

# Table of Contents

## Volume 1

Notice .....	iv
Abstract .....	iv
Acronyms / Abbreviations .....	v
Summary .....	xix
Introduction .....	xix
What Action is Proposed? .....	xx
Why is the Action Needed? .....	xxi
What Would it Mean Not to Meet the Need? .....	xxi
Are There Other Alternatives that Would Meet the Need? .....	xxii
What Factors Will be Used in Making the Decision Between Alternatives? .....	xxii
What are the Effects of the Alternatives? .....	xxiii
Can Any of the Adverse Effects be Mitigated? .....	xxviii
What Monitoring is Necessary? .....	xxviii
Which Alternative is Preferred? .....	xxix
<b>Chapter 1 - Purpose and Need .....</b>	<b>3</b>
Introduction .....	3
Background .....	4
The <i>Need</i> .....	6
Proposed Action .....	7
Alternatives to the Proposed Action .....	8
The Purposes .....	8
Decision to be Made .....	12
Scoping .....	12
Public Review of the Draft EIS .....	13
Consultation .....	13
Related Plans and Analyses .....	14
2007 National PEIS .....	15
Resource Management Plans .....	15
Existing and Future Project-Level Planning .....	16
Non-BLM Actions Potentially Affecting the Use of Herbicides on BLM Lands in Oregon .....	17
2004 Court-Ordered Buffer Around Salmon and the Settlement Agreement to Complete Consultation on 37 Pesticides .....	17
Potential Consultation Lawsuit Regarding 394 Pesticides .....	17
Petition to Cancel all Registrations of 2,4-D .....	18
Sulfometuron Methyl Reregistration Eligibility Decision (RED) .....	18
Oregon Priority Persistent Pollutant (P3) List .....	20
Oregon Department of Environmental Quality Toxics Reduction Strategy .....	20
EPA Endocrine Disruptor Screening Program (EDSP) .....	20
Rulemaking to Require Disclosure of All Pesticide Ingredients .....	21
Pending EPA Action to Address Pesticide Drift .....	21
Conflicts and Consistency with Other Plans .....	21

<b>Chapter 2 - The Alternatives</b> .....	27
Introduction .....	27
The Reference Analysis .....	27
Elements Common to All Alternatives .....	28
Applicable Lands .....	28
Legal and Policy Requirements .....	28
Standard Operating Procedures .....	28
Mitigation Measures Adopted by the Record of Decision for the PEIS .....	28
Conservation Measures for Federally Listed Species .....	29
The Alternatives .....	29
The No Action Alternative .....	30
Alternative 2 (No Action) – Use 4 Herbicides to Treat Noxious Weeds Only .....	30
The Action Alternatives .....	30
Alternative 3 – Use 12 (W) or 13 (E) Herbicides to Treat Invasive Weeds and Control Pests and Diseases .....	30
Alternative 4 (Proposed Action) – Use 13 (W) or 16 (E) Herbicides to Treat Invasive Weeds plus Limited Additional Uses .....	31
Alternative 5 – Use 18 Herbicides to Treat Invasive Weeds and Meet Other Vegetation Management Objectives .....	32
Alternatives Eliminated From Detailed Study .....	34
No Use of Acetolactate Synthase (ALS)-inhibiting Herbicides .....	34
No Aerial Application of Herbicides .....	34
Reduce Management Activities Implicated in Weed Spread .....	35
Use Vinegar, Salt, and other Household Products .....	35
Increase the Use of Non-Herbicide Methods .....	36
Reconsider Other BLM Management Practices that Encourage the Spread of Invasive Plants, such as OHV Use or Policies on the use of Weed Free Feed .....	36
Increase Funding to Pay for Additional Non-Herbicide Control Treatments .....	36
Consider the Use of Different Herbicides Other than the 18 Being Considered .....	37
Use the Same Herbicides as the Forest Service .....	37
Permit the Use of All EPA Tested and Approved Herbicides .....	37
Permit the Use of Herbicides for the Full Range of BLM Management Responsibilities Including Livestock Forage and Timber Production .....	38
Comparison of Alternatives .....	38
The Reference Analysis and Alternatives .....	38
Estimated Annual Treatment Acres Under Each Alternative (Table 2-4) .....	40
Comparison of the Effects of the Alternatives (Table 2-5) .....	41
Response of the Alternatives to the Purposes (Table 2-6) .....	41
The Preferred Alternative .....	50
Potential Mitigation .....	50
Introduction .....	50
Potential Mitigation .....	51
<b>Chapter 3 - Background and Assumptions for Effects Analysis</b> .....	57
Introduction .....	57
Background for Effects Analysis .....	57
The 18 Herbicides .....	58

