapter 2 refers only to climate change-related *increases* in temperature and/or CO_2. The EIS does not recognize that future climate change-related increases in temperature and changes in precipitation are actually very region and sub-region specific and may not favor invasive plants west of the Cascades. Changes are also speculative east of the Cascades.

Response: Although CO_2 levels are predicted to increase from historic levels, temperature and rainfall changes resulting from global climate change could be either up or down as suggested in the coment, depending upon location. The *Comparison of the Effects of the Alternatives* section has been changed to say that CO_2 increases will likely favor invasive plants, and that disturbances to native plant communities exacerbated by significant shifts in temperature or rainfall would likely be exploited by invasive plants.

It is certainly possible that a warming wetting trend west of the Cascades will not benefit invasive plants as visibly, or to the same degree, as climate changes in other areas of the State. However, there are invasive plants in Oregon from all over the world. Any change in environmental conditions would result in some vegetation shift, and that can be expected to be exploited by invasive plants.

167. Comment: The EIS should also include a discussion of the interactions between climate change (changes in fire regimes, increased CO_2 concentrations, changes in precipitation and temperature regimes, changes in the frequencies of droughts, heat waves and cold snaps, and so forth) and other natural and anthropogenic disturbances (logging, OHV use, grazing, planned and unplanned fires, and so forth) that may increase the frequency and extent of soil disturbance, thereby exacerbating invasive plant problems.

Response: In large part, the science needed for this type of discussion is not available. How climate change may interact with anthropogenic disturbances and management activities has not been studied or simulated. Several studies have examined the potential impacts of different forest management scenarios on carbon storage, but these studies have only taken place under the current climate, not taking into account how changing climate may also alter site capability. A small number of studies have examined how increasing atmospheric CO_2 concentrations may affect certain invasive plants (see *Implications of Climate Change on Invasive Plants* in Chapter 4) but none of those studies has examined subsequent interactions between plant response to increased CO_2 concentrations and livestock grazing. Several climate change projections have included a projected increase in fire size, intensity and severity, and an increase in insect outbreaks in forests but none have included a projection of disturbance regime changes in rangeland ecosystems nor have such projections included a discussion on expected interactions with other natural or anthropogenic disturbances.

168. Comment: The EIS should discuss carbon storage.

Response: The effects of the alternatives on climate change and carbon storage has been added to the *Climate Trends, Projections, and Implications* section in Chapter 4.

Soil Resources

169. Comment: Treating administrative sites and rights-of-way acres with herbicides (instead of mechanical means) is more toxic to soil organisms or disruptive to nutrient cycling. These impacts cannot be compared to erosion and compaction from non-herbicide methods. Erosion and compaction effects can be better understood, and more easily mitigated and restored.

Response: Some herbicides could reduce, but not eliminate, soil microorganisms and nutrient cycling processes. The expected recovery for these reductions in populations comes in several (1-3) growing seasons as native or seeded vegetation returns to the site.

The acres in administration sites, rights-of-way and recreation areas not treated with herbicides would continue to be treated through mechanical or manual means. Using mechanical equipment repeatedly in rights-of-ways, administrative sites, and recreation sites generally does not denude the sites enough to allow erosion. When soil is lost from such sites, the potential to restore the soil organisms and cycling processes will take much longer to return, as soil (weathered rock and organic components) will need to be replaced in order to provide a medium for populations of organisms to live and process nutrients. Compaction reduces soil air space, infiltration of water and also reduces or changes the type of populations of organisms. Compaction occurs under the wheeled track portion of the treated area. This compaction can be repeated every year or several times a year in some instances. While this compaction could be restored with an aerator, they are not often utilized, as the equipment for these types of environments is not readily available or is more destructive to the surface and increases the potential for erosion. Compaction and erosion also create surface disturbances and change soil properties, favoring reinvasion by invasive plants. These in turn adversely affect soil chemistry and stability when compared to soils populated with native plants. A major benefit of using herbicides is that they can often avoid or minimize reinvasions associated with surface disturbances (see Reference Analysis in the *Soils Resources* section in Chapter 4, and others).

170. Comment: The EIS should explain which invasive plants would be targeted with a prescribed fire treatment. For the follow-up restoration, when treating by seeding, range drills should not be used in areas of intact biological crusts.

Response: As described in the *Fire and Fuels, Air Quality,* and other sections in Chapter 4, prescribed fire would be used primarily east of the Cascades, in a three-step treatment regimen for preventing or controlling invasive annual grasses. A determination regarding the most appropriate seeding method would be made during site-specific analysis that would consider the existence and sensitivity of soil crusts.

171. Comment: A detailed analysis of the effects on killing or weakening biological crusts (microbiotic crusts) should be included in the EIS. Biological crusts are increasingly recognized as providing natural benefits in reducing climate change processes.

Response: The *Soil Resources* section describes biological crusts and outlines the major components of biological crusts and where these crusts are expected to be located on BLM managed lands. This section has been expanded to note that the application of herbicides could be considered a disturbance event that could result in decreased soil organism diversity, nutrient cycling, soil stability, and organic matter. Individual components of the crusts can be reduced by herbicide applications, causing the crusts to lose some ability to function as a soil protection and a nutrient cycling mechanism.

A section on the potential impact of the alternatives on the carbon storage capacity of biological soil crusts has been added to the *Climate Change* section as well.

172. Comment: In the *Additional Information about the Fate and Effects of Herbicides* subsection, changing the wording to note that chlorsulfuron is "more stable" in neutral soils is suggested. This would be more correct, as well as more consistent with the information on tables in the *Soil Resources* section, than the current wording indicating it "is relatively stable" in neutral soils.

Response: The wording regarding chlorsulfuron in the *Soil Resources* section has been changed to state that it is more stable in neutral soils.

173. Comment: The EIS should include the following information relative to clopyralid in the EIS: Clopyralid has an inability to bind with soils; therefore, it can be highly mobile and a contamination threat to water and non-target plants. It is considered persistent in soil, water, and plants. When applied to cold dry soils or waterlogged soils the residues may persist for years. This herbicide may leach to 180 cm in 20 days and move to streams when placed directly on soil. Direct application to soil may also prevent germinating plants from emerging from the soil. Clopyralid can also present problems for organic farmers as the herbicide can be transferred to other non-target crop plants through compost, plant residues, soil residue, runoff, or leaching.

Response: In the *Soil Resources* section, the characteristics of clopyralid are addressed. Clopyralid is disclosed in the EIS as being unstable in soil and is considered moderately persistent based on its half-life. It will leach under favorable conditions such as in wet, sandy soils like Inceptisols or Andisols as it does not bind to soil tightly. However, biodegradation is rapid in soil and thus the potential for leaching or runoff is low. Clopyralid can persist in plants and, therefore, can be introduced into the soil when plants die and kill other plants. This chemical is not expected to be applied to cold dry soils, as the method of application is to be foliar, it is not approved for wetland or riparian areas, and thus no applications would be expected on waterlogged soils. According to the study by Elliott et al. (1998), the leaching to 180 cm occurred on worst-case experimental conditions (application to a harvested, cultivated field followed by irrigation). These conditions or any such conditions that resemble this level of disturbance would not be encountered during the application of clopyralid on BLM lands. Movement of plant material, soil residue, or compost is not expected under any alternative and thus contamination of secondary crops would not occur. The potential for leaching and runoff are low due to the rapid biodegradation of the active chemicals.

174. Comment: The EIS should address what organisms 3, 4-DCA (diuron's breakdown product) affects, and to what extent.

Response: The effects described for diuron are attributable to the 3,4-DCA. More specifically, according to one study in a Risk Assessment report of the substance 3, 4-dichloroaniline, bacteria, fungi, and red wiggler worms were affected by the application of this chemical to soil (EINECS 2006). Growth inhibition and rate of anaerobic nitrate respiration were reduced for the bacteria and fungi. Reductions of 80 to 40 percent depending on the organism and concentration of the chemical were noted.

A radiorespirometric[3] technique was used to examine the effect of 100 ppm diuron and 3, 4-DCA on respiration of fresh sandy loam soil. *Pseudomonas putida* (a soil bacterium) was inoculated to the sterilized soil and incubated for 18 hours at 25ºC. The results show that diuron had no inhibitory effect on *P. putida* or soil microbial activity. For 3,4-DCA, an inhibition of about 50% could be found. A growth test in vitro showed no inhibition by 3,4-DCA, leading the authors to conclude an influence of physical properties of the soil were the cause for the reduction by 3,4-DCA.

In a second study (also reported in EINECS 2006), nitrification was inhibited with a lag phase of 1, 2, and 17 days by the application of 2.5, 5, and 25 mg/kg of soil of 3,4-DCA, but the eventual appearance of nitrate was almost identical with that of the control. For worms, no effects on mortality and body weight of adults and the number of offspring were observed for the test concentrations of 1 to 100 mg/kg dry weight soil for fresh (2 hrs after application) and aged (5 weeks after chemical application) soil variants. The highest test concentration of 320 mg/kg provided significant effects on mortality and body weight of adults in the freshly contaminated soil, and no offspring were found. In aged soil, some reduction in offspring numbers has been observed at 320 mg/kg dry weight soil only. These findings indicate that the bioavailability of the test substance decreased in the 5 week aged soil.

According to the European Food Safety Authority's Conclusion on the Peer Review of Diuron (EFSA 2005) for bees, non-target arthropods, and soil micro- and macro-organisms including earthworms, the risk is considered low for the representative uses with regard to diuron and metabolites. The above paragraphs are consistent with the information summarized for diuron. This last summary paragraph has been added to the *Soils Resources* text in Chapter 4.

175. Comment: The *Additional Information about the Fate and Effects of Herbicides* subsection states that diuron is a highly persistent herbicide. To be consistent with tables in the *Soil Resources* section, this should be changed to moderately persistent.

Response: The wording regarding diuron in the *Soil Resources* section has been changed to state that diuron is moderately persistent.

176. Comment: The EIS should describe what other soil organisms and other life might be affected by dicamba's breakdown product 3,6-dichlorosalicylic acid in addition to earthworms, and describe its persistence time in soil.

Response: As noted in the EIS, dicamba breaks down in soil to very simple substances like carbon dioxide and water. The soil bacterium *Pseudomonas maltophilia* (strain DI-6) converts dicamba to 3,6-dichlorosalicylic acid (3,6-DCSA), which is adsorbed to soil much more strongly than is dicamba and lacks herbicidal activity. Very little information is available on the toxicity of these breakdown intermediates. According to Smith (1974), the degradation product 3,6-dichlorosalicylic acid built up during the three weeks of degradation of dicamba and was followed by a slow loss that was complete within nine weeks.

177. Comment: The non-persistent rating in tables in the *Soil Resources* section conflicts with the text that states that fluridone may last up to a year on dry soils and is moderately persistent.

Response: Fluridone is an aquatic herbicide for the control of vascular aquatic plants and not proposed for treatments outside lakes, ponds, canals and reservoirs (see the *Water Resources* section). However, information

3 Respirometric: of, relating to, or being a study of metabolism by the measurement of carbon dioxide labeled with carbon 14 from the carbohydrate substrate.

for this herbicide exists for application on soil. In field studies using different soil types, less than10 percent of the originally applied fluridone was found after 220 days in Miller clay, and 20 percent was found remaining after 385 days in Lufkin fine sandy loam soil. In laboratory studies, fluridone persistence in non-sterilized soils after 210 days was 62, 44, 10, and 5% in Lufkin fine sandy loam, Miller clay, Hidalgo sandy clay loam, and Brennan fine sandy loam, respectively (Banks 1979).

The wording in the *Soil Resources* section has been clarified to say fluridone would be used in an aquatic environment. The persistence rating has been footnoted to show it applies to aquatic applications. Fluridone would not be applied to a dry soil environment for weed control on BLM lands in Oregon.

178. Comment: The EIS should explain how, for imazapyr, it can know that "the potential for longer-term effects on soil organisms exists but little is known if the effects would be positive or not."

Response: The *Soil Resources* section notes that studies have reported that imazapyr may be actively exuded from the roots of legumes (such as mesquite). This exudate and the ability of imazapyr to move via intertwined root grafts may therefore adversely affect the surrounding desirable vegetation (SERA 2004d, Tu et al. 2001). SERA (2004d) also describes the lack of known effects to soil microorganisms. Based on the persistence time of the herbicide in soil and the ability of it to be taken up by other vegetation, there may be the potential for soil organisms to be affected, either positively or negatively. In the Forest Service Final EIS Appendix U (USDA 2005), the chemicals are individually assessed for effects and the following statements reflect the knowledge of imazapyr. No other literature searches have yielded new or contradictory information.

- There are no studies on the effects of imazapyr on soil invertebrates, and incomplete information on the effects on soil microorganisms.
- One study indicates cellulose decomposition, a function of soil microorganisms, can be decreased by soil concentrations higher than concentrations expected from [BLM] applications.
- There is no basis for asserting adverse effects to soil microorganisms.
- Imazapyr degrades in soil, with a half-life of 25 to 180 days.
- Degradation rates are highly dependent on microbial action.
- Anaerobic conditions slow degradation.
- Adsorption increases with time as soil dries and is reversible.
- Field studies indicate that imazapyr remains in the top 20 inches of soil and do not indicate any potential for imazapyr to move with surface water.
- In forest field studies, imazapyr did not runoff and there was no evidence of lateral movement.
- Modeling results indicate imazapyr runoff is highest in clay and loam soils with peaks after the first rainfall.
- Imazapyr percolation is highest in sandy soils

This or corresponding relevant information has been included in the discussion of imazapyr in the *Soil Resources* section, and the sentence cited in the comment has been changed to show there are no studies on the effects of imazapyr on soil invertebrates, and there is incomplete information on the effects on soil microorganisms.

179. Comment: The conclusion of no effects to soil quality from herbicide use is contradictory given the stated picloram effects to soil organisms and persistence.

Response: The statement for soil quality degradation has been revised to show that of the four potential herbicides available for use in Alternative 2 (No Action), 2,4-D, dicamba, and glyphosate would not reduce soil quality when used to control noxious weeds under this alternative. Picloram effects may reduce soil organisms for up to a year.

180. Comment: The discussion of sulfometuron methyl in the *Soil Resources* section says that sulfometuron methyl is broken down through hydrolysis and biodegradation and moves readily through coarse textured soils. This is true for laboratory studies but field studies show it to be immobile under field conditions. The EIS should be edited to state that the mobility and persistence of sulfometuron methyl in soil is low.

Response: Field studies by Trubey et al. (1998) determined the persistence of sulfometuron methyl in soils is low. The degradation and mobility of sulfometuron methyl and potential degradates in the Trubey et al. field studies were evaluated under actual field conditions in the United States following application of Oust® herbicide to bare ground at the maximum-labeled rate. Sulfometuron methyl degraded rapidly at the four test sites; calculated half-life values ranged from 12 to 25 days. Sulfometuron methyl and its degradates were immobile under field conditions.

Information from the Extoxnet Pesticide Information Profile cites that the information on the rapid disappearance of sulfometuron methyl and the slight potential to move through soils indicates that the compound does not pose a threat to groundwater (Extoxnet 1996c).

Based on this supporting and new information, the mention of coarse textured soils and mobility within them has been supplemented in the *Soil Resources* section to note that the half-life of sulfometuron methyl is short, and that it has been found to move readily through coarse textured soils such as sand and sandy loams under laboratory conditions but that in field studies it has been demonstrated to be immobile and does not pose a threat to groundwater.

181. Comment: How toxic is triclopyr acid and how long does it persist in soils?

Response: As noted in the *Soil Resources* section, triclopyr is manufactured in two forms: a triethyamine salt (TEA) and a butoxyethyl ester (BEE). Both forms degrade readily in sunlight to the parent compound, triclopyr acid, which is also photodegradable. No information is available for toxicity of the degraded form, triclopyr acid, in soil. The *Soil Resources* section has been expanded to include the following information regarding its half-life: A study of photolysis found the half-life of triclopyr acid on soil under midsummer sun was two hours (McCall and Gavit 1986). Photodegradation can be particularly important in water. Johnson et al. (1995) found triclopyr acid dissolved in water had a half-life due to photolysis of one to 12 hours. They also found that sunlight plays a role in the rate of microbial metabolism of triclopyr, as microbial metabolism slowed when soil was deprived of light. The average half-life of triclopyr acid in soil is 30 days (Tu et al. 2001).

Water Resources

182. Comment: The *Summary* does not mention the potential for contamination of ground or well water.

Response: Although not in the Draft EIS *Summary*, known groundwater contaminates (those herbicides detected in groundwater regardless of the amount) were identified in the *Water Resources* section of the EIS in Chapter 4, and were listed in the short summary of Water Resources information in the *Additional Effects by Resource* section in Chapter 2. In the Final EIS, the *Summary* has been combined with the Final EIS so a complete effects analysis is within one document. The *Additional Effects by Resource* section in Chapter 2 has been replaced with a *Comparison of the Effects of the Alternatives* table, which continues to include a list of known groundwater contaminates.

183. Comment: The Clean Water Act declares a National goal that the “discharge of pollutants into the navigable waters be eliminated.” The Act defines pollutants as “chemical waste” and “biological materials,” which includes herbicides.

Response: Standard Operating Procedures, PEIS Mitigation Measures, and other measures are designed to keep non-aquatic BLM herbicides from getting into waters. For aquatic herbicides used to control invasive plants in and near water, site-specific analysis would demonstrate that benefits outweigh the risks before projects are authorized. For these cases, the EPA (in 2006) defined label-specified herbicide applications as not constituting a discharge of a pollutant under the Clean Water Act. The EPA's decision was subsequently overturned by the United States Court of Appeals for the Sixth Circuit, but the EPA was given until April 11, 2011 to prepare a general National Pollutant Discharge Elimination System (NPDES) permit for label-applied herbicides into or near water. The general permit, once issued, would have the effect of certifying compliance with the National goal. The BLM would comply with the provisions of the general permit, but the permit would not necessarily result in any changes to the applications described in the EIS.

184. Comment: More than 2,000 miles of BLM streams in Oregon are already listed on the Clean Water Act's 303(d) list as impaired for water quality, and 1,711 of those miles are impaired for temperature violations. The BLM has not adequately examined the effect of herbicide use on temperature-impaired streams.

Response: Both the *Fish* and *Water Resources* sections describe how invasive plants generally provide less stream shading and are less effective at providing bank stability than native, site appropriate, vegetation. In addition, total maximum daily loads (of sediments) are identified for each 303(d)-listed stream, and these include identification of "system potential vegetation" as the target (native) vegetation to meet water temperature standards. Slowing the spread of invasive species and removing invasive species from the riparian areas along streams, allows for the improvement of riparian vegetation important for stream shading and the maintenance of bank stability, both helpful in meeting temperature and other Clean Water Act objectives. Treatments along rights-of-way might have little effect on stream temperatures because of required buffers, and because acres proposed for herbicide use are already being managed using mowers and other non-herbicide methods. In any case, treatments would be analyzed in site-specific analysis that would consider potential effects to specific listed streams.

185. Comment: Oregon Department of Environmental Quality recommends that BLM establish direct communication with the Public Water System (PWS) operators or community liaisons downstream of the BLM treatment areas. Oregon Department of Environmental Quality generally recommends 100 or 200 feet buffers within 500 to 1,000 feet of a PWS intake and that BLM's management in municipal watersheds and aquifers management should support the overall goal of providing the highest quality water possible downstream at intakes and wells.

Response: These Oregon Department of Environmental Quality recommendations have been included in the *Water Resources* section in Chapter 4.

186. Comment: The EIS is defective because it fails to disclose the increasing frequency of pesticide detections over time for watersheds affected by the EIS. For example, the EIS fails to disclose that the [Reference Analysis][4] (no herbicides) would result in the least number of pesticide detections in streams, whereas, Alternative 5 could have up to 18 additional pesticide detections.

Response: The EIS variously reports actual levels of herbicides currently found in water bodies and groundwater, or the percentage of samples in which herbicides were detected, most notably in the *Water Resources* and the revised *Cumulative Impacts* sections early in Chapter 4. The *Water Resources* section goes on to discuss specific

4 This was "Alternative 1" in the Draft EIS and in the public comment. The title "Reference Analysis" is used in this Appendix to conform to the rest of the Final EIS.

herbicides in State waters, routes of delivery, and fate. That same section concludes that the Reference Analysis "would not have the potential to contaminate water with herbicides," while Alternative 5 says "the higher number of acres treated would add to the risk of herbicides impacting water quality …" The potential effects described in the comment are fully disclosed.

187. Comment: The EIS is defective because it fails to provide baseline conditions of potentially affected streams (existing detections of pesticides).

Response: The EIS variously notes the results of State, the EPA, and other herbicide-related water monitoring efforts. Recent monitoring results for the Willamette Basin have been added to the *Water Resources* section. This section also describes incidences and sample results for surface and groundwater. The EIS is programmatic however; no site-specific treatments are proposed, so no specific streams are directly affected by the Record of Decision. Water quality monitoring could occur on a subset of herbicide application projects, particularly where there are Federally Listed fish or where the project is considered higher risk (see Appendix 3). Monitoring is described in the BLM's Chemical Pest Control Handbook (USDI 1992c). The handbook says no set criteria for when to monitor are prescribed, but that a toxic chemical proposed for use in a susceptible areas such as near a residential area, or domestic water supply, must be monitored. Where water quality monitoring occurs, a baseline sample is collected before application of herbicides.

188. Comment: In 2008, the Oregon Department of Environmental Quality initiated a long-term program to monitor surface waters for toxic pollutants. Monitoring objectives were to collect data on pollutants known to present a substantial threat to human health or aquatic life and to gather information about the occurrence of chemicals of emerging concern in the Willamette River Basin. Water samples and fish were collected from mainstem and tributary locations throughout the basin and analyzed for a wide range of organic pollutants and metals. Herbicides were the class of pesticides most commonly found in water samples. Of the herbicides addressed in this EIS, diuron was found in many samples collected at locations throughout the basin.

Response: A discussion of this Oregon Department of Environmental Quality water monitoring has been added to the *Water Resources* section. Diuron was the 13th most commonly used herbicide in the State of Oregon in 2008. Diuron was found at low concentrations, less than 1 microgram per liter, which is 10 to 100 times less than the EPA benchmark for fish and invertebrates. There is no numeric water quality criteria established for diuron at this time (ODEQ 2008).

BLM would use diuron only under Alternative 4 (the Proposed Action) and Alternative 5. The estimated use west of the Cascades would be approximately 100 acres per year (800 acres for the whole State), a small fraction of the total acres treated in Oregon (see the *Cumulative Impacts* section early in Chapter 4). Standard Operating Procedures and PEIS Mitigation Measures include minimum buffers for use of upland labeled herbicides near water, based on application method (Appendix 2). In addition, for project level analysis, Standard Operating Procedures include the guidance to develop further refined buffer widths based on herbicide properties and site-specific conditions, to minimize impacts to water qualities. Buffers limit the transport of herbicide from upland treatments to water (*Water Resources,* Berg 2004, Dent and Robben 2000, Rashin and Graber 1993).

189. Comment: The Oregon Department of Forestry (ODF) encourages the BLM to share any water quality effectiveness monitoring data collected in support of this EIS with the State of Oregon's Water Quality Pesticide Management Team (WQPMT). Initiated and led by the Oregon Department of Agriculture, the inter-agency WQPMT acts to review and respond to pesticide detections in Oregon's ground and surface water as described in the Pesticide Management Plan for Water Quality Protection. As a Team member, the ODF is keenly interested in expanding the knowledge base regarding pesticides use and water quality on forestlands.

Response: Appendix 3 (Monitoring), has been revised to show that the BLM would share effectiveness monitoring data with the Oregon Department of Forestry's Water Quality Pesticide Management Team.

190. Comment: BLM should consider the EPA list of Pesticides of Interest and Oregon's Pesticides of Concern as well as other water protection methods when developing and implementing projects under NEPA.

Response: A subsection addressing Pesticides of Interest and Pesticides of Concern has been added to the *Water Resources* section in Chapter 4.

191. Comment: Many of the herbicides addressed by the EIS were detected in surface or groundwater in the 1992-95 USGS National Ambient Water Quality Assessment (NAWQA) studies in the Willamette Basin. These include 2,4-D, bromacil, dicamba, diuron, glyphosate, and triclopyr (Wentz et al. 1998). These data suggest that standard application practices may result in measurable concentrations of these compounds in surface waters near application areas, sometimes above water quality standards. These results emphasize the need to limit use of chemical herbicide controls whenever feasible.

Response: A discussion of the NAWQA study was added to the *Water Resources* section in Chapter 4.

The herbicides listed in the comment are all commonly used by agriculture, where herbicides are applied at regular intervals to large acreages following label requirements. Of the 18 herbicides addressed in this EIS, the 1992-95 data showed diuron in 53 percent of surface water samples, sometimes in levels exceeding drinking water standards. The BLM manages 25 percent of the land in Oregon but would use less than one percent of the herbicide under any alternative. Standard Operating Procedure-required buffers lessen the risk of herbicides entering water when compared to label requirements. Standard Operating Procedures also require that additional buffer widths be developed based on herbicide-specific and site-specific conditions, to minimize impacts to water quality. The *Water Resources* section includes information about the effectiveness of buffers at limiting the transport of herbicide from upland treatments to water (Berg 2004, Dent and Robben 2000, Rashin and Graber 1993). Diuron use west of the Cascades is estimated at 100 acres per year. The herbicide-specific information added to the Final EIS in Appendix 9 indicates diuron would be used for nursery-bed site preparation, and weed control around cell phone, radio, and television towers and electrical substations well away from water. Given the relatively small amount of herbicide used and the buffers required, it is unlikely that herbicides used by BLM would add measurably to the herbicide levels in surface waters.

192. Comment: While no National Pollutant Discharge Elimination System (NPDES) permit is required by Oregon Department of Environmental Quality at this time, a general NPDES permit for pesticide applications will be required starting in April 2011. The NPDES general permit will include conditions that must be followed by the applicant.

Response: The EPA has until April 2011 to prepare a general NPDES permit for label-applied herbicides into or near water. Such a permit is required by the Clean Water Act for the discharge of "pollutants." The general permit would not necessarily result in any restrictions other than those already required by EPA-approved labels. The BLM would meet all regulatory requirements and obtain required permits as needed, before project implementation.

193. Comment: There are hundreds of domestic water supplies on or adjacent to BLM checkerboard lands, many predating BLM permitting requirements, which are unknown to the BLM. Several of the proposed new herbicide applications could introduce toxic chemicals to people's drinking water. The EIS does not appear to consider this. The USGS report "Pesticides in the Nation's Streams and Ground Water, 1992-2001" confirmed that commonly used pesticides (including herbicides) show in domestic water supplies.

Response: To protect human health and safety a minimum buffer of ¼ mi for aerial application and 100 feet for ground applications would be used between treatment areas and human residences, unless a written waiver is granted (Appendix 2). Where water sources are on BLM or away from the residence, an additional mitigation measure to protect wells and springs used for domestic water supplies has been suggested by the analysis in this EIS (see *Potential Mitigation* in Chapter 2). Analyses for most herbicide use west of the Cascades also consider that almost all streams are in community source water protection areas. Buffers limit the transport of herbicide from upland treatments to water (*Water Resources*, Berg 2004, Dent and Robben 2000, Rashin and Graber 1993). Domestic water intakes on BLM lands would be considered if their location were known through required land use permitting processes. Intakes cannot be buffered if their location is unknown. However, the application of normal water buffers could be expected to minimize herbicides getting into nearby water bodies. The *Water Resources* section describes the incidence of herbicides in ground and other waters, and notes that the EPA has set tolerances for several of the herbicides addressed in this EIS. Herbicide use proposed with this EIS could, but is unlikely to, contribute to herbicides within domestic water supplies.

The referenced USGS report focused on agriculture and urban areas. The report indicates detections occurred most frequently in shallow ground water beneath agricultural and urban areas, where more than 50 percent of wells contained one or more pesticide compounds. About one-third of the deeper wells sampled, which tap major aquifers used for water supply, contained one or more pesticides or degradates. The findings show that streams are most vulnerable to pesticide contamination, but ground water also merits careful monitoring—especially in agricultural and urban areas. Shallow ground water in some of these areas is used for drinking water and ground-water contamination is difficult to reverse once it occurs (USGS 2008).

194. Comment: Herbicides should not be used in the Mt. Hood watershed. Instead, a CCC[5]-type group could be created to assist local efforts in eradicating invasive plants.

Response: It is not clear what area is referenced by "Mt. Hood watershed," but analysis of proposed herbicide use within source water areas for communities would normally involve the potentially affected water district. In any application, potential effects to domestic uses are taken into account. The difficulties of relying on government-employed work-crews range from the costs of transport, supervision, and housing to non-herbicide methods simply not working for many types of invasive plants. As described in Chapter 1, non-herbicide vegetation management methods are already available and being used to the extent practicable.

195. Comment: The EIS cites Austin et al. (1991) in saying glyphosate may stimulate algal growth at low concentrations, contributing to eutrophication of waterways, yet the effects of the proposed use of glyphosate on eutrophication and resultant cynobacterial blooms has not been analyzed on a site-specific or cumulative level.

Response: Austin et al. (1991) cultured periphyton[6] on glass plates suspended in artificial "stream-troughs" which were supplied with flowing water pumped from natural streams in British Columbia. The stream water was low in phosphorus and flowed out of an oligotrophic lake. Glyphosate was added to give nominal concentrations in the troughs of between 0.001 and 0.3 mg/liter. A further series of treatments added nutrients to troughs. The herbicide was not toxic to the periphyton. A transitory decrease in growth was followed by a stimulation of biomass in the glyphosate-treated troughs. Similar effects were seen with added nutrient. The authors considered the effect to be the result of algae using glyphosate as a phosphate source (WHO 1994).

5 Civilian Conservation Corps (CCC) was a public work relief program for unemployed men, providing vocational training through the performance of useful work related to conservation and development of natural resources in the United States from 1933 to 1942.

6 Periphyton is a complex matrix of algae and heterotrophic microbes attached to submerged substrata in almost all aquatic ecosystems

The EIS has been edited to note that the study has more implications in streams flowing through agricultural and urban areas where glyphosate is shown to be relatively common, although additional phosphates from those same areas might mask the effect. The amount of glyphosate expected to reach streams from BLM terrestrial applications would be expected to have no noticeable effect on eutrophication. Aquatic formulations could conceivably affect waterborne algae, and this possibility is noted in the analysis. Studies by the Washington Department of Ecology showed that out of five treatments, three had no detection of herbicide within one hour of treatment, and the two treatments with herbicide detected 1 hour later also had low levels 24 hours after treatment (see *Water Resources* section). However, the spread of riparian or submerged invasive plants is a much higher risk for eutropication than glyphosate. Glyphosate is generally used on small patches of plants, and where herbicide-killed aquatic vegetation is a concern, the plants are removed from the water after treatment.

196. Comment: The *Water Resources* section states that sulfometuron methyl degrades quickly by hydrolysis in acidic water but is stable in neutral water, and that biodegradation and photolyosis are major loss pathways in aquatic systems where hydrolysis rates are generally slow. A more accurate statement would be "Biodegradation is a major loss pathway in aquatic systems, where hydrolysis rates are generally slow."

Response: The statement has been changed to read as suggested.

197. Comment: The EIS does not adequately acknowledge and address the fact that the way BLM's road drainage system has been engineered, roadsides are really an extension of the stream network. Therefore, anything that BLM sprays along roadways has a high chance of polluting streams. This is a powerful argument in favor of alternative treatment methods.

Response: The *Water Resources* section in Chapter 4 addresses this issue with "Roads often parallel streams or have stream crossings. Roads can act as extensions of stream networks with roadside ditches having low but measurable herbicide concentrations months after treatment (Wood 2001). Since vehicles are a major invasive weed vector, a high percentage of invasive weed treatments are along roadsides. Herbicides used in these areas could reach streams even when buffers to the actual stream are applied. Standard Operating Procedures such as stream buffers reduce potential impacts to water quality from herbicide applications but do not specifically address ditches." Some of this same wording is included in the *Special Status Fish* section. Appendix 2 includes a PEIS Mitigation Measure to "Consider the proximity of application areas to salmonid habitat and the possible effects of herbicides on riparian and aquatic vegetation. Maintain appropriate buffer zones around salmonid-bearing streams." The *Potential Mitigation* section in Chapter 2 of the EIS now includes a requirement that "site-specific analysis for road-side treatments should specifically consider that drainage structures lead to streams and that normal buffer distances, herbicide selection, and treatment method selection may need to be changed accordingly, particularly where those ditches are connected to streams with Federally Listed or other Special Status species."

The concern expressed in this comment is one reason bromacil and tebuthiuron are absent, and diuron nearly so, west of the Cascades under Alternative 4 (the Proposed Action).

198. Comment: The EIS gives a misleading impression that streams are particularly adversely affected by western juniper expansion and would especially improve if we apply chemical treatments to western juniper. The EIS lacks a clear bigger picture of all the things that degrade streams and the many more effective means of improving stream conditions by, for instance, removing or reducing roads, livestock, OHVs, logging, and mining.

Response: There are many factors and management actions that can either degrade or improve riparian areas or stream function and water quality. Discussion of most of these factors or changes in their management is outside the scope of this analysis.

The EIS provides a cumulative effects analysis for a proposal (and alternatives) to increase the number of herbicides, and their uses, on BLM lands in Oregon. The treatment acres are estimates for analysis purposes, and are provided in enough detail to provide background for effects analysis. The EIS does not propose to make decisions about western juniper removal. That said, district herbicide use estimates are based on known or likely vegetation management needs. The analysis sets the context and basis for one likely future use by describing that western juniper expansion has led to to decreasing stream flow (*Effects of Invasive Plants on Water Resources*). The use of herbicides to control western juniper expansion could occur under Alternative 4 (the Proposed Action) and Alternative 5. Localized improvements in stream flows and riparian vegetation would be expected with restoration activities that include western juniper removal. Reducing western juniper cover has been shown to increase understory vegetation and infiltration and reduce erosion (Miller et al. 2005, Pierson et al. 2007, Peterson and Stringham 2008). Removal of western juniper has been the focus of several projects in the Prineville area to increase stream flows (*Wetlands and Riparian Areas*).

199. Comment: The EIS should explain how [the Reference Analysis] can lead to a decrease in water quality, compared with the alternatives, or why "invasive plants have the potential to adversely affect water resources more than herbicides."

Response: There are five reasons described in the *Water Resources* section that support the conclusion that the Reference Analysis could lead to localized impairments in water quality compared to the alternatives.

1) Some non-herbicide methods of removing plants disturb more ground than the use of herbicides. While mowing leaves groundcover in place, pulling or digging plants such as Himalayan blackberry or English ivy can disturb more soil, leaving more area vulnerable to erosion and runoff. The Reference Analysis would use directed livestock on 8,800 acres annually, a threefold increase from the No Action Alternative (Alternative 2). Livestock can also affect water quality by trampling banks, increasing sediment and contributing fecal coliform.
2) Noxious weeds are predicted to spread faster under the Reference Analysis, and many invasive plants provide poor erosion control compared to native plants. Japanese knotweed is an example of an invasive plant providing poor erosion control compared to native plants. Knotweeds spread rapidly downstream and out-compete native vegetation.
3) Large patches of certain plants cannot be treated effectively without herbicides. Although there are potentially successful mechanical or manual control options for small patches of knotweed, landscape-level projects and large sites would almost certainly require integrating herbicide use into a control strategy (Sol 2004).
4) Many aquatic species lead to decreased oxygen in the water and herbicides are an important method of control. For example, Eurasian watermilfoil accelerates eutrophication and lowers amounts of oxygen in the water (also described in the *Fish* section).
5) Invasive plants exclude native plants, typically reducing shade and detritus needed by stream organisms.

Comparing these weed effects against the comparatively small potential for the proposed herbicide treatments to adversely affect water quality, leads to the conclusion questioned in the comment.

200. Comment: The EIS fails to address the cumulative impact of herbicide on oceanic phytoplankton. There are already dead zones in the ocean off the coast of Oregon and at the mouth of the Mississippi.