Assumptions and Information about Treatment Acres . . . . .	65
Integrated Vegetation Management . . . . .	65
Herbicide Treatment Methods . . . . .	70
Non-Herbicide Treatment Methods . . . . .	73
Treatment Acres, Gross Acres and Net Acres, and Pounds of Herbicides to be Applied . . . . .	77
Assumptions about Herbicide Treatments . . . . .	81
Risk . . . . .	85
EPA Labels . . . . .	85
Risk Assessments . . . . .	86
Drift . . . . .	88
High, Moderate, and Low Risk in BLM and Forest Service Risk Assessments . . . . .	89
Uncertainty in the Risk Assessment Process . . . . .	91
Use of the Individual Risk Assessment Tools During Implementation . . . . .	92
Toxicity Comparison with Household Products . . . . .	92
Methodology for Assessing Effects . . . . .	92
Standard Operating Procedures, PEIS Mitigation Measures, Risk, and the Potential for Adverse Effects . . . . .	93
<b>Chapter 4 - Affected Environment and Environmental Consequences . . . . .</b>	<b>113</b>
Incomplete and Unavailable Information . . . . .	113
Accidental Spill or Misapplication . . . . .	116
Cumulative Impacts . . . . .	117
Changes in Herbicide Use on Adjacent Non-BLM Lands Resulting From the BLM Alternatives . . . . .	118
Cumulative Effects of Insect Spraying . . . . .	118
Oregon Department of Agriculture’s Pesticide Use Reporting System . . . . .	118
Forest Service’s Invasive Plant Program . . . . .	120
Previous Herbicide Use . . . . .	120
Environmental Setting . . . . .	120
Current Climate . . . . .	120
Biomes . . . . .	123
Sagebrush Steppe Biome . . . . .	125
Eastern Forest Biome . . . . .	126
East Side Riparian Biome . . . . .	126
Siskiyou Biome . . . . .	127
Western Forest Biome . . . . .	129
Willamette Valley Biome . . . . .	130
Noxious Weeds and Other Invasive Plants . . . . .	131
Affected Environment . . . . .	131
Traits of Invasive Plants . . . . .	131
Mechanisms of Invasion . . . . .	132
Weed Infestations in Oregon . . . . .	133
Environmental Consequences . . . . .	134
Noxious Weed Spread Rate by Alternative . . . . .	135
Native and Other Non-Invasive Vegetation . . . . .	139
Affected Environment . . . . .	139