Response: The low oxygen conditions (hypoxia) found in some summers off the Oregon coast has been linked to changes in surface winds. During normal years, cold water rich in nutrients but low in oxygen upwells from the deep ocean off Oregon, mixes with oxygen-rich water near the surface, causes some phytoplankton growth, and provides the basis for a thriving fishery and healthy marine food chain. During dead zone periods, some of the normal processes (including wind and current conditions) can change. This allows huge masses of plant growth to die, decay and in the process consume even more of the available oxygen near the sea floor, causing hypoxic conditions for marine life. This is a different process than in the Gulf of Mexico where agriculture runoff high in fertilizers is implicated in the Gulf dead zone.

Regarding BLM activity affecting ocean phytoplankton, BLM manages 25 percent of the land in Oregon while proposing to use less than 1 percent of the herbicides. Use of Standard Operating Procedures and PEIS Mitigation Measures, site-specific mitigations decided at the project level, and the generally limited uses proposed, would provide protection for water. Given the relatively small amount of herbicide used and the buffers required, it is unlikely that herbicides used by BLM would add measurably to the herbicide levels in the ocean off the Oregon coast.

Wetlands and Riparian Areas

201. Comment: The EIS fails to explain how using or drifting herbicides into riparian areas would meet the Land and Resource Management Plan's Aquatic Conservation Strategy (ACS) objectives west of the Cascades. Herbicides that harm aquatic species including native aquatic plants, and native plants within the riparian areas such as those in campgrounds, would not meet the ACS.

Response: The Aquatic Conservation Strategy is a requirement of the Northwest Forest Plan and affects districts west of the Cascades and a portion of the Klamath Falls Resource Area, although similar requirements have been made a part of some plans east of the Cascades as well. The important phrases in the ACS standards and guidelines are "meet Aquatic Conservation Strategy objectives," "does not retard or prevent attainment of Aquatic Conservation Strategy objectives," and "attain Aquatic Conservation Strategy objectives." These phrases, coupled with the phrase "maintain and restore" within each of the nine Aquatic Conservation Strategy objectives, define the context for agency review and implementation of management activities. Complying with the Aquatic Conservation Strategy objectives means that an agency must manage the riparian-dependent resources to maintain the existing condition or implement actions to restore conditions. The standards and guidelines focus on "meeting" and "not preventing attainment" of Aquatic Conservation Strategy objectives. Management actions that do not maintain the existing condition or lead to improved conditions in the long term would not "meet" the intent of the Aquatic Conservation Strategy and thus, should not be implemented (USDA, USDI 1994b:B-9-10). Of the nine ACS objectives listed in the standards and guidelines, those most pertinent to herbicide use are probably:

2) …. network connections must provide chemically and physically unobstructed routes to areas critical for fulfilling life history requirements of aquatic and riparian-dependent species.
3) Maintain and restore the physical integrity of the aquatic system, including shorelines, banks, and bottom configurations.
4) Maintain and restore water quality necessary to support healthy riparian, aquatic, and wetland ecosystems. Water quality must remain within the range that maintains the biological, physical, and chemical integrity of the system and benefits survival, growth, reproduction, and migration of individuals composing aquatic and riparian communities.
5) Maintain and restore the sediment regime under which aquatic ecosystems evolved. Elements of the sediment regime include the timing, volume, rate, and character of sediment input, storage, and transport.
8) Maintain and restore the species composition and structural diversity of plant communities in riparian areas and wetlands to provide adequate summer and winter thermal regulation, nutrient filtering, appropriate rates of surface erosion, bank erosion, and channel migration and to supply amounts and distributions of coarse woody debris sufficient to sustain physical complexity and stability.
9) Maintain and restore habitat to support well-distributed populations of native plant, invertebrate, and vertebrate riparian-dependent species.

Slowing the spread of invasive plant and protecting native ecosystems, particularly within the riparian areas and in water, would contribute to most of these objectives. The question, then, is whether treatments (including those for native plants along rights-of-way or in developed sites), would lead to degradation.

Potential negative effects from getting herbicides in water are avoided through the use of Standard Operating Procedures and PEIS Mitigation Measures that include the PEIS Biological Opinion (NMFS 2007) Protection Measures, as well as through other site-specific design features and practices. Stream buffers are one effective method of keeping herbicides out of water. Most of the herbicide applications proposed in the EIS are directed, not broadcast, sprays. Aerial applications are excluded from Alternatives 3 and 4 (the Proposed Action) west of the Cascades, in part to avoid drift into undetected waters.

Application of aquatic herbicides to control aquatic invasive plants would be done only where the overall impact on present and future water body conditions would be positive, where collateral mortality of native plants or the effect of the killed plants on water quality are neutral or better when considered in context with the effects of the invasive plants themselves.

However, findings of ACS consistency are made during project-level planning and are based on project design, Watershed Analysis specific to the watershed in which treatments are proposed, and other site-specific factors.

202. Comment: The problem of aquatic invasive plants appears to be very limited in Oregon. This suggests that manual and mechanical control would be feasible, and does not require 2,4 D, diquat, and glyphosate herbicide treatment.

Response: Riparian and wetland invasive plants have not been inventoried intensively. Acres shown on Table A7-1 are small because aquatic habitats are limited. Elodea, parrot's feather, Bohemian knotweed, Japanese knotweed, yellow flag iris, and purple loosestrife have been treated by the BLM in the past. Other weeds getting treatment in riparian areas for restoration projects in the recent years are Himalayan blackberry, saltcedar, Russian olive, perennial pepperweed, and butterfly bush. Any State listed noxious weed in a wetland or riparian area can inhibit habitat functions that only these areas can provide. On the east side of the Cascades in particular, the East Side Riparian Biome description explains that these areas provide benefits that greatly outweigh the acres they cover, so basing treatment on acres alone would lead to improper treatment priorities. Manual and mechanical means are often more disturbing to wet areas than an herbicide application by hand. Manually removing weeds from water can be impractical, since not all material can be collected.

All three herbicides listed above are labeled for use in the wetland or riparian environment and are thus appropriate for treating undesirable vegetation in these areas. Treatments are generally in conjunction with other landowners (private or as part of a watershed council project) so entire stream systems are treated. Methods that would miss some plants would reduce the treatment effectiveness for all sections, since streams could quickly transport seeds and other vegetative material to other areas.

Fish

203. Comment: What is the basis for the Chapter 2 *Comparison of the Effects of the Alternatives* statement that benefits to fish from Alternatives 2 through 5 would outweigh the impacts from toxic herbicide use? There is no clear cost/benefit analysis in the EIS to justify this repeated assumption.

Response: The *Comparison of the Effects of the Alternative* section in Chapter 2 of the Draft EIS summarized the key conclusions from the more detailed resource sections in Chapter 4. The Chapter 4 resource sections indicate that the amount and types of herbicide uses proposed by the BLM, using required site-specific analyses, Standard Operating Procedures and PEIS Mitigation Measures, and Endangered Species Act consultation, are expected to result in little to no adverse effects to fish. On the other hand, invasive plants displace native plant communities and expose watersheds and stream banks to erosion, increase runoff temperatures, reduce stream shading and native food sources, and have other adverse effects to fish. Any significant reduction or slowing of invasive plants is thus predicted to benefit fish, and this benefit is predicted to be well beyond the potential for adverse herbicide effects arising from the uses proposed under the alternatives. While both sides of this comparison include qualitative judgments, various estimates of the economic impact of invasive plants, and the quantitative risk calculations made in the Risk Assessments and reflected on the "Risk Categories" tables in Chapter 3, tend to support this conclusion.

204. Comment: There is no quantified or clear analysis supporting the assumption under Alternative 4 (the Proposed Action) that the benefits of invasive plant control would outweigh herbicide risks to fish.

Response: The risks to fish from herbicides are well studied and quantified, but only to the degree exposure is known. At the scale of this EIS, the BLM cannot conclude with certainty that herbicides could not potentially reach fish-bearing streams and cause adverse effects. However, site-specific analysis and application of Standard Operating Procedure-required buffers and other measures minimize the likelihood of exposures, and reduce the actual risk to fish to extremely low levels. The presence of certain herbicides in some of the State's rivers, for example, does not indicate that BLM applications are implicated, or that BLM applications would contribute measurably or at all. BLM herbicide use under the Proposed Action would be less than one percent of the pesticides used in Oregon (Table 4-1). Required buffers, typical rates, spot treatments, and other measures mean that BLM contributions to adverse fish effects in Oregon would be orders of magnitude lower than even the one percent that might be inferred from these numbers.

The spread of invasive plants, however, is predictable and observable. Effects of this spread on stream shading, food sources, and stream-bank stability are known and discussed under Invasive Plant Effects in the *Fish* section. Although the actual spread reduction that would be accomplished under each alternative is a calculated estimate, rendering a portion of the conclusion qualitative rather than quantitative, the Alternative 4 (the Proposed Action) conclusion that the weed spread reduction would be more beneficial than the risk from herbicides is well founded and clear.

205. Comment: A recent study (Baldwin et al. 2009) examined the effects of exposure to sub-lethal amounts of various pesticides (including herbicides) on salmon. Major efforts are currently underway to restore Pacific salmon habitats in an effort to recover depressed populations. However, not much research has been done to determine the importance of pollution as a limiting factor of Federally Listed species. Pesticide exposure lasting only four days can change the freshwater growth and, by extension, the subsequent survival of sub yearling salmon.

Response: The study by Baldwin et al. (2009) used a modeling approach to link short-term, sub-lethal exposures of organophosphate and carbamate insecticides to chinook salmon. They did not consider herbicides. Because insecticides and herbicides work so differently it is difficult to compare the sub-lethal effects to fish between the two pesticides. However, the analysis shows that some of the herbicides analyzed in this EIS could harm fish if they were exposed. The amount of herbicides expected to reach water are expected to be very low under the alternatives in this EIS, and site-specific treatment design and required Endangered Species Act consultation would attempt to prevent adverse effects to Federally Listed species, including sub-lethal effects. At the scale of this EIS, the BLM cannot conclude with certainty that herbicides could not potentially reach fish-bearing streams and cause adverse effects. Herbicide use at the local or project scale, conducted under the Standard Operating Procedures and PEIS Mitigation Measures, and following site-specific analysis and appropriate consultation, is unlikely to contribute substantially to downstream effects.

206. Comment: The EIS fails to consider the synergistic effects to salmon from herbicides proposed to be applied by the BLM and those pesticides already present in the streams from other users.

Response: There is no sound way to estimate background levels of contaminants in the environment and incorporate that information into a quantitative Risk Assessment. It is impractical and beyond the scope of this EIS to evaluate the potential effect of all possible pesticide contaminants in all surface water bodies of Oregon.

The BLM has done extensive analysis to study the effects of all of the proposed herbicides, and has adopted Standard Operating Procedures and PEIS Mitigation Measures (Appendix 2) to prevent or limit translocation to surface waters and effects to non-target species. These include using appropriate herbicide-free buffer zones for herbicides not labeled for aquatic use based on Risk Assessment guidance, with minimum widths from water of 100 feet for aerial, 25 feet for vehicle, and 10 feet for hand spray applications. Additional herbicide-specific buffer zones may be established for water bodies, habitats, and fish or other aquatic species of interest based on Endangered Species Act consultation requirements and site-specific analysis.

A discussion of *Synergistic Toxicity of Mixtures in the Aquatic Environment* has been added to the *Fish* section in Chapter 4.

207. Comment: New information since the PEIS Biological Opinion (NMFS 2007) indicates mixtures of pesticides that have been commonly reported in salmon habitats may pose a more important challenge for species' recovery than previously anticipated (Laetz et al. 2009:348). Although Laetz et al. (2009) did not test the herbicides proposed for use by the BLM, the fact remains that pesticides found to be not lethal singly may become lethal when mixed (Laetz et al. 2009:348) and with toxicity that greatly exceeds what would be expected from merely additive effects (i.e. synergistic effects).

Response: At the scale of this EIS, the BLM cannot conclude with certainty that herbicides could not potentially reach fish-bearing streams and cause adverse effects. However, the amount of herbicides expected to reach water is expected to be very low under the alternatives in this EIS, and site-specific treatment design would attempt to prevent adverse effects to aquatic species, including synergistic effects.

Laetz et al. (2009) studied the synergistic effects of multiple insecticides on fish. Cumulative adverse effects to humans or other elements of the environment are most likely when two pesticides share a common mechanism of toxicity. That is, they both affect an organism the same way. Cumulative effects assessments conducted by the EPA typically *begin* by grouping pesticides by mechanism of toxicity (EPA 2002). Because insecticides and herbicides work so differently, even a concurrent application would be unlikely to result in significant environmental effects when both products are applied within label limits. As a group, insecticides are far more likely to adversely affect fish than herbicides, because insects and fish share most biological processes.

The potential for synergistic effects to fish was examined in the Risk Assessments (Appendix 8). The information reported by Laetz et al. (2009) has been incorporated into the *Fish* section.

208. Comment: The PEIS Biological Opinion (NMFS 2007) cannot be used for herbicide proposals/decisions in the EIS because of new scientific information about unexpected synergistic (lethal) effects to Coho salmon from pesticide combinations.

Response: The analysis provided in this programmatic EIS adequately addresses the potential impacts to Federally Listed species and critical habitat when considered as a supplement to the Biological Assessment completed for the PEIS as described in Appendix 5. Appendix 5 of the EIS provides information concerning

Federally Listed species known to occur in Oregon and is provided as a supplement to the Biological Assessment which is incorporated by reference in accordance with 50 C.F.R. 402.12 (g). The EIS is programmatic by design and does not identify or authorize site-specific vegetation treatments or amend Land and Resource Management Plans. As a programmatic analysis, the EIS contains the appropriate level of Endangered Species Act analysis at the scale for which it was intended. To minimize potential impacts to Federally Listed species and critical habitat, all Standard Operating Procedures and PEIS Mitigation Measures indentified in Appendix 2 of the EIS, as well as the protective measures in the PEIS Biological Opinion (NMFS 2007) are applicable unless otherwise modified by subsequent site-specific analysis and Endangered Species Act consultation. The EIS states that site-specific analysis, as well as Endangered Species Act consultation, must be completed prior to any project approval for vegetation treatments with herbicides. It is at the site-specific level that potential impacts to specific Federally Listed species are best analyzed and the most effective Conservation Measures are developed.

The local Biological Assessment and supporting documentation must include relevant reports, including EISs, Environmental Assessments, Biological Assessments, or other analyses prepared on the proposal and other relevant studies or other information available on the action, the affected Federally Listed species, or critical habitat. In other words, new scientific information about unexpected synergistic effects to Coho salmon from pesticide combinations would be used to develop the site-specific Biological Assessment.

There does not appear to be any significant new information indicating the PEIS consultation conclusions are flawed. Recent studies showing synergism of two insecticides, with resultant effects on salmonids, are neither unexpected nor necessarily relevant. The Risk Assessment examined the potential for synergistic effects of herbicides, and no new information indicates the Risk Assessment conclusions are wrong or inadequate.

209. Comment: The discussion of herbicides in the *Fish* section states that diuron has a low to moderate tendency to bioaccumulate. Based on research done on fathead minnows by Call et al. (1987), that statement should be changed to “diuron has a low tendency to bioaccumulate.”

Response: Carp (*Cyprinus carpio*) exposed for 6 weeks to diuron had experimental bioconcentration factor (BCF) values from two trials ranging from 3.4 to 4.9 (0.5 mg/l exposure) and <3 to 74 (0.05 mg/l exposure)[7] (Chemicals Evaluation Research Institute 2000). According to (Franke et al. 1994), these BCF values suggest the potential for bioconcentration in aquatic organisms is low-to-moderate. Based on these references the original language has been retained, but a statement has been added that diuron has a low tendency to bioaccumulate in fathead minnows.

Wildlife Resources

210. Comment: BLM fails to address the inherent complexity and complex interspersion of vegetation across the landscape, and instead claims that “treatments” are necessary to create more of a mosaic, or for greater diversity.

Response: The *Wildlife Resources* section reports on literature that suggests mosaics of habitat, rather than large monocultures, benefit many species. Some wildlife in some areas will benefit from the creation of mosaics; the examples in the EIS are mostly the facilitation of habitat improvement projects already identified in sage grouse Conservation Strategies. Conversely, some wildlife could be adversely affected by large-scale habitat improvement; hence, a potential mitigation measure is included in Chapter 2 suggesting such treatments mimic natural disturbance mosaics. However, the EIS does not attempt to fully describe or justify vegetation treatment

7 Bioconcentration factor is the concentration of a particular chemical in a tissue per concentration of chemical in water.

prescriptions. Actual habitat improvement and other vegetation treatment needs are identified in the districts' Land and Resource Management Plan, species management plans, and other planning documents. Treatment acres used in the EIS are simply program estimates made by the districts based on knowledge of existing plans and site-specific needs. These estimates provide a basis for the statewide herbicide cumulative effects analysis, and are not a commitment to conduct projects.

211. Comment: Landscape-level fragmentation, cheatgrass presence, livestock facilities, and other information about degraded sage grouse habitat (USGS 2009) should be considered in the cumulative impact analysis of herbicide use where there is potential for native vegetation (required by sagebrush-associated species) to be killed.

Response: Both the *Sage Grouse Conservation Assessment* (Connelly et al. 2004) and *Ecology and Conservation of Greater Sage-Grouse: A Landscape Species and Its Habitats* (USGS 2009) were reviewed and considered in preparation of the EIS and would be considered again when actual treatments are proposed. Invasive plant treatments in infested sage grouse habitats would normally be spot treatments or would be a part of restoration projects carefully designed to benefit sage grouse. Standard Operating Procedures and PEIS Mitigation Measures included in Appendix 2 would help prevent the treatment of vegetation needed by wildlife species during an herbicide application. Hence, the BLM does not anticipate any significant adverse cumulative impacts to native wildlife from the treatment of noxious weeds and other invasive plants. However, invasive weed and habitat-improvement treatment estimates in the EIS are for herbicide cumulative effects analysis, and actual vegetation treatment decisions would follow local direction and be subject to site-specific analysis.

According to Connelly et al. (2004), use of herbicides on private land was historically used to improve forage for livestock grazing and this was often done at the expense of native species. This EIS does not propose the use of herbicides for livestock forage production. The Proposed Action (Alternative 4) is designed in part to protect native ecosystems and the flora and fauna that depend on them; provide sustainable habitats for wildlife, fish, and native plants; and prevent herbicide control treatments from having unacceptable adverse effects to desirable flora and fauna.

The EIS found that the differences between the alternatives regarding noxious weed spread are more detrimental than the risks from herbicides proposed under those alternatives.

212. Comment: The EIS needs to explain the anticipated effects of herbicide use on fragmented sagebrush habitats and sagebrush dependent species such as the sage grouse, pygmy rabbits, Brewer's sparrow, sage sparrow, and sage thrasher.

Response: Sagebrush habitats and the species that depend on them have been negatively impacted by the spread of noxious weeds and other invasive plants. A significant portion of the Proposed Action (Alternative 4) endeavors to reduce the rate of invasive plant spread and help reduce further degradation of imperiled habitats such as those associated with sagebrush steppe ecosystems. No treatment is entirely risk free, but the herbicides proposed in this EIS were chosen to have minimal toxic impacts to native plant and wildlife species. Prior to any specific herbicide treatment, site-specific analyses would be conducted; the action alternatives in this EIS would add several herbicides to the choices available, so the best combination of mechanical and herbicide treatments for the wildlife and plants in their area would be used. In many cases, herbicide treatments would provide a means to restore habitat for these species that is not available with currently approved herbicides and mechanical treatments. Habitat improvement projects permitted under Alternative 4 (the Proposed Action) and Alternative 5 could specifically improve or protect sage grouse and other wildlife habitats. Standard Operating Procedures, PEIS Mitigation Measures, and Conservation Measures for Special Status species (identified in Appendix 2 of this EIS) would help to reduce or avoid adverse treatment effects.

213. Comment: Shrubland and grassland birds such as Brewer's sparrow, sage sparrow, and sage thrasher are declining faster than any other group of species in North America (Saab and Rich 1997, Paige and Ritter 1999, Dobkin and Sauder 2004) and may be important predictors of ecological collapse.

Response: Although these bird species are not Special Status species, they are Fish and Wildlife Service Birds of Conservation Concern. As such, they are evaluated in project planning (USDI 2008c, 2009x). The references cited in the comment are consistent with the *Habitat Change Resulting from Invasive Plants* subsection in the *Wildlife Resources* section, which states that exotic invasive species are contributing to habitat declines. Effects on Brewer's sparrow from invasive grasses adversely affecting sagebrush habitats, for example, are specifically mentioned. Restoration of healthy sagebrush communities for native plants and animals (including the rare birds mentioned in the comment) is one of purposes of the EIS. The Proposed Action (Alternative 4) incorporates Standard Operating Procedures and PEIS Mitigation Measures to allow restoration to occur while minimizing adverse effects to native wildlife species. Additional information on the Brewer's sparrow, sage sparrow, and sage thrasher has been incorporated into the *Wildlife Resources* section.

214. Comment: Juniper birds are of high conservation concern, yet western juniper habitats are among the most consistently under-represented habitat types in biological and ecological survey efforts.

Response: The BLM seeks to maintain native species and habitats in a sustainable way. Any rare birds dependent upon western juniper habitats would be focal species where those habitats are rare (such as in the agriculturally dominated landscapes where western juniper were once more common). However, western juniper treatment projects would most likely occur in areas where western juniper has expanded into sagebrush communities, and are affecting native wildlife in those communities. Western juniper would not be treated where they have not become out of balance with historic and sustainable communities. The western juniper control referenced in the EIS is an estimate made by the districts based on local vegetation management issues and priorities. The EIS does not propose or approve actual projects; decisions to control western juniper would be made following site-specific analysis.

215. Comment: The EIS fails to adequately display the effects of increased herbicide use on birds. The EIS should address the potential impacts to birds using the Partners in Flight Assessment factors, which include population size, breeding distribution, non-breeding distribution, threats to breeding, threats to non-breeding, and population trend (Rich et al. 2005).

Response: BLM is a partner in the Partner in Flight program, and reference to the BLM's participation in this program has been added to the *Wildlife Resources* section. The factors listed in the comment would be considered when identifying potential impacts at the project level. Impacts related to breeding and specific population trends vary depending on the ecosystem affected, species' occurrence, pre-project habitat condition, the objective of the treatment proposed, and the timing, dosage, and application method of the treatment, all of which cannot be accurately identified or analyzed in a statewide, programmatic EIS. The EIS predicts the potential effects under proposed dosages and scenarios, and identifies Standard Operating Procedures and PEIS Mitigation Measures designed to reduce impacts to the extent possible at this programmatic scale. These analyses would identify the potential effects of specific herbicide treatments to the wildlife species and habitats within a defined project area. Site-specific analysis would utilize the factors identified by Partners in Flight and many other wildlife and resource parameters in their analysis of applicable effects of a specific project in order to choose the most effective treatment to meet the objective while having the least impact to wildlife and other resource values.

216. Comment: Direct exposure and indirect ingestion of chemicals by birds and grazing or insectivorous mammals through food or water have caused skin and eye irritation, respiratory distress, organ malfunction, suppressed immune response, reproductive problems and behavioral changes leading to reduced vigor or survival.

Response: The *Wildlife Resources* section discloses that the use of chemicals can have deleterious effects to wildlife, and no chemical treatment is entirely risk free. Direct effects to wildlife from herbicides would depend on the dose (how much herbicide), exposure (whether direct contact or ingestion of contaminated food or water), and the toxicity or LOAEL of that level of dosage (if any). The Ecological Risk Assessments (Appendix 8) that form the basis of the *Wildlife Resources* effects discussion determine the possibility of having the effects noted in the comment at plausible exposure scenarios. The resultant risk levels for plausible scenarios are shown on the "Risk Categories" tables at the end of Chapter 3 and are considered in the *Wildlife Resources* effects discussions. Many of the adverse effects reported in the literature are from dosages hundreds of times higher than plausible BLM spray scenario exposures.

217. Comment: A literature review (including Bernanke and Kohler (2008)) suggests a link between endocrine disrupting chemicals and the reproductive system of birds and other vertebrates. The EIS should include and address this research.

Response: The potential for any of the herbicides included in this EIS to be endocrine disrupters is discussed in the *Effects Common to All Alternatives* section within the *Wildlife Resources* section, and in the *Human Health and Safety* section. The EPA reports that endocrine disruption effects can include abnormal thyroid, decreased fertility, decreased hatching success and demasculinization, and feminization of birds. The EPA is in the process of evaluating all pesticides for these potential effects, but to date, there is no confirmation that any of the herbicides proposed in the EIS are known endocrine disruptors of wildlife in field situations. Many papers, including Bernanke and Kohler (2008) summarize the effects of several different chemicals (including PCBs, DDT/DDE, and organochlorines) into an EDC (endocrine disrupting chemical) group. PCB's, DDT/DDE insecticides and organochlorines all have documented adverse effects to wildlife, but are not proposed for use by this EIS. The herbicides proposed in this EIS were chosen to have minimal adverse impacts to non-target species.

218. Comment: Although Roundup is not registered for aquatic uses and studies of its effects on amphibians indicate it is toxic to them, scientists have found that it may wind up in small wetlands anyway due to inadvertent spraying during its application. Studies found that even at concentrations one-third of the maximum concentrations expected in nature, Roundup still killed up to 71 percent of tadpoles raised in outdoor tanks.

Response: Herbicide formulations like Roundup® that are not registered for aquatic use would not be applied by the BLM near water. The surfactant POEA (a surfactant in most Roundup formulations) is associated with risk to aquatic organisms and amphibians and thus would also not be used near water. Standard Operating Procedures prescribe minimum buffers between water and treatments with non-aquatic herbicides to lessen the risk of herbicides entering water. These also require that additional buffer widths be developed based on herbicide-specific and site-specific conditions to minimize impacts to water quality. Buffers limit the transport of herbicide from upland treatments to water (*Water Resources*, Berg 2004, Dent and Robben 2000, Rashin and Graber 1993). The Standard Operating Procedures and PEIS Mitigation Measures are designed to minimize the risk of inadvertent overspray and the site-specific potential for inadvertent overspray would be evaluated and addressed in project level analysis.

219. Comment: The EIS does not adequately address the potential effects of herbicide use on amphibians, reptiles, and mollusks. Although the EIS mentions that some herbicides have low toxicity to mollusks, no further analysis is provided. Recent research suggests that triclopyr and hexazinone have adverse effects to amphibians (Relyea et al (2005), Bernanke and Kohler (2008)), and that diuron inhibits ovulation in frogs (Orton et al 2009). Research by Relyea (2005) suggests adverse effects of the herbicide glyphosate on amphibians.

Response: The *Effects Common to all Alternatives* subsection of the *Wildlife Resources* section discusses potential impacts to amphibians, reptiles, and mollusks. Relyea (2005) and Relyea et al (2005) both describe effects of glyphosate formulations that include the surfactant POEA on amphibians and laboratory communities of aquatic organisms. The surfactant POEA is identified in both papers as adverse to amphibians.

Bernanke and Kohler (2008) summarize the effects of several pesticides (including insecticides and herbicides not proposed for use on BLM lands). Two herbicides being proposed for use are mentioned in their summary: triclopyr and hexazinone, which were evaluated by Berrill et al (1994). The study by Berrill et al. (1994) evaluated dose levels likely to occur in commercial forestry applications, a much different application than proposed by BLM. Even in the studied application, Berrill et al. (1994:658) noted that field level dosages of hexazinone were unlikely to affect invertebrates, resident animals, tadpoles, and embryos. Laboratory studies reported in Orton (2009) suggest some minor changes to testosterone levels in frogs due to diuron, but it was not clear that such effects rose to a level that caused adverse effects to the animals. No estrogenic effects were noted.

Local project planners would evaluate habitat for rare species and incorporate appropriate buffers around wetlands and ponds. Appendix 2 details Standard Operating Procedures and PEIS Mitigation Measures specifically designed to reduce the chance of wildlife exposures. These include avoiding the use of glyphosate with POEA to avoid risks to amphibians.

220. Comment: The spraying of roadsides, rights-of-way, campgrounds, and around BLM offices and buildings would deprive butterflies of much of their current territory, as those are places where sun-loving native plants often grow.

Response: Rights-of-ways and other developed areas require safety and maintenance treatments specific to their objectives, and wildlife habitat may be a secondary objective. It is assumed that in these areas, vegetation is currently being maintained primarily with mechanical methods, such as mowing (see Chapter 3). However, prior to any specific herbicide treatment, site-specific analyses would be conducted that would include wildlife surveys and other efforts to identify particularly important wildlife habitat. Such information can be used to design mitigation measures, make a treatment method selection, and design habitat restoration projects to protect, conserve, or develop alternate habitat for potentially impacted species if appropriate. It is BLM policy to maintain natural conditions that support sustainable populations of native wildlife, particularly rare species.

221. Comment: The EIS lacks specificity in describing the actual effects of herbicides on wildlife.

Response: The effects of herbicide use on wildlife discussed in the *Wildlife Resource* section are summaries of the detailed BLM and Forest Service Risk Assessments. These Risk Assessments are based both on models and surrogate species, as well as on wildlife (the EPA does not require the testing of herbicides on wildlife, and allows the use of surrogate species for Risk Assessments). The EIS also evaluated recent literature on the effects of herbicides on wildlife that have been published since the Risk Assessments were completed. The Risk Assessments are discussed in Chapter 3 and are included in Appendix 8.

Effects are summarized in terms of expected dose (Risk quotient, or RQ; or Hazard Quotient, or HQ) of the herbicide and whether that exposure level exceeds the level of concern (LOC) for each wildlife group tested. BLM's evaluated herbicide risk categories summarize the High, Moderate, or Low chance that the RQ would exceed the LOC for the scenario and exposure method discussed. The risks vary by application scenario, the animals tested, whether typical or maximum dosage is applied, and many other factors. The actual nature of the adverse effects varies; the LOC is based on the first observable adverse effect. This is often eye irritation; the LOC does not usually mean mortality. Actual field risks are likely to be less than analyzed in the Risk Assessments because of the low likelihood that native wildlife would actually be in contact with the herbicide or with food/water sprayed by herbicide, at the modeled doses, or would be exposed to such a level that adverse effects might occur. Most herbicide treatments would be highly focused to treat invasive species and to reduce chances of non-target species being affected.

The *Wildlife Resources* section also describes the potential effects to wildlife food, behavior, and interspecific reactions that may occur from the treatment methods. Effects to wildlife would vary widely by species, timing, treatment method and treatment herbicide, extent and other factors that cannot be evaluated at a programmatic level. The EIS predicts the potential effects under proposed dosages and scenarios, and identifies Standard Operating Procedures and PEIS Mitigation Measures (Appendix 2) designed to reduce impacts to the extent possible at this programmatic scale. Prior to any specific herbicide treatment, site-specific analyses would be conducted, and these analyses would identify the potential effects of specific herbicide treatments to the wildlife species and habitats within a defined project area. These site-specific analyses would allow for the incorporation of such things as buffers, seasonal restrictions, partial treatments of occupied habitat, and other appropriate application methods to reduce potential risks to wildlife. Until actual projects are proposed, it is impossible to say what site-specific effects would be.

Livestock

222. Comment: The Draft EIS states in Chapter 1 that it "does not propose the use of herbicides specifically for commodity production such as projects to improve … livestock forage." This statement is not reflected in the rest of the rest of the EIS. For instance, the EIS describes how ranching on lands adjacent to BLM would commercially benefit by the BLM using herbicides.

Response: The word "commodity" in the description of the Alternatives in Chapter 2 has been replaced with "specifically for livestock forage or timber production," to remove confusion about other economic effects. Noxious weeds adversely affect commodity and non-commodity resource values statewide. These effects are one reason weeds are listed as "noxious" by the State. The *Livestock* section, therefore, displays the effects of the various alternatives on livestock use, the same as the *Recreation* section, *Fish* section, and so forth. Examination of the effects of the alternatives on resource values such as livestock use is a requirement of NEPA, and does not infer herbicides would be proposed specifically to improve livestock forage production. This point is discussed in more detail in the first two paragraphs of the *Livestock* section.

223. Comment: There is no summary of acres of disturbance by livestock, or of range improvement projects such as pipelines, troughs, livestock facility roads, and fences that are or may become infested and serve as weed conduits.

Response: The *Noxious Weeds and Other Invasive Plants* section notes that numerous vectors and events contribute to invasive weed spread including grazing and its appurtenant developments. However, an examination of the factors contributing to weed spread is outside the scope of the EIS; they are mentioned only to support a better understanding of the effects of the alternatives. Grazing is authorized by the FLPMA, Public Rangeland Improvement Act, O& C Act, and the Taylor Grazing Act, and a reconsideration of grazing or its effect on the spread of invasive plants is beyond the scope of this analysis. The potential for grazing and related activities to spread weeds is analyzed during district planning processes and in the analyses for site-specific ground disturbing projects such as fences and pipelines, forage enhancements, and other projects that have the potential to alter plant communities. These analyses must include an assessment of the risk of introducing noxious weeds and other invasive plants.

224. Comment: The EIS needs to recognize livestock grazing exacerbates any climate change-related vegetation shifts that may be occurring, particularly in areas facing increased heat and aridity due to climate change.

Response: A consideration of grazing, or any possible interaction between grazing and climate change, is outside the scope of this EIS.

225. Comment: The EIS should address the effects of intensified grazing as livestock are shifted away from sprayed areas. The EIS should mandate livestock removal from treated areas.

Response: Livestock exclusion times are short, most treatment areas under this EIS would be small, and livestock are already frequently moved to accommodate range conditions. Required herbicide exclusions are not likely to result in adverse grazing effects to alternative grazing sites. Site-specific planning for larger control or restoration projects such as those involving imazapic over thousands of acres would include consideration of the effects on alternate grazing sites.

Wild Horses and Burros

226. Comment: The discussion of wild horses and burros in the *Comparison of the Effects of the Alternatives* section in Chapter 2 does not acknowledge greater risk to grazing animals from herbicides.

Response: The referenced section in the EIS noted that risks to wild horses and burros from herbicides are similar to those for livestock, where herbicide risks were discussed. Additional detail can be found in the corresponding sections in Chapter 4. The *Comparison of the Effects of the Alternatives* section in Chapter 2 has been reformatted and rewritten, and the *Livestock* and *Wild Horses and Burros* sections have been combined.

Fire and Fuels

227. Comment: Fire suppression has increased unwanted vegetation that the BLM now proposes to kill with herbicides, instead of considering the reintroduction of a more natural fire regime. For instance, the EIS notes in Chapter 1, *Purpose* 3, that fire suppression has resulted in a many fold increase in the number of western juniper east of the Cascades when compared with historic levels, and that herbicides could facilitate restoration of habitats for nesting sage grouse and other species.

Response: As identified in the EIS, herbicides would be used as part of an integrated vegetation management approach. The Proposed Action (Alternative 4) would constrain western juniper or sagebrush treatments to objectives specified in Conservation Strategies. The use of prescribed burning would be used to meet multiple hazardous fuels reduction objectives across Oregon as part of the State fuels program. A full examination of the use of fire for ecosystem restoration or fuels reduction is outside the scope of this EIS. Herbicides would be one tool for habitat manipulation and invasive grass fuels treatments; implementation decisions would be the result of site-specific analysis.

228. Comment: A recent study by Dodson and Fielder (2006) and a recent master's thesis by Dodson (2004) indicate a synergistic relationship between fuels treatment, fire, and increased invasion of exotic and undesirable species, with the greatest increases occurring with thinning followed by prescribed burning, versus no treatment at all. Current fuels treatments in sagebrush habitats often encourage cheatgrass invasion.

Response: The BLM recognizes that hazardous fuels treatments, like any other site-disturbing management activity, can contribute to the introduction and spread of noxious weeds and other invasive plants. However, as noted in the *Fire and Fuels* section, wildfire suppression activities can also introduce or spread invasive plants, so thinning and burning are fuels reduction tools that may be used. Decisions about if and how to conduct these and other activities include consideration of their potential to spread noxious weeds. Their reconsideration is outside the scope of this analysis; these are ongoing programs already covered in part by Integrated Vegetation

Management policies designed to prevent and control weed spread. For example, a management activity with a moderate or high risk of spreading noxious weeds is required to have a noxious weed risk assessment that identifies actions to be taken to reduce or prevent the spread of noxious weeds.

229. Comment: The EIS does not clearly identify vegetation to be targeted for hazardous fuels treatment using herbicides and appears only to identify old growth and mature native sagebrush steppe vegetation.

Response: In the Sagebrush Steppe biome, herbicides would be used for the treatment of invasive annual grasses, such as medusahead and cheatgrass, which have altered the historic fire regime. In these areas, as described in the *Fire and Fuels* section, herbicides would be used to help achieve fuels reduction goals in a number of different ways:

- As a standalone treatment or in combination with other vegetation treatments to change the vegetation structure and composition to reduce fire behavior characteristics (rate of spread, fire line intensities) and facilitate suppression actions;
- As a follow up or maintenance treatment to mechanical or prescribed fire treatments or post wildfire rehabilitation treatments, to either further reduce the fuels hazard or to help control new or existing invasions. (The EIS has been edited to help clarify the use of herbicides in conjunction with non-herbicide hazardous fuels reduction treatments.); and,
- To create strategically placed breaks in vegetation (fuel) continuity adjacent to wildland urban interface (WUI) communities or where treatment of the entire affected area would be either impractical or too expensive.

However, these are general estimates for programmatic analysis purposes, not a commitment to conduct treatments. An evaluation of treatment need and a determination of the most appropriate tools for meeting that need are the subject of site-specific analysis. Such treatments are normally implemented based upon vegetation management priorities set in Land and Resource Management Plans or other plans and policies. An examination of the applicability of any particular tool for meeting any particular vegetation management objective is outside the scope of this EIS.

230. Comment: The EIS is not clear how the BLM's existing fuels control program of brushing, controlled burns, thinning, and other activities would be affected by herbicide use.

Response: A noted in the *Fire and Fuels* section, only Alternative 5 would permit herbicides to be used to control *native* plants contributing to high fuel loading. An example might be a treatment to desiccate vegetation so a subsequent prescribed burn can be conducted more safely and under less intense burning conditions. The analysis states that such treatments would be rare in Oregon; fuels issues in the State do not normally lend themselves to those types of treatment.

Alternatives 3 through 5, however, would permit the use of herbicides on noxious weeds and invasive annual grasses currently invading susceptible sagebrush habitats and increasing the risk of hot fast wildfires in some unban interface areas. Herbicides, such as imazapic, could be used alone or in combination with prescribed fire to reduce these fuels in the wildland-urban interface, or to create protection zones through important sagebrush steppe habitats. These herbicide treatments would be in the range of one to five percent of the total fuels treatments done by the BLM in Oregon annually. Herbicides would also be used to prevent reinvasion of some wildfire areas with invasive annual grasses. These uses are described in detail in the *Fire and Fuels* section in Chapter 4.

Timber

231. Comment: The Draft EIS states in Chapter 1 that it "does not propose the use of herbicides specifically for commodity production such as projects to improve timber growth…" This statement is not reflected in the rest of the rest of the EIS. For instance, the EIS describes how logging on lands adjacent to BLM would commercially benefit by the BLM using herbicides.

Response: The word "commodity" has been replaced with "specifically for livestock forage or timber production," to remove confusion about other economic effects. That said, noxious weeds adversely affect commodity and non-commodity resource values statewide. These effects are one reason weeds are listed as "noxious" by the State. The *Timber* section, therefore, displays the effects of the various alternatives on timber production, the same as for the *Recreation* section, *Fish* section, and so forth. Examination of the effects of the alternatives on resource values, such as timber production, is a requirement of NEPA, and does not infer herbicides would be proposed specifically for timber production. This point is discussed in more detail in the first two paragraphs of the *Timber* section.

Paleontological and Cultural Resources

232. Comment: Herbicides should not be applied in areas of American Indian traditional use and subsistence activities.

Response: The Standard Operating Procedures implemented for weed treatment include provisions for reducing risks to traditional use areas from herbicide treatments. Included in the Standard Operating Procedures is a provision for consulting and working with tribes to minimize impacts from herbicide treatments to areas of vegetation considered significant by the tribes. Implementation of the Standard Operating Procedures with cultural resource review, and inventory and consultation with American Indian tribes in areas likely to include cultural resources and traditional cultural values prior to vegetation treatments, would reduce potential adverse effects to native plants species and wildlife utilized in traditional American Indian activities. Treatments potentially affecting the public would also be signed per Standard Operating Procedures and label requirements.

Traditional use and subsistence activities are adversely affected by the spread of invasive plants and displacement of plants and animals of traditional importance. Because only about 1/3 of the noxious weeds on BLM lands can be effectively controlled with non-herbicide methods, the ability to respond to specific weed problems in traditional tribal use areas would be reduced. Without the ability to use herbicides, weeds and other invasive vegetation would continue to displace native species desirable to traditional American Indian activities and would adversely affect the quality of forage and cover for wildlife utilized by tribes.

Visual Resources

233. Comment: It seems implausible that people would prefer the appearance of vegetation that has been treated with herbicides to the appearance of vegetation that has been mowed as stated in the *Summary of the Major Effects of Each Alternative* section in the *Summary*.

Response: The language in the *Summary of the Major Effects of Each Alternative* in the *Summary* (and similar language in Chapter 2) did not accurately reflect the discussion of visual effects found in Chapter 4, and the verbiage related to the visual effects of mowing and herbicide use has been removed. The *Visual Resources* section notes that mowing has the short-term visual effect of cut and browned vegetation and that the visual effect of using herbicides to treat vegetation varies depending on which herbicide is applied and how it is applied. When herbicides are applied directly to the invasive plant using a backpack sprayer or wicking method, the short-term visual impact is browned and dead vegetation mixed with green native vegetation. When non-selective herbicides are applied aerially or with a boom sprayer, the resulting short-term visual effect is one of an open, browned landscape. If herbicides are used in areas in place of mowing (such as along roadsides) the short-term visual effect would be a swath of browned and dead vegetation.

Wilderness and Other Special Areas

234. Comment: The EIS proposes to increase the use of herbicides in such areas as Wilderness Areas, National Monuments, and Wild and Scenic Rivers and does not adequately estimate the number of people likely to be exposed to the herbicides or the effects of this exposure on the visitors to these areas.

Response: With a greater variety of herbicides available to treat noxious weeds and other invasive plants under Alternatives 3, 4 and 5, the EIS assumes there would be increased use of herbicides across all BLM administered lands including Wilderness Areas, National Monuments, and Wild and Scenic Rivers. With increased use of herbicides, there is an increased likelihood of human exposure. This programmatic EIS does not identify where specific herbicide treatments would take place, therefore, it does not attempt to quantify the likelihood of visitor exposure to herbicides. The Risk Assessments, summarized on the "Risk Categories" tables at the end of Chapter 3, include recreational users such as hiker/hunters, anglers, berry pickers, swimmers, and subsistence users of plant materials. The categories for most of the herbicides likely to be used within special areas indicate no risk for these activities. Whether or not an herbicide might pose a risk to one of these user groups would be a site-specific consideration in the selection of which herbicide to use and the timing of the application. Prior to any specific herbicide treatment, site-specific analyses would be conducted that would include public notification and opportunity for public comment and involvement.

In order to help protect public land visitors from herbicide exposure, access to treatment sites is restricted for a short time. During these closures, the BLM posts signs noting the exclusion area and the duration of the exclusion. Wording explaining this closure procedure has been added to the *Wilderness and Other Special Areas* section.

235. Comment: The Western Rivers Conservancy is in the process of purchasing Wildwood Park and associated properties along the Wild and Scenic Salmon River near Welches, Oregon. The purpose is to resell to the BLM to protect the Salmon River Watershed. Use of herbicides in this area would appear to be in conflict with the watershed protection efforts being done in the Salmon River watershed, and would likely not be supported by the local community.

Response: Herbicide treatment within Wild and Scenic River corridors are only permitted if they are conducted in an effort to protect and enhance the outstandingly remarkable values identified in the legislation establishing the river designation. If those values involve public access developments, herbicides might be used for their maintenance. The analysis in the *Water Resources* and *Fish* sections of the EIS indicates proposed herbicide uses are not likely to compromise water and watershed protection objectives including those in Wild and Scenic Rivers. Watershed values would be best protected by controlling invasive plants. Permitting invasive plants to displace native ecosystems within donated Wild and Scenic River corridors would be poor land stewardship. An example of herbicide treatments getting wide public support is the ongoing interagency effort to control Japanese knotweed along the Clackamas and Sandy Rivers (CRBC 2008). Prior to any specific herbicide treatment, site-specific analyses would be conducted that would include public notification and opportunity for public comment and involvement.

Recreation/Interpretive Sites

236. Comment: BLM should require, not simply encourage, weed-free feed for grazing and recreational pack animals on BLM administered lands, and should provide strong inspection and enforcement measures to ensure the requirement is followed.

Response: BLM's Integrated Vegetation Management policy emphasizes the prevention of noxious weeds and other invasive plants and identifies a variety of prevention measures including requiring weed-free seed and mulch in restoration and other re-vegetation projects, and promoting the use of weed-free hay for grazing and recreational pack animals. The BLM in Oregon encourages the use of weed-free hay for grazing and recreational pack animals, because in general, enforcement of stronger measures is not feasible in Oregon at this time. BLM National policy on weed free forage encourages BLM state offices to work cooperatively with state and local agencies to implement a weed free forage plan. The Oregon Department of Agriculture has developed a pilot weed-free forage certification program. This is a voluntary pilot program with the intent of certifying weed forage as a part of overall weed prevention effort. In 2003, Wallowa County adopted the North American Weed Management Association certification standards and now has certified hay and straw products available. The BLM in Oregon will continue to work towards weed free forage as it becomes available, and will implement BLM National policy as it evolves. However, consideration of this policy is ongoing and outside the scope of this EIS. Its disposition would not affect the analysis of the alternatives because it would not materially affect the *Need*, and because a reexamination of all of the BLM policies that might change the noxious weed spread rate is outside the scope of this analysis. There is currently no statewide certification program in Oregon for weed-free hay. If weed-free hay is not available, enforcement is unlikely.

237. Comment: Posting of signs for at least two weeks following an herbicide application in a recreation area may not be sufficient due to herbicide persistence (e.g. picloram).

Response: The *Recreation/Interpretive Sites* section erroneously stated that signs would be posted for at least two weeks following an herbicide treatment in a recreation area. The language in this section has been edited to accurately reflect the procedure BLM follows when applying herbicides in recreation areas or other public access areas. The label requirement of the herbicide being used determines how long an area would be closed to visitor use following an herbicide treatment. Access to a site treated with an herbicide is usually restricted for a few hours or days, depending on the requirements on the herbicide label. During these closures, the BLM posts signs noting the exclusion area and the duration of the exclusion. An herbicide with no demonstrated risk to human health may have a very short exclusion time.

Administrative Sites, Roads, and Rights-of-Way

238. Comment: The EIS has correctly identified rights-of-way as a primary vector for the spread of noxious weeds. Control of roadside vegetation would not only greatly reduce the spread of these plants, it would provide the additional benefit of improving sight distance and subsequently the safety of its road systems.

Response: The *Administrative Sites, Roads, and Rights-of-Way* section includes sight distance as one of the safety and maintenance objectives for vegetation treatments along roadsides. This objective could be met in part by using herbicides under Alternative 4 (the Proposed Action) and Alternative 5. Such use could be particularly advantageous in checkerboard lands where private timber companies share road ownership and maintenance responsibilities. Under Alternatives 4 and 5, herbicide availability could allow shared owners to accomplish safety-related maintenance of entire haul routes in a single treatment. The EIS has been edited to note this benefit.

239. Comment: Invasive weed concerns should be a priority during transportation planning on BLM lands. All motorized travel should be limited to designated routes, cross-country motorized use should be prohibited, and all unnecessary roads should be closed.

Response: Invasive weeds are one element considered during transportation planning on BLM lands, both at the plan and project scale. Transportation planning is beyond the scope of this EIS.

240. Comment: Public funds should not be used to pay for maintenance and protection of private and corporate infrastructure such as under power line rights-of-way.

Response: The EIS notes that in general, vegetation management around developments is the responsibility of the development owner, using methods approved by the BLM. Except for noxious weed control using one of the four currently approved herbicides, herbicide use is not currently approved for vegetation management in or around these sites. Information has been added to this section pointing out that invasive plant control on developed sites is also (usually) a permit-required responsibility of the development owner. Any of the action alternatives would provide more tools so development owners could better meet this permit requirement.

241. Comment: The National Park Service routinely uses herbicides to control noxious and non-native weeds on public lands, but is careful to not begin spraying in areas that do not truly need spraying. Aren't there other cost effective ways to limit weed growth on roadways and in campgrounds? Rather than expose the public, wildlife, and native flora, aren't there less intrusive ways to control unwanted weeds in these public area? Mowing, flame treatments, public education, public weed pulls, and even spot spraying of the worst weeds to control spread are sometime more effective, less expensive, and less harmful/toxic to the watershed and to the humans and wildlife that utilize these areas.

Response: BLM practices are similar to those described in the comment. Like the National Park Service, BLM is guided by Department of the Interior policy. That policy calls for accomplishment of pest management through cost-effective means that pose the least risk to humans, natural and cultural resources, and the environment, and requires bureaus to establish site management objectives and then choose the lowest risk, most effective approach that is feasible for each pest management project (Chapter 3, USDI 2007e). The BLM also has no wish to unnecessarily close recreation sites, or to post herbicide warning signs that discourage public use. These considerations help guide local decision-makers to use non-herbicide methods in such sites wherever feasible. Popular recreation sites are also the locations most likely to enlist volunteers to help remove infestations. Finally, because high public use areas are highly susceptible to invasive weeds, BLM personnel attempt to watch these areas so they can treat new infestations when they are small and might more easily be removed with non-herbicide methods. The vast majority of invasive weed (and native plant) control treatments within developed recreation sites are done with non-herbicide methods.

In some instances, herbicides are the most appropriate treatment method in developed sites. Many invasive plants cannot be reasonably controlled with non-herbicide methods; BLM dispersed sites are potentially more likely to become infested with invasive plants because of a broader array of seed-carrying recreational equipment use the area, including horses and OHVs.

Along roadways, most herbicide treatments of invasive plants are spot treatments posing little risk to the traveling public. A high percentage of the invasive plant treatments are along roadways because roads serve as weed spread corridors. The Reference Analysis shows that relying exclusively on non-herbicide methods in some areas would cost nearly three times more than under the Proposed Action (Alternative 4) when calculated on an effectively treated acre basis (*Implementation Costs* section in Chapter 4). Assuming fixed budgets, this would translate to two-thirds fewer weeds controlled.

242. Comment: Lane County is also concerned about the pollution from herbicides and does not conduct roadside spraying. In addition, in April 2009, the Board of Commissioners adopted a resolution inviting the Oregon Department of Transportation (ODOT) to form a partnership with the County to ensure implementation of an effective plan to prevent roadside spraying on State roads in the County. The resolution states the board "finds that persistent long-term herbicide exposure is now recognized as hazardous." The Board relied on a) a U.S. Geological Survey study on the prevalence in water quality samples of herbicides commonly used on roads and rights-of-way, b) the likelihood of the herbicides sprayed entering the water during and after rains, and c) scientific evidence that even small amounts of herbicides can damage aquatic life. The BLM now proposes to do something counter to the Board's resolution that "persistent long-term herbicide exposure is now recognized as hazardous" and the intent of the County to reduce herbicide use.

Response: The BLM believes the Board's position is more accurately interpreted as follows: The resolution (#09-4-8-16) indicates that Lane County has adopted a Roadside Vegetation and Last Resort Policy in which the Board has offered to collaborate with ODOT and share resources to assist in pesticide use reduction. The Board resolved as a matter of pesticide-use reduction that persistent herbicide exposure is now recognized as hazardous and recommends a reconsideration of routine and "residual" herbicides sprays as a roadside maintenance practice. The Board also resolved, in December of 2009, to support ODOTs Last Resort Herbicide Spray Pilot Project for Highway 36.

The EIS does not dispute that "persistent long-term herbicide exposure" would likely be hazardous. The uses proposed in the EIS would not result in persistent nor long-term herbicide exposures. Herbicides proposed for roadside use west of the Cascades would almost all be applied to foliage, where they would be absorbed and metabolized. Soil-applied herbicides used east of the Cascades are not particularly subject to leaching and washing to streams because of the dry conditions and lower steam densities. The EIS agrees that "residual" (persistent) herbicides used in roadside drainage ditches can find their way into streams where they can harm fish (see *Water Resources* and *Fish* sections). This is why the projected acres of bromacil, tebuthiuron, and diuron are so low west of the Cascades (100 acres per year under the Proposed Action, Alternative 4), and why there is a proposed mitigation measure requiring project planners to consider that roadside ditches connect directly to streams and conventional buffers would not apply. BLM policy regarding the selection of treatment methods prevents herbicide applications from being considered "routine." Although the BLM does not refer to its decision process as a last resort policy, it requires a hard look. The EIS does not dispute the cited research. For example, it is true that small amounts of certain herbicides can damage aquatic life, and that herbicides are found in Oregon's streams. BLM's Standard Operating Procedures and PEIS Mitigation Measures, application measures, and site-specific planning are designed to minimize or eliminate negative effects from herbicide treatments.

243. Comment: The *Administrative Sites, Roads, and Rights-of-Way* section might benefit from examples that are more specific. For instance, Idaho Power uses a diuron/tebuthiuron herbicide to treat vegetation around wooden power poles on BLM lands in Idaho, to reduce the risk of wildfire burning down the poles. Such treatments could be undertaken on BLM lands east of the Cascades under Alternative 4 (the Proposed Action) and Alternative 5.

Response: This example has been added to the *Administrative Sites, Roads, and Rights-of-Way* section.

244. Comment: Saving money, noted in the *Implementation Costs* section for roadside spraying, is not an acceptable reason to further expose the public to chemicals while they are enjoying and recreating on public lands.

Response: As indicated in the *Social and Economic Values* section, there is a part of the population that does not consider cost savings to be a legitimate reason for potentially increasing public herbicide exposure. That position is described in the EIS and would be considered by the decision-maker in formulating the Record of Decision.

That said, it is equally appropriate to display implementation costs in order to inform the decision-maker of the potential for cost savings. BLM toxicologists also detail in the EIS that treatments constitute a negligible effect on human health risks, even if the public is exposed, which is highly unlikely. The analysis indicates that under Alternative 4 (the Proposed Action) and Alternative 5, current road and rights-of-way maintenance budgets would see cost savings of approximately $1 million which would then be available to meet other types of maintenance and improvement needs, or be available to reduce utility customer's costs.

Social and Economic Values

245. Comment: The EIS states there is "higher public acceptance" of herbicide risks east of the Cascades. Whom did you query on this? The Oregon State Extension Service and the County Soil and Water districts, who work almost exclusively with ranchers? Were fish and wildlife biologists from the Oregon Department of Fish and Wildlife and the Forest Service included? Were the Warm Springs, Paiute, and Umatilla Tribes included? Were the environmental communities such as The Nature Conservancy consulted? Were the Native Plant Society and various birding groups east of the Cascades encouraged to comment? We can hardly fathom that people concerned with native plants and insects, recovery of aquatic habitat and fish populations, bird numbers and habitat, etc. east of the Cascades are by nature more receptive to intensive toxic herbicide use than those west of the Cascades.

Response: All of the groups named in the comment are included on the EIS mailing list, most submitted comments, and most comments were supportive of Alternative 3 or Alternative 4 (the Proposed Action). The Oregon Department of Fish and Wildlife submitted a comment letter in favor of Alternative 4 (the Proposed Action). Oregon Department of Environmental Quality "realizes that herbicides will be needed in certain situations to control invasive species." The Nature Conservancy "supports efforts by the BLM to treat noxious weeds and non-native invasive plants that negatively impact biodiversity, natural communities, rare and endangered species, plant communities and habitats, and ecosystem processes. We support BLM using an expanded list of herbicides for vegetation treatments on public lands…" Oregon State Extension and County Soil and Water districts are highly concerned with the long-term sustainability of all county resources including soil and water, as well as with the quality of life for county residents, and many wrote in support of the proposed herbicide increase during scoping and during the public comment period for the Draft EIS. This support tended to come more from east of the Cascades where, for a variety of reasons, public awareness of the scope and effects of invasive plants is higher than west of the Cascades. BLM lands make up a higher percentage of lands east of the Cascades, and the flat, open terrain means invasive weeds are more visible. Scoping meetings east of the Cascades were attended by at least five county supervisors, all of whom were supportive of increasing the number of herbicides available to the BLM for invasive plant control. Tribes received personal contacts as well as specific scoping letters; those responding said they would save comments for site-specific proposals; one noted the need to protect ethnobotany resources in the West Eugene Wetlands. The Forest Service provided internal review comments and other information for the BLM analysis. The EPA gave the Draft EIS its highest grade, "lack of objection," meaning they did not identify any potential environmental impacts requiring changes to the proposal.

The BLM and all of its resource specialists involved with preparation of the EIS are preeminently concerned with the resources and habitats mentioned in the comment. However, nearly every resource section in Chapter 4 concludes that while there is some increased risk to resources because of using herbicides, the effects of invasive plants are far worse.

More herbicide use may be proposed for east of the Cascades in part because 85 percent of the BLM lands in Oregon are east of the Cascades (Table 4-2). Although it is probably also true in a larger sense, the "higher social acceptance" comment was made only in reference to the likely public acceptability of a 4,000 to 5,000 acre per year increase in wildlife habitat improvement projects using herbicides that would occur east of the Cascades under Alternative 5 (when compared to Alternative 4, the Proposed Action), two-thirds of which would be new opportunities that would not happen with non-herbicide methods.

246. Comment: The EIS does not explain the basis for the conclusion in the *Comparison of the Effects of the Alternatives* section in Chapter 2, that on both sides of the Cascades, people believe that invasive plants are more harmful than herbicide use.

Response: While a breadth of perceptions exist on the effects of herbicide use and continued invasive plant spread, many voiced concerns for the threat to resource values from invasive species. These concerns do not overshadow concerns expressed regarding the threat to resource values from herbicide use, and thus the statement may have over generalized the degree of social consensus. The statement does not occur in the reformatted *Comparison of the Effects of the Alternatives* section in Chapter 2.

247. Comment: The *Summary* statement that states that social acceptance of the Reference Analysis is likely to be low, ignores public concerns about the use of herbicides.

Response: This phrase appeared in the *Summary* as well as in Chapter 2 in the *Summary of the Major Effects of Each Alternative*, and was followed by "Although some scoping comments expressed a desire for no herbicide use, most communities are concerned with the resource damage caused by invasive plants and are aware of the higher costs and lower practicality of non-herbicide control methods." The statement has been modified to better state the conclusions in Chapter 4.

248. Comment: The *Social and Economic Values* section states "there is a *perception* of unguarded exposure and the possibility of direct contact or ingestion …" The EIS needs to state there is a *real* threat and not just a perception.

Response: Threats are described in this section as they relate to perceptions instead of actual threats since perceptions vary between individuals, groups, or communities. Thus, while actual threats to specific resources or to human health are discussed in other sections of the EIS, the *Social and Economic Values* section uses perceptions as an indicator since individuals, groups, or communities are of interest.

249. Comment: The EIS should consider the effects on tourism from invasive plants spread. Specifically, effects on wildlife habitat could decrease opportunities for wildlife viewing in certain areas.

Response: That point was addressed in the EIS. The first paragraph of the *Environmental Consequences* subsection of the *Social and Economic Values* section explains, "Invasive plants can have a negative effect on observation-based tourism, as the wildlife and wildflowers that people come to enjoy and photograph are crowded out by invasive plants (Westbrooks 1998). Consequently, recreation dependent communities in Oregon may be more susceptible to the effects of invasive weed spread than more economically diversified communities."

250. Comment: The EIS should consider that the effects of controlling the spread of noxious weeds include a reduced need for control on lands adjacent to BLM.

Response: In the subsection *The Spread of Invasive Plants from Adjacent BLM Lands,* under *Effects by Alternative,* this benefit is discussed. Specific points include "future costs to neighboring private and public lands would decrease" (Alternative 3); "wildland fire-related costs in these communities…could be reduced…" (Alternative 3); and "benefits to adjacent landowners would particularly accrue from the roadside herbicide treatments indirectly reducing noxious weeds and other invasive plants in locations where they are most likely to be spread to their lands" (Alternative 4). A subsection discussing the possibility that herbicide use on BLM lands could result in an overall reduction of herbicide use on adjacent non-BLM lands has been added to the *Cumulative Impacts* section near the beginning of Chapter 4.

251. Comment: The *Social and Economic Values* section should acknowledge the widespread public concern over the use of herbicides in its *Cumulative Effects* subsection.

Response: Language under the *Cumulative Impacts* heading early in Chapter 4 explains that "because this is a statewide programmatic document covering the estimated level of future herbicide use in Oregon, …this entire analysis is itself a cumulative effects analysis." Thus, the *Cumulative Effects* subsection in the *Social and Economic Values* section does not summarize, but adds to, the "cumulative" effects already discussed in the rest of the section.

Environmental Justice

252. Comment: Consider including ranchers in the analysis of *Environmental Justice* and acknowledge that ranchers are poor and their income is affected by increasing commodity prices. In addition, acknowledge that weeds decrease farm income when forage resources are affected.

Response: The Environmental Justice Principles in BLM's Land Use Planning Handbook requires the BLM to "determine if its proposed actions will adversely and disproportionately impact minority populations, low-income communities, and Tribes and consider aggregate, cumulative, and synergistic effects, including results of actions taken by other parties" (USDI 2005f). Per this definition, ranchers are not a defined environmental justice population. However, the handbook encourages consideration of "all potential social and economic effects, positive and negative, on any distinct group." Consequently, the EIS describes loss incurred from the spread of invasive plants in the second paragraph of the *Environmental Consequences* section of the *Social and Economic Values* section stating:

> "Similarly, the *Livestock* section in this Chapter identifies reductions in livestock carrying capacity of thirty-five to ninety percent from weed infestations. Invasive weeds affect the livestock industry by lowering yield and quality of forage, poisoning animals, increasing the costs of managing and producing livestock, and reducing land value (DiTomaso 2000). A 1993 economic study in Grant County showed the annual economic impact to livestock grazing was $326,000 and losses would climb to over $3.96 million [2009 dollars] without increased weed management (Test 1993)."

Losses to ranch values are also included under the subsection on *Concerns Raised During Oregon Scoping* in the *Social and Economic Values* section. In order to provide additional detail suggested by this comment, the text of the EIS has been augmented with the example given in a public comment letter. The text under the section on *Concerns Raised During Oregon Scoping* now includes the sentence:

"Incomes in ranching dependent communities are also affected by weed spread since weeds decrease the nutritional value and availability of forage in pastures. These effects are compounded by increasing commodity prices which further decrease profitability."

253. Comment: Please clarify the sentence "While the percentage of the population living below poverty was slightly greater east of the Cascades, its percentage of total population decreased by a greater degree than west of the Cascades."

Response: The sentence has been changed to "In 1999 the percentage of the population living below poverty was slightly greater east of the Cascades (13.1 percent) than west of the Cascades (11.4 percent). In addition, the percentage of the total population east of the Cascades decreased by a greater degree than west of the Cascades over the period from 1989 and 1999 - decreasing by 1.6 and 0.7 percent, respectively."

254. Comment: The EIS should consider effects to wild mushrooms as a commercial resource and not only in an environmental justice context.

Response: The EIS describes the concern for loss from herbicide use in the *Herbicide as a Threat to Resource Values and Human Health* subsection of the *Social and Economic Values* section, stating: "Many comments proposed that the potential damage to resource values from treatments does not justify the use of herbicides. Many suggested herbicides threaten non-target native, rare, Federally Listed and other Special Status species."

However, concern on potential effects to the commercial value of other forest products was not specifically mentioned in the Draft EIS. Consequently, the text under the *Social and Economic Values* section now goes on to include: "Some noted effects to other forest products collected for their subsistence, cultural or commercial value such as chanterelle or matsutake mushrooms."

Specificity on commercial value of these specific resources is not added to the analysis of the alternatives, as they are included in the *Effects by Alternative* section on *Herbicide as a Threat to Resource Values and Human Health* section in Chapter 3. The topic is also addressed under *Native and Other Non-Invasive Vegetation* section in Chapter 4, and will be considered during site-specific analysis.

255. Comment: The EIS fails to consider the effects of general herbicide use on those who collect native species and "other forest products" such as mushrooms, manzanita, medicinal plants, and greenery for wreaths.

Response: There is a potential for herbicides to contact mushrooms and other forest products. Some native special forest products species could be targeted under Alternative 4 (the Proposed Action) and Alternative 5. The potential for exposure to people who collect or use these products is discussed in the *Environmental Justice* and *Human Health and Safety* sections.

Under the *Environmental Justice* section of Alternative 4 (the Proposed Action), the EIS notes "under Alternative 4, [native species within a few feet of the road edge] would be deliberately targeted, increasing the potential to affect plants and other products (which include other forest products such as mushrooms, manzanita, and greenery for wreaths) utilized by under-represented groups." Corresponding language under Alternative 5 has also been similarly edited.

The *Environmental Justice* section under all the alternatives also notes that site-specific analysis prior to treatments, and Standard Operating Procedures that reduce drift, would help minimize exposure of non-target food and water sources. The Risk Assessments evaluated people who gather and use large amounts of range and forest products and generally found no risk (see "Risk Categories" tables at the end of Chapter 3). Standard Operating Procedures require consultation with tribes to locate any areas of vegetation that are significant to the tribes and that might be affected by herbicide treatments. In addition, when herbicides are used, the application site would be signed to inform the public what herbicides had been used in the area and what precautions to take. To the degree any risk remains, the document notes under all action alternatives that the potential for disproportionate or adverse impacts to minority or low-income groups would still exist.

Regarding the collection of forest products that are classified as noxious weeds, Oregon law does not permit the sale, purchase, propagation, or transport of noxious weeds. Therefore, the BLM does not issue permits for collection of noxious weeds even when they have medicinal uses such as milk thistle and St. John's wort.

256. Comment: The *Environmental Justice* section indicates minorities, American Indians, and low-income people will be disproportionately affected by herbicides. Why are these people sacrificed? Why is there no alternative or provision to better protect these groups?

Response: The comment assumes "risk" equals "effects," which is not the case. The entire analysis is about variations in risk, while in reality Standard Operating Procedures and PEIS Mitigation Measures, and the nature of the proposed treatments, make risk negligible. No actual human health incidents are predicted, and adverse wildlife and other effects would be extremely limited, short-term, and localized.

American Indian tribes were specifically contacted during scoping for this EIS. Those responding indicated support of the Proposed Action (Alternative 4) because improved invasive plant control would help protect traditional uses valuable to the tribes. Tribes are also directly involved with site-specific planning through government-to-government consultation in order to minimize adverse effects and identify safety concerns with regard to traditional gathering areas. Hispanics were identified as potentially adversely affected because language differences could lead to poorer understanding of label and other instructions. State-licensing requirements, however, are aimed at reducing this particular effect. Lower income people and minorities are simply more likely to be gathering food including mushrooms; thus, the analysis identifies them as <u>potentially</u> more exposed. The Risk Assessments, however, examined this potential exposure and found risks to be very low (see *Human Health and Safety* section), and identification of these groups as potentially more exposed does not infer that their exposure would change that. Executive Order 12898 simply requires agencies to identify and address disproportionately high and adverse human health or environmental effects of its decisions on minority and low income populations. This section of the EIS examines that potential.

Implementation Costs

257. Comment: The EIS should consider the effect on employment from mechanical and herbicide treatments that includes potential effects from unemployment. In addition, it should consider updating 2005 data with most recent available information considering effects from the economic downturn.

Response: The programmatic scale of this analysis makes assumption of site-specific project planning speculative; thus, information on anticipated treatments is not available and employment impact estimation is not feasible. Site-specific analysis prior to treatment would include employment effects if public scoping reveals a community concern related to employment impacts. In regards to the need for more current information beyond 2005, the EIS used 2009 cost information and other sources more recent than 2005 for all data except population growth and density, where 2005 is the most recent available data. While additional slight changes in population density and growth over the period from 1970 to the present could have occurred - demographics are discussed in the EIS at a broad regional scale and not affected by the EIS at this scale. Thus, some change in population or demography could occur at the site-specific level, but as stated above, the programmatic nature of this document makes the assumption of site-specific effects infeasible.

258. Comment: The herbicide application cost estimates should have included the cost of monitoring surface water effects from herbicide treatments.

Response: Districts provided their experienced project-level costs, so these costs included existing monitoring.

259. Comment: The EIS should display costs and benefits, showing the true costs of invasive plants (in terms of resources and income losses). It should also show the cost/benefit of treating an infestation early, in order to more clearly support increased budget requests.

Response: Non-market components of wildland resources affected by invasive species are notoriously difficult to quantify, and information about invasive species' economic effects is unavailable specific to BLM lands. These factors make estimates at this scale of analysis speculative; effects might be more discernable at the site and weed-specific scale. BLM-specific data is simply insufficient for any such display to be meaningful. Regardless, the EIS considered much of the identified literature regarding economic losses statewide and for specific sites. Where these losses are relevant, they have been cited in the *Social and Economic Values* section, the *Noxious Weeds and Other Invasive Plants* section, or elsewhere. In addition, despite our inability to quantify non-market values, such values are discussed qualitatively in the *Social and Economic Values* section and in other sections of the EIS. In general, these serve only as examples, and the portion of such numbers that are applicable to BLM lands can only be estimated.

That said, there is little doubt that invasive plants are having a significant economic impact on resource values on BLM lands in Oregon. Effects, and resultant weed control emphasis, *is* a part of district land management plans. The idea that cost information would justify early treatment seems to be well supported by laws and policy at all levels. As the available number of herbicides increase, the cost information presented in Chapter 4 demonstrates the effectiveness of increased treatment on the rate of spread and resulting cost decreases. In effect, this shows cost savings of early treatment.

260. Comment: The EIS should consider that loss to non-commodity resources and non-market values (such as the cost to human health, native plants, water quality, fish, soils, Federally Listed species, grazing mammals, scavengers, neotropical songbirds, amphibian, etc) are not compensated by monetary savings to Federal Agencies from using herbicides.

Response: In the *Environmental Consequences* portion of the *Social and Economic Values* section the document notes that *Concerns Raised During Public Scoping* included "understanding the value of non-commodity resources and non-market values was important, since without estimates, these resources may be undervalued and decisions regarding their use may not accurately reflect their true value to society." The document then notes that while there have been many studies on the impacts of invasive species in localized settings, few take into account non-market impacts of invasive species, which "might be due to the difficulty in preparing estimates and the controversy over available methods" [Cusack and Harte 2008]. In the absence of quantitative information for these goods, they are discussed qualitatively where indicated below."

Under the subsection Herbicide *as a Threat to Resource Values and Human Health* in the section *Effects by Alternative*, the document now notes, "comments expressed concerns that herbicides would unacceptably damage non-target plants and other non-commodity resources and non-market values" to include those values of concern stated in the public comment. The same paragraph of this section then addresses effects by alternative, stating, "Alternative 2 may be more acceptable because of the fewer acres treated with herbicides, but Alternative 3 would use 35 percent fewer total pounds … and provides more herbicides to accomplish control objectives while decreasing environmental risk." In addition, any risks to these values are discussed implicitly in the specific resource sections of this EIS.

While losses to non-commodity and non-market values from herbicide use could occur as recognized above, the document also notes in the *Environmental Consequences* portion of the *Social and Economic Values* section, under *Effects Common to All Alternatives* that "treatments under the action alternatives would variously result in improvements in the condition of BLM resources and would lead to increases in commodity, non-commodity, and non-market values."

261. Comment: The EIS should consider the merits of manual removal beyond just cost. It should consider the environmental and health costs of using herbicides. Studies showing the impacts of pesticides on human health have been published by the Oregon Environmental Council (see, e.g., *The Price of Pollution: Cost Estimates of Environmentally-Related Disease in Oregon,* OEC 2008).