Susceptibility of Plant Communities to Damage from Invasive Plants . . . . .	141
Endangered, Threatened, and other Special Status Plant Species . . . . .	142
Environmental Consequences . . . . .	144
Effects Common to All Alternatives . . . . .	144
Effects by Alternative . . . . .	151
Endangered, Threatened, and other Special Status Plant Species . . . . .	155
Pests and Diseases (Sudden Oak Death) . . . . .	156
Affected Environment . . . . .	156
Sudden Oak Death Characteristics and Dispersal Strategy . . . . .	157
Regulations and Control . . . . .	158
Treatment History in Oregon . . . . .	158
Environmental Consequences . . . . .	159
Effects Common to All Alternatives . . . . .	159
Effects (to Vegetation) by Alternative . . . . .	161
Air Quality . . . . .	163
Affected Environment . . . . .	163
Environmental Consequences . . . . .	165
Effects Common to All Alternatives . . . . .	166
Effects by Alternative . . . . .	168
Climate Trends, Projections, and Implications . . . . .	169
Observed Climate Trends . . . . .	169
Climate Change Projections . . . . .	169
Implications of Climate Change on Invasive Plants . . . . .	171
Effects of the Alternatives on Climate Change: Greenhouse Gas Emissions and Carbon Storage . . . . .	172
Soil Resources . . . . .	174
Affected Environment . . . . .	174
Environmental Consequences . . . . .	178
Effects Common to All Alternatives . . . . .	178
Effects by Alternative . . . . .	185
Cumulative Effects . . . . .	188
Water Resources . . . . .	188
Affected Environment . . . . .	188
Flows . . . . .	189
Water Quality . . . . .	189
Environmental Consequences . . . . .	194
Effects of Herbicides on Water Resources . . . . .	194
Routes for Off-Site Movement of Herbicides . . . . .	198
Effect of Invasive Plants on Water Resources . . . . .	202
Effects by Alternative . . . . .	203
Cumulative Effects . . . . .	207
Wetlands and Riparian Areas . . . . .	208
Affected Environment . . . . .	208
Environmental Consequences . . . . .	210
Effects Common to All Alternatives . . . . .	211
Effects by Alternative . . . . .	214

Fish	216
Affected Environment	216
Fish and Their Habitat	217
Setting - Aquatic Systems	218
Environmental Consequences	220
Effects Common to All Alternatives	220
Effects by Alternative – Non-Special Status Fish	232
Effects by Alternative – Special Status Fish	235
Cumulative Effects	238
Wildlife Resources	241
Affected Environment	241
Wildlife Considerations by Biome	243
Environmental Consequences	245
Effects Common to All Alternatives	246
Effects by Alternative	254
Cumulative Effects	257
Livestock	258
Affected Environment	258
Environmental Consequences	259
Effects Common to All Alternatives	260
Effects by Alternative	264
Cumulative Effects	267
Wild Horses and Burros	268
Affected Environment	268
Environmental Consequences	268
Effects Commons to All Alternatives	269
Effects by Alternative	270
Cumulative Effects	273
Fire and Fuels	273
Affected Environment	273
Environmental Consequences	276
Effects Common to All Alternatives	276
Effects by Alternative	277
Timber	278
Affected Environment	278
Existing Timber Volume Production	279
Invasive Plants on Timberlands	280
Environmental Consequences	280
Effects Common to All Alternatives	280
Effects by Alternative	282
Paleontological and Cultural Resources	283
Affected Environment	283
Paleontological Resources	283
Cultural Resources	283
Traditional and Cultural Uses (American Indian Interests)	284

Environmental Consequences . . . . .	285
Effects Common to All Alternatives . . . . .	285
Effects by Alternative . . . . .	286
Cumulative Effects . . . . .	290
Visual Resources . . . . .	292
Affected Environment . . . . .	292
Environmental Consequences . . . . .	292
Effects Common to All Alternatives . . . . .	293
Effects by Alternative . . . . .	295
Wilderness and Other Special Areas . . . . .	298
Affected Environment . . . . .	298
Wilderness and Wilderness Study Areas . . . . .	298
Wild, Scenic, and Recreational Rivers . . . . .	299
National Monuments . . . . .	299
National Scenic and Historic Trails . . . . .	299
Areas of Critical Environmental Concern, Research Natural Areas, and Outstanding Natural Areas . . . . .	300
Environmental Consequences . . . . .	300
Effects Common to All Alternatives . . . . .	301
Effects by Alternative . . . . .	301
Recreation/Interpretive Sites . . . . .	304
Affected Environment . . . . .	304
Recreation Management Categories . . . . .	304
Environmental Consequences . . . . .	305
Effects Common to All Alternatives . . . . .	305
Effects by Alternative . . . . .	306
Administrative Sites, Roads, and Rights-of-Way . . . . .	311
Affected Environment . . . . .	311
Government Facilities and Roads . . . . .	312
Rights-of-Way . . . . .	313
Environmental Consequences . . . . .	315
Effects by Alternative . . . . .	315
Social and Economic Values . . . . .	318
Affected Environment . . . . .	318
Analysis Area . . . . .	319
Population and Demographic Change . . . . .	319
Economic Specialization . . . . .	320
Perceptions, Values, and Concerns . . . . .	321
Environmental Consequences . . . . .	321
Concerns Raised During Oregon Scoping . . . . .	322
Effects Common to All Alternatives . . . . .	323
Effects by Alternative . . . . .	324
Cumulative Effects . . . . .	327
Environmental Justice . . . . .	328
Affected Environment . . . . .	328
Population and Demographic Change . . . . .	328

Environmental Consequences . . . . .	330
Effects Common to All Alternatives . . . . .	331
Effects by Alternative . . . . .	332
Cumulative Effects . . . . .	334
Implementation Costs . . . . .	338
Treated Acres and Effectively Treated Acres, by Alternative . . . . .	338
Costs by Treatment Method . . . . .	339
Total Cost and Cost per Effectively Treated Acre by Alternative . . . . .	340
Effects by Alternative . . . . .	341
Non-Quantified and Cumulative Effects . . . . .	342
Human Health and Safety . . . . .	343
Affected Environment . . . . .	343
Background Health Risks . . . . .	343
Risks from Diseases . . . . .	343
Risks from Cancer . . . . .	344
Injury Risk from Using Herbicides and Non-Herbicide Treatments . . . . .	344
Environmental Consequences . . . . .	345
Methodology for Assessing Effects . . . . .	346
Effects Common to All Alternatives . . . . .	347
Effects by Alternative . . . . .	355
Critical Elements of the Human Environment . . . . .	359
Other Environmental Consequences . . . . .	360
Adverse Effects Which Cannot Be Avoided . . . . .	361
Relationship Between Short-Term Uses of the Human Environment and Maintenance of Long-term Productivity . . . . .	362
Irreversible or Irretrievable Impacts . . . . .	362
<b>Glossary . . . . .</b>	<b>363</b>
<b>References . . . . .</b>	<b>391</b>
<b>List of Preparers . . . . .</b>	<b>421</b>
<b>Distribution List . . . . .</b>	<b>427</b>
<b>Index . . . . .</b>	<b>445</b>

## Tables

Table S-1. Estimated Annual Treatment Acres with Herbicide and Non-Herbicide Methods, West (W) and East (E) of the Cascades (FEIS:77-78) . . . . .	xxiii
Table S-2. Projected Annual Noxious Weed Spread and Acreage Change for Each Alternative (FEIS:137-138) . . . . .	xxiv
Table S-3. Selected Parameters for Each Alternative Relevant to the Effects Comparison (FEIS:77-78, 80, 138) . . . . .	xxv
Table S-4. Herbicides Available Under Each Alternative (FEIS:59-61) . . . . .	xxix
Table 2-1. Herbicide Treatments by Alternative and Treatment Objective . . . . .	29
Table 2-2. Herbicides Available Under Each Alternative . . . . .	33
Table 2-3. Comparison of the Features of the Alternatives . . . . .	39
Table 2-4. Estimated Annual Treatment Acres Under Each Alternative . . . . .	40
Table 2-5. Comparison of the Effects of the Alternatives . . . . .	42