Response: Treatment effects from manual and other non-herbicide methods are described in most of the resource sections in Chapter 4.

The *Social and Economic Values* section acknowledges concerns related to human health in the subsection titled *Herbicide as a Threat to Resource Values and Human Health* and examines human health concerns by alternative. While the Oregon Environmental Council study provides an estimate of the cost associated with environmentally attributable disease and disability in Oregon it is not specific to pesticides and does not provide cost estimates specific to pesticide related illness. Hence, use of this information would thus overstate the cost of pesticide related illness in Oregon. In addition, the paper states "the purpose of this study is to estimate how much money is spent in Oregon annually to pay for environmentally attributable diseases, which are largely preventable" and is thus limited to just cost estimates represented by monetary transactions.

The EIS acknowledges that the cost of pesticide related disease is important and does not limit the discussion to just quantifiable costs of pesticide related illness and disease treatment. In the *Environmental Consequences* subsection of the *Social and Economic Values* section, the document notes that *Concerns Raised during Public Scoping* included "concerns about adverse effects on human health. These comments noted the increased human health threat to users of BLM lands, adjacent landowners, herbicide applicators, and BLM personnel who work in the field." Rather than a quantitative assessment using the incurred cost of disease, the EIS qualitatively recognizes the risks to human health may be greater under some alternatives than others based on levels of treatment.

In this manner, the analysis of cost effectiveness is not a cost-benefit analysis and thus does not claim to cover pesticide related costs associated with illness or resource damage. These costs are discussed qualitatively in the *Social and Economic Values* section (where noted above). This qualitative assessment of non-market transactions is valuable and appropriate given limitations discussed in the EIS, "Understanding the value of non-commodity resources and non-market values was important, since without estimates, these resources may be undervalued and decisions regarding their use may not accurately reflect their true value to society." The EIS then notes the difficulty in preparing estimates of non-market values due to controversy over available methods (Cusack and Harte 2008).

Human Health and Safety

262. Comment: The EIS needs to explain that pesticides cause birth defects and miscarriages.

Response: The herbicides proposed for use in the EIS, used in the manner described, would not cause birth defects of miscarriages. This conclusion is based on the Human Health Risk Assessments and the body of scientific evidence that are the basis for the EIS analysis.

263. Comment: BLM did not analyze effects to recreational users and the young and elderly.

Response: The Risk Assessments, summarized in the "Risk Categories" tables at the end of Chapter 3, include recreational users such as hiker/hunters, angler, berry pickers, swimmers, and subsistence users of plant materials. Both children and adults were also evaluated. In addition, the reference doses used for the acceptable dose contain uncertainty factors for extrapolating to humans including susceptible sub-populations like subsistence users.

264. Comment: The EIS does not discuss that violations of the Rehabilitation Act of 1973 would occur when the BLM disparately harms disabled people by forcing people to endure non-consensual herbicide exposures when they are on BLM lands, or near enough to them to receive drift or vapors, runoff into surface waters, or ground water contamination, or contact via other means of transport. If people suffer from disabilities that render them unable to detoxify the chemicals that BLM proposes to use, they will be disparately harmed by the BLM's massive spray program.

Response: BLM herbicide treatments would not be a violation of the Rehabilitation Act. Under Section 504 of the Rehabilitation Act of 1973, as amended (29 USC 794), no person can be denied participation in a Federal program that is available to all other people solely because of his or her disability. The purpose of this is specifically to allow all people access to services and benefits of a program; it does not protect the public from programs (such as the Integrated Vegetation Management program) potentially denying people access to something else (public lands). In addition, agencies are not required to take any action to facilitate such participation if such action would result in a fundamental alteration in the nature of a program or activity (7 C.F.R. 15(e) 103) (for example, Wilderness does not have to be wheelchair accessible). It should also be noted that no court has found chemical sensitivities to be a disability.

However, herbicide use under the Proposed Action (Alternative 4) would be scattered and infrequent, and not comparable to industrial uses on farms or timberlands. Standard Operating Procedures and PEIS Mitigation Measures require signing and/or other notification when herbicides are applied, and require buffer distances around residences to limit risks to people. In addition, the calculation of human health risk categories used in the EIS included uncertainty factors for extrapolating to humans including susceptible sub-populations.

265. Comment: Private homeowners suffer from negative health conditions because of the BLM and private timber companies' herbicide use.

Response: The Pesticide Analytical Response Center (PARC), a division of the Oregon Department of Agriculture, prepares an annual report to the State Legislature, detailing all suspected or confirmed cases of pesticide poisoning. Physicians are required by State law to report suspected or confirmed pesticide poisoning, and all cases are followed up on. PARC investigated 89 reports in their 2006-2007 report, 84 reports in their 2005-2006 reports, and 213 reports in their 2001 reports (PARC did not receive funding to produce annual reports between 2002-2004, nor have they produced their 2008 or 2009 reports yet). Out of these 386 reports, 28 were herbicide specific. The majority of the reports were occupational incidents, and employers were cited by OSHA for lack of training and lack of safety measures. There were a few reports of drift, where herbicide application (on agricultural lands) blew onto nearby lands and killed non-target plants. There were some reports from homeowners who misapplied herbicides, and some reports of accidental consumption. However, there was only one report of homeowners being affected by long-term herbicide exposure because they live near forested land where herbicides were being applied.

That report occurred in 2001; four residents in Polk County reported human illness and ill horses (cancer and blindness) after long-term exposure to clopyralid, sulfometuron methyl, and 2,4-D used on agricultural and forestry lands. PARC found insufficient information to pursue the case. It should be noted that the lands in question were not BLM lands. The BLM is not proposing to use herbicides for commodity production, and hence application is target specific and not likely to drift to non-target species (including humans).

People who suspect that they have been poisoned by any pesticide should report the incident to their doctor (and/or the Pesticide Analytical Response Center) as soon as possible.

266. Comment: All of the potential public exposures are non-consensual. Unlawful testing of herbicides on humans is in violation of the labels and of the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) Section 12 (unlawful testing on humans).

Response: The herbicides addressed in this EIS have been tested and registered for the proposed uses. While analysis of any application contributes information to future adaptive management decisions, the proposed applications are not tests. The FIFRA Section 12 refers to testing of the pesticide for registration, not to application under labeled uses.

267. Comment: The proposed roadside spraying forces the public to endure non-consensual exposures and violates their right to safety at home and during travel.

Response: The proposed herbicides are registered for roadside use, and Risk Assessments indicate those uses are highly unlikely to affect road users. Standard Operating Procedures and PEIS Mitigation Measures further limit exposures.

The BLM is aware of no health issues to the public or workers originating from BLM herbicide applications in Oregon during the past 25 years. Recognizing that current BLM herbicide use is far less than one percent of such use in the State, the BLM chose to examine a larger sample and reviewed the annual Oregon Department of Agriculture Pesticide Analytical Response Center's pesticide incident reports for three different years. The Oregon Department of Agriculture is required to investigate all reported injuries to people or property, as well as reported violations of pesticide application rules. Further, doctors are required to report to the Oregon Department of Agriculture every incident where a patient alleges pesticide poisoning, or the doctor suspects it. Therefore, the Oregon Department of Agriculture reports should represent a good summary of verified herbicide injuries. The Oregon wide reports generally contain two to four herbicide-related illnesses statewide per year (no deaths were found) (PARC 2001, 2006, 2007). These included illnesses from home use, from untrained operators without required safety equipment, and from applications during wind conditions well beyond those permitted by BLM Standard Operating Procedures. Although there were not enough injuries to indicate a statistical trend, it appeared injuries are most likely to occur to incidental operators. Few of the injuries were to trained agricultural or forestry workers or to landowners adjacent to these types of uses. The intent of this examination was to determine if herbicides were inherently risky and if the BLM Standard Operating Procedures were barely keeping us from harm, or if these are reasonable industrial and home-use tools that might be compared to using ladders or radial arm saws, and good work practices would reasonably eliminate most risk. The latter seems most true.

268. Comment: Native plants along roads and other areas can be treated under Alternative 4 (the Proposed Action) and Alternative 5. Herbicides could be applied to forest products such as mushrooms, manzanita, and greenery for wreaths, and species like milk thistle and pennyroyal that are used as medicinal herbs. How does the analysis address effects to those who gather and use these forest products?

Response: The Risk Assessments evaluated human subsistence use (Native American) of those who gather and use large amounts of range and forest products exposed to direct sprays or drift, and generally found no risk (see "Risk Categories" tables at the end of Chapter 3). When an herbicide is used, the potential for exposure would be reduced by posting the spray site to inform the public of herbicide use.

269. Comment: The *Human Health and Safety* section states that the EPA has not developed toxicity categories for sulfometuron methyl. However, they are provided in the Reregistration Eligibility Decision in 2008 (all endpoints are either IV or III)

Response: Toxicity categories III and IV are not endpoints used in Risk Assessment per se. They are simply label categories of the level of caution or danger associated with acute effects associated with handling the herbicide. The Risk Assessments use actual acute and chronic toxicity data for dermal and oral exposure. Sulfometuron methyl does not have any oral toxicity data, but the dermal data were used.

270. Comment: A recent article in Scientific American had an article on Roundup titled: *Weed-Whacking Herbicide Proves Deadly to Human Cells*. The summary says:

> Used in yards, farms and parks throughout world, Roundup has long been a top-selling weed killer. But now researchers have found that one of Roundup's inert ingredients can kill human cells, particularly embryonic, placental and umbilical cord cells... Glyphosate, Roundup's active ingredient, is the most widely used herbicide in the United States. About 100 million pounds are applied to U.S. farms and lawns every year, according to the EPA. Until now, most health studies have focused on the safety of glyphosate, rather than the mixture of ingredients found in Roundup. However, in the new study, scientists found that Roundup's inert ingredients amplified the toxic effect on human cells - even at concentrations much more diluted than those used on farms and lawns. One specific inert ingredient, polyethoxylated tallowamine, or POEA, was more deadly to human embryonic, placental and umbilical cord cells than the herbicide itself -- a finding the researchers call "astonishing." "This clearly confirms that the [inert ingredients] in Roundup formulations are not inert," wrote the study authors from France's University of Caen. "Moreover, the proprietary mixtures available on the market could cause cell damage and even death [at the] residual levels" found on Roundup-treated crops, as soybeans, alfalfa and corn, or lawns and gardens. The research team suspects that Roundup might cause pregnancy problems by interfering with hormone production, possibly leading to abnormal fetal development, low birth weights, or miscarriages.

Response: POEA was specifically evaluated for the PEIS (Appendix D) and found to be toxic for aquatic life, but non-toxic to humans. The Benachour and Seralini (2008) study referenced in Scientific American was published in the Journal of Chemical Research in Toxicology, and shows potential endocrine disruption, DNA damage, and toxicity of glyphosate with and without POEA in human cell cultures. This is a new finding (since the PEIS) based on laboratory tests with cells, and needs to be confirmed by other studies and possible dose implications considered. The Final EIS has been changed to report these findings.

271. Comment: The BLM should not be using 2,4-D because of health risks including the presence of deadly dioxins in about 60 percent of 2,4-D formulations.

Response: The EPA's 2005 Reregistration Eligibility Decision for 2,4-D has concluded 2,4-D is not associated with lymphoma or any cancer, that the dioxins present are of no toxicological concern, and reports that the dioxin/furan contaminant concentration was always low in 2,4-D in the 1980s and the industry has since further reduced these contaminants. Using 1987 data, the EPA found cancer and non-cancer effects from these contaminants to be of no toxicological concern. Additional studies requested by the EPA based on the 2005 Reregistration Eligibility Decision document, are nearing completion (EPA 2005a).

272. Comment: 2,4-D is persistent and has high, not moderate, risks to public and applicators.

Response: The EIS evaluation of the risk is based on the 2006 Forest Service Risk Assessment, which the PEIS analysis did not use. The new Risk Assessment actually reduced risks shown in the EIS when compared to the PEIS. (In addition, errors on Draft EIS Risk Category Tables for 2,4-D have been corrected.) Risks for typical or central exposures average from none to low with moderate risks for only 2 of 21 categories. Risks for maximum exposures average low to moderate with 5 moderate risk categories for 21 categories. According to the EPA's

2005 Reregistration Eligibility Decision document, the degradation of 2,4-D was rapid (half-life= 6.2 days) in aerobic mineral soils. The half-life of 2,4-D in aerobic aquatic environments was 15 days (EPA 2005a). These findings demonstrate that 2,4-D is not persistent.

273. Comment: California is listing 2,4-D as a developmental toxicant.

Response: California listed 2,4-D as a developmental toxicant under Proposition 65 several years ago, based on indicators described in the EPA's 2005 2,4-D Reregistration Eligibility Decision document. The Risk Assessment prepared by the EPA as part of that process, and the Forest Service Risk Assessment, both indicate the cited information is inconclusive. The EPA has requested registrants to provide additional information about these apparent effects. The indicators, and the uncertainty associated with them, are discussed under 2,4-D in the *Human Health and Safety* section. Listing by California's Office of Environmental Health Hazard Assessment does not represent a toxicity interpretation by an authoritative source, only that they believed the evidence met Proposition 65's criteria for listing.

274. Comment: The EIS should consider various draft EPA documents on dioxin and restrict 2,4-D containing the dioxins 2,4,7,8 TCDD and 1,2,4,7,8,PCDD.

Response: It is not clear what draft documents are referred to nor would it be scientifically defensible to take action based on draft EPA documents. The EPA's 2005 Reregistration Eligibility Decision for 2,4-D concluded 2,4-D is not associated with lymphoma or any cancer, and reports that the dioxin/furan contaminant concentration was always low in 2,4-D in the 1980s and the industry has since further reduced these contaminants. Using 1987 data, the EPA found cancer and non-cancer effects from these contaminants to be of no toxicological concern (EPA 2005a). The EPA has not restricted its use nor required any identification of dioxin constituents. The EPA continues to require testing to ensure dioxin contamination continues to decline.

275. Comment: The statement in the *Human Health and Safety* section that eye and skin irritation are the only overt effects of mishandling chlorsulfuron should be deleted. Chlorsulfuron is in toxicity category IV (labeled with "Caution") for skin and eye effects (only slight effects were seen in the studies).

Response: The text properly states that eye and skin irritation are the only overt effects of mishandling of chlorsulfuron because the Risk Assessment did not find any other risks.

276. Comment: Clopyralid can cause severe eye damage, including permanent loss of vision if splashed into the eyes by, for example, a worker accident.

Response: The potential for clopyralid to cause eye irritation and damage is described in the *Human Health and Safety* section of the EIS, under *Human Health Risks Associated with Herbicides Evaluated in the 2005 Forest Service EIS.* That section notes "irritation and damage to the skin and eyes can result from direct exposure to relatively high levels of clopyralid…..as a consequence of mishandling clopyralid (SERA 2004b)." "Severe" effects are not quantified, but study results included in the Risk Assessment show slight to marked conjunctival[8] redness, diffuse to marked corneal opacity, and slight to marked chemosis[9], sometimes lasting longer than 21 days in rabbits treated with high doses. The Risk Assessment does not suggest permanent loss of vision.

8 Conjunctiva: A delicate mucous membrane that covers the internal part of the eyelid and is attached to the cornea.

9 Chemosis: Swelling of eye whites; an inflammatory collection of fluid under the membrane covering the white of the eye so that it swells. It indicates conjunctivitis, often of allergic origin.

277. Comment: Glyphosate has been demonstrated to cause genetic damage in lab tests with human cells and tested animals. Farmers see increased risk of non-Hodgkin's lymphoma. Glyphosate contamination has been demonstrated in all six of King County urban streams tested. The USGS Hydrology Program survey of Midwest Streams (2002) found over one-third of stream samples contained glyphosate, while two-thirds contained primary breakdown products.

Response: No references were provided for the genetic damage portion of this comment. Glyphosate does not cause mutations (EPA 1993). Regarding non-Hodgkin's lymphoma, the glyphosate Risk Assessment (Appendix 8) discusses the available evidence and concludes:

> "Given the marginal mutagenic activity of glyphosate and the failure of several chronic feeding studies to demonstrate a dose-response relationship for carcinogenicity and the limitations in the available epidemiology study, the Group E classification given by the U.S. EPA/OPP (1993a, 3-18 2002) appears to be reasonable. As with any compound that has been studied for a long period and tested in a large number of different systems, some equivocal evidence of carcinogenic potential is apparent and may remain a cause of concern, at least in terms of risk perception (e.g., Cox 2002). While these concerns are understandable, there is no compelling basis for challenging the position taken by the U.S. EPA and no quantitative risk assessment for cancer is conducted as part of the current analysis" (SERA 2003a).

Regarding King County urban streams, it would not be surprising to find glyphosate in urban streams, given the apparent quantities sold in home and garden stores. The USGS publication *Pesticides Detected in Urban Streams in Kings County, Washington 1998-2003* (USGS 2004) identifies lawn and shrub care as the potential source. Wildland use by Federal Agencies following Standard Operating Procedures and PEIS Mitigation Measures is not comparable. USGS has detected glyphosate in Midwest streams but at levels more than 100 times lower than the allowable drinking water standards. The USGS study contributes information that would help guide the future use of glyphosate, but these specific results are not a health concern per se. Glyphosate is the world's best selling herbicide, used in more than 90 countries on 150 crops as well as along roadsides and other locations (USGS 2002). The USGS findings do not indicate BLM uses are inherently dangerous.

278. Comment: The BLM should not be using diuron because it is carcinogenic.

Response: Diuron has been characterized as a "known/likely" human carcinogen; however, risk assessments by EPA shows a lifetime risk estimate of 1.68 cases per million exposed (EPA 2003b). The EPA considers this a low risk.

279. Comment: The *Human Health and Safety* section states that diuron is a "suspected carcinogen, and possible endocrine disruptor." Both of these endpoints have been recently assessed by the EPA. The EPA's 2003 Reregistration Eligibility Decision document for diuron states, "At this time, neither the available submitted studies on diuron or the literature show any indication of endocrine disruption effects" (EPA 2003b). In the Reregistration Eligibility Decision, diuron was classified as a known/likely carcinogen. We suggest the EIS be changed to reflect the EPA's assessment.

Response: The diuron sentence has been changed as suggested.

280. Comment: One of the stated *Purposes* for increasing the number of herbicides is the benefit of the use of "newer, less toxic herbicides" (Chapter 1). However, in all of the action alternatives, the use of at least one of the four older, more toxic herbicides already in use would increase ("Risks to Worker and Public Health" table in the *Human Health and Safety* section). Under the Proposed Action (Alternative 4) the use of herbicides "would more than double the use of moderate risk herbicides (when compared to Alternative 3)." Alternative 3 is designated as having "higher risk" than the No Action Alternative (Alternative 2). In would seem that the action alternatives do not, in fact, meet the stated purpose of "minimizing the effects to non-target plants and other species" and lead "to lower human and ecosystem risk" as suggested in *Purpose* number 6.

Response: The statewide acres treated totals for all four of the currently used herbicides would go down under *all* of the action alternatives, even though total estimated acres treated (with all herbicides) would triple under Alternative 5 ("Estimated Annual Treatment Acres…" table in Chapter 3). The "Risk to Workers and Public Health" table in the *Human Health and Safety* section displays *only* those herbicides registering at least one moderate or low human health risk category (as opposed to zero), and not counting accidental exposure scenarios. Since 2,4-D is the only moderate risk herbicide in Alternative 2 (No Action) and Alternative 3 (the legitimate comparison since any increases between Alternatives 3 and 4 (the Proposed Action) come from the addition of other treatment objectives), there is projected to be a slight increase annually west of the Cascades (shown in the top half of the referenced table), and a 4,800 acre decrease annually east of the Cascades, for a 4,500 acre reduction statewide. Low risk herbicides would be added by Alternative 3, but those 2,400 acres do not negate the gain.

For Alternative 4 (the Proposed Action), the addition of soil active herbicides for use around certain rights-of-way and developments doubles the moderate risk acres when compared with Alternative 3, but the total acres of moderate risk herbicides are still 1,200 acres below those of Alternative 2 (No Action). Even with its expanded objectives, the acres of moderate risk herbicides are lower under the Proposed Action (Alternative 4) than under the No Action Alternative (Alternative 2). With respect to human health, it would appear that the objectives of *Purpose* 6 would be furthered by the Proposed Action.

Third, these numbers only address human health risk. Changes in ecosystem risks are best extrapolated from the individual resource sections in Chapter 4. Thus, in the *Comparison of the Effects of the Alternatives* section in Chapter 2, the Final EIS includes a numerical summary of the acres by risk categories by resource. These numbers are only indicators, because several parameters were rated for each resource. However, they indicate a reduction in overall ecosystem risk between the No Action Alternative (Alternative 2) and Alternative 3.

Other Environmental Consequences

281. Comment: The section on the *Relationship Between Short-Term Uses of the Human Environment and Maintenance of Long-term Productivity* is inadequate because it does not address the potential long-term effects of herbicides.

Response: The potential for long-term effects is addressed in the discussion of half-lives of the herbicides under various conditions in the *Soil Quality* and *Water Resources* sections. BLM applications are not expected to significantly contribute to cumulative downstream effects to fish. BLM-applied herbicides will break down at or near the point of application. The analysis indicates there would be no herbicide-related effects to long-term productivity. These conclusions, inferred or stated by the environmental effects discussions in the pertinent resource sections in this chapter, have been added to this section in the Final EIS.

282. Comment: The section on *Irreversible or Irretrievable Impacts* does not include a discussion of the irretrievable health problems for workers of the public; potential irreversible contamination of waterways, soils, or change to ecological diversity, or loss of vulnerable species such as amphibians.

Response: The potential for such effects is addressed in their respective sections in this chapter. The analysis indicates no such permanent effects are likely under BLM treatment scenarios.

References

283. Comment: An up-to-date search of scientific literature should be undertaken to better inform the BLM in their use of pesticides. There is a lack of references addressing certain issues in the otherwise extensive references section.

Response: The comment does not suggest specific missing references, or name the issues lacking references. To help inform the BLM of the risks associated with their proposed herbicide use, this EIS relies on BLM or Forest Service-prepared Human Health and Ecological Risk Assessments for each of the 18 herbicides. These Risk Assessments are included in this EIS as Appendix 8, and each Risk Assessment itself includes a very extensive references section. The references section at the end of Chapter 4 is also very extensive but generally only includes references that made it into the main body of the EIS. The summaries of the herbicide risk that occur in Chapter 4 are necessarily brief, and often cite the Risk Assessment as the reference rather than the primary source. Pertinent new information published since compilation of the Risk Assessments is included in Chapter 4 and its references section. Additional references have been added based on public comments and resultant new information added between the Draft and Final EISs.

Distribution List

284. Comment: The BLM failed to notify the public of this planning process. Local community leaders and parties that had no vested economic interest in removing invasive weeds or using herbicides should have been informed.

Response: In June of 2008, the Oregon BLM sent out 17,200 postcards and 2,000 emails notifying individuals and organizations that the Oregon BLM was going to begin preparation of an EIS. The postcards and emails advised recipients how to get on the mailing list and when scoping meetings would be held. Those notified included: State and Federal elected officials; American Indian Tribes and Nations; lessees of BLM land; Soil and Water Conservation Districts and Oregon State University Extension Boards, as well as other interested parties identified by the Oregon Department of Agriculture; and, mailing lists from other planning efforts including the BLM Western Oregon Plan Revisions, the Forest Service Pacific Northwest Region Invasive plant program: Preventing and Managing Invasive Plants (2005), the PEIS, and all Oregon BLM districts' mailing lists of persons having expressed an interest in being kept informed about local BLM planning efforts.

Approximately 400 press releases were sent to media outlets throughout the State. Newspapers do not have to publish news releases, but articles were published in several papers, including the Oregonian and the Ontario Argus Observer, and the issue received airtime on KEX and KCBY.

In addition, a Notice of Intent was published in the Federal Register on June 23, 2008. The Federal Register notice, news releases, and the postcards all announced the twelve scoping meetings, subsequently held throughout the State in July 2008.

About 1,300 interested parties were on the mailing list to receive the Draft EIS and about 2,000 interested parties are on the mailing list to receive the Final EIS. Per NEPA regulations, a distribution list is included in both the Draft and the Final EIS, which includes the names and/or organizations of all parties who are on the mailing list. An introduction paragraph has been added to the start of the distribution list to clarify how the distribution list was compiled.

285. Comment: Do form letters count as multiple responses?

Response: The Dear Reader letter in the Draft EIS states that the purpose of the public comment period is to ensure that the appropriate range of reasonable alternatives is presented, that the analysis of effects is complete, appropriately presenting and interpreting the available published information. Comments on the Draft EIS should be as specific as possible and should address the adequacy of the Draft EIS and the merits of the alternatives discussed (40 C.F.R. 1503.3). Comments meeting this standard were identified as "substantive" comments. One letter might have several substantive comments, and another may have none. Receiving the same substantive comment several times has no additional effect on the Final EIS; the deficiency is corrected one time, and no tally or "vote" is otherwise kept. All letters were treated equally and were not given weight by number received, organizational affiliation, or other status of the respondents.

Letters sent during the public comment period process were read by a public comment coding team who found the substantive comments and compiled them into comment statements. All of these comment statements are included in this Appendix, all have written responses, and many resulted in changes to the Final EIS.

Comments received are part of the public record on the Draft EIS and are available for public inspection. Individuals or organizations that submitted comment letters (including form letters) have been added to the distribution list, and would receive or be notified about the Final EIS and the Record of Decision.

Appendix 2 – Standard Operating Procedures and Mitigation Measures from the PEIS

286. Comment: The EIS never mentions or discusses buffer zones.

Response: Non-spray "buffer" zones are mentioned more than 50 times in the body of the EIS, with particular emphasis in the *Water Resources* section. Buffer zones are also specified or emphasized in 20 of the Standard Operating Procedures and PEIS Mitigation Measures in Appendix 2, variously requiring non-spray buffers up to 1500 feet. Four tables in Appendix 2 are titled "Buffer Distances to Minimize Risk to…." As with other Standard Operating Procedures and PEIS Mitigation Measures, effects discussions in Chapter 4 are predicated on the application of these required no-spray buffers.

287. Comment: Loopholes, such as language like "where practicable" and "for the most part" in Appendix 2 (Standard Operating Procedures and PEIS Mitigation Measures) would allow the BLM to avoid using these protective measures. Thus, assurance of few or no effects is weak.

Response: Neither of these phrases appears in Appendix 2. "Where feasible" appears, and denotes a requirement to seek an alternative way of meeting the objective (including reconsideration of whether the control is necessary) and infers that the extra risk of the higher dose be a part of the analysis. However, pending that analysis, the action may be selected. The entire section also has language that would allow departures if the adverse effects they seek to avoid are unlikely to occur. This is one reason measures are duplicated in two or more sections, so users can understand (and achieve) all of the objectives of specific measures. BLM field offices would tailor these Standard Operating Procedures and PEIS Mitigation Measures based on local conditions and site-specific analysis. Such "tailoring" would normally be described in the site-specific analysis documents that would be subject to public involvement and comment.

Appendix 3 – Monitoring

288. Comment: Appendix 3 (Monitoring) should include additional information on Oregon BLM's vision of an adaptive management framework.

Response: The Oregon and Washington BLM State Office follows the Bureau's Adaptive Management Implementation Policy (USDI 2008d). Guidance for implementation of this policy is contained in the US Department of the Interior's Adaptive Management Technical Guide (USDI 2009). The adaptive management framework employed by the State Office includes developing stated management objectives to guide decisions about what actions to take and identifying explicit assumptions about expected outcomes that are then compared against actual outcomes. This framework acknowledges uncertainty about how natural resources systems function and how they would respond to management actions, and it makes use of management intervention and monitoring to improve subsequent decision-making. This information has been added to Appendix 3 as suggested.

289. Comment: Appendix 3 states that Pesticide Application Records are kept for 10 years. What are the implications of that for long term monitoring? Appendix 7 and the *Noxious Weeds and Other Invasive Plants* section both discuss weed spread in the next 15 years; how will Pesticide Application Records kept for only 10 years be sufficient to facilitate meaningful measurement of the control strategy in the Record of Decision?

Response: Pesticide Application Records are retained in project files for a minimum of 10 years as per Bureau Manual 9011 (USDI 1992c). Even if Pesticide Application Records are not kept, district summary records typically include weed treatment information from previous decades. With the deployment of the BLM's National Invasive Species Information Management System (NISIMS) in 2010, Pesticide Application Records would be entered electronically and maintained indefinitely, which would better facilitate long-term data retention. This point has been clarified in Appendix 3.

The 15 year projected weed spread discussed in Appendix 7 and the *Noxious Weeds and Other Invasive Plants* section is a statewide estimate (based on available literature) for analysis purposes, and Appendix 3 does not suggest those should be used as a basis for any sort of monitoring. Potential and existing monitoring indentified in Appendix 3 is generally at a smaller scale than statewide. The 15-year weed spread rate is to show an indication of the size of the problem; individual species, populations, and ecosystems would have varying rates of weed spread, and varying responses to the alternatives.

290. Comment: The EPA recommends monitoring include a description of how BLM's data retention guidelines will facilitate long-term effectiveness monitoring.

Response: Appendix 3 in the Draft EIS failed to describe the BLM's new National Invasive Species Information Management System (NISIMS), which would help address this monitoring need. A description of the system and of the components that would facilitate effectiveness monitoring has been added to Appendix 3 in the Final EIS.

291. Comment: The EPA recommends that Part II of Appendix 3, *Potential Monitoring* be incorporated into all action alternatives in order to help avoid adverse environmental impacts from herbicide use. The EPA also recommends the proposal be amended to explicitly identify minimum site-specific requirements of monitoring. These requirements should provide guidance on how site-specific project planning and NEPA analysis would consider the costs and benefits of monitoring impacts on air, vegetation, soil, and water. Descriptions such as "water quality monitoring would be conducted at discretion of the district" and "there might also be a need to determine if the standards and protection measures were effective at reducing potential effects to Federally Listed species and/or designated critical habitat" do not sufficiently disclose how districts will develop and implement adequate effectiveness monitoring for environmental and human health concerns.

Response: The Appendix has been edited to better describe existing BLM policy direction directing that monitoring should be dictated by the nature of the critical components of the environment in the treatment area. The action alternatives do not propose a new program; they propose to add additional herbicides to an existing BLM program that has been conducted without a significant incident for decades, and operates under BLM-wide guidance developed from BLM's experience with herbicides. This monitoring ideas presented in this section of Appendix 3 could apply to any or all of the action alternatives; the decision-maker would determine which monitoring to adopt, based on concerns raised in the analysis or concerns the decision-maker may have about the selected alternative. Adoption of all monitoring in this section is probably not feasible or necessary. The Standard Operating Procedures and PEIS Mitigation Measures are designed to reduce treatment risks to acceptable levels. Departures from these measures might be a reason to add project-specific implementation monitoring.

292. Comment: The "Five-year Examination of Weed Spread" should be incorporated into the action alternatives because it - or something similar - would provide a mechanism to measure the effectiveness of the chosen control strategy relative to EIS weed spread projections. Coordinating large-scale evaluations with relevant State and Federal Agencies and publishing the results would greatly increase their relevance.

Response: This monitoring is not automatically included in the action alternatives because it would be complicated, and its ability to accomplish the stated objectives unclear or expensive to fine-tune. If selected by the decision-maker, the BLM and relevant cooperators would need to determine its design and what objectives it could achieve. One problem is that the current 12 percent spread rate is an estimate, and BLM actions under the action alternatives are, according to the analysis presented in Appendix 7, will reduce the current rate over the next 10 to 15 years. It is not clear a significant change in weed spread rate would be discernable in five years.

This is not to suggest these issues are insurmountable, but that like other potential monitoring, a decision would have to consider whether the likelihood of meaningful monitoring results would justify the deferral of funds from direct weed control efforts.

293. Comment: *Monitoring Specific Concerns Identified in the EIS* should be incorporated into all action alternatives because it would help to ensure that adverse impacts on non-target resources have been effectively avoided or mitigated. Please also consider a more operational title for this effectiveness monitoring proposal, e.g., "Effectiveness Monitoring on the Avoidance and Mitigation of Adverse Impacts to Non-target Resources."

Response: A new title for this potential monitoring item, similar to that suggested by this comment, has been incorporated into Appendix 3. This monitoring is not automatically adopted because the decision-maker needs to determine if there are any significant concerns remaining after one of the alternatives and potential mitigation are selected. PEIS Mitigation Measures were designed to eliminate all significant effects at the west-wide analysis level, and the Oregon EIS may not have identified adverse effects deemed by the decision-maker to need, or significantly benefit from, monitoring.

294. Comment: The EPA recommends Appendix 3 explicitly identify different potential monitoring as either implementation or effectiveness monitoring. For example, "Monitoring for Concerns Identified in the EIS" might be more broadly understood as statewide implementation monitoring. The EIS describes two major effectiveness monitoring proposals – "Five-year Examination of Weed Spread" and "Monitoring Specific Concerns Identified in the EIS."

Response: The potential monitoring listed in Part II of Appendix 3 has been categorized into new *Implementation* and *Effectiveness* monitoring sections, as suggested.

295. Comment: The Oregon Department of Environmental Quality requests that the BLM coordinate with them when sending data electronically for potential entry into Oregon Department of Environmental Quality's Laboratory Analytical Storage and Retrieval Database (LASAR). In addition, the Oregon Department of Environmental Quality requests copies of any monitoring reports of herbicide effectiveness and impacts on water quality and ecological conditions are shared with Oregon's Water Quality Pesticide Management Team (WQPMT).

Response: These requests have been forwarded to the BLM State Office restoration coordinator. A discussion of the request to coordinate LASAR entries with Oregon Department of Environmental Quality has been added to Appendix 3 in the *Potential Monitoring* section. The request to share any water quality effectiveness monitoring data collected in support of this EIS with Oregon's WQPMT is also described in Appendix 3. The multi-agency WQPMT acts to review and respond to pesticide detections in Oregon's ground and surface water.

Appendix 5 – Federally Listed and other Special Status Species

296. Comment: The Endangered Species Act analysis in the EIS is insufficient and does not adequately address potential impacts to Federally Listed species and Critical Habitat.

Response: The Endangered Species Act analysis provided in this programmatic EIS adequately addresses the potential impacts to Federally Listed species and Critical Habitat when considered as a supplement to the Biological Assessment completed for the PEIS, as described in Appendix 5. Appendix 5 of the EIS provides information concerning Federally Listed species known to occur in Oregon, and is provided as a supplement to the Biological Assessment which is incorporated by reference in accordance with 50 CFR 402.12 (g). The EIS is programmatic by design and does not identify or authorize site-specific vegetation treatments or amend Land and Resource Management Plans, and as a programmatic analysis, it contains the appropriate level of Endangered Species Act analysis at the scale for which it was intended. To minimize potential impacts to Federally Listed species and critical habitat, all Standard Operating Procedures and PEIS Mitigation Measures indentified in Appendix 2, as well as the Protective Measures in the PEIS Biological Opinion (NMFS 2007) and the Conservation Measures listed in the Biological Assessment are applicable unless otherwise modified by subsequent site-specific analysis and Endangered Species Act consultation. The EIS states that site-specific analysis, as well as Endangered Species Act consultation, must be completed prior to any project approval for vegetation treatment with herbicides. It is at the site-specific level that potential impacts to specific Federally Listed species are best analyzed and the most effective Conservation Measures are developed.

297. Comment: The entire Biological Assessment from the PEIS should have been provided as part of the EIS for easier reference.

Response: The Biological Assessment for the PEIS includes information on almost 300 species, of which only a small subset occur in Oregon and are therefore not affected by the Proposed Action (Alternative 4). Some parts of the PEIS Biological Assessment covered non-herbicide treatments addressed in the PER, but outside of the scope of this EIS. The relevant information concerning those species that do occur in Oregon is provided in Appendix

5 of the EIS. At over 530 pages, printing the entire Biological Assessment for distribution was not practical. The Biological Assessment is available on the EIS website, and has been included on CD versions of the Final EIS.

298. Comment: The EIS does not adequately address the effects that 2,4-D, diuron, and triclopyr BEE may have on Federally Listed fish species. The EPA found that current labeled uses of these three herbicides are likely to adversely affect Oregon's Threatened and Endangered salmon and steelhead. The BLM should not propose their use until the National Marine Fisheries Service completes final Biological Opinions for these herbicides.

Response: Near the end of Chapter 1, the EIS notes that 37 pesticides including three of the herbicides included in the Proposed Action (Alternative 4) in this EIS are part of a July 2008 settlement agreement reached in Northwest Coalition for Alternatives to Pesticides et al. v. National Marine Fisheries Service, which requires National Marine Fisheries Service to complete consultation on the registration of these pesticides. That settlement agreement stems from a 2002 decision by the District Court for the Western District of Washington finding that the EPA had not consulted with National Marine Fisheries Service regarding the potential affects to Federally Listed salmon for 55 pesticides. That consultation has not been completed.

In January 2004, in response to the EPA consultations having not been completed, the same court ordered buffer zones be applied to salmon supporting waters, noting pesticide application buffer zones are a common, simple, and effective strategy for avoiding jeopardy for Threatened and Endangered salmonids. The court, however, exempted applications by Federal Agencies for which National Marine Fisheries Service consultation had been conducted, perhaps because such uses already meet one of the "termination events" applicable to the court-ordered buffer requirements, that is, the issuance of a National Marine Fisheries Service Biological Opinion. As noted in the EIS, the BLM would conform to any future EPA label restrictions resulting from the EPA and National Marine Fisheries Service consultation on these pesticides, but there is certainly nothing to indicate the BLM's use should be stopped pending completion of that consultation, or indeed that BLM's uses do not already meet the resolution sought in the original case.

That said, the potential effects that herbicides, including; 2,4-D, diuron and triclopyr BEE, pose to Federally Listed fish species are addressed in the EIS and Biological Assessment and are consistent with the results of NEPA analysis and Endangered Species Act consultation conducted for the PEIS. To further minimize the potential effects to Federally Listed fish species, the PEIS Biological Opinion (NMFS 2007) contains Protective Measures to be followed in addition to the Standard Operating Procedures identified in Appendix 2 of the EIS. The EIS states that site-specific analysis, as well as Endangered Species Act consultation, as appropriate, must be completed prior to any project approval for vegetation treatment.

299. Comment: The BLM cannot assure compliance with the Endangered Species Act if approving herbicides with undisclosed ingredients that are likely harmful to Federally Listed species such as Coho salmon.

Response: Additional information about inert ingredients and adjuvants has been added to the Final EIS. The additional information documents BLM and Forest Service reviews of confidential business information and other information that indicates a very low likelihood that any undisclosed ingredients would have toxic effects on any resource beyond those already described in the Risk Assessments for the herbicides themselves. A list of herbicide products approved for use by the BLM at the National level is included in Appendix 9. Many inerts have been found to have high toxicity levels, and inclusion of one or more of those toxic inerts would preclude the formulation from being approved by the BLM for use.

300. Comment: The list of Endangered, Threatened and Bureau Sensitive species provided in the EIS is not complete based on information contained in *Butterflies and Moths of Pacific Northwest Forests and Woodlands: Rare, Endangered, and Management-Sensitive Species* (USDA 2007x).

Response: The EIS list is complete. Tables A5-1 and A5-2 of the EIS accurately reflect the current list of butterflies in the BLM's Special Status Species Program, which includes Threatened, Endangered, proposed, and Bureau Sensitive species. It appears that the referenced text is using the term "management-sensitive," which is not a category of species considered by the BLM.

Appendix 8 – Human Health and Ecological Risk Assessments

301. Comment: Appendix 8 states that the courts have found that the Federal Insecticide, Fungicide and Rodenticide Act does not require the same examination of the impacts that the BLM is required to undertake under NEPA. What courts?

Response: The United States Court of Appeals for the Ninth Circuit found this in their 1983/84 rulings. This point has been clarified in the text.

Appendix 9 – Additional Information About the 18 Herbicides

302. Comment: Appendix 9 lists a number of important native species and the herbicides that would target them. It is not clear when herbicides would be used to target these species.

Response: Herbicides could be used under Alternative 3 on native plants only to control the spread of pests and diseases in State-identified control areas, such as the one for Sudden Oak Death in Curry County. Herbicides could be sprayed on native species under Alternative 4 (the Proposed Action), to accomplish safety and maintenance objectives in administrative sites, rights-of-way, and recreation sites, or to achieve habitat goals specified in Conservation Strategies for Federally Listed or other Special Status species. Herbicides could be used on any undesired vegetation under Alternative 5, provided that the objective was not to grow timber or livestock forage.

Native species were also included in Appendix 9 because it is important to know what desired species might be harmed if the species were to be exposed to one of the proposed herbicides. An explanation of this has been added to Appendix 9.

303. Comment: The Oregon Institute of Applied Ecology in Corvallis Oregon has helped conduct research on biology, management, and recovery of native plant species; studied and performed habitat management and restoration; and, conducted research on effective control techniques for invasive weeds. Our studies indicate herbicides are needed as follows:

1) The only non-herbicide method that is effective in removing meadow knapweed is hand-grubbing which is relatively expensive. Herbicides have been effectively used to control this species.
2) After eight years of studying various control techniques for false-brome, we found that herbicides could successfully be used to control this invasive species, while avoiding negative impacts to native species, including the Threatened Kincaid's lupine, Nelson's checkermallow, and the Endangered Fender's blue butterfly. Although manual techniques can be used to control false-brome in small areas, those areas are re-invaded within a year or two and manual techniques are not cost effective on large infestations.

3) Each year, rare native prairie habitat is lost to invasive species since the current control methods are not effective at killing priority invasive species such as Canada thistle, Himalayan blackberry, annual grasses, and reed canarygrass. Judicious use of herbicides would restore these areas.
4) In a five-year study of restoration methods in Willamette Valley upland prairies, a combination of burning and treatment with both a broad-spectrum and grass-specific herbicide was the most successful restoration method. When timed correctly, this treatment had minimal effects on established native species, but caused a significant decline in the cover of non-native species. In contrast, treatments without herbicides were ineffective in reducing the cover of non-native species or increasing the cover of native species.

Response: The control of invasive plants to restore native plant communities is a primary purpose for BLM's proposal to increase the number of herbicides available for use. Native plant communities contain the primary resources that comprise wildlife habitat and forage. The herbicides being proposed were selected for their efficiency in controlling weeds and the ability to use them in a manner that prevents or minimizes impact to non-target species. Table A9-2 lists the recommended herbicides for various species. It also lists the alternative where effective control becomes available. The information in this table applies to established infestations that are more difficult and costly to control than new or small infestations. Many species may be effectively controlled with non-herbicide methods such as hand pulling or digging; however, on a larger scale, these treatments are not practical. For example, the Oregon Institute of Applied Ecology noted that hand pulling was effective on Meadow knapweed. While this is true, hand pulling may be too expensive to be feasible on larger infestations. Therefore, there is no conflict in the findings of the Oregon Institute of Applied Ecology and the information summarized in Table A9-2.

304. Comment: Numerous field studies done by The Nature Conservancy, the Institute for Applied Ecology, and a wide variety of local organizations have shown that the only cost/time/resource-effective method for managing Garlic mustard, false brome, Knotweed, False Indigo and yellow archangel is through the use of herbicide treatments.

Response: Treatment recommendations for these species have been added to Appendix 9.

Miscellaneous

305. Comment: Tables should clearly identify the No Action (Alternative 2) and the Proposed Action (Alternative 4) in the headers, so as not to confuse or mislead the reader.

Response: This issue has been corrected in the Final EIS.

306. Comment: The EIS format is confusing. For example, *Affected Environment and Environmental Consequences* have been combined for no apparent benefit; *Comparison of Alternatives* should be in the *Environmental Consequences* chapter; subjects are hard to find without footers or being placed alphabetically; *Incomplete and Unavailable Information* should be in Chapter 3; *Conflicts with Other Plans* should be in Chapter 1; and *Cumulative Impacts* should be at the end of the *Environmental Consequences* chapter.

Response: Although the CEQ regulations at 40 CFR 1502.15 and 16 address the requirements of the *Affected Environment* and *Environmental Consequences* separately, they do not require they be separated in the analysis. In this case, we believe the reader is better served to have the description of the resource presented immediately prior to addressing the effects of the alternative on that resource. This approach has been used by other EISs, notably the Northwest Forest Plan (USDA, USDI 1994a) and its subsequent amendments. It was also used in the 2004 EIS for amending National Forest and BLM District Plans for the management of Port-Orford-cedar (USDA, USDI 2004). This approach prevents needing to summarize the affected environment section before starting the environmental consequences section.

The BLM discovered during preparation that the narrow focus of the analysis required a significant discussion of setting and assumptions; hence, Chapter 3 is long and detailed. Nothing in Chapter 3 is effects per se, but assumptions for the effects analysis. Thus, *Incomplete and Unavailable Information* and other sections correctly addressing affected environment and/or environmental consequences have been left in Chapter 4.

The *Comparison of Alternatives* section has been rewritten and left in Chapter 2. This is consistent with 40 CFR 1502.14, *Alternatives Including the Proposed Action*. This regulation states, "This section is the heart of the environmental impact statement. Based on the information and analysis presented in the sections on the Affected Environment (Sec. 1502.15) and the Environmental Consequences (Sec. 1502.16), it should present the environmental impacts of the proposal and the alternatives in comparative form, thus sharply defining the issues and providing a clear basis for choice among options by the decision-maker and the public." The separation is elucidated in CEQs Forty Most Asked Questions, question number 7, *Difference Between Sections of EIS on Alternatives and Environmental Consequences* (CEQ 1981). The discussion builds on the regulation with:

> In order to avoid duplication between these two sections, most of the "alternatives" section should be devoted to describing and comparing the alternatives. Discussion of the environmental impacts of these alternatives should be limited to a concise descriptive summary of such impacts in a comparative form, including charts or tables, thus sharply defining the issues and providing a clear basis for choice among options (Section 1502.14). The "environmental consequences" section should be devoted largely to a scientific analysis of the direct and indirect environmental effects of the proposed action and of each of the alternatives. It forms the analytic basis for the concise comparison in the "alternatives" section.

The Chapter 2 *Comparison of the Effects of the Alternatives* section in the Final EIS has been converted mostly to table form to better contrast the differences between the alternatives, as suggested by the CEQ direction.

The resource sections in Chapter 4 are sequenced to match the PEIS upon which they are tiered. Consideration was given to alphabetizing, but the titles are not necessarily intuitive enough for an alphabetical arrangement to be very helpful. However, a) the EIS chapters are now separated by colored card stock; b) a table of contents has been added to the start of each chapter immediately following the colored chapter separators; and c) resource section headers now include the name of the section.

The *Conflicts with Other Plans* has been moved to Chapter 1 as suggested.

Finally, since the entire programmatic analysis is essentially a cumulative effects analysis, miscellaneous information applicable to more than one section were presented early in Chapter 4 to help provide context to individual sections, particularly as some of those sections refer to those actions. Some of the ongoing actions described in the Draft EIS in the *Cumulative Impacts* section, however, are not impacts. These have been moved to the end of Chapter 1.

References

Austin et al. 1991	Austin, A.P., G.E. Harris, and W.P. Lucey. 1991. Impact of an Organophosphate Herbicide (Glyphosate) on Periphyton Communities Developed in Experimental Streams. Bulletin of Environmental Contamination and Toxicology 41:29-35.
Baldwin et al. 2009	Baldwin, David H, Julann A. Spromberg, Tracy K. Collier, Nathaniel L. Scholz (2009) A fish of many scales. Extrapolating sublethal pesticide exposures to the productivity of wild salmon populations. Ecological Applications. 19(8)2004-2015
Banks 1979	Banks P. A.; M. L. Ketchersid; M. G. Merkle. The Persistence of Fluridone in Various Soils under Field and Controlled Conditions. Weed Science, Vol. 27, No. 6 (Nov., 1979), pp. 631-633
Bedell et al. 1993	Bedell, T.E.; L.E. Eddleman; T. Deboodt; C. Jacks.1993. Western Juniper-Its Impact and Management in Oregon Rangelands. Oregon State University Extension Service, EC 1417. pp15.
Benachour and Seralini 2008	Benachour, N. and Seralini, G-E. 2008. Glyphosate Formulations Induce Apoptosis and Necrosis in Human Umbilical, Embryonic, and Placental Cells Chemical Research in Toxicology, DOI:10.1021/tx800218n. December 23, 2008. Available at http://pubs.acs.org/doi/abs/10.1021/tx800218n
Berg 2004	Berg, Neil, 2004, Assessment of Herbicide Best Management Practices: Status of Our Knowledge of BMP Effectiveness, Pacific Southwest Research Station, USDA Forest Service, Albany, CA.
Bernanke and Kohler 2008	Bernanke Julie, and Heinz-R Kohler. 2008. The Impact of Environmental Chemicals on Wildlife Vertebrates. Reviews of Environmental Contamination and Toxicology. 198:1-47
Berrill et al 1994	Berrill, M., S. Betram, L. McGillivray, M. Kolohan, and B. Pauli. 1994. Effects of low concentrations of forest-use pesticides on frog embryos and tadpoles. Environmental Toxicology and Chemistry 13:657-664.
Brown 2009	Brown, Gay. 2009. Oregon Grasshopper and Mormon Cricket Summary for 2009. United States Department of Agriculture, APHIS
Busse et al. 2003	Busse, M.; G. Fiddler; and N. Gillette. 2003. Are herbicides detrimental to ectomycorrhizae? In: Cooper, S.L. (comp.) Proceedings, 24th Ann. Forest Vegetation Management Conference, Jan. 14-16, 2003; Redding, CA. Univ. California Coop. Exten., Redding, CA. pp. 46-53.
Call et al. 1987,	Call, D.J, L. T. Brooke, R. J. Kent, M. L. Knuth, S. H. Poirier, J. M. Huot, and A. R. Lima. 1987. Bromacil and Diuron Herbicides: Toxicity, Uptake, and Elimination in Freshwater Fish. Archives of Environmental Contamination and Toxicology. 16, 607-613.
CEQ 1981	Council of Environmental Equality. 1981. Forty Most Asked Questions. 46 Fed. Reg. 18026. Available at http://ceq.hss.doe.gov/nepa/regs/40/40p1.htm
Connelly et al. 2004	Connelly, J.W., S.T. Knick, M.A. Scrhoeder and S.J. Stiver. 2004. Conservation Assessment of Greater Sage-grouse and Sagebrush Habitats. Western Association of Fish and Wildlife Agencies. Unpublished Report. Cheyenne, Wyoming
Cooperrider 1995	Cooperider, A., et. al. 1995. In, State of the Biome Uniqueness, Biodiversity, Threats and the Adequacy of Protection in the Sonoran Bioregion. The Wildland Project. March 1998,Tucson, Arizona

Cornell University 2008	Cornell University. 2008. Evaluation of acetic acid based herbicides for use in broad-spectrum turfgrass and weed control. Available at http://www.ccerensselaer.org/Horticulture-Program/Turfgrass-Research/Vinegar-Herbicide.aspx
CRBC 2008	Clackamas River Basin Council. 2008. History of Knotweed Control in Clackamas County. Available at http://www.clackamasriver.org/misc/knotweed_history.htm
Cusack and Harte 2008	Cusack, C., and Harte, M. 2008. The Economics of Invasive Species. Prepared for the Oregon Invasive Species Council. July 2008
Dent and Robben 2000	Dent, Liz and Joshua Robben, 2000, Aerial Pesticide Application Monitoring Final Report, Oregon Department of Forestry, Forest Practices Monitoring Program, Technical Report 7.
DiTomaso 2000	DiTomaso, Joseph. 2000. Invasive weeds in rangelands: Species, impacts, and management. Weed Science, Volume 48 pages 255-266. March – April, 2000.
DiTomaso and Healy 2007	DiTomaso, J.M. and E.A. Healy. 2007. Weeds of California and other Western States. UC DANR Publ. #3488. 1808 pp.
Dobkin and Sauder 2004	Dobkin, D. S. and J. D. Sauder. 2004. Shrubsteppe landscapes in jeopardy. Distributions, abundances and the uncertain future of birds and mammals in the Intermountain West. High Desert Ecological Research Institute. Bend, OR.
EFSA 2005	EFSA (2005). Conclusion on the peer review of diuron. EFSA Scientific Report 25. European Food Safety Organisation.
Elliott et al. 1998	Elliott, J.A. et al. 1998. Leaching and preferential flow of clopyralid under irrigation: Field observations and simulation modeling. J. Environ. Qual. 27: 124-131.
ENSR 2005j	ENSR. 2005j. Vegetation Treatments Programmatic EIS – Sulfometuron Methyl Ecological Risk Assessment Final Report. Prepared for the U.S. Department of the Interior Bureau of Land Management, Nevada State Office, Reno, Nevada. Westford, Massachusetts.
EPA 1993	Environmental Protection Agency. 1993. Reregistration Eligibility Decision (RED). U.S. EPA Publication Glyphosate. Office of Prevention, Pesticides and Toxic Substances.
EPA 2001	Environmental Protection Agency. 2001. Pesticide Registration (PR) Notice 2001-x Draft: Spray and Dust Drift Label Statements for Pesticide Products
EPA 2002	see Branda
EPA 2003b	Environmental Protection Agency. 2003b. Reregistration Eligibility Decision for Diuron. Washington D.C. Available at http://www.epa.gov/pesticides/reregistration/REDs/diuron_red.pdf
EPA 2005a	Environmental Protection Agency. 2005a. Reregistration Eligibility Decision for 2,4-D. EPA 738-R-05-002, Washington D.C. Available at http://epa.gov/oppsrrd1/REDs/24d_red.pdf
EPA 2008b	Environmental Protection Agency. 2008b. Reregistration Eligibility Decision for Sulfumeturon methyl, Washington D.C.
EPA 2010	Endocrine disruptor screening program

Extoxnet 1996c	Extension Toxicology Network (Extoxnet). 1996c Sulfometuron Methyl. Pesticide Information Profiles. Extension Toxicology Network. Available at: http://extoxnet.orst.edu/pips/sulfomet.htm.
Franke et al. 1994	Franke, C., G. Studinger, G. Berger, S. Bohling, U. Bruckmann, D. Cohors-Fresenborg, and U. Johncke. 1994. The Assessment of Bioaccumulation. Chemosphere. 29, 1501-14.
Health Canada 2009	Health Canada. 2009. Questions and Answers - Final Decision on the Re-evaluation of 2,4-D. Available at http://www.hc-sc.gc.ca/cps-spc/pest/part/protect-proteger/use-utiliser/_24d/24d-faq-eng.php#dogs
Houston et al. 1998	Houston, A.P.C.; S. Visser; R.A. Lautenschlager. 1998. Response of microbial processes and fungal community structure to vegetation management in mixed wood forest soils. Canadian Journal of Botany 76: 2002-2010.
IUCN 2008	International Union for Conservation of Nature. 2008. Wildlife in a Changing World. Ana Analysis of the 2008 IUCN Red List of Threatened Species. Edited by Jean-Christophe Vie, Craig Hilton-Taylor and Simon N Stuart.
Johnson et al. 1995	Johnson, W.G., T.L. Lavy, and E.E. Gbur. 1995. Persistence of Triclopyr and 2,4-D in Flooded and Non-flooded Soils. Journal of Environmental Quality 24:493-497.
JPR 1998	Journal For Pesticide Reform. 1998. Herbicide Gact Sheet: Clopyralid. Winter 1998, Vol 18, No 4.
Kao et al. 1995	L.M. Kao, C.F. Wilkinson, L.B. Brattsten, In vivo effects of 2,4-D and atrazine on cytochrome P450 and insecticide toxicity in southern armyworm (Spodoptera eridania) larvae, Pestic. Sci. 45 (1995) 331–334.
Laetz et al. 2009	Laetz, Cathy A David H. Baldwin, Tracy K. Collier, Vincent Hebert, John D. Stark, and Nathaniel L. Scholz. 2009. The Synergistic Toxicity of Pesticide Mixtures: Implications for Risk Assessment and the Conservation of Endangered Pacific Salmon. Environmental Health Perspectives. Volume 117, Number 3.
McCall and Gavit 1986	McCall, P. J. and P. D. Gavit. 1986. Aqueous photolysis of triclopyr and its butoxyethyl ester and calculated environmental photodecomposition rates. Environ. Toxic. Chem. 5:879-885.
Miller et al. 2005	Miller, R.F., Bates, J.D., Svejcar, A.J., Pierson Jr, F.B., Eddleman, L.E. 2005. Biology, ecology, and management of western juniper (juniperus occidentalis). Oregon State University Agricultural Experiment Station. Technical Bulletin 152. 77 p. Available at http://juniper.oregonstate.edu/bibliography/article.php?article_id=53
NMFS 2007	National Marine Fisheries Service. 2007. Biological Opinion on the 2007 Vegetation Treatments Using Herbicides on BLM Lands in 17 Western States Final Environmental Impact Statement. Available as an Appendix to the 2007 Vegetation Treatments Using Herbicides on BLM Lands in 17 Western States Record of Decision at http://www.blm.gov/wo/st/en/prog/more/veg_eis.html
ODEQ 2008	Oregon Department of Environmental Quality. 2008. Oregon Toxics Monitoring Program Willamette River Basin Year One (2008) Summary Report DRAFT. http://www.deq.state.or.us/about/eqc/agendas/attachments/2009oct/E-AttA-ToxicsMonitoring.pdf

OSU 2009	Oregon State University. 2009. Pacific Northwest Weed Management Handbook. Editor: Ed Peachey. Available at http://weeds.ippc.orst.edu/pnw/weeds?01W_INTR06.dat
Paige and Ritter 1999	Paige, C. and S. Ritter. 1999. Birds in a sagebrush sea. Partners in Flight, Western Working Group. Boise, ID.
PARC 2001, 2006, 2007	Pesticide Analytical and Response Center (Oregon Department of Agriculture) 2001 Annual Report. Available at http://www.oregon.gov/ODA/PEST/parc.shtml
Peterson and Stringham 2008	Peterson S. L. and Stringham T.K. 2008. Infiltration, Runoff and Sediment Yield in Response to Western Juniper Encroachment in Southeast Oregon. Rangeland Ecology and Management 61(1) 24-81
Pierson et al. 2007	Pierson, Frederick B., Jon D. Bates, Tony J. Svejcar, and Stuart P. Hardegree. 2007. Runoff and Erosion after cutting western juniper. Rangeland Ecology and Management. 60(3)285-292
Radke and Davis 2000	Radke, Hans D. and Shannon W. Davis. 2000. Economic Analysis of Containment Programs, Damages, and Production Losses From Noxious Weeds in Oregon. Oregon Department of Agriculture, Plant Division, Noxious Weed Control Program.
Rashin and Graber 1993	Rashin, Ed and Craig Graber, 1993, Effectiveness of Best Management Practices For Aerial Application Of Herbicides, Washington State Department of Ecology Publication 93-81.
Relyea 2005	Relyea, R. A. 2005. The lethal impact of Roundup® on aquatic and terrestrial amphibians. Ecological Applications 15:1118-1124. Available at http://www.pitt.edu/~relyea/Site/Publications.html
Relyea et al 2005	Relyea, R.A., N.M. Schoeppner, and J.T. Hoverman. 2005. Pesticides and amphibians: The importance of community context. Ecological Application. 15:1124-1134
SERA 2003a	Syracuse Environmental Research Associates, Inc. (SERA). 2003a. Glyphosate – Human Health and Ecological Risk Assessment Final Report. SERA TR 02-43-09-04a. Prepared for the U.S. Department of Agriculture Forest Service, Arlington, Virginia. Fayetteville, New York.
SERA 2004b	Syracuse Environmental Research Associates, Inc. (SERA). 2004b. Clopyralid (Transline) – Human Health and Ecological Risk Assessment Final Report. SERA TR 04 43-17-03c. Prepared for the U.S. Department of Agriculture Forest Service, Arlington, Virginia. Fayetteville, New York.
SERA 2004d	Syracuse Environmental Research Associates, Inc. (SERA). 2004d. Imazapyr – Human Health and Ecological Risk Assessment Final Report. SERA TR 04-43-17-05b. Prepared for the U.S. Department of Agriculture Forest Service, Arlington, Virginia. Fayetteville, New York.
Sheley and Petroff 1999	Sheley, Roger L and Janet K Petroff. 1999. Biology and Management of Noxious Rangeland Weeds. Oregon State University Press.
Smith 1974	Smith, Allan E. 1974. Breakdown of the herbicide dicamba and its degradation product 3,6-dichlorosalicylic acid in prairie soils. Journal of Agricultural and Food Chemistry. *22* (4), pp 601–605
Theodoropoulos 2003	Theodoropoulos, David. 2003. Invasion Biology: Critique of A Pseudoscience. Avatar Books. Blythe, CA

TNC 2009	The Nature Conservancy. 2009. The Nature Conservancy Element Stewardship Abstracts. Avaliable at http://www.imapinvasives.org/GIST/ESA/index.html
Trubey et al. 1998	Truby, R.K., Bethem, R.A., and Peterson, B. (1989). Degradation and Mobility of Sulfometuron-methyl (Oust Herbicide) in Field Soil. J. of Agricultural and Food Chem. 46:2360-2367.
Tu et al. 2001	Tu, M., C. Hurd, and J. M. Randall. 2001. Weed Control Methods Handbook: Tools & Techniques for Natural Areas. The Nature Conservancy, http://www.invasive.org/gist/handbook.html, version. June 2001.
USDA 2005	USDA Forest Service. 2005. Pacific Northwest Region Invasive Plant Program: Preventing and Managing Invasive Plants. Final Environmental Impact Statement. Available at http://www.fs.fed.us/r6/invasiveplant-eis/
USDA, USDI 1994a	USDA Forest Service and USDI Bureau of Land Management. 1994a. Final Supplemental Environmental Impact Statement on management of habitat for late-successional and old-growth species within the range of the Northern Spotted Owl.
USDA, USDI 1994b	USDA Forest Service and USDI Bureau of Land Management. 1994b. Record of Decision on management of habitat for late-successional and old-growth species within the range of the Northern Spotted Owl.
USDA, USDI 2004	USDA Forest Service and USDI Bureau of Land Management. 2004. Management of Port-Orford Cedar in Southern Oregon. Final Environmental Impact Statement.
USDI 1989	USDI Bureau of Land Management. 1989. Western Oregon – Management of Competing Vegetation Final Environmental Impact Statement. Washington D.C.
USDI 1992a	USDI Bureau of Land Management. 1992a. BLM Manual 1745. Introduction, Transplant, Augmentation, and Reestablishment of Fish, Wildlife, and Plants. 14pp.
USDI 1992b	USDI Bureau of Land Management. 1992b. Manual 9015. 2-Dec-92. Integrated Weed Management. Release 9-321. Available at http://www.blm.gov/ca/st/en/prog/weeds/9015.html
USDI 1992c	USDI Bureau of Land Management. 1992c. Chemical Pest Control Handbook (BLM Manual 9011)
USDI 2005f	USDI Bureau of Land Management. 2005f Land Use Planning. Manual Handbook Number 1601-1. Washington D.C.
USDI 2005g	south deer landscape EA
USDI 2006d	Columbia White tailed deer
USDI 2007e	USDI. 2007e. Department of the Interior Departmental Manual. Part 517. Pesticides.
USDI 2008a	USDI Bureau of Land Management. 2008a. Integrated Vegetation Management. Manual Handbook Number H1740-2. Washington D.C. March 2008.
USDI 2008b	USDI Fish and Wildlife Service. 2008b. Biological opinion for SOD eradication activities scheduled to occur on federal lands administered by the Rogue River–Siskiyou National Forest (Forest) and the Coos Bay District Bureau of Land Management (District), FWS Reference Number 13420-2008-F-0041. FWS Roseburg Field Office. Roseburg, OR. 113 pp.
USDI 2008d	USDI Bureau of Land Management.. 2008d. 522 Department Manual 1; Adaptive Management. Washington D.C. 3 pp.

USDI 2009	USDI Bureau of Land Management. 2009. IM No OR-2009-018
USGS 2002	U.S. Geological Survey. 2002. Glyphosate Herbicide Found in Many Midwestern Streams, Antibiotics Not Common. Toxic Substances Hydrology Program. Available at http://toxics.usgs.gov/highlights/glyphosate02.html
Vencill et al. 2002	Vencill, W. K. (ed.). 2002. Herbicide Handbook, 8th ed. Weed Science Society of America, Lawrence, KS. pp. 155-157.
Wentz et al. 1998	Wentz, Dennis A., Bernadine A. Bonn, Kurt D. Carpenter, Stephen R. Hinkle, Mary L. Janet, Frank A. Rinella, Mark A. Uhrich, Ian R. Waite, Antonius Laenen, and Kenneth E. Bencala. 1998. Water Quality in the Willamette Basin, Oregon, 1991–95. US Department of the Interior and US Geographical Survey
Westbrooks 1998	Westbrooks, R. 1998. Invasive plants, changing the landscape of America: Fact book. Federal Interagency Committee for the Management of Noxious and Exotic Weeds (FICMNEW), Washington, D.C. 109 pp.
Wood 2001	Wood, Tamara, 2001, Herbicide Use in the Management of Roadside Vegetation, Western Oregon, 1999–2000: Effects on the Water Quality of Nearby Streams, USGS, Water-Resources Investigations Report 01–4065.
Woodward et al. 1997	Woodrow J. E., Seiber J. N., and Baker L. W. (1997) Correlation techniques for estimating pesticide volatilization flux and downwind concentrations. Environ. Sci. Technol. 31(2), 523–529.

Appendix 11 - Comment Letters from Federal, State, and Local Government Agencies on the 2009 Draft EIS

This appendix contains comment letters from Federal, State, and local government agencies. The Environmental Protection Agency (EPA) has a legal obligation under Section 309 of the Clean Air Act to review and comment on environmental impact statements. Their letter reviewing the Draft EIS appears at the beginning of this appendix.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 Sixth Avenue, Suite 900
Seattle, WA 98101-3140

OFFICE OF
ECOSYSTEMS, TRIBAL AND
PUBLIC AFFAIRS

December 4, 2009

Vegetation Treatments EIS Team
P.O. Box 2965
Portland, Oregon 97208-2965

RE: U.S. Environmental Protection Agency (EPA) review and comments for the Vegetation Treatments Using Herbicides on Bureau of Land Management (BLM) Lands in Oregon Draft Environmental Impact Statement (DEIS). EPA Project Number: 08-045-BLM

Dear Vegetation Treatments EIS Team:

This review was conducted in accordance with our responsibilities under the National Environmental Policy Act (NEPA) and Section 309 of the Clean Air Act. Under our policies and procedures, we evaluate the environmental impact of the proposed action and the adequacy of the impact statement. We have assigned a Lack of Objections (LO) rating to the DEIS. A copy of our rating system is attached.

We agree that invasive plants and noxious weeds are a serious environmental problem. Invasive plants threaten native plant communities and change fire behavior. They reduce water quality, soil productivity, wilderness characteristics, recreation values, and habitat and forage for wildlife and livestock. To limit these adverse impacts we strongly support the principles of Integrated Pest Management (IPM). IPM includes many tools - one of which is herbicides - and we support increasing the BLM's ability to select the most effective methods with the least amount of risk to non-target resources.

Due to persistent uncertainties associated with the safety and effectiveness of herbicide use and in the interest of encouraging a cautious approach we have focused our review on monitoring and adaptive management. This focus reflects EPA's July 30, 2007 comments on Vegetation Treatments Using Herbicides on Bureau of Land Management Lands in 17 Western States Final Programmatic EIS (PEIS). Namely, "EPA would expect regional and site specific NEPA documents to include information ensuring adequate monitoring and description of evaluation methods to determine if application rates are effective, buffers are sufficient, drift is minimized and specific goals and endpoints are being met."

In our enclosed comments we recommend that Part II of Appendix 3, "Potential Monitoring" be incorporated into all action alternatives. We also recommend that this "Potential Monitoring" be further developed and (i) establish minimum effectiveness monitoring requirements for site specific project planning, (ii) include additional information on the Oregon BLM's State Office vision of an adaptive management framework, and, (iii) describe how data retention guidelines will facilitate long term effectiveness monitoring.

2

EPA supports BLM's efforts to restore native plant communities and related ecosystems and we look forward to collaborating further on future phases of this project. In the interim, if you have any questions or concerns about these comments please contact Erik Peterson of my staff at (206) 553-6382 or by electronic mail at peterson.erik@epa.gov.

Sincerely,

Teresa Kubo, Acting Manager
Environmental Review and Sediment Management Unit

Enclosures:
EPA Region 10 Detailed Comments for the Vegetation Treatments Using Herbicides on BLM Lands in Oregon DEIS.
EPA Rating System for Draft Environmental Impact Statements

3

EPA REGION 10 DETAILED COMMENTS FOR THE VEGETATION TREATMENTS USING HERBICIDES ON BLM LANDS IN OREGON DEIS

Monitoring and Adaptive Management

To help bolster and define your monitoring plans we recommend you consider the following suggestions for incorporation into your FEIS and Record of Decision.

Potential Monitoring

For clarification, we recommend that the FEIS explicitly identify different Potential Monitoring as either implementation or effectiveness monitoring. For example, "Monitoring for Concerns Identified in the EIS" might be more broadly understood as State-wide implementation monitoring. The DEIS describes two major effectiveness monitoring proposals - "Five-year Examination of Weed Spread" and "Monitoring Specific Concerns Identified in the EIS". We recommend that all of these Potential Monitoring proposals be further developed and incorporated into the action alternatives.

The "Five-year Examination of Weed Spread" should be incorporated into the action alternatives because it – or something similar - would provide a mechanism to measure the effectiveness of the chosen control strategy relative to EIS projections (e.g., Table 2-3). We believe coordinating large scale evaluations with relevant State and Federal agencies and publishing the results would greatly increase their relevance.

"Monitoring Specific Concerns Identified in the EIS" should be incorporated into all action alternatives because it would help to ensure that adverse impacts on non-target resources have been effectively avoided or mitigated. Please also consider a more operational title for this effectiveness monitoring proposal, e.g., "Effectiveness Monitoring on the Avoidance and Mitigation of Adverse Impacts to Non-target Resources".

In addition to incorporating Potential Monitoring on the avoidance of adverse environmental impacts from herbicide use we recommend the proposal be amended to explicitly identify minimum site specific requirements. These requirements should provide guidance on how site specific project planning and NEPA analyses will consider the costs and benefits of monitoring impacts on air, vegetation, soil and water. We do not believe descriptions such as, "Water quality monitoring, would be conducted at the discretion of the district." and "There might also be a need to determine if the standards and protection measures were effective at reducing potential effects to Federally Listed species and/or designated critical habitat." sufficiently disclose how districts will develop and implement adequate effectiveness monitoring for environmental and human health concerns (p.422).

Adaptive Management Framework

The DEIS has numerous references to monitoring and adaptive management. Appendix 3, for example, references BLM Manual Sections 9011, 9014, and 9015; and, BLM Technical Reference 1730-1 etc. Appendix 3 also states, "Adaptive management strategies require implementation monitoring to determine whether we followed the plan and obtained the expected results"; and, "If treatment was not effective, the decision maker would review the strategy (USDA 2005:2-15)". Appendix 6 adds to the DEIS's disclosure of BLM monitoring

4

and adaptive management policies by quoting relevant sections of various District level Resource Management Plans.

These references are helpful, yet we remain unsure what the minimum adaptive management requirements for site specific planning would be.

Recommendations:

We recommend that the FEIS dedicate a sub-section of Appendix 3 to a systematic description of the conceptual and legal framework which will guide site specific adaptive management planning. If appropriate, please define the stages of adaptive management (planning, implementation, monitoring and evaluation) and list the relevant authorities for each of these stages. Clearly defining a framework and disclosing sidebars for site specific adaptive management planning may strengthen state wide strategic planning by ensuring a minimum level of comparable information.