Table 2-6. Response of the Alternatives to the <i>Purposes</i> . . . . .	47
Table 3-1. Herbicide Information . . . . .	59
Table 3-2. Herbicide Application Methods on BLM Lands in Oregon . . . . .	71
Table 3-3. Estimated Annual Treatment Acres West/East of the Cascades for Each Alternative. . . . .	77
Table 3-4. Estimated Annual Pounds of Herbicides that Would be Applied at Typical and Maximum application Rates East/West of the Cascades for Each Alternative.. . . . .	80
Table 3-5. 2006-2008 Oregon BLM Pesticide Use Reports Summary. . . . .	81
Table 3-6. Ground and Aerial Herbicide Application . . . . .	82
Table 3-7. Estimated Annual Herbicide Treatment Acres under Alternatives 3, 4, and 5 . . . . .	84
Table 3-8. Estimated Change in Native Vegetation Annual Treatment Acres. . . . .	85
Table 3-9. Herbicide Label Categories . . . . .	86
Table 3-10. Human Health and Ecological Risk Assessment Sources . . . . .	88
Table 3-11. Comparison of oral LD <sub>50</sub> values for commonly used herbicides and consumer goods. . . . .	92
Table 3-12. BLM-Evaluated Herbicide Risk Categories for Vegetation. . . . .	94
Table 3-13. FS-Evaluated Herbicide Risk Categories for Vegetation . . . . .	95
Table 3-14. BLM-Evaluated Herbicide Risk Categories for Wildlife, Fish, and Aquatic Species . . . . .	96
Table 3-15. FS-Evaluated Herbicide Risk Categories for Wildlife, Fish, and Aquatic Species . . . . .	98
Table 3-16. BLM-Evaluated Herbicide Risk Categories for Workers . . . . .	100
Table 3-17. BLM-Evaluated Herbicide Risk Categories for the Public . . . . .	101
Table 3-18. FS-Evaluated Herbicide Risk Categories for Workers. . . . .	102
Table 3-19. FS-Evaluated Herbicide Risk Categories for the Public . . . . .	103
Table 3-20. BLM 1991-Evaluated Herbicide High Risk Scenarios for Workers . . . . .	104
Table 3-21. BLM 1991-Evaluated Herbicide High Risk Scenarios for the Public . . . . .	104
Table 4-1. 2008 Oregon-Wide Use of the 18 Herbicides Analyzed in this EIS and Comparison with BLM Proposed Action (Alternative 4) . . . . .	119
Table 4-2. BLM Lands by Biome . . . . .	123
Table 4-3. Projected Annual Acres of Effective Noxious Weed Control by Alternative. . . . .	137
Table 4-4. Projected Annual Noxious Weed Spread Rates and Acreage Changes for Each Alternative . . . . .	138
Table 4-5. Potential Vegetation Types. . . . .	141
Table 4-6. Projected Noxious Weed Spread Rates and 15-Year Infested Acres for Each Alternative . . . . .	149
Table 4-7. Estimated Change in Native Vegetation Annual Treatment Acres by Treatment Method under Alternative 4 (Proposed Action) When Compared to Alternative 2 (No Action). . . . .	154
Table 4-8. Sudden Oak Death in Oregon Forests . . . . .	159
Table 4-9. Primary and Secondary National Ambient Air Quality Standards (NAAQS) . . . . .	163
Table 4-10. Non-Attainment and Air Quality Maintenance Areas in Oregon . . . . .	164
Table 4-11. Mandatory Class I Areas in Oregon and Nearby in Adjoining States . . . . .	165
Table 4-12. Emissions from Vegetation Treatments . . . . .	167
Table 4-13. Soil Order Properties and Extent on BLM Lands . . . . .	177
Table 4-14. Selected Characteristics that Affect the Fate of Herbicides in Soils . . . . .	181
Table 4-15. Miles of BLM Streams on ODEQ 303(d) List . . . . .	190
Table 4-16. Maximum Herbicide Concentration Allowed in Potable Water . . . . .	192
Table 4-17. Herbicide Persistence in Water . . . . .	199
Table 4-18. Drift Distance Versus Drop Diameter (NDSU 1993). . . . .	200
Table 4-19. Glyphosate Concentration in Washington Streams 1 Hour and 24 Hours After Injection . . . . .	201