Long Term Monitoring

According to the DEIS, Pesticide Application Records (PAR) are kept for 10 years (p. 420). We are interested in this time period's potential implications for long-term monitoring. For example, Table 2-3 provides projections for weed spread to 15 years; how will PARs kept for only 10 years be sufficient to facilitate a meaningful measurement of the control strategy identified in the ROD?

Recommendation:

Please include additional information on long term monitoring in the FEIS – including a definition of what constitutes "long-term" for the BLM. Data retention guidelines, whether for PARs or other monitoring documentation, should be designed to facilitate long-term analysis.

HARNEY COUNTY WEED CONTROL
450 N. Buena Vista Ave. ~ Burns, Oregon 97720
541-573-8385 Office ~ 541-573-8387 Fax

November 1, 2009

Vegetation Treatments EIS team
PO Box 2965
Portland, OR 97208-2965

To whom it may Concern:

The Harney County Weed Board has received and reviewed the Draft Environmental Impact Statement of September 2009. The board would like to comment in support of the document and the management opportunities that the acceptance of this document will afford the BLM of Oregon.

Since 1987, BLM managed lands in Oregon have been mismanaged when it comes to invasive species, habitat improvement though herbicides, and safety on right of ways. The cost to the State of Oregon, local Governments, Tax Payers, and the Federal Government has been astronomical. Here locally we have been waiting for over 20 years for this document to be put together so we could move forward with protecting our private and public lands, improving habitats, and making our public roadways safer.

It is very important to the landowners in Harney County that this document continues to move forward and become active. Without this document the 9th Circuit Court injunction cannot be lifted, causing private landowners, as well as federally managed lands, to continue to lose value with irreparable damage to wildlife habitat and native rangelands as the cost of restoring the acres that are being lost to invasive species in this area is crippling to any landowner or agency.

Sincerely,

Shane Otley, Chair
Harney County Weed Board
450 N. Buena Vista, Ave #10
Burns, OR 97720
541-573-8385

HARNEY COUNTY COURT

Office of Dan Nichols, Commissioner
450 North Buena Vista, Burns, Oregon 97720
Phone: 541-493-2440   Fax: 541-493-2440
E-mail: dannichols@wildblue.net
Websites: www.co.harney.or.us ♦ www.harneycounty.org

November 29,2009

To Whom It May Concern,

After review and consideration of the Draft EIS for Vegetative Treatments it is the consensus of the Harney County Court to support Alternative 5 as the preferred alternative. After 23 years of losing the battle with invasive weeds because of the restrictive and inadequate availability of effective herbicides it is clear that the broadest base of herbicides should be incorporated into the EIS.

The EIS summary estimates that Alternative 5 would only increase herbicide use by 10% over Alternative 4. The summary also correctly points out that more than 90% of that increase would be in Eastern Oregon where environmental risk is lower, advantages more apparent and public acceptance of herbicide use is higher. The extremely limited use of herbicides for the past 20 years has allowed for major infestations of medusahead, knapweeds and thistles in Eastern Oregon. Alternative 5 would allow for the use of diflufenzopyr – dicamba combination for the treatment of knapweeds and thistle species. Their control is of significant importance to the overall health and sustainability of Eastern Oregon rangelands.

Developing an EIS that would exclude the potential for the treatment of the total array of noxious weeds and invasive plants on BLM lands would once again leave the BLM restricted in its management opportunities to the detriment of the public lands. The initial cost of effective, comprehensive treatment is much more practical than attempted restoration or potential loss of valuable resources. Please, do not build a notable restriction into this necessary EIS document.

The Harney County Court requests that you strongly consider Alternative 5 as the Preferred Alternative that would allow for the comprehensive management of all noxious and invasive weeds on BLM lands.

Thank you for moving forward to resolve an issue of paramount importance to the health and sustainability of BLM managed lands.

Sincerely,

Dan Nichols

Dan Nichols
Commissioner, Harney County Court

DN;sj

Appendix 12 - 2,4-D

Introduction

Because of public concern over the use of 2,4-D, the BLM has focused particular attention on whether or not to continue to include 2,4-D in one or more of the action alternatives. Following the July 2008 scoping period, while the EIS team was seeking herbicide use estimates from the nine BLM districts in Oregon, districts were specifically asked to identify what their program would look like without 2,4-D. The Steering Committee considered this and other preliminary information and decided to include 2,4-D in the action alternatives in the Draft EIS. Again in January of 2010 in response to the Draft EIS analysis and over 800 public comments specifically mentioning concerns with 2,4-D, the districts and others were again asked about the implications of managing invasive plants and other vegetation without 2,4-D. The Steering Committee examined the responses along with the other available information about 2,4-D and decided to retain it within the action alternatives in the Final EIS. This appendix includes much of the information considered by the Steering Committee in 2010 (updated to Final EIS language), in the hopes that it will facilitate public and decision-maker understanding of the risks and the value associated with this product.

2,4-D is a widely used, selective, broad-leaf herbicide first registered for use in 1944, and extensively studied since that time. It is inexpensive, effective on a broad range of noxious weeds and other plants either alone and in tank mixes, one with which BLM and other applicators are well familiar, and non-carcinogenic. BLM Weed Coordinators, permit and rights-of-way holders, and cooperators all report serious implications to their programs if its use on BLM lands is discontinued.

However, its association with Agent Orange, with timber spraying in the 1980s, and potential human and environmental risks when compared with some of the other herbicides being proposed, continue to raise public controversy. Of the 1050 public letters received on the DEIS, 821 (including form letters) specifically mentioned 2,4-D as something they opposed. A few writers were opposed to 2,4-D in spite of being in favor of the remainder of the Proposed Action.

Uses and Importance

District Query 2008

Scoping comments in 2008 led the BLM to consider removing 2,4-D during formulation of the alternatives in late 2008. The districts reported heavy reliance on 2,4-D, particularly in tank mixes to reduce the quantity of other herbicides needed, and to make other herbicides more effective. It was noted that BLM permit/rights-of-way holders and cooperators also rely on 2,4-D when spraying on BLM lands. Wind farms, solar, and transmission corridors are increasing rapidly, contributing to a continuing need for such reliance.

District Query 2010

In January 2010, the districts were asked again if there were reasonable substitutes for 2,4-D, and specifically, would removing 2,4-D reduce the BLM's ability to meet *Purpose* 6, to *cooperatively control invasive plants so they do not infest or re-infest adjacent non-BLM lands*. Districts were encouraged to contact cooperators and ask specifically what the loss of 2,4-D would mean to cross-boundary control efforts. The districts were also asked why 2,4-D use was not projected to decrease on the west side between Alternatives 2 and 3, when eight more herbicides become available but only invasive weeds are added to the control objectives. (East side projections dropped 72 percent.) District and Oregon State Office (OSO) staff responses included the following:

Effectiveness

- 2,4-D increases the effectiveness of other herbicides thereby reducing the pounds of herbicide applied per acre, reducing the need for multiple applications, reducing cost, and reducing weed population resistance development.
- The development of weed resistance to 2,4-D has been minor.
- 2,4-D provides a burn-down that effectively stops the plants' progress towards seed ripening, even at advance phenological stages, that cannot be duplicated with other herbicides. This extends the control window so crews can reach multiple control locations.
- 2,4-D in tank mixes similarly extends the spray season for many weeds (e.g. knapweed).
- ALS-inhibitor herbicides are more likely to result in herbicide resistance than 2,4-D.
- One of the few effective treatments for rush skeletonweed is 2,4-D early in the season, followed by picloram in the late season. 2,4-D and sulfometuron methyl is effective on difficult-to-control whitetop and perennial pepperweed.
- Aquatic formulations of 2,4-D can be used in riparian areas and are less damaging to other vegetation than the use of glyphosate.
- 2,4-D is selective for woody vegetation that encroaches on roads, but does not kill grass important to maintaining road cut and ditch stability.

Cooperator Implications

- Oregon Department of Agriculture and Oregon Department of Transportation use 2,4-D as a component of 85 percent of their roadside noxious weed spraying. Heavier reliance on glyphosate could lead to weed resistance.
- The lower cost of 2,4-D when compared to other herbicides makes it commonly used by BLM cooperators.
- 2,4-D is commonly used by BLM cooperators such as Counties and timber companies due in part because it was one of only four herbicides available for use on BLM lands and there was a desire to develop compatible weed control strategies and applications.

<u>Target Species:</u> 2,4-D is one recommended herbicide for 91 of the 230 invasive and native target plants listed on Table A9-2 in Appendix 9, and is the only herbicide available under the proposed action for the control of three of the invasive plant species (see 2,4-D entries in Attachment 1). However, dropping 2,4-D because other herbicides would control most target plants means decreasing the options for site-specific selection of the most effective, least impacting herbicide. For example, loss of 2,4-D and restrictions on picloram use (it is persistent and leachable) mean only one other herbicide is available for diffuse and spotted knapweeds, Mediterranean sage, puncturevine, St. Johnswort, Swainsonpea, velvetleaf, European centaury, sowthistles, and rabbit brush – which could lead to herbicide resistance. 2,4-D is effective on Scotch and Portuguese brooms and gorse at low rates. (Triclopyr is effective on brooms as well, but it has various risks for wildlife.) West side districts reported needing it as a tank mix component for most of their spraying.

The "newer, more target-specific" herbicides are an advantage for specific target weeds located where avoiding collateral damage is necessary, but those herbicides have few general uses and thus are not used for most weed control. Time, equipment costs, and worker health risks are all reduced when one, multiple-species herbicide mix can be used on many different target plants.

Acres and Trends

Estimated use by alternative shows 2,4-D dropping statewide:

	Alt 2	Alt 3	Alt 4	Alt5
West side	1800	2100	2300	2300
East side	6700	1900	3100	5200
Total	8500	4000	5400	7500

West side use is projected to increase across all alternatives

While the additional uses added by Alternatives 4 and 5 would increase herbicide use when compared to Alternative 3, the reason for the west side increase between Alternatives 2 and 3 is that, because of the nature of the weeds on the west side, 2,4-D is a part of almost all tank mixes. Perhaps the pounds of 2,4-D will go down, but the 2008 query to the districts was not specific enough to reflect that.

Worker and Public Health

2,4-D enjoys widespread home and commercial use. It is the second-most commonly used herbicide in Oregon, and the BLM use would be .73% (less than 1%) of the 2,4-D used commercially in the State. The districts have used 2,4-D for more than 25 years without incident. It has been registered for use for over 60 years, and been the subject of extensive study. It was reregistered in 2005 with no uses dropped and two more added. Label changes in 2007 removed most grazing restrictions and tightened mixing instructions to reduce worker exposures. The EPA has set food and water tolerances; tolerance for drinking water is 70 ppb. It is not carcinogenic and is only remotely implicated in development abnormalities at extremely high doses. (These implications are currently being retested.) 2,4-D has a half-life in the body of 12 hours, does not metabolize or transform, is excreted unchanged, and does not accumulate.

The label rate for 2,4-D is 4 lbs/ac, and until recently, many BLM uses were at that rate. The current (PEIS) BLM maximum rate is 1.9 lbs, with a PEIS Mitigation Measure limiting applications to typical rate (1.0 lbs/ac, or 1/4 of label rates) where feasible, to reduce risk to workers and the public. Average application rates on BLM lands have been 1.66, 1.50, and 1.05 lbs/ac for 2006, 2007, and 2008 respectively, and they are still trending down in response to the new (lower) PEIS rates. Tank mixes normally include about 1/2 lb of 2/4-d per acre, but tank mixes raise additional health risks identified in the risk assessment (see Attachment 2). The risk ratings for maximum rate are based on the 4.0 pound label rate.

Although the BLM in Oregon has not had an incident with 2,4-D in 25 years, BLM use is less than one percent of state use. Therefore, the BLM queried three years of statewide Oregon Department of Agriculture pesticide incident reports and found relatively minor incidents at the rate of 3 or 4 a year, mostly home users drifting it onto neighbor's plants. BLM uses SOPs and PEIS Mitigation Measures, certification, training, good equipment, and other standards to reduce the likelihood of incidents.

The Final EIS analysis and associated 2006 2,4-D Risk Assessment shows moderate risk to workers and the public under two accidental exposure scenarios (Attachment 3, EIS Tables 3-18 and 19). It is responsible for about 67 percent of the treatment acres posing a *moderate or high* risks to workers and public resulting from the proposed action, not counting spill scenarios (Table 4-36). The persistent soil-applied bromacil, diuron, and tebuthiuron herbicides are the only ones higher. (Attachment 2 contains the 2,4-D-related human health and safety excerpts from the Final EIS.)

The Risk Assessment Executive Summary recommends 2,4-D be used only as a last resort. The Forest Service decided not to include 2,4-D in their 2005 selected alternative for invasive plant control in Oregon and Washington, at least at the programmatic scale (see Attachment 4 for further discussion).

The Northwest Coalition for Alternatives to Pesticides (NCAP) has petitioned the EPA to drop 2,4-D registration and all food and water tolerances (see *Non-BLM Actions Potentially Affecting the Use of Herbicides on BLM Lands in Oregon* near the end of Chapter 1). EPA initiated a public comment period on the petition, and the Industry Task Forest II on 2,4-D Research Data submitted illustrative comments (project record; available upon request). The Industry Task Force is made up of several herbicide manufacturers for the purpose of funding (not directing) any registration research requested by the EPA or the Canadian Pest Management Regulatory Agency.

Environmental Effects

The risk table ratings for wildlife, fish, and aquatic species are included in Attachment 5, along with the 2,4-D discussion extracted from each of the various resource sections in the EIS. 2,4-D poses some of the higher risk scenarios in the EIS but that is relative, and the analysis indicates Standard Operating Procedures and PEIS Mitigation Measures (like buffers, wind limitations, etc.) would virtually negate adverse effects, at least at the community and population level.

2,4-D is bound tightly to organic matter, and breaks down quickly in wildland settings. It has a half-life of 10 days; the shortest of the 18 herbicides addressed in the EIS. It is one of the herbicides found in the Columbia River, and can be moderately toxic to fish. All resource sections including *Water Quality* indicated that slowing noxious weed spread would more than make up for any risks from the proposed herbicide use.

2,4-D is important enough to noxious weed control that if it is dropped, the estimated weed spread-rate projections for the alternatives would need to be increased. Alts 3, and 4 are projected to reduce the spread of noxious weeds on BLM from the current 12% annually to 7% and 6% respectively. Not having 2,4-D would raise those rates at least to 8% and 7%. This would be consistent with the Forest Service 2005 analysis.

DEIS Public Comments

The BLM received 1050 public comment letters on the Vegetation Treatments Using Herbicides on BLM Lands in Oregon DEIS, with 821 of these specifically mentioning 2,4-D

From the letters mentioning 2,4-D, 18 unique substantive comments statements were created. These and their responses are in Appendix 10, numbers 19-22, 24, 35, 37, 38, 52, 75, 116-117, 191, 271-274, and 298. The Proposed Action would reduce the use of 2,4-D about 50 percent when compared to the No Action Alternative.

Attachment 1 - 2,4-D Vegetation Control

(Source: Table A9-2)

Common Name	2,4-D	Clopyralid	Dicamba	Fluridone	Glyphosate	Hexazinone	Imazapic	Imazapyr	Metsulfuron	Picloram	Sulfometuron	Triclopyr	Chlorsulfuron	Diflufenzopyr+	Diquat	Diuron	Tebuthiuron	Bromacil
Vegetation that can only be controlled with 2,4-D																		
Creeping buttercup	√																	
European Water chestnut	√																	
Western water hemlock	√																	
Vegetation that can only be controlled with 2,4-D under Alts 2-4																		
Parrot’s feather	√														√			
Vegetation that is especially well controlled with 2,4-D and another herbicide																		
Burdock, common	√[2]	√[3]	√[2]		√					√[2]		√[3]						
Knapweed, Diffuse	√[2]									√[2]		√						
Thistle, Bull	√[2]	√	√[2,3]						√			√	√	√[3]				
Thistle, Musk	√[2]	√			√[2]					√		√		√[3]				
Vegetation that is especially well controlled with 2,4-D, and not with any other herbicide																		
Kochia	√[2]		√				√		√									
Vegetation where 2,4-D is one of many tools that can be used for control																		
Babysbreath	√		√															
Big sagebrush	√	√						√									√	
Bur buttercup	√		√		√			√			√							
Chicory	√	√	√[2]		√					√[2]								
Cocklebur, spiny	√	√	√		√													√
Common bugloss	√						√		√	√			√					
Dyers woad	√		√						√				√					
European centaury	√		√															
Field bindweed	√		√						√									
Field mustard	√										√		√					
Field sowthistle	√	√								√								
Garden cornflower or bachelor buttons	√	√			√		√			√		√		√[3]				
Garden vetch	√	√			√							√						
Goatsrue	√	√	√															
Halogeton	√						√		√								√	
Hawkweed, common	√	√	√							√		√						
Hawkweed, Yellow	√	√	√							√		√						
Horehound	√											√				√[3]		√[3]
Hounds-tongue	√								√	√[2]			√					
Knapweed, Meadow	√	√			√		√			√[2]		√		√[3]				

Common Name	2,4-D	Clopyralid	Dicamba	Fluridone	Glyphosate	Hexazinone	Imazapic	Imazapyr	Metsulfuron	Picloram	Sulfometuron	Triclopyr	Chlorsulfuron	Diflufenzopyr+	Diquat	Diuron	Tebuthiuron	Bromacil
Knapweed, spotted	√	√								√[2]								
Madrone	√				√			√		√								
Mediterranean sage	√	√								√								
narrowleaf plantain	√		√		√													
Oblong spurge	√		√		√		√			√			√					
Paterson's curse	√						√		√	√			√					
Paterson's curse	√						√		√	√			√					
Poison hemlock	√		√		√				√	√								
Policemans helmet	√				√							√						
Prickly sowthistle	√	√								√								
Puncturevine	√									√			√					
Purple foxglove	√		√				√			√			√					
Rabbitbrush	√							√		√								
Rush skeletonweed	√	√	√							√[2]								
Spurge, Myrtle	√		√				√			√			√					
St. Johnswort	√								√	√								
Sulfur cinquefoil	√		√[2]		√				√	√[2]								
Swainsonpea	√	√																
sweet fennel	√									√								
Syrian bean-caper	√						√						√			√[3]		√[3]
Tansy ragwort	√		√						√	√		√						
Teasel, common	√	√	√[3]				√		√			√	√	√[3]				
Thistle, Italian	√	√	√							√								
Thistle, Milk	√	√	√[3]		√				√			√	√	√[3]				
Thistle, Plumeless	√	√	√[3]		√[2]				√	√		√	√	√[3]				
Thistle, Russian	√						√		√									
Thistle, Slender flowered	√	√	√							√								
Thistle, Taurian or bull cottonthistle	√	√	√															
Thistle, wavyleaf	√	√	√[3]		√				√			√	√	√[3]				
Toadflax, Dalmation	√		√							√			√					
Tumbleweed or Prickly Russian thistle	√		√		√		√		√	√								
Velvetleaf	√				√[2]					√								
Whitetop, (Hoary cress)	√		√		√		√	√	√				√					
whitetop, Lens-podded	√						√	√	√				√					
Whitetop, Hairy	√						√	√	√				√					

Common Name	2,4-D	Clopyralid	Dicamba	Fluridone	Glyphosate	Hexazinone	Imazapic	Imazapyr	Metsulfuron	Picloram	Sulfometuron	Triclopyr	Chlorsulfuron	Diflufenzopyr+	Diquat	Diuron	Tebuthiuron	Bromacil
Willow	√	√						√	√	√		√						
Yellow Flag Iris	√				√		√	√	√									
Yellow glandweed	√		√				√			√			√					
Vegetation where 2,4-D would be used as part of a tank mix																		
Blackberry, Evergreen	√[3]				√				√	√		√						
Blackberry, Himalayan	√[3]				√			√	√	√		√						
Broom, French	√[3]	√			√			√		√[3]		√						
Broom, Portugese	√[3]	√			√			√		√[3]		√						
Broom, Scotch	√[3]	√			√			√		√[3]		√						
Broom, Spanish	√[3]	√			√			√		√[3]		√						
Common cruprina	√[3]	√	√[3]							√		√						
Gorse	√[3]		√		√				√	√[3]		√						
Hawkweed, King-devil	√[3]	√	√[3]							√		√[3]						
Hawkweed, Meadow	√[3]	√	√[3]							√		√						
Hawkweed, Mouse-eared	√[3]	√	√[3]							√		√[3]						
Hawkweed, Orange	√[3]	√	√[3]							√		√						
Hawkweed, Yellow	√[3]	√	√[3]							√		√						
Mutiflora rose	√[3]				√					√[3]		√						
Poison ivy	√[3]				√			√				√[3]						
Poison Oak	√[3]				√			√		√		√[3]						
Ragweed	√[3]	√			√			√										
Skeletonleaf bursage	√[3]	√[3]			√													
Spanish heath	√[3]									√[3]		√						
Starthistle, Iberian	√[3]	√[3]	√							√		√						
Starthistle, Purple	√[3]	√[3]	√							√[3]		√						
Thistle, Scotch	√[3]	√	√[3]						√	√		√	√					
Tree-of-heaven	√[3]		√[3]		√			√	√	√		√						
White Bryonia	√[3]		√		√					√		√[3]						

[2] Excellent control, recommended from multiple sources.
[3] Used in combination with another herbicide (tank mix)

Based on the experience of District Weed Specialists and various references, primarily the Pacific Northwest Weed Management Handbook (Oregon State University 2008 and 2009), the Weed Control Methods Handbook (Tu et al. 2001), DiTomaso, Joseph M., Evelyn A.Healy. Weeds of California and other Western States (DiTomaso et al. 2007), Biology and Management of Noxious Rangeland Weeds (Shelly and Petroff 1999), The Nature Conservancy Element Stewardship Abstracts (http://www.imapinvasives.org/GIST/ESA/index.html updated 2009)

Attachment 2 - Worker and Public Health

Selected Citations from the Final EIS

Risk Assessment (Final EIS Appendix 8) – Risk ratings used in the Final EIS are based on a Forest Service Risk Assessment completed in 2006 (new since the PEIS, see Appendix 8). The Overview in the *Executive Summary* of the 2,4-D Risk Assessment includes the following:

> Potential exposures to 2,4-D are developed based on the anticipated use patterns and a number of relatively standard exposure scenarios used in most Forest Service risk assessments. Estimates of risk are presented in terms of a hazard quotient. A hazard quotient is simply the quotient of an estimate of exposure divided by the appropriate toxicity value. Concern for the development of adverse effects increases as the value of the as hazard quotient increases. For 2,4-D, substantial concern is evident for workers, members of the general public, as well as several groups of organisms covered in the ecological risk assessment.
>
> For many pesticides, including 2,4-D, accidental exposure scenarios, some of which are extremely conservative and perhaps implausible, lead to risk quotients that exceed the level of concern. 2,4-D is, however, somewhat atypical because many non-accidental exposure scenarios – i.e., exposures that are plausible under normal conditions of use – also exceed the level of concern and often by a very substantial margin.
>
> Unless steps are taken to mitigate risks, workers involved in the application of 2,4-D and members of the general public who consume vegetation contaminated with 2,4-D could be exposed to 2,4-D levels greater than those which are generally regarded as acceptable. In some cases, the exceedances are substantial. Similarly, adverse effects in the normal use of 2,4-D salts or esters could occur in groups of non-target organisms including terrestrial and aquatic plants, mammals, and possibly birds. Adverse effects on aquatic animals are not likely with formulations of 2,4-D salts except for accidental and extreme exposures at the upper ranges of application rates. The ester formulations of 2,4-D are much more toxic to aquatic animals and adverse effects are plausible in sensitive species and sometimes in relatively tolerant species. The results of this risk assessment suggest that consideration should be given to alternate herbicides and that the use of 2,4-D should be limited to situations where other herbicides are ineffective or to situations in which the risks posed by 2,4-D can be mitigated. *[There is a potential mitigation measure to that effect in Chapter 2.]*

The Risk Assessment also suggests that reduced application rates in tank mixes do not necessarily reduce, and in fact may increase, the potential for human health risks. Risk Assessment section 3.1.1 says:

> "Based on recent studies published in the open literature, 2,4-D is toxic to the immune system and developing immune system, especially when used in combination with other herbicides. The mechanism of action of 2,4-D toxicity is disruption of the cell membrane and cellular metabolic processes. The molecular basis for 2,4-D toxicity to human lymphocytes and nerve tissue is likely the induction of programmed cellular death known as apoptosis" (p. 3-2).

The Risk Assessment later expands on this risk saying:

> "That 2,4-D can induce programmed cell death (apoptosis), as discussed in section 3.1.2, suggests a potential for additive, synergistic, or inhibitory effects on other apoptic agents, depending upon the nature of the agent and it's mechanism for induction of the apoptic cascade of events. As discussed in Section

> 3.1.2 (Mechanism of Action) 2,4-D disrupts the cell at a fundamental level; therefore, interactions are likely to occur between 2,4-D and any of the many other chemicals that affect cell membranes and cell metabolism" (p. 3-48).

In 2003, the Forest Practices Branch, British Columbia Ministry of Forests published *Toxicology and Potential Health Risk of Chemicals that May Be Encountered by Workers Using Forest Vegetation Management Options, Part III: Risk to Workers Using 2,4-D Formulations* (Author Frank N. Dost), from which the Abstract reads:

> 2,4-D is possibly the most extensively researched of all pesticides, and the data have been examined by an unusual number of advisory committees and work groups.
>
> 2,4-D is slowly absorbed from the skin, and is rapidly excreted unchanged by the kidneys. It is not stored in the body. Mutagenic activity of 2,4-D is negligible or absent, nor is there evidence of carcinogenicity in animal assays. It does not cause significant reproductive effects except at doses high enough to cause general intoxication. Its ability to cause birth defects is very limited.
>
> The large number of epidemiology studies seeking evidence of a relation between phenoxy herbicides and human cancer has been inconsistent and conflicting. Review panels, including that convened by United States Environmental Protection Agency (USEPA) in April 1993 have consistently concluded that the evidence is at best weakly suggestive and does not warrant change in regulatory policy.
>
> A number of cases of human intoxication from either careless handling or suicide attempts have been reported in the medical literature, almost all in the fifties and sixties. The pattern of effects has been inconsistent but a few individuals have experienced neurologic problems in the extremities.
>
> There is extensive data on exposure of forest workers to 2,4-D, showing that careless work habits increase exposure. The primary concern is skin and eye irritation from certain formulations. Simple protective clothing and work discipline reduce exposure to very low levels.

2,4-D excerpts from the *Human Health and Safety* section of the Final EIS include:

> *2,4-D*: PEIS Mitigation Measures (Appendix 2) limit the use of 2,4-D to typical application rates, where feasible. At the typical and maximum application rates, workers involved in backpack spray, boom spray, and aerial application face low to moderate risk from 2,4-D exposure. Workers also face moderate risk from wearing contaminated gloves for 1 hour and no risk from exposure to a spill on lower legs for one hour or from exposure to spill on the hands for one hour. Based on upper bound hazard quotients that exceed 1, adverse health outcomes are possible for workers exposed repeatedly over a longer period. The public faces zero risk from most modeled scenarios at the typical and maximum application rates. Consumption of contaminated vegetation (fruit) over a period of several months would have a low risk to the public and a moderate risk to subsistence populations. Other chronic exposures to the public have no risk.
>
> Based on recent studies reviewed by SERA, 2,4-D is toxic to the immune system and developing immune system, especially when used in combination with other herbicides (tank mixes). The mechanism of action of 2,4-D toxicity is cell membrane disruption and cellular metabolic processes. 2,4-D toxicity affects human lymphocytes and nerve tissue. Therefore, interactions are likely to occur when 2,4-D is mixed with other chemicals that affect cell membranes and cell metabolism (SERA 2006).
>
> SERA (2006) suggests that 2,4-D may cause endocrine disruption in male workers applying large amounts of this herbicide; however, the study was inconclusive. Based on currently available toxicity information that demonstrate effects on the thyroid and gonads following exposure to 2,4-D, there are

some data supporting its endocrine disruption potential and EPA is studying this further (EPA 2005a). In the Human Health Risk Assessment conducted to support the reregistration of 2,4-D (EPA 2004), the EPA concluded that there is not sufficient evidence that 2,4-D is an endocrine disrupting chemical.

Human Health Risks by Application Method

Ground applications … spot rather than boom/broadcast applications are less likely to result in health risks to people downwind. However, these spot applications could present an increased risk [compared to aerial application] to the workers charged with applying the herbicide because they are more likely to come into contact with the herbicide (their exposure doses is higher). In particular, workers applying … 2,4-D by backpack and horseback would be at low to moderate risk for health risks from exposure to the herbicide. Ground boom spray applicators of 2,4-D would have low to moderate risk...

Typical Application Rate

PEIS Mitigation Measures limit the use of [2,4-D] to the typical application rate, where feasible. 2,4-D applications at the typical application rate would pose a low to moderate risk to plane and helicopter pilots and mixer/loaders, backpack applicator/mixer/loaders, horseback applicators and applicator /mixer / loaders, and consumers of contaminated fruit/vegetation.

Accidental Direct Spray and Spill Scenarios

Accidental direct spray and spill scenarios for many herbicides pose a risk to workers and the public (accidental scenarios for diflufenzopyr, imazapic, and sulfometuron methyl were not evaluated because these herbicides are not considered toxic through short-term dermal exposure). These scenarios are unlikely, and can be minimized by following Standard Operating Procedures. However, these scenarios are included on Table 4-36, Estimated Annual Acres of Treatments with Risk to Human Health.

Human Health Risks

Worker: 2,4-D, …. pose risks to workers when applied at both typical and maximum application rates. For 2,4-D, … people working with aerial applications would be at low to moderate risk for applications at the typical application rate, and most workers would be at risk when applying these herbicides at maximum application rates. 2,4-D, also poses risks to ground applicators, particularly during applications at the maximum application rate.

Public: In general, there are lower risks to the public than occupational workers. However, within this category, there is higher risk to children than adults. 2,4-D….pose[s] a risk to the public under one or more maximum application rate accidental exposure scenarios (e.g., exposure resulting from the spill of an herbicide into a small pond). [R]isk to the public can be minimized or avoided by using the typical application rate, including other proposed mitigation measures, and following Standard Operating Procedures that greatly reduce the likelihood of accidents.

Summary of Highest Human Health Risks

… 2,4-D has possible endocrine disruption abilities in workers applying large amounts of 2,4-D and poses moderate risks to workers performing ground-based boom spraying at maximum rates and under some accidental exposure scenarios.

Attachment 3 – Forest Service Risk Tables

FS-Evaluated Herbicide Risk Categories for Workers (Source: Table 3-18)

Treatment Method	Risk Categories 2,4-D[1]	
	Typ[2]	Max[4]
General Exposures		
Directed foliar and spot treatments (backpack)	L[3]	M
Broadcast ground spray (boom spray)	L	M
Aerial applications (pilots and mixer/loaders)	L	M
Accidental/Incidental Exposures		
Immersion of hands	0	0
Wearing contaminated gloves	M	M
Spill on hands	0	0
Spill on lower legs	0	0

[1] Where different formulations exist, risks reported are the most conservative.

[2] Typ = Typical application rate; and Max = Maximum application rate.

[3] Risk categories: 0 = No risk (majority of HQs < 1); L = Low risk (majority of HQs >1 but < 10); M = Moderate risk (majority of HQs > 10 but < 100); H = High risk (majority of HQs > 100); and NE = Not evaluated. Risk categories are based on typical and upper HQ estimates. To determine risk for lower or central HQ estimates, see the individual herbicide risk assessments (SERA 2005b). Risk categories are based on comparison to the HQ of 1 for typical and maximum application rates.

[4] The 2,4-D Risk Assessment used a maximum rate of 4 lbs/acre. However, at the National level, BLM is limited to 1.9 lbs/acre. PEIS Mitigation Measures limit 2,4-D to typical application rates where feasible.

FS-Evaluated Herbicide Risk Categories for the Public (Source: Table 3-19)

Treatment Method	Hazard Quotient 2,4-D[1]	
	Typ[2]	Max[4]
Acute/Accidental Exposures		
Direct spray - child, entire body	0[3]	L
Direct spray - woman, lower legs	0	0
Dermal - contaminated vegetation, woman	0	0
Consumption of contaminated fruit	0	L
Consumption of contaminated water - pond, spill	M	M
Consumption of contaminated water - stream, ambient	0	0
Consumption of contaminated fish - general public	0	L
Consumption of contaminated fish - subsistence populations	L	L
Chronic/Longer-term Exposures		
Consumption of contaminated fruit	0	L
Consumption of contaminated water	0	0
Consumption of contaminated fish - general public	0	0
Consumption of contaminated fish - subsistence populations	0	0

Attachment 4 – 2005 Forest Service Decision

2,4-D was included in the Forest Service's proposed action in 2005. They de-selected it six months later in their Record of Decision. Their EIS analysis indicates its loss compromises their weed control ability and projections.

Record of Decision-stated reasons for de-selection of 2,4-D were fairly brief: At the regional scale, there were no invasive plants identified that could not be treated with another of their selected herbicides. (They specifically left the door open for site-specific proposals however.) Also 2,4-D (and dicamba) were inherently more risky than the ten herbicides approved for use – being in higher risk categories for humans, large mammals, and birds (FS ROD:25). Finally, the FS analysis indicated 2,4-D and dicamba gave no advantage in terms of avoiding herbicide resistance.

The decision recognized that higher prices for replacement herbicides would reduce acres treated in the neighborhood of 25 percent. (The BLM cannot link this rationale to this EIS. Early in the EIS process, the BLM did a cost per acre comparison of the 18 herbicides in this EIS and decided the herbicide costs were close enough on a per acre basis that there was no reason to track them separately in the EIS cost analysis.)

Effects to cooperators are not mentioned in the Forest Service's Record of Decision. The Forest Service objective is to totally remove invasive weeds, so the decision officially just slows accomplishment of that because it increases cost. Effects to adjacent landowners are not discussed in the Record of Decision, nor would they be the same issue as they are on BLM lands. It may be that BLM lands are crossed by more permitted road and utility rights-of-way, and there are more checkerboard ownership and other adjacent private lands. These would imply that weed and vegetation control by cooperators is more applicable to the BLM than to the Forest Service.

Short-Term Implications for National Forests and, Potentially, the BLM

The Forest Service 2,4-D decision means National Forests have been reduced to (variously) three herbicides since 2005, until they can complete and implement their step-down Forest NEPA documents.

BLM units have expressed a concern that a similar thing could happen to the BLM; if the BLM Record of Decision chooses to drop 2,4-D in favor of other herbicides, and then part of the decision is enjoined, districts could be reduced to three herbicides indefinitely.

Attachment 5 - Environmental Effects

Selected Citations from the Final EIS

Risk Ratings for Wildlife, Fish, and Aquatic Species (Source: Table 3-15)

	2,4-D	
Application Scenario	**Typ[5]**	**Max[1]**
Acute/Accidental Exposures		
Direct spray, small mammal, 1st order absorption	0[6]	L
Direct spray, small animal, 100% absorption	L	M
Direct spray, bee, 100% absorption	L	L
Consumption of contaminated fruit, small mammal	L	L
Consumption of contaminated grass, large mammal	M	M
Consumption of contaminated grass, large bird	L	L
Consumption of contaminated water, small mammal, spill	L	L
Consumption of contaminated water, small mammal, stream	0	0
Consumption of contaminated insects, small mammal	M	H
Consumption of contaminated insects, small bird	L	M
Consumption of contaminated small mammal, predatory mammal	M	M
Consumption of contaminated small mammal, predatory bird	0	0
Consumption of contaminated fish, predatory bird, spill	0	0
Fish (susceptible species) – accidental spill	H	H
Fish (tolerant species) – accidental spill	M	M
Fish (susceptible species) – acute exposure, peak EEC	M	M
Fish (tolerant species) – acute exposure, peak EEC	0	0
Aquatic Invertebrates – accidental spill	L	M
Aquatic Invertebrates – acute exposure, peak EEC	0	0
Chronic Exposures		
Consumption of contaminated vegetation, small mammal, on- site	0	0
Consumption of contaminated vegetation, small mammal, off- site	0	0
Consumption of contaminated vegetation, large mammal, on- site	L	L
Consumption of contaminated vegetation, large mammal, off -site	0	0
Consumption of contaminated vegetation, large bird, on-site	0	0
Consumption of contaminated vegetation, large bird, off-site	0	0
Consumption of contaminated water, small mammal	0	0
Consumption of contaminated fish, predatory bird	0	0
Fish – chronic exposure	0	0
Aquatic invertebrates – chronic exposure	0	0

Shading denotes herbicides that are limited by PEIS Mitigation Measures to typical application rates where feasible.

[1] The 2,4-D Risk Assessment used a maximum rate of 4 lbs/acre. However, at the National level, BLM is limited to 1.9 lbs/acre.

[5] Typ = typical application rate; and Max = maximum application rate.

[6] Risk categories: 0 = No risk (HQ < LOC); L = Low risk (HQ = 1 to 10 x LOC); M = Moderate risk (HQ = 10 to 100 x LOC); H = High risk (HQ > 100 LOC); and NE = Not evaluated. Risk categories are based on upper estimates of hazard quotients and the BLM LOCs of 0.1 for acute scenarios and 1.0 for chronic scenarios. The reader should consult the text of this section of the individual Forest Service Risk Assessments to evaluate risks at central estimates of hazard quotients.

Fish susceptible species include coldwater fish, such as trout, salmon, and Federally Listed species. Fish tolerant species include warm water fish, such as fathead minnows.

2,4-D Summaries From Resource Effects Sections in Chapter 4, Final EIS

Native and Other Non-Invasive Vegetation - *2,4-D* (salts and esters) is a selective herbicide that kills broadleaf plants, but not grasses. It has a long history of use and is relatively inexpensive. Direct spraying of non-target plant species is the highest potential for damage due to 2,4-D application. Drift could damage non-target species close to the application site (much less than 100 feet) although some species such as grapes are more susceptible. One study determined that 2,4-D could affect three species of ectomycorrhizal fungi in laboratory experiments (Estok et al. 1989).

Soils - *2,4-D* has a very short half-life that averages 10 days in moist soil. Its fate is dependent on soil acidity or alkalinity (pH). A soil pH of 7.0 is neutral. Acid soils measure between 1 and 7 on the pH scale whereas alkaline soils measure between 7 and 14. 2,4-D on a Spodosols would resist to degradation, but on a Mollisols, it would readily degrade in a warm and moist environment. 2,4-D is readily broken into simpler components in alkaline soils but the break-down is slower in acidic soils. Temperature affects degradation as well, with slower break-down in cold or dry soils or where microbial organisms are not present. Warm, moist soils previously treated with 2,4-D have been shown to dissipate the herbicide more rapidly due to the presence of bacteria that degrade it (Oh and Tuovinen 1991, Smith and Aubin 1994, Shaw and Burns 1998, all cited in Tu et al. 2001). Furthermore, most studies of the effects of 2,4-D on microorganisms concluded that the quantity of 2,4-D reaching the soil from typical applications would probably not have a serious negative effect on most soil microorganisms (Bovey 2001).

Water Resources - *2,4-D*: Some salt forms of 2,4-D are registered for use in aquatic systems. 2,4-D is a known groundwater contaminant[1] although potential for leaching into groundwater is moderate by its being bound to organic matter and its short half-life. Concentrations of up to 61 mg/L have been reported immediately following direct application to water. Concentrations as low as 0.22 mg/L can damage susceptible plants (Que Hee and Sutherland 1981 cited in Tu et al. 2001).

In terrestrial applications, most formulations of 2,4-D do not bind tightly with soils, and therefore have a moderate potential to leach into the soil column and to move off site in surface or subsurface water flows (Johnson et al. 1995 cited in Tu et al. 2001). In a study on groundwater in small shallow aquifers in Canadian prairies, 2,4-D was detected in 7 percent of 27 samples (Wood and Anthony 1997).

[According to EPAs 2005 Reregistration Eligibility Decision document, the EPA Office of Water has established a Maximum Contaminant Level (MCL) of 0.07 ppm for 2,4-D in drinking water.]

Wetlands and Riparian Areas - *2,4-D*: The principle hazard is unintended spraying or drift to non-target plants; spot treatments applied according to the labeled rate do not substantially affect native aquatic vegetation or significantly change species' diversity (USDA 2005a, WA Dept of Ecology c). Kuhlmann et al. (1995) found no biodegradation of 2,4-D under anaerobic (sulfate reducing) conditions in a laboratory experiment of sediments and groundwater. In aerobic riparian soils that have a high content of organic material, an active microbial community, high pH values, and high temperatures, toxic effects are limited because of rapid degradation of 2,4-D. 2,4-D may inhibit shoot and/or root growth of macrophytes in aquatic systems (Roshon et al. 1999).

Fish - *2,4-D* has formulations that are registered for use on aquatic vegetation, including water hyacinth and Eurasian watermilfoil, and as a tank mix partner to control purple loosestrife. The toxicity of 2,4-D to fish is relatively low (Norris et al. 1991). Risk is greater under scenarios of direct application to water bodies or

1 Has been detected in groundwater. Does not necessarily mean levels have exceeded any established health standard or allowance.

accidental direct spills. The ester forms of 2,4-D (including the BEEs found in Aqua-Kleen) are approximately 200 to 1,000 times more toxic to fish than the amine forms, when toxicity is measured by acute (24- to 48-hour) LC-50 values. While these esters are chemically stable, they are short-lived in natural water because of biological degradation. At the typical application rate, 2,4-D poses a low risk to fish, while at the maximum application rate, 2,4-D poses a moderate risk to fish under scenarios of accidental direct spray or spill to a stream and pond. Routine (non-spill) acute and chronic exposure scenarios do not pose a risk to fish.

Wildlife Resources - *2,4-D* is a possible endocrine disrupter (see *Endocrine Disrupters*) and is one of the more toxic herbicides for wildlife of the foliar-use herbicides considered in this EIS. The ester form is more toxic to wildlife than the salt form. Ingestion of treated vegetation is a concern for mammals, particularly since 2,4-D can increase palatability of treated plants (USDA 2006b) for up to a month following treatment (Farm Service Genetics 2008). Mammals are more susceptible to toxic effects from 2,4-D, and the sub-lethal effects to pregnant mammals were noted at acute rates below LD_{50}. Birds are less susceptible to 2,4-D than mammals, and the greatest risk is ingestion of contaminated insects or plants. The salt form is practically non-toxic to amphibians, but the ester form is highly toxic. It can be neurotoxic to amphibians; although not all amphibians respond the same (e.g., toads were more susceptible than leopard frogs). There is little information on reptile toxicity, although one study noted no sexual development abnormalities. It presents low risk to honeybees (Table 3-15), but little information is available for other terrestrial invertebrates. Parasitic wasps may be affected, which could result in changes to community structure by favoring damaging insects controlled by parasitic wasps.

Livestock and Wild Horses and Burros - *2,4-D* presents a low to moderate acute risk to livestock under several of the direct spray, ingestion, and spill scenarios, and a moderate chronic risk for large mammals for consumption of on-site contaminated vegetation under both typical and maximum rate (SERA 2006). The Risk Assessment suggests that because large livestock eating large quantities of grass and other vegetation are at risk from routine exposure to 2,4-D and because 2,4-D is considered for use in rangeland, it should not be applied over large application areas where livestock would only consume contaminated food. According to label directions for one formulation, dairy animals should be kept out of areas treated with 2,4-D for 7 days. Grass for hay should not be harvested for 30 days after treatment. Meat animals should be removed from treated areas 3 days prior to slaughter. Similar restrictions may be in place for other formulations.

Industry Task Force

The chairman of the Industry Task Force II on 2,4-D Research Data responded to our request for 2,4-D information from cooperators, taking issue with most of the negative effects (risks) described in the DEIS. He also said relabeling in 2007 removed all grazing restrictions except mowing hay. (The Industry Task Force is made up of several herbicide manufacturers for the purpose of funding (not directing) any registration research requested by the EPA or the Canadian Pest Management Regulatory Agency.) [The letter was coded and specific EIS citations were checked and corrected where appropriate.]

Appendix 13 - EPA Pesticide Registration and Reregistration and BLM/FS Risk Assessment Processes

This appendix contains an overview of the EPA pesticide registration process, reregistration eligibility decisions (REDs), and overviews of the BLM and Forest Service Ecological and Human Health Risk Assessments conducted to support effects analysis under the NEPA process. The information is provided to help clarify the parameters and intensity of safety analyses conducted for all herbicides before they can be used on federal lands.

This appendix also includes the *Uncertainty Analysis in Risk Assessments* from Appendix C in the PEIS.

Table of Contents

Data Requirements for EPA Pesticide Registration

The primary reference for this section is: Environmental Protection Agency. 2007. Data Requirements for EPA Pesticide Registration. Available at http://www.epa.gov/pesticides/regulating/data_requirements.htm. References cited in this section are internal to the above-referenced document.

In 2007, the Agency revised the data requirements that pertain to conventional pesticides. The following information is current as of October 26, 2007.

Before manufacturers can sell pesticides in the United States, EPA must evaluate the pesticides thoroughly to ensure that they meet federal safety standards to protect human health and the environment. EPA grants a "registration" or license that permits a pesticide's distribution, sale, and use only after the company meets the scientific and regulatory requirements. These data requirements apply to anyone or any company that registers pesticides under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) or seeks a tolerance or tolerance exemption for a pesticide under the Federal Food, Drug, and Cosmetic Act (FFDCA).

In evaluating a pesticide registration application, EPA assesses a wide variety of potential human health and environmental effects associated with use of the product. Potential registrants must generate scientific data necessary to address concerns pertaining to the identity, composition, potential adverse effects, and environmental fate of each pesticide. The data allow EPA to evaluate whether a pesticide has the potential to cause harmful effects on certain nontarget organisms and endangered species that include:

- Humans
- Wildlife
- Plants
- Surface water or ground water

EPA recommends the pesticide registrant provide data from tests conducted according to published EPA test guidelines.

Types of Studies Required

The following sections describe the reasons for each type of test and the kind of information EPA obtains from the results of each test.

Product Performance

Requirements to develop data on product performance provide a mechanism to ensure that pesticide products will control the pests listed on the label and that unnecessary pesticide exposure to the environment will not occur as a result of the use of ineffective products. Specific performance standards are used to validate the efficacy data in the public health areas, including disinfectants used to control microorganisms infectious to humans in any area of the inanimate environment and those pesticides used to control vertebrates (such as rodents, birds, bats, and skunks) and invertebrates (ticks, mosquitoes, etc.) that may directly or indirectly transmit diseases to humans.

Data from Studies that Determine Hazard to Humans and Domestic Animals

Data required to assess hazards to humans and domestic animals are derived from a variety of acute, subchronic, and chronic toxicity tests, and tests to assess mutagenicity and pesticide metabolism.

Acute Studies

Determination of acute oral, dermal, and inhalation toxicity is usually the initial step in the assessment and evaluation of the toxic characteristics of a pesticide. These data provide information on health hazards likely to arise soon after, and as a result of, short-term exposure. Data from acute studies serve as a basis for classification and precautionary labeling. For example, acute toxicity data are used to calculate farm worker reentry intervals and to develop precautionary label statements pertaining to protective clothing requirements for applicators. They also:

- provide information used in establishing the appropriate dose levels in subchronic and other studies;
- provide initial information on the mode of toxic action(s) of a substance;
- determine the need for child-resistant packaging; and
- determine the need to restrict use of the pesticide to trained applicators or in other ways to minimize human and environmental hazards.

Information derived from primary eye and primary dermal irritation studies serves to identify possible hazards from exposure of the eyes, associated mucous membranes, and skin.

Subchronic Studies

Subchronic tests provide information on health hazards that may arise from repeated exposures over a limited period of time. They provide information on target organs and accumulation potential. The resulting data are also useful in selecting dose levels for chronic studies and for establishing safety criteria for human exposure. These tests are not capable of detecting those effects that have a long latency period for expression (e.g., carcinogenicity).

Chronic Studies

Chronic toxicity (usually conducted by feeding the test substance to the test species) studies are intended to determine the effects of a substance in a mammalian species following prolonged and repeated exposure. Under the conditions of this test, effects that have a long latency period or are cumulative should be detected. The purpose of long-term carcinogenicity studies is to observe test animals over most of their life span for the development of neoplastic lesions during or after exposure to various doses of a test substance by an appropriate route of administration.

Data from Studies that Determine Hazard to Non-target Organisms

The information required to assess hazards to nontarget organisms are derived from tests to determine pesticidal effects on birds, mammals, fish, terrestrial and aquatic invertebrates, and plants. These tests include short-term acute, subacute, reproduction, simulated field, and full field studies arranged in a hierarchical or tier system that progresses from the basic laboratory tests to the applied field tests. The results of each tier of tests must be evaluated to determine the potential of the pesticide to cause harmful effects and to determine whether further testing is required. A purpose common to all data requirements is to help determine the need for (and appropriate wording for) precautionary label statements to minimize the potential harm to nontarget organisms.

Acute and Subacute Studies

The short-term acute and subacute laboratory studies provide basic toxicity information that serves as a starting point for the hazard assessment. These data are used to:

- establish acute toxicity levels of the active ingredient to the test organisms;
- compare toxicity information with measured or estimated pesticide residues in the environment in order to assess potential effects on fish, wildlife, plants, and other nontarget organisms; and
- indicate whether further laboratory and/or field studies are needed.

Chronic and Field Studies

Additional studies (i.e., avian, fish, and invertebrate reproduction; life cycle studies; and plant field studies) may be required when basic data and environmental conditions suggest possible problems. Data from these studies are used to:

- estimate the potential for chronic effects, taking into account the measured or estimated residues in the environment; and
- determine if additional field or laboratory data are necessary to further evaluate hazards.

Simulated field and/or field data are used to examine acute and chronic adverse effects on captive or monitored fish and wildlife populations under natural or near-natural environments. Such studies are required only when predictions as to possible adverse effects in less extensive studies cannot be made, or when the potential for harmful effects is high.

Post-Application Exposure Studies

Data required to assess hazard to farm employees resulting from reentry into areas treated with pesticides are derived from studies on toxicity, residue dissipation, and human exposure. Monitoring data generated during exposure studies are used to determine how much pesticide people may be exposed to after application and to establish how long workers must wait before reentering a treated area.

Applicator/User Exposure Studies

EPA requires applicator/user exposure data for all pesticides to evaluate the potential risks to people applying the pesticide, i.e., those who may be exposed to higher concentrations of the pesticide through handling, including mixing or applying.

Pesticide Spray Drift Evaluation

Data required to evaluate pesticide spray drift are derived from studies on the range of droplet sizes and spray drift field evaluations. These data contribute to development of the overall exposure estimate. Along with data on toxicity for humans, fish, and wildlife, or plants, data on spray drift are used to assess the potential exposure of these organisms to pesticides. A purpose common to all these tests is to provide data to help determine the need (and appropriate wording) for precautionary labeling to minimize the potential harm to nontarget organisms.

Environmental Fate

EPA uses the data generated by environmental fate studies to:

- assess the presence of widely distributed and persistent pesticides in the environment that may result in loss of usable land, surface water, ground water, and wildlife resources;
- assess the potential environmental exposure of other nontarget organisms, such as fish, wildlife, and plants, to pesticides; and
- help estimate expected environmental concentrations of pesticides in specific habitats where threatened or endangered species or other wildlife populations at risk are found.

Residue Chemistry

EPA uses residue chemistry data to estimate the exposure of the general population to pesticide residues in food and for setting and enforcing tolerances for pesticide residues in food or feed. The Agency can estimate the amount and nature of residues likely to be present in food or animal feed because of a proposed pesticide usage by evaluating information on:

- the chemical identity and composition of the pesticide product;
- the amounts, frequency, and time of pesticide application; and
- test results on the amount of residues remaining on or in the treated food or feed.

EPA Reregistration Eligibility Decision (RED) Documents

The primary reference for this section is: Environmental Protection Agency. 2008. Pesticide Reregistration Facts. Available at http://www.epa.gov/pesticides/reregistration/reregistration_facts.htm. References cited in this section are internal to the above-referenced document.

The 1988 amendments to the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) authorized EPA to conduct a comprehensive pesticide reregistration program - a complete review of the human health and environmental effects of pesticides first registered before November 1, 1984, to make decisions about these pesticides' future use. The goal of the reregistration program is to mitigate risks associated with the use of older pesticides while preserving their benefits. Pesticides that meet today's scientific and regulatory standards may be declared "eligible" for reregistration. The results of EPA's reviews are summarized in Reregistration Eligibility Decision (RED) documents.

Risk Reduction through REDs

The reregistration program is bringing about improvements in pesticide safety. Most REDs include at least some of the following risk reduction requirements:

- Voluntary cancellation;
- Some uses not eligible or not yet eligible;
- Limit amount, frequency or timing of applications;
- Other application restrictions;
- "Restricted Use Pesticide" classification;

- Personal Protective Equipment (PPE);
- Restricted Entry Intervals (REIs);
- User safety requirements and recommendations;
- Improved use directions and precautions;
- Special or tamper-resistant packaging;
- Engineering or production controls;
- Ground or surface water safeguards;
- Spray drift labeling;
- Ecological safeguards;
- Special programs to better protect young children.

Product Reregistration

After EPA has issued a RED and declared a pesticide eligible for reregistration, individual end-use products that contain the pesticide active ingredient still must be reregistered. Through this concluding part of the process, known as "product reregistration," the Agency makes sure that the risk reduction measures called for in REDs are reflected on individual pesticide product labels. In some cases, the Agency uses Memoranda of Agreement or other measures to include risk reduction measures on pesticide labels sooner, before product reregistration is completed. EPA plans to complete the last product reregistration decisions by 2014, several years after the last REDs are signed.

Registration Review

Even before the reregistration program was completed, EPA began implementing registration review starting in early 2007. This new program ensures that, as the ability to assess risk evolves and as policies and practices change, all registered pesticides will continue to meet the statutory standard of no unreasonable adverse effects.

BLM Ecological Risk Assessments

The primary reference for this section is: ENSR. 2004. Vegetation Treatments Programmatic EIS Ecological Risk Assessment Protocol. Pages 2-1 & 2-2. Prepared for the BLM. Westford Massachusetts. Available at http://www.blm.gov/or/plans/vegtreatmentseis/riskassessments/. References cited in this section are internal to the above-referenced document.

For the PEIS, ecological risk assessments (ERAs) were produced for ten herbicides: bromacil, chlorsulfuron, dicamba, diflufenzopyr, diquat, diuron, fluridone, imazapic, sulfometuron methyl, and tebuthiuron (see Appendix 8). The ERAs for each of the herbicides were produced as separate documents. While the risk assessments have been tailored to address the potential usage of each particular herbicide, they follow the same essential format and methodology, which is described below. Each ERA includes the following sections:

- Introduction – covers general concepts and document overview.
- BLM Herbicide Program Description – describes BLM-specific uses of the product, statistics of use to date, and incident reports compiled by the USEPA.
- Herbicide Toxicology, Environmental Fate, and Physical-Chemical Properties – discusses the review of toxicity literature and its results, environmental fate of the herbicide, and specific physical-chemical properties used in the ERA.

- Ecological Risk Assessment – evaluates potential risk to ecological receptors resulting from exposure to the herbicide in a number of different scenarios (discussed in more detail in this section).
- Sensitivity Analysis – discusses the sensitivity of predicted exposure concentrations to variation in environmental processes and the models used to represent them. This analysis is provided in order to verify that most predicted concentrations are overestimates, and to identify situations where the general assumptions of the models might be relaxed or should be made more stringent.
- Rare, Threatened, and Endangered (RTE) Species – discusses potential direct and indirect impacts to RTE species, including consideration of taxa for which ecotoxicological data are not available.
- Uncertainty in the Ecological Risk Assessment – describes data gaps, assumptions, and uncertainties of the risk assessment.
- Summary – summarizes the overall implications of the risk assessment.
- References – presents references considered in the document.

The following appendices are also included in each ERA:

- Summary of Available and Relevant Toxicity Data/Ecological Risk Assessment Literature Review
- Ecological Risk Assessment Worksheets
- Species Listed Under the Endangered Species Act for 17 BLM States
- Review of Confidential Business Information Memo
- Summary of Tank Mix Risk Quotients

Transport via surface runoff and wind-blown dust, and the resulting exposure concentrations, are not included in the ERAs for the aquatic herbicides (diquat and fluridone). Therefore, exposure scenarios and appendices relating to GLEAMS and CALPUFF are not included in the risk assessment documents for these herbicides.
The overall goal of the ERAs is to facilitate risk management decisions for the PEIS and support development of the Biological Assessment (BA) for the PEIS. An additional goal of this process is to provide risk managers with a tool that presents a range of generic risk estimates that vary as a function of site conditions. The tool to accomplish this primarily consists of the Excel spreadsheets (presented in the ERA Worksheets) that may be used to calculate exposure concentrations and evaluate potential risks provided in the risk assessment. For further site-specific evaluation of a particular herbicide, BLM land managers can modify specific variables in the worksheets.

The general approach and analytical methods for conducting the ERAs were based on U.S. Environmental Protection Agency's (USEPA) *Guidelines for Ecological Risk Assessment* (hereafter referred to as the "Guidelines" [USEPA 1998]). The ERA is a structured evaluation of all currently available scientific data (exposure chemistry, fate and transport, toxicity, etc.) that leads to quantitative estimates of risk from environmental stressors to non-human organisms and ecosystems. The current Guidelines for conducting ERAs include three primary phases: problem formulation, analysis, and risk characterization.

BLM Human Health Risk Assessments (HHRA)

The primary reference for this section is: ENSR. 2004. Vegetation Treatments Programmatic EIS Human Health Risk Assessment Protocol. Pages ES1-ES3. Prepared for the BLM. Westford Massachusetts. Available at http://www.blm.gov/style/medialib/blm/wo/Planning_and_Renewable_Resources/veis.Par.82009.File.dat/Risk%20Assessment%20(November%202005).pdf. References cited in this section are internal to the above-referenced document.

For the PEIS, the BLM convened an inter-agency work group from May through October of 2002 to reach consensus on updated risk assessment methods to ensure that the risk assessment methodology is scientifically defensible, is consistent with currently available guidance where appropriate, and meets the needs of the BLM vegetation treatment program.

For the HHRA methods discussion, the inter-agency work group consisted of representatives from the BLM, USEPA, and ENSR International, the contractor who prepared the HHRA for the BLM. The resultant HHRA complies with USEPA guidance for conducting risk assessments for pesticides including, but not limited to, the following documents:

- The Role of Use-related Information in Pesticide Risk Assessment and Risk Management (USEPA 2000a)
- Guidance for Performing Aggregate Exposure and Risk Assessments (USEPA 1999a)
- Exposure Factors Handbook (EFH; USEPA 1997a)

In 1983, the National Research Council of the National Academy of Sciences (NAS 1983) recommended a basic approach for risk assessments that are conducted by or for groups within the federal government. NAS (1983) recommended a four step process: hazard identification, exposure assessment, dose-response assessment, and risk characterization. For risks to be quantified, a hazard must be identified, exposures must be quantitatively estimated, and a dose-response relationship must be expressed quantitatively. A description of the four st.

Hazard Identification

The Hazard Identification section provides information on the herbicide active ingredient (a.i.) characteristics and usage, and toxicity profiles. The toxicity profiles include information on acute, subchronic, and chronic toxicity studies, reproductive and developmental toxicity studies, results of cancer bioassays, mutagenesis, and metabolism. The USEPA's acute toxicity categories are I, II, III, and IV representing severe, moderate, slight, and very slight toxicity. The criteria considered are oral, inhalation, and dermal acute toxicity, eye irritation, skin irritation, and dermal sensitization. For most of the criteria, the herbicide a.i. evaluated in this HHRA are in toxicity categories III and IV. Dicamba is in toxicity category III for acute oral and acute dermal effects, in toxicity category IV for acute inhalation effects, and in toxicity category II for primary eye and primary skin effects. Diquat is in toxicity category II for acute dermal and eye irritation, and fluridone is in toxicity category II for eye irritation. The USEPA has not developed acute toxicity categories for sulfometuron methyl. None of the six herbicide a.i. are designated as potential carcinogens by the USEPA.

Dose-response Assessment

For pesticide risk assessments, noncarcinogenic effects are evaluated differently depending on whether the exposure is dietary or non-dietary. Dietary exposures are evaluated by dividing site-specific herbicide a.i. intakes by a Population Adjusted Dose (PAD). The results are expressed as %PADs. The %PAD approach was used to evaluate public receptor ingestion of drinking water, berries, and fish. Non-dietary exposures are evaluated by dividing a No Observable Adverse Effects Level (NOAEL) by the site-specific intake to calculate a Margin of Exposure (MOE). The MOEs are typically compared to a target MOE of 100, unless specified otherwise. NOAELs are available for a variety of exposure durations and exposure routes. The NOAEL approach is used to evaluate the occupational receptors and the public receptors for the following scenarios: dermal contact with spray, dermal contact with foliage, dermal contact with water while swimming, and incidental ingestion of water while swimming.

For each of the six herbicide a.i. evaluated in this HHRA, the USEPA has developed NOAELs for a majority but not all of exposure durations and exposure routes.

Exposure Assessment

The exposure assessment involves identifying receptors and exposure scenarios and quantifying exposures. To understand how humans may be exposed to herbicide a.i. as a result of the BLM vegetation treatment program, it is necessary to understand herbicide use within the BLM. Within the BLM vegetation treatment program, public lands are classified into various land programs (rangeland, public domain forestland, energy and minerals sites, rights-of-way, recreation and cultural sites, and aquatic sites). Within each program, aerial-, ground-, or boat-based applications may be used. Various application vehicles can be used for each application type, and for each vehicle, there are different application methods. Similarly, there are different BLM job descriptions associated with each application method. It is assumed that occupational receptors may be incidentally exposed to the herbicide a.i. through dermal contact and inhalation exposure routes. In addition, an accidental spill scenario was evaluated for the occupational receptors, assuming a direct spill of herbicide a.i. on the skin.

Members of the public may also be incidentally exposed to herbicide a.i. used on public lands. Such receptors include hikers, hunters, berry pickers, swimmers, anglers, area residents, and Native Americans using natural resources on public lands. Although there are many different exposure scenarios and receptors that could be evaluated, these receptors cover a range of potential exposures that could occur under worst case conditions on BLM lands. It is assumed that these receptors could be exposed through one or more of the following exposure pathways:

- Dermal contact with spray
- Dermal contact with foliage
- Dermal contact with water while swimming
- Ingestion of drinking water or incidental ingestion of water while swimming
- Ingestion of berries
- Ingestion of fish

Although all public receptor exposures to herbicide a.i. used on public lands are considered to be accidental, public receptor exposures are evaluated under two scenarios. Routine-use exposures are assumed to occur when public receptors come into contact with environmental media that have been impacted by spray drift. Accidental exposures are assumed to occur when public receptors come into contact with environmental media that have been subject to direct spray or spills. Under the direct spray scenarios, it is assumed that a receptor enters a foliated area or a pond (for the aquatic herbicide a.i.) that has recently been treated, even though the area is posted with warning signs. The direct spray pathway for terrestrial herbicide a.i. onto ponds assumes that the herbicide a.i. are accidentally sprayed on the pond.

To quantify exposures, it is necessary to estimate the herbicide a.i. concentrations to which receptors could be exposed. For the occupational receptors, routine exposures were calculated using unit exposure (UE) values developed by USEPA combined with the herbicide a.i. application rates (ARs) and the acres treated (AT) per day. Accidental exposures were calculated using the undiluted herbicide a.i. concentrations for liquid formulations and application-ready concentrations for solid formulations, and assuming a certain amount of spill and absorption through the skin.

For the public receptors, routine exposures from spray drift were calculated using exposure point concentrations (EPCs) developed using computer models. The AgDrift model was used to estimate deposition of herbicide a.i. drift onto the receptor, foliage, berries, and pond. The GLEAMS model was used to calculate herbicide a.i. concentrations in the pond resulting from runoff (short-, intermediate-, and long-term exposure durations). For the terrestrial herbicide a.i., pond concentrations calculated in AgDrift were added to the highest pond concentrations calculated in GLEAMS. Accidental exposures were calculated assuming direct spray of the herbicide a.i. at the maximum ARs onto the receptor, foliage, berries, and pond. In addition, an accidental spill scenario was evaluated for the pond assuming that the entire contents of a truck or helicopter could spill into the pond.

Risk Characterization

The risk characterization section provides quantitative risk estimates for each of the herbicide a.i. for the various receptors and exposure scenarios. USEPA's Office of Pesticide Programs (OPP) has developed an Aggregate Risk Index (ARI) approach that combines risks calculated using the %PAD and MOE methods. As with the MOE, potential risk increases as the ARI decreases. The ARI is compared against a target value of 1. Values greater than 1 do not exceed the USEPA's level of concern.

Diquat results in ARIs less than 1 for a majority of the occupational receptors and public receptors, indicating a level of concern. Fluridone results in ARIs less than 1 for several of the occupational and public receptors under the maximum AR scenarios. Dicamba, diquat, and fluridone result in ARIs less than one for the occupational accidental spill scenario (spill to worker skin). The other three herbicide a.i. (diflufenzopyr, imazapic, and sulfometuron methyl) do not result in ARIs below 1 for any scenario, indicating no level of concern with use of these three herbicide a.i.

Forest Service Human Health and Environmental Risk Assessments

The primary reference for this section is: Syracuse Environmental Research Associates, Inc. (SERA). 2007. Preparation of Environemnatl Documentation and Risk Assessments. Pages 1-2 to 1-13. Prepared for the U.S. Department of Agriculture Forest Service. Arlington, Virginia. Fayetteville, New York. Available at http://www.fs.fed.us/foresthealth/pesticide/pdfs/PrepEnvirmentalDoc_01-07.pdf. References cited in this section are internal to the above-referenced document.

The Forest Service Risk Assessments contain both human health and environmental risk assessments sections. Each section follows the four-step process recommended the National Research Council of the National Academy of Sciences (NRC 1983) and used in the BLM Human Health Risk Assessments. For risks to be quantified, a hazard must be identified, exposures must be quantitatively estimated, and a dose-response relationship must be expressed quantitatively. Each of these four basic steps are summarized as follows:

Hazard Identification

Hazard identification is the process of identifying what, if any, effects a compound is likely to have on an exposed population. Hazard identification is the first and most critical step in any risk assessment. Unless some plausible biological effect can be demonstrated, the nature of the subsequent dose-response assessment and risk characterization is extremely limited. Both the human health and ecological risk assessments are prepared using *in vivo* and *in vitro* data from experimental animal studies. Additional sources of information like epidemiology studies, case reports, and clinical investigations are used to prepare human health risk assessment. Studies on various model nontarget test species (e.g., ducks, quail, fish, aquatic invertebrates, plants, and terrestrial invertebrates) are commonly available to strengthen an ecological risk assessment. In addition, available field studies on nontarget species are used in ecological risk assessments in much the same way epidemiology studies are used in human health risk assessments. The hazard identification is based on a review of the toxicological and pharmacokinetics data and is arranged to focus on the dose-response and dose-severity relationships. Of these two relationships, the dose-severity relationship is generally more relevant for non-carcinogenic effects in humans and nontarget species. The severity scale used to conduct the risk assessment typically employs four levels of severity, which are defined in Table 1-1.

Table 1-1: Severity definitions used in human health risk assessment (HHRA) and ecological risk assessment (ERA)

Acronym		
HHRA	**ERA**	**Definition**
NOEL	**NOEC**	*No-observed-effect level (concentration)*: No biologically or statistically significant effects attributable to treatment.
NOAEL	**NOAEC**	*No-observed-adverse-effect level (concentration)*: Effects that are attributable to treatment but do not appear to impair the organism's ability to function and clearly do not lead to such an impairment.
LOEL	**LOEC**	*Lowest-observed-effect level (concentration)*: The lowest exposure level associated with an adverse effect.
AEL		*Adverse-effect level*: Signs of toxicity that must be detected by invasive methods, external monitoring devices, or prolonged systematic observations. Symptoms that are not accompanied by grossly observable signs of toxicity.
FEL		*Frank-effect level*: Gross and immediately observable signs of toxicity.

The terminology used in human health and ecological risk assessments is somewhat different, but the concepts are virtually identical. In human health risk assessment, severity is typically defined by the consequences of different levels of exposure. These include the no-observed-effect level (NOEL), no-observed-adverse-effect level (NOAEL), adverse-effect level (AEL), and frank-effect level (FEL). An additional term, lowest-observedadverse-effect level (LOAEL) is sometimes used to designate the lowest AEL. This scale, with minor differences in nomenclature, is used by many government agencies to classify the toxicological effects observed in experimental or epidemiology studies. In the ecotoxicology literature, the term NOEC—no observed effect concentration—is sometimes used rather than the term NOEL. As indicated in Table 1-1, these terms as well as their variations are synonymous. The hazard identification process involves making judgments about which effects are most relevant to the assessment of human health or nontarget species. During this process, studies may be eliminated from consideration because they are inherently flawed, or because they are grossly inconsistent with the preponderance of other studies.

Although hazard identification results in a qualitative determination, quantitative methods are usually required as in most other assessments of causality. For instance, the process of hazard identification often hinges on a statistical assessment of exposure-response or dose-response relationships. Furthermore, hazard identification must also consider fundamental and qualitative differences among species. Depending on the chemical of concern, hazard identification also may include the use of quantitative or qualitative structure activity relationships or differences in pharmacokinetics.

Exposure Assessment

The exposure scenarios considered in a risk assessment involving pesticide exposure are determined by the application method and the chemical and toxicological properties of the compound. Depending on the properties of the chemical and the application method, the risk assessment may consider acute, subchronic, or chronic durations of oral, dermal, inhalation or combined exposure to the pesticide.

Human Health

Exposure scenarios are developed for workers and members of the general public. For each group, two types of exposure scenarios are generally taken into consideration: *general exposure* and *accidental/incidental exposure*. The term *general exposure* refers to human exposure resulting from the normal use of the chemical. For workers, general exposure involves the handling and application of the compound. These general exposure scenarios can be interpreted relatively easily and objectively. The exposure estimates are calculated from the amount of the chemical handled/day and the exposure rates for the worker group. Although each of the specific exposure assessments for workers involves degrees of uncertainty, the exposure estimates are objective in that they are based on empirical relationships of absorbed dose to pesticide use. For the general public the general exposure scenarios are somewhat more arbitrary and may be less plausible. For each pesticide, at least three general exposure scenarios are considered, including walking through a contaminated area shortly after treatment, the consumption of ambient water from a contaminated watershed, and the consumption of contaminated vegetation. These three scenarios are consistently used because one of them usually leads to the highest estimates of exposure. Additional scenarios discussed below may be considered for each of the individual compounds as warranted by the available data and the nature of the program activities.

Some, if not all, of these general exposure scenarios for the general public may seem implausible or at least extremely conservative. For example, in many cases compounds are applied in relatively remote areas and so it is not likely that members of the general public would be exposed to plants shortly after treatment. Similarly, the estimates of longer-term consumption of contaminated water are based on estimated application rates (lbs a.i./acre) and monitoring studies that can be used to relate levels in ambient water to treatment rates in a watershed; however, in most pesticide applications, substantial portions of a watershed are not likely to be treated. Finally, the exposure scenarios based on longer-term consumption of contaminated vegetation assume that an area of edible plants is inadvertently sprayed and that these plants are consumed by an individual over a 90-day period. While such inadvertent contamination might occur, it is extremely unlikely to happen as a result of directed applications (e.g., backpack applications). Even in the case of boom spray operations, the spray is directed at target vegetation and the possibility of inadvertent contamination of cultivated or edible vegetation would be low. In addition, for herbicides and other phytotoxic compounds, it is likely that the contaminated plants would show obvious signs of damage over a relatively short period of time and would therefore not be consumed.