Table 4-20. Herbicide Half-Life in Anaerobic Soils . . . . .	.211
Table 4-21. Federally Recognized American Indian Tribes with Interests in Oregon . . . . .	.284
Table 4-22. Vegetation Treatment Methods Contributing to Ground Disturbance . . . . .	.287
Table 4-23. Estimated Annual Treatment Acres by Alternative . . . . .	.294
Table 4-24. Approximate Acres of Noxious Weeds Currently Treated Annually in Special Areas . . . . .	.302
Table 4-25. Approximate Acres of Other (non-noxious) Invasive Vegetation Currently Treated Annually in Special Areas	302
Table 4-26. Approximate Annual Acres of Vegetation Currently Treated Within Developed Recreation Sites . . . . . and Hiking Trails by Treatment Method . . . . .	.306
Table 4-27. Population Living Below the Poverty Level . . . . .	.330
Table 4-28. Racial and Ethnic Change Compared to the Total Population Change in Oregon, by County (1990 to 2000) . . . . .	.335
Table 4-29. Racial and Ethnic Share of 2000 Population . . . . .	.336
Table 4-30. Population Living Below the Poverty Level in Oregon, by County, Race, and Ethnicity . . . . .	.337
Table 4-31. Estimated Annual Acres of Noxious/Invasive Weed Treatment by Alternative . . . . .	.339
Table 4-32. Average Direct Cost of Treatment by Treatment Method, per Acre, East and West of the Cascades . . . . .	.340
Table 4-33. Annual Cost of Noxious Weed/Invasive Plant Treatment per Alternative . . . . .	.340
Table 4-34. Annual Cost for Rights-of-Way/Administrative Sites/Recreation Sites Treatments. . . . .	.342
Table 4-35. Leading Causes of Death by Percentage . . . . .	.344
Table 4-36. Estimated Annual Acres of Treatments with Risk to Worker and Public Human Health by Alternative . . . . .	.356

## Figures

Figure 1-1. Lands Administered by the Bureau of Land Management in Oregon . . . . .	.5
Figure 1-2. Average Annual Precipitation 1961-1990 . . . . .	.19
Figure 3-1. Basis for Risk Assessments . . . . .	.91
Figure 4-1. Oregon Biomes . . . . .	.124
Figure 4-2. Relationship between Area Occupied by Invasive Species and Time. . . . .	.132
Figure 4-3. Potential Vegetation Types . . . . .	.143
Figure 4-4. Soil Orders . . . . .	.175
Figure 4-5. Wind Erosion Risk Groups 1 and 2 . . . . .	.180
Figure 4-6. Source Water Protection. . . . .	.191
Figure 4-7. Invasive Annual Upland Grasses East of the Cascades . . . . .	.275
Figure 4-8. Population change for Oregon and counties east and west of the Cascades (Source: US Department of Commerce 2005) . . . . .	.320

## Volume 2

### Appendices

Table of Contents . . . . .	.449
Appendix 1 – The PEIS . . . . .	.455
Appendix 2 - Standard Operating Procedures and Mitigation Measures from the PEIS. . . . .	.457
Appendix 3 – Monitoring. . . . .	.469
Appendix 4 – Protocol for Identifying, Evaluating, and Using New Herbicides . . . . .	.477

Appendix 5 – Federally Listed and other Special Status Species . . . . .	.483
Appendix 6 – Summary of Existing District Resource Management Plan Direction for Noxious Weeds . . . . .	.555
Appendix 7 – Additional Information about Noxious Weeds and Other Invasive Plants . . . . .	.585
Appendix 8 – Human Health and Ecological Risk Assessments. . . . .	.605
Appendix 9 – Additional Information About the 18 Herbicides . . . . .	.609
Appendix 10 - Response to Public Comments on the September 2009 Draft EIS . . . . .	.649
Appendix 11 - Comment Letters from Federal, State, and Local Government Agencies on the 2009 Draft EIS . . . . .	.765
Appendix 12 - 2,4-D . . . . .	.783
Appendix 13 - EPA Pesticide Registration and Reregistration and BLM/FS Risk Assessment Processes . . . . .	.799