All of the factors discussed above concerning general exposure scenarios for the general public have merit and must be considered in the interpretation of the risk characterization (Section 3.4). Thus, the *typical* hazard to the general public may often be negligible because significant levels of exposure are not likely. For the general public, the general exposures may be regarded as *extreme* in that they are based on very conservative exposure assessments and/or very implausible events. Nonetheless, these general exposure assessments are included because the risk assessment is intended to be extremely conservative with respect to potential effects on the general public, and to provide estimates regarding the likelihood and nature of effects after human exposure to pesticides.

Accidental/incidental exposure scenarios describe specific examples of gross over-exposure associated with mischance or mishandling of a chemical. All of these exposure scenarios are arbitrary in that the nature and duration of the exposure is fixed. For example, the worker exposure scenario involving immersion of the hands is based on a 1-minute period of exposure but could just as easily be based on an exposure period of 5 seconds or 5 minutes. Similarly, the consequences of wearing contaminated gloves could be evaluated at 4 hours rather than at 1 hour.

These scenarios are intended to provide an indication of relative hazard among different pesticides and different events in a manner that facilitates conversion or extrapolation to other exposure conditions.

Like the general exposure scenarios, the accidental exposures for the general public may be regarded as more extreme than those for workers. Three scenarios are included in each exposure assessment. They include direct spray, the consumption of contaminated water shortly after a spill, and the consumption of contaminated vegetation shortly after treatment. The direct spray scenario is clearly extreme. It assumes that a naked child is sprayed directly with a pesticide as it is being applied and that no steps are taken to remove the pesticide from the child for 1 hour. There are no reports of such incidents in the literature, and the likelihood of such an incident occurring appears to be remote. Nonetheless, this scenario and others like it are useful not only as a uniform comparison among pesticides but also as a simplifying step in the risk assessment. If the *'naked child'* scenario indicates no basis for concern, other dermal spray scenarios will not suggest a potential hazard and need not be explored. If there is a potential hazard, other more plausible exposure scenarios may need to be considered. The other two accidental scenarios are similarly intended to serve as uniform comparisons among chemicals as well as a means of evaluating the need to explore additional exposure scenarios.

In all cases, the level of exposure is directly proportional to the exposure parameters. The exposure associated with wearing gloves for 4 hours is 4 times the exposure associated with wearing contaminated gloves for 1 hour. Similarly, the general exposure scenarios for workers are based on an 8-hour work day. If a 4-hour application period were used, the hazard indices would be reduced by a factor of two. As another example, general exposure scenarios for both workers and the general public are linearly related to the application rate. Consequently, if the application rate were to double or vary by some other factor, the estimated exposure would double or vary by the same factor. Thus, the specific exposure parameters used in the risk assessment are selected to allow for relatively simple extrapolation to greater or lesser degrees of exposure.

Additional variability is taken into consideration by estimating exposure doses or absorbed doses for individuals of different age groups (i.e., adults, young children, toddlers, and infants). Children may behave in ways that increase their exposure to applied pesticides (e.g., long periods of outdoor play, pica, or imprudent consumption of contaminated media or materials). In addition, anatomical and physiological factors, such as body surface area, and breathing rates and consumption rates for food and water, are not linearly related to body weight and age. Consequently, the models used to estimate the exposure dose (e.g., mg/kg body weight/day) based on chemical concentrations in environmental media (e.g., ppm in air, water, or food) indicate that children, compared with individuals of different age groups, are generally exposed to the highest doses of chemicals for a given environmental concentration.

Ecological Effects

The exposure assessments for ecological effects are conceptually similar to those conducted in the human health risk assessment, and for many terrestrial organisms the exposure assessments are parallel to those used in the human health risk assessment. Similarly, exposures of aquatic species are typically based on the same estimates of concentrations of the chemical in water that are used in the human health risk assessment. Terrestrial animals might be exposed to any applied pesticide from direct spray, the ingestion of contaminated media (vegetation, prey species, or water), grooming activities, or indirect contact with contaminated vegetation. Estimates of oral exposure are expressed in the same units as the available toxicity data. As in the human health risk assessment, these units are usually expressed as mg of agent per kg of body weight and abbreviated as mg/kg body weight. For dermal exposure, the units of measure usually are expressed in mg of agent per cm2 of surface area of the organism and abbreviated as mg/cm2. In estimating dose, however, a distinction is made between the exposure dose and the absorbed dose. The *exposure dose* is the amount of material on the organism (i.e., the product of the residue level in mg/cm2 and the amount of surface area exposed), which can be expressed either as mg/ organism or mg/kg body weight. The *absorbed dose* is the proportion of the exposure dose that is actually taken in or absorbed by the animal. For the exposure assessments discussed below, general allometric relationships are used to model exposure (e.g., Boxenbaum and D'Souza 1990). These relationships dictate that for a fixed level of exposure (e.g., concentrations of a chemical in food or water), small animals will receive a higher dose, in terms of mg/kg body weight, than large animals will receive. Based on allometric relationships, it would be possible to model exposure in a very large number of nontarget terrestrial animals. This approach has been used in some past USDA assessments. This approach is no longer used because highly species-specific exposure assessments are of little use in the absence of species-specific dose-response assessments. Thus, if the pesticidespecific information indicates that large mammals may be more sensitive than smaller mammals (i.e., in contrast to the more general relationship noted above), both large and small mammals are modeled separately. Similarly, if the available information suggests that the compound under review may be more toxic to birds than to mammals, separate exposure assessments are conducted for both birds (large and small) and mammals. The basic philosophy behind this approach is that the exposure assessment should not be more complicated than the dose-response assessment.

Generic estimates of exposure are always given for a small mammal. A body weight of 20 g is used for a small mammal, which approximates the body weight of small mammals like mice, voles, shrews, and bats. Other body weights, food consumption, and caloric requirements for mammals and birds are taken from U.S. EPA (1993). The computational details for each exposure assessment presented in this section are provided in standard worksheets (see Appendix 3). Depending on the available toxicity data and the uses of the chemical under review, exposure assessments may be made for larger mammals, birds, various terrestrial invertebrates, and terrestrial plants. The specific scenarios most often considered are detailed in Section 4.2.

Dose-Response Assessment

The purpose of the dose-response assessment is to describe the degree or severity of risk as a function of dose. In classical toxicology, doseresponse assessments are usually expressed as linear or non-linear equations, such as probit analysis and the multistage model, respectively. Using these methods, the prevalence or magnitude of a response can be estimated for any dose level. In regulatory toxicology, this approach is the exception rather than the rule.

Most dose-response assessments in regulatory toxicology, as discussed below, result in point estimates. Although some methods in regulatory toxicology use dose-response models, the regulatory value used is a point estimate. For example, U.S. EPA cancer risk assessments usually employ a form of the multistage model or some other linear dose-response relationship that provide measures of variability or error. The estimate used in setting exposure criteria, however, is typically a point estimate that is a single value rather than a range of values. The results of other commonly used dose-response assessments, such as RfDs, and RfCs, are point estimates of doses that are not believed to be associated with any adverse effect and that are not directly related to a dose-response model.

The practice of relying on point estimates in regulatory toxicology is grounded in the history of this discipline (Dourson and Stara 1983). From its inception, the focus of regulatory toxicology has been the development of criteria (i.e., levels of exposure that are defined as *safe)*. Consequently, the methods used in regulatory toxicology are conservative.

Consistent with the recommendation of NRC (1983) that various groups within the federal government adopt common risk assessment methodologies, standard dose-response assessments are generally based on reference values, like RfDs, derived by other government agencies. This approach avoids a duplication of effort, capitalizes on the expertise of other organizations, and decreases the size, complexity, and cost of risk assessments.

In cases for which these standard approaches yield evidence of potential risk, other statistical methods such as categorical regression may be used to characterize the likelihood and severity of the risk. Categorical regression analysis is used as a tool to supplement RfDs and analogous values. The method defines a relationship between responses that can be categorized according to exposure dose and duration (factors that may influence the response), and estimates the probability that a group of animals subjected to a given exposure will be classified into a particular category (Dourson et al. 1997, Durkin et al. 1992, Guth et al. 1997). Categorical regression as well as other methods (quantitative and semi-quantitative) are discussed further in Section 3.3.5.

In most respects, dose-response assessments for ecological effects are conceptually similar to the methods employed in the human health risk assessments, with one major exception. Human health risk assessments focus on protecting the individual. This is why uncertainty factors (sometimes very large) are used to derive RfD values and why cancer risk is estimated using very conservative assumptions. In ecological risk assessment, the focus is on a population or community rather than an individual. Thus, the use of uncertainty factors is less common and the general methods for dose-response assessment are less conservative.

For terrestrial mammals, the dose-response assessment generally is based on the same data used to derive the RfD in the human health risk assessment: an NOAEL from a chronic exposure study. The data on other terrestrial animals, both birds and invertebrates, are often not as detailed as the available information on experimental mammals. Fewer toxicological endpoints are examined, and, at least for vertebrates, lifetime or chronic studies are seldom available.

For some terrestrial plants as well as some aquatic species, sensitive life-stage studies are often available. Such studies include egg-and-fry studies in fish, life-cycle toxicity studies in *Daphnia magna*, and seed germination and growth studies in plants, all of which are required by the U.S. EPA for the registration of herbicides. The studies are obtained and assessed following the same criteria applied to studies for the human health risk assessment. The principal difference is that NOEL, NOEC, or LD or LC values are used directly rather than RfD values that involve the application of uncertainty factors.

Nonetheless, dose-response assessments for some nontarget species considered in a risk assessment can be complicated (Section 4.3). As in the human health dose-response assessment, the nature of the available data as well as the potential risk may dictate the use of relatively complex dose-response analyses.

Risk Characterization

Conceptually, risk characterization is simply the process of comparing the exposure assessment to the dose-response assessment. In this process, risk is characterized quantitatively either as a ratio or as an incidence of response or a defined risk level – i.e., a risk of 5%.

Because the risk characterization flows directly from the exposure and dose-response assessments, the complexity and clarity of the risk characterization will be dependent on complexity and clarity of both the exposure and dose-response assessments. In most cases, risk will be quantitatively characterized as a ratio: a level of exposure divided by some defined effect level. In the human health risk assessment, the defined effect level is almost always the reference dose (RfD), and the ratio of the exposure to the reference dose is referred to as the hazard quotient (HQ). In the ecological risk assessments, the defined effect level is may be an NOEC or a risk level. The risk level, in turn, may be a lethal dose (e.g., LD50 or some other response level such as an LD25) or a dose causing some risk of a non-lethal effect (e.g., an ED50 or ED25). For aquatic organisms and for some terrestrial organisms for which exposure is characterized by a concentration rather than a dose, the defined risk levels may be expressed as a lethal concentration (LC50 or some other response level) or a sublethal concentration that leads to some effect (e.g., an EC50). In general, the Forest Service prefers to use NOAEL or NOEC values in risk characterizations. If NOAEL or NOEC values are not available, a sublethal effective dose at some response rate (e.g., EDX or ECX where *X* is some level of response) is generally preferred over a lethal response rate (e.g., LDX or LCX). While these ratios are sometimes referred to as HQs, more suitable terms are risk quotients (RQs).

If sufficient data are available and if the simple HQs or RQs suggest some level of concern, doseresponse or dose-severity relationships may be used to characterize risk. Dose-response relationships most often involve explicit dose-response functions that lead to an explicit estimate of risk (e.g., a response rate of 13.2% for some effect or an 8% decrease in some biological function). Dose-severity relationships are typically less quantitative and lead to some assessment of what effects might be observed in a population at various levels of exposure. A fuller discussion of the quotient methods (HQs and RQs) as well as the dose-response and doseseverity relationships are given in Section 3.4 (Human Health Effects) and Section 4.4 (Ecological Effects).

Elaborations

Probabilistic Risk Assessment

Variability and *uncertainty* may be dominant factors in any risk assessment, and these factors should be expressed. Within the context of a risk assessment, the terms *variability* and *uncertainty* signify different conditions. In general, *variability* and *uncertainty* can be distinguished from each other depending on the state of knowledge or information. *Variability* reflects the knowledge of how things may change. By acquiring more knowledge or information, better estimates of variability may be obtained but the *variability* itself will not decrease – i.e., it is inherent in the population or system being considered. Differences in human body weights are a good example of variability. Uncertainty reflects a lack of knowledge and uncertainty can be reduced by acquiring information. For example, while the toxicity of herbicides has been tested in the honey bee, very little information is available on the toxicity of most herbicides to other nontarget terrestrial insects. This leads to uncertainty (in terms of how representative the honey bee is for other insects) but this uncertainty can be reduced by conducting experiments on the toxicity of the herbicide to other insects.

Variability may take several forms. For this risk assessment, three types of variability are distinguished: *statistical*, *situational*, and *arbitrary*. *Statistical variability* reflects apparently random patterns in data. For example, various types of estimates used in this risk assessment involve relationships of certain physical properties to certain biological properties. In such cases, best or maximum likelihood estimates can be calculated, as well as upper and lower confidence intervals that reflect the statistical variability in the relationships. *Situational variability* describes variations depending on known circumstances. For example, the application rate or the applied concentration of an herbicide will vary according to local conditions and goals. As discussed in the following section, the limits on this variability are known and there is some information to indicate what the variations are. In other words, *situational variability* is not random. *Arbitrary variability*, as the name implies, represents an attempt to describe changes that cannot be characterized statistically or by a given set of conditions that cannot be well defined. This type of variability dominates some spill scenarios involving either a spill of a chemical on to the surface of the skin or a spill of a chemical into water. In either case, exposure depends on the amount of chemical spilled and the area of skin or volume of water that is contaminated.

In order to quantitatively address both variability and uncertainty, risk assessment methods generically referred to as ***probabilistic risk assessment*** have been and continue to be developed. The general approach for probabilistic risk assessment, particularly with respect to ecological species, has been articulated by Ecological Committee on FIFRA Risk Assessment Methods (ECOFRAM 1999). The basic approach given in ECOFRAM (1999) involves a tiered risk assessment process:

Tier 1: Very conservative screening methods involving worse case assumptions in terms of both exposure and dose-response. Risk is typically expressed as a point estimate such as an HQ or RQ.

Tier 2: Typically elaborates or refines the exposure assessment to include more realistic estimates of exposures and may elaborate the dose-response assessment to include the use of full dose-response curves. Risk may be expressed in terms of probabilities rather than point estimates.

Tier 3: An extension of a Tier 2 approach that may involve the inclusion of data on additional species (e.g., species sensitivity distributions) and more sophisticated exposure models.

Tier 4: Is the most complex risk assessment and may involve experimental or monitoring programs designed to definitively characterize either exposure and toxicity and the use of all available data including microcosm, mesocosm, and field studies.

As implied by the term *Tier*, probabilistic risk assessments under the general ECOFRAM model are designed to be conducted in stages going from the most conservative or worst-case approach (Tier 1) to less extreme and presumably more realistic assessments. Because this staged approach typically results in progressively lessened perceptions of risk, probabilistic risk assessments have been criticized as simply mechanisms to make risk disappear by mathematical manipulations. This criticism is addressed in ECOFRAM (1999) and is largely unfounded. While any risk assessment, probabilistic or otherwise, can be manipulated to distort risk (either upward or downward), the proper application of probabilistic risk assessment typically results not in conflicting risk characterizations at the different tiers but rather in more fully elaborated and refined risk assessments.

The nomenclature of probabilistic risk assessments, particularly as embodied in ECOFRAM (1999) is somewhat different from that of NAS (1983) but the concepts are essentially the same. The first stage of a probabilistic risk assessment is typically referred to as the *Problem Formulation*. This is similar to the *Hazard Identification* as defined by NAS (1983) but focuses on identifying which organisms are likely to be at greatest risk. The other stages of the risk assessment process defined by ECOFRAM (1999) are exposure characterization, effects characterization, and risk characterization and correspond closely to more general definitions given by NAS (1983) for the exposure assessment, dose-response assessment, and risk characterization.

In the higher tiered risk assessments, the probabilistic approach is based on more sophisticated methods of handling data and expressing both variability and uncertainty. A central feature of many higher tiered probabilistic risk assessments is Monte Carlo Analysis. *Monte Carlo Analysis* is a general term for any simulation that uses probability distributions rather than point estimates to represent and approximate the variability in a system model. The method was originally developed in the 1940's, shortly after the development of computers, to make probabilistic approximations to the solutions of mathematical equations or models that could not be solved analytically (U.S. EPA/Risk Assessment Forum, 1997).

Monte Carlo Analyses can be relatively simple or very complicated depending on the simplicity or complexity of the model. As a simple example, take a situation in which we knew that a population of individuals will be exposed each day to up to 200 mg of a chemical. In this population, the smallest individual will have a body weight of about 52 kg. Thus, the maximum daily dose is about 3.8 mg/kg body weight. In addition, we knew that the RfD for the general population is 3.5 mg/kg. Taking a standard ratio approach using point estimates (Section 1.2.1.4), the hazard quotient would be about 1.1, somewhat above the level of concern. This would be a standard point-estimate worst-case approach and the risk assessment would conclude that some unspecified number of individuals could be subject to exposures that would not be generally considered acceptable.

Suppose, however, that the average body weight was 70 kg and the body weights in the population evidenced a normal distribution with a standard deviation of 10 kg. In addition, suppose that we knew that not all individuals would be exposed to the same amount of the chemical but that the amount could vary from 50 mg/day to 200 mg/day. Lastly, while the RfD was 3.5 mg/kg/day, we also knew that some individuals could be more sensitive and might respond with an adverse effect at a dose above 2 mg/kg/day, but that other individuals would not respond adversely until the dose reached 10 mg/kg/day. This sort of variability could be modeled in a Monte Carlo Analysis with the following assumptions:

Parameter	Distribution
Body weight	Normal distribution with a mean of 70 kg and a standard deviation of 10 kg
Exposure	Uniform distribution with a range of 50 mg/day to 200 mg/day.
RfD	Triangular with a mode of 3.5 mg/kg/day, a lower limit of 2 mg/kg/day and an upper limit of 10 g/kg/day

An illustration of the results of a Monte Carlo Analysis of this simple model is given in Figure 1-2. Under the conditions of the simulation, the hazard quotient would be greater than unity (the level of concern for this scenario) for about 5% of the population. Note that the use of a Monte Carlo simulation does not necessarily change the conclusions risk assessment. In the above example, the simulation is consistent with the worst-case point estimate approach: some people will be at risk. The Monte Carlo simulation, however, does incorporate more information into the assessment and allows the risk assessor to better characterize the consequences – i.e., about 5% of the individuals may be exposed to more of the agent than would be generally considered acceptable.

Most practical Monte Carlo simulations are much more complicated and may involve quantitative considerations of differences in sensitivity among different species (e.g., Posthuma et al. 2002) as well as very complex applications of environmental fate models (e.g., Randall et al. 2003). Also, although elementary Monte Carlo Analyses can be conducted in commonly available software programs like EXCEL, most Monte Carlo analyses require relatively specialized software. The above example was conducted using an EXCEL add-in called Crystal Ball (Decisioneering 2004) that is commonly used in probabilistic risk assessments conducted by or for the U.S. EPA's Office of Pesticides, Environmental Fate and Effects Division. Other packages capable of more sophisticated modeling include acslXtreme (AEgis Technologies Group 2004), ModelMaker (Cherwell Scientific 2000), and Mathematica (Wolfram Research 2004).

Extreme Value Risk Assessment

The USDA Forest Service has not adopted probabilistic risk assessment methods. Historically, the Forest Service has developed different scenarios that have been referred to as typical and worst-case (e.g., USDA/FS 1989a,b,c). With the advent of the SERA risk assessments, a somewhat different approach was taken in which almost no values used in a risk estimate are presented as a single number. Instead, most numbers used in calculating risk values are expressed as a central estimate and a range, which is sometimes very large. The central estimate would generally correspond to the *typical* value and the upper value in the range (or more specifically the upper or lower bound that leads to the highest estimate of risk) would generally correspond to what used to be called the *"worst-case"* value. The other end of the range (the upper or lower bound that leads to the lowest estimate of risk) might be termed the *"best case"* value. The best case assessment is made simply because an unacceptable level of risk from a *best case* would lead to the clear conclusion that the use of the agent under any circumstances would likely result in some adverse effect.

As with a probabilistic risk assessment, an attempt is often made to apply the extreme value approach both to the exposure assessment as well as to the dose-response assessment. Applications of the exposure assessment are relatively simple and may involve various assumptions concerning animal weight, food consumption, water consumption, rainfall and so forth. Many of the specific assumptions are detailed in Section 3.2 (Human Health) and Section 4.2 (Ecological Effects). In terms of the dose-response assessment, the extreme value approach most often involves the identification of both tolerant and sensitive species, typically in the ecological risk assessment (Section 4.3). In the human health risk assessment (Section 3.3), different RfD values may be derived for sensitive subgroups – e.g., children or women of childbearing age.

The extreme value approach has some but not all of the benefits of probabilistic risk assessment. For example, it can and often does indicate that a particular use of an agent might not cause any adverse effects under some circumstances but could cause adverse effects under other circumstances. To the extent that the circumstances are clearly defined, this may serve as a guide to using the agent in a manner that will minimize the potential for adverse effects. While probabilistic risk assessments may be used by the Forest Service at some point in the future, probabilistic risk assessments generally take longer to conduct (because of the tiered nature of the risk assessment process) and involve the commitment of greater resources.

Uncertainty Analysis in Risk Assessments

The primary reference for this section is: USDI Bureau of Land Management. 2007. Vegetation Treatments using Herbicides on Bureau of Land Management Lands in 17 Western States Programmatic Environmental Impact Statement (PEIS). Appendix C, PEIS C-78 to C-86. Available at http://www.blm.gov/wo/st/en/prog/more/veg_eis.html. References cited in this section are internal to the above-referenced document.

For any ERA, a thorough description of uncertainties is a key component that serves to identify possible weaknesses in the analysis and to elucidate what impact such weaknesses might have on the final risk conclusions. The uncertainties of this risk assessment are discussed below (also see Table 7-1 in the herbicide ERAs [ENSR 2005a-j]).

Toxicity Data Availability

The majority of the available toxicity data was obtained from studies conducted as part of the USEPA pesticide registration process. There are a number of uncertainties related to the use of this limited data set in the risk assessment. In general, it would be preferable to base any ecological risk analysis on reliable field studies that clearly identify and quantify the amount of potential risk from particular exposure concentrations of the chemical of concern. However, in most risk assessments it is more common to extrapolate the results obtained in the laboratory to the receptors found in the field. It should be noted, however, that laboratory studies often overestimate risk relative to field studies (Fairbrother and Kapustka 1996).

Species for which toxicity data are available may not necessarily be the most sensitive species to a particular herbicide. These species have been selected as laboratory test organisms because they are generally sensitive to stressors and can also be maintained under laboratory conditions. Toxicity values for the most appropriate sensitive surrogate species for each receptor were selected by qualified toxicologists based on a thorough review of the available toxicity data; however, there is a possibility that some non-tested receptors in a given receptor group would be more sensitive.

Furthermore, the surrogate species used in the registration testing are not an exact match to the wildlife receptors included in the ERA. For example, avian data are only available for two primarily herbivorous birds: the mallard duck and the bobwhite quail. However, TRVs based on these receptors were also used to evaluate risk to insectivorous and piscivorous birds. Species with alternative feeding habits may be more or less sensitive to the herbicide than those species tested in the laboratory (see Tables C-3 and C-4 for a list of surrogate species and their receptor groups).

In general, the most sensitive available endpoint for the appropriate surrogate test species was used to derive TRVs. This approach is conservative as there may be a wide range of data and effects for different species. For example, the EC_{50}s available for aquatic invertebrates exposed to bromacil ranged from 65 mg a.i./L to >1,000 mg a.i./L. Accordingly, 65 mg a.i./L was selected as the aquatic invertebrate TRV, even though the majority of results were well above this value. In general, this selection criterion for TRVs has the potential to overestimate risk within the ERA.

In addition, several of the toxicity tests conducted during the registration process did not use herbicide formulations with 100% a.i. The assumption has been made that any toxicity observed in the tests is due to the herbicide a.i.; however, it is possible that the additional ingredients in the different formulations also had an effect. For purposes of TRV derivation and the ERA, it was assumed that all toxicity data applies to the a.i. itself and not the particular product formulation tested. This may result in an overestimate of risk to certain receptors and species guilds.

Degradates, Inert Ingredients, Adjuvants, and Tank Mixtures

In a detailed herbicide risk assessment, it is preferable to estimate risks not just from the a.i. of an herbicide, but also from the cumulative risks of degradates, inert ingredients (inerts), and adjuvants. Other pesticides may also factor into the risk estimates, as herbicides can be tank mixed to expand the level of control and to accomplish multiple identified tasks (the BLM usually only tank mixes herbicides with other herbicides). However, using currently available models (e.g., GLEAMS), it is only practical to make deterministic risk calculations (i.e., exposure modeling, effects assessment, and RQ derivations) for a single a.i.

In addition, information on inerts, adjuvants, and degradates is often limited by the availability of, and access to, reliable toxicity data for these constituents. The sections below present a qualitative evaluation of the potential risks from degradates, inert ingredients, adjuvants, and tank mixtures.

Degradates

The potential toxicity of degradates should be considered when selecting an herbicide. However, it is beyond the scope of this risk assessment to evaluate all of the possible degradates of the various herbicide formulations of the 10 herbicides. Degradates may be more or less mobile and more or less toxic in the environment than their source herbicides (Battaglin et al. 2003). Differences in environmental behavior (e.g., mobility) and toxicity between parent herbicides and degradates makes prediction of potential impacts challenging. For example, a less toxic, but more mobile bioaccumulative, or persistent degradate may have a greater adverse impact due to residual concentrations in the environment. A recent study indicated that 70% of degradates had either similar or reduced toxicity to fish, daphnids, and algae than the parent pesticide. However, 4.2% of the degradates were more than an order of magnitude more toxic than the parent pesticide, with a few instances of acute toxicity values below 1 mg/L (Sinclair and Boxall 2003). No evaluations of impacts to terrestrial species were conducted in the study. The lack of data on the toxicity of degradates of the specific herbicides represents a source of uncertainty in the risk assessment.

Inerts

Pesticide products contain both active and inert ingredients. The terms "active ingredient" (a.i.) and "inert ingredient" have been defined by federal law—the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)—since 1947. An a.i. is one that prevents, destroys, repels, or mitigates the effects of a pest, or is a plant regulator, defoliant, desiccant, or nitrogen stabilizer. By law, the a.i. must be identified by name on the label, together with its percentage by weight. An inert ingredient is simply any ingredient in the product that is not intended to affect a target pest. For example, isopropyl alcohol may be an a.i. and antimicrobial pesticide in some products; however, in other products, it is used as a solvent and may be considered an inert ingredient. The law does not require inert ingredients to be identified by name and percentage on the label, but the total percentage of such ingredients must be declared. Because neither the federal law nor the regulations define the term "inert" on the basis of toxicity, hazard or risk to humans, non-target species, or the environment, it should not be assumed that all inert ingredients are non-toxic.

The USEPA has a listing of regulated inert ingredients at http://www.epa.gov/opprd001/inerts/index.html. This listing divides inert ingredients into four lists. The number of inert ingredients found in the nine herbicides evaluated in the ERAs for each category is shown below (nine inerts were not found on the USEPA lists):

- List 1 - Inert Ingredients of Toxicological Concern: None.
- List 2 - Potentially Toxic Inert Ingredients: None.
- List 3 - Inerts of Unknown Toxicity: 12.
- List 4 - Inerts of Minimal Toxicity. List 4 is subdivided into List 4A (minimal risk inert ingredients) and List 4B (inerts that have sufficient data to substantiate that they can be used safely in pesticide products): Over 50.

Toxicity information was also searched in the following sources:

- TOMES (a proprietary toxicological database including USEPA's IRIS, the Hazardous Substance Data Bank, and the Registry of Toxic Effects of Chemical Substances (RTEC).
- USEPA's ECOTOX database which includes AQUIRE (a database containing scientific papers published on the toxic effects of chemicals to aquatic organisms).
- TOXLINE (a literature searching tool).
- Material Safety Data Sheets from suppliers.
- Other sources, such as the Farm Chemicals Handbook.
- Other cited literature sources.

Relatively little toxicity information was found. A few acute studies on aquatic or terrestrial species were reported. No chronic data, no cumulative effects data, and almost no indirect effects data (food chain species) were found for the inerts in the 10 herbicides.

A number of the List 4 compounds (Inerts of Minimal Toxicity) are naturally-occurring earthen materials (e.g., clay materials or simple salts) that would produce no toxicity at applied concentrations. However, some of the inerts, particularly the List 3 compounds and unlisted compounds, may have moderate to high potential toxicity to aquatic species based on information in Material Safety Data Sheets or on published data.
As a tool to evaluate List 3 and unlisted inerts in the ecological risk assessment, the exposure concentration of the inert compound was calculated and compared to toxicity information. As described in more detail in Appendix D of the ERAs, the GLEAMS model was set up to simulate the effects of a generalized inert compound in the base-case watershed (annual precipitation rate of 50 inches per year, application area of 10 acres, slope of 0.05, surface roughness of 0.015, erodibility of 0.401 tons per acre, and vegetation type of weeds) with a sand soil type. The chemical characteristics of the generalized inert compound were set at either extremely high or low values to describe it as either a very mobile or stable compound. The application rate of the inert/adjuvant compound was fixed at 1 lb a.i./acre. Under these conditions, the maximum predicted ratio of inert concentration to herbicide application rate was 0.69 mg/L per lb a.i./acre (3 day maximum in the pond), and in every case (acute and chronic, pond and stream scenarios) the inert concentrations exceeded herbicide a.i. concentrations.

In general, higher application rates resulted in higher exposure concentrations of surfactant inerts, exceeding 1 mg/L for the maximum pond scenario. This suggests that inerts associated with the application of herbicides may contribute to acute toxicity to aquatic organisms if they reach the aquatic environment. However, due to the lack of specific inert toxicity data, this may be an overestimate of the potential toxicity. It is assumed that toxic inerts would not represent a substantial percentage of the herbicide and that minimal impacts to the environment would result from these inert ingredients.

Adjuvants and Tank Mixtures

Evaluating the potential additional/cumulative risks from mixtures and adjuvants of pesticides is substantially more difficult than evaluating the inerts in the herbicide composition. While many herbicides are present in the natural environment along with other pesticides and toxic chemicals, it is extremely difficult to estimate the potential cumulative risks of such mixtures. The composition of such mixtures is highly site-specific, and thus nearly impossible to address at the programmatic level of the EIS.

Herbicide label information indicates whether a particular herbicide can be tank mixed with other pesticides. Adjuvants (e.g., surfactants, crop oil concentrates, fertilizers) may also be added to the spray mixture to improve the herbicide efficacy when mixed and applied to according to the label. Without product specific toxicity data, it is impossible to quantify the potential impacts of these mixtures. In addition, a quantitative analysis could only be conducted if reliable scientific evidence allowed a determination of whether the joint action of the mixture was additive, synergistic, or antagonistic. Such evidence is not likely to exist unless the mode of action is common among the chemicals and receptors.

Adjuvants

Adjuvants generally function to enhance or prolong the activity of an a.i. For terrestrial herbicides, adjuvants aid in proper wetting of foliage and absorption of the a.i. into plant tissue. Adjuvant is a broad term that includes surfactants, selected oils, anti-foaming agents, buffering compounds, drift control agents, compatibility agents, stickers, and spreaders. Adjuvants are not under the same registration guidelines as pesticides; the USEPA does not register or approve the labeling of spray adjuvants. Individual herbicide labels contain lists with "label-approved" adjuvants for use with a particular herbicide under specific conditions.

Following the same procedure used to address inerts in Appendix D of the ERAs, the GLEAMS model was used to estimate the potential portion of an adjuvant that might reach an adjacent waterbody via surface runoff. In addition, sources (Muller 1980; Lewis 1991; Dorn et al. 1997; Wong et al. 1997) generally suggest that the acute toxicity of surfactants and anti-foam agents to aquatic life ranges from 1 to 10 mg/L, and that chronic toxicity ranges as low as 0.1 mg/L. This evaluation indicates that, for herbicides with high application rates, adjuvants have the potential to cause acute, and potentially chronic, risk to aquatic species. However, more specific modeling and toxicity data would be necessary to define the level of uncertainty. Selection of adjuvants is under the control of BLM land managers, and it is recommended that land managers follow all label instructions and abide by any warnings. In general, adjuvants compose a relatively small portion of the volume of herbicide applied; however, selection of adjuvants with limited toxicity and low volumes is recommended to reduce the potential for the adjuvant to influence the toxicity of the herbicide.

Tank Mixtures

The use of tank mixtures of labeled herbicides, along with the addition of an adjuvant (when stated on the label), may be an efficient use of equipment and personnel; however, knowledge of both products and their interactions is necessary to avoid unintended negative effects. In general, herbicide interactions can be classified as additive, synergistic, or antagonistic:

- Additive effects occur when mixing two herbicides produces the same response as the combined effects of each herbicide applied alone. The products neither hurt nor enhance each other.
- Synergistic responses occur when two herbicides provide a greater response than the added effects of each herbicide applied separately.
- Antagonistic responses occur when two herbicides applied together produce less control than if you applied each herbicide separately.

While a quantitative evaluation of all of these mixtures is beyond the scope of this ERA, a qualitative evaluation may be made if the assumption is made that the products in the tank mix will act in an additive manner. The predicted RQs for two active ingredients can be summed for each individual exposure scenario to see if the combined impacts result in additional RQs elevated above the corresponding LOCs.

The RQs for any two herbicides in a tank mix were combined to simulate a tank mix in Appendix E of each ERA (diquat, fluridone, and tebuthiuron are not generally tank mixed by the BLM and were not included in this analysis). The application rates within the tank mix are not necessarily the same as each individual a.i. applied alone. See Table 7-2 in each ERA (ENSR 2005a-j) for a comparison of the percent of RQs exceeding LOCs for each of the 10 herbicide active ingredients applied alone and in a tank mix.

These comparisons indicate that tank mixes for bromacil (with sulfometuron methyl) and imazapic with diflufenzopyr do not result in more RQs above the associated LOCs for birds, mammals, fish, and invertebrates (and aquatic plants for imazapic), than were predicted for bromacil, imazapic, or diflufenzopyr alone. Additional elevated RQs are predicted for both aquatic and RTE terrestrial plants when tank mixes of bromacil with sulfometuron methyl, and imazapic with diflufenzopyr, are applied (aquatic plant risk is not elevated versus imazapic applied alone). This suggests that in some cases plant species may be particularly sensitive to the tank mix. However, when chlorsulfuron and diuron are tank mixed, all receptors are at higher risk than with application of chlorsulfuron alone (risks are not higher than with the application of diuron alone), and most receptors are also at higher risk when sulfometuron methyl is applied with bromacil versus sulfometuron methyl alone.

The comparison of the RQs from herbicide a.i. and tank mixes of these herbicides indicate that results are specific to each tank mix. Aquatic plants and RTE terrestrial plants may be at greater risk from the tank mixed application than from the a.i. alone. However, in some cases all receptors are at greater risk and precautions (e.g., increased buffer zones, decreased application rates) should be taken to reduce risk. There is some uncertainty in this evaluation because herbicides in tank mixes may not interact in an additive manner; this may overestimate risk if the interaction is antagonistic, or it may underestimate risk if the interaction is synergistic. In addition, other products may also be included in tank mixes and may contribute to the potential risk.

Selection of tank mixes, like adjuvants, is under the control of BLM land managers. To reduce uncertainties and potential negative impacts, it is required that land managers follow all label instructions and abide by any warnings. Labels for both tank mixed products should be thoroughly reviewed and mixtures with the least potential for negative effects should be selected. This is especially relevant when a mixture is applied in a manner that may have increased potential for risk. Use of a tank mix under these conditions increases the level of uncertainty in risk to the environment (PEIS C-78 to C-86).

United States Department of the Interior
Bureau of Land Management
333 SW 1st Avenue
Portland, Oregon 97204

Vegetation Treatments Using Herbicides on BLM Lands in Oregon FEIS July 2010

Volume 1

Spine Text

Vegetation Treatments Using Herbicides on BLM Lands in Oregon FEIS July 2010

Volume 2 - Appendices