Willamette National Forest
Integrated Weed Management
Environmental Assessment

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CHAPTER 1: PURPOSE AND NEED

Background

A number of federal documents direct National Forests to initiate Integrated Weed Management (IWM) programs to control noxious weeds. The 1990 Farm Bill amendment to the 1974 Noxious Weed Act directs the Secretary of Agriculture to "develop and coordinate a management program for control of undesirable plants which are noxious, harmful, injurious, poisonous or toxic" (FSM, 2080. 1), to complete and implement cooperative agreements regarding management of noxious weeds, and to budget for IWM programs. The 36 Code of Federal Regulations (222.8b) states,"the Chief, Forest Service, will cooperate with county or other local weed control districts in analyzing noxious weed problems and developing control programs in areas of which the National Forests and National Grasslands are a part.

The U.S. Department of Agriculture (USDA) Forest Service Manual (sections 2080-2082) directs Forests to control and contain noxious weeds using an IWM approach. The manual stresses preventing the introduction and establishment of new noxious weed infestations through cooperation with state agencies, local landowners, and other Federal agencies and through education.

The Pacific Northwest Region of the USDA Forest Service wrote an Environmental Impact Statement entitled "Managing Competing and Unwanted Vegetation in 1988. This document (hereto referred to as the EIS) and its subsequent mediated agreement provide the framework for project analysis using a five-step IWM process. The EIS Record of Decision states that for managing competing and unwanted vegetation use of prevention and natural processes is the preferred alternative. All tools are available for noxious weed control (manual, mechanical, prescribed burning, biological, chemical), but herbicides are to be used "only when other methods are ineffective, or will increase project cost unreasonably" (USDA, 1988).

The Willamette National Forest initiated an IWM plan to manage noxious weeds in 1993. This involved identification of target noxious weed species, density thresholds that will trigger action, and development of alternative management strategies for target species. The Willamette NF is also responsible for a site-specific analysis of plan alternatives.

The 1990 Willamette National Forest Land and Resource Management Plan was amended in 1993 to include the following forestwide standard and guideline 255a:

> "An integrated management approach, as described in the Decision Notice and Environmental Assessment for Integrated Weed Management on the Willamette National Forest (5/93), shall be used to treat noxious weeds. Noxious weed sites should be identified and analyzed for the most effective control method based on site-specific conditions. The priority is prevention. Noxious weed sites will be identified and analyzed for the most effective control method, depending on site conditions. A full range of control methods will be available for use."

Other direction in the Willamette Forest Plan includes standard and guideline 264, which states that the forest will cooperate with state, county and other federal agencies in noxious weed control. Noxious weeds are also mentioned in standard and guideline 259: "project plans should consider existing noxious weed infestations within the project area. Activities should be designed to minimize the risk of spreading the infestation. Mitigation measures should be used as needed to reduce the spread of noxious weeds" (USDA, 1990).

Since 1988, Willamette NF has had a Memorandum of Understanding (MOU) with the Oregon Department of Agriculture to work together managing noxious weeds. Most of the work accomplished under this MOU has consisted of inventory and mapping noxious weed infestations on major roadsides on the forest, release of biological control agents, and, since 1995, spraying of new invader noxious weed populations along roadsides in the Forest.

The Willamette National Forest has also worked with the Oregon Department of Transportation (ODOT) in its weed control efforts. ODOT has helped mow infestations along state Highway 126. They also cooperate in traffic control during treatments on the state Highway 58 corridor.

Purpose and Need

The proposed action is to add four Standards and Guidelines to the Willamette National Forest Land and Resource Management Plan through a non-significant amendment. This will enable future environmental documents to tier for direction on prevention measures, control methods for timely treatment of new invasions, and control methods for established infestations. These standards and guidelines will update the current Integrated Weed Management program by adding potential and new invaders to the 1993 list and prescribing treatment for 205 populations of weeds.

The need for the IWM program on the Forest is the same now as it was in 1993. Because of their superior competitive and reproductive abilities, weeds are a threat to many established natural areas on the forest such as Wilderness areas and Botanical Special Interest Areas as well as species-rich meadows near roadsides. Noxious weeds can potentially outcompete plants used as deer and elk forage within roadway corridors and in dry meadows, clearcuts and open forest. These weed species may also outcompete native plants, which are better at binding the soil, preventing erosion on steep hillsides, cutbanks and meadows (Lacey et al., 1989). The National Forest Management Act states that the Forest Service will maintain viable populations of all desired native species (36 Code of Federal Regulations Section 219.19). Weeds also have an adverse effect on aesthetic values in recreational sites and along Highways 20, 22, 58 and 126.

The Forest's largest weed problems currently consist of the need to stem the east-west flow of spotted and diffuse knapweed species and the west-east flow of meadow knapweed and tansy ragwort.

This analysis will address new weed species; several species that were previously considered potential invaders have been documented on the Willamette National Forest (Table 1). No forestwide standards and guidelines exist for institutionalizing prevention strategies, treating small infestations using manual methods or for allowing biological control releases.

One hundred fifty-six additional populations of new invaders have been located and need a site-specific analysis to treat them. Populations previously analyzed in the 1993 Environmental Assessment need to be reanalyzed. The Northwest Forest Plan provides very different standards and guidelines for riparian areas and it also provides standards and guidelines for surveying and managing species. The U.S. Fish and Wildlife Service (USFWS) have listed several new fish species.

Scoping

A scoping letter which explained the purpose and need for the project and detailed possible control methods (manual, mechanical, chemical, biological) was sent out to all organizations in the 1998 Schedule of Proposed Actions (SOPA) mailing list, the 1993 noxious weed Environmental Assessment mailing list, all

adjacent landowners. A news release went out to all newspapers during the scoping in March, 1998. Articles have been placed in the quarterly SOPA list of activities.

Following the public comment period, the following issues were identified as key issues by the Deciding Official and were used to develop Alternatives and mitigation measures:

1. Water Quality and Aquatic Species- There was concern from members of the public about the effects of herbicide treatment on water quality and aquatic species health due to drift or runoff from roads and riparian areas. (Measured in number of sites potentially treated with chemicals within Riparian Reserves)

2. Economics- There was concern that cost-benefit analyses be conducted for control methods, especially those affecting water quality. Also concern was expressed over the potential for noxious weed infestations to cost a great deal more money in the future if measures are not taken to prevent or treat them now, for example cheatgrass in rangelands and kudzu in the southeastern U.S. (Measured by cost of implementing program)

3. Human Health. Several respondents felt that there could be potential health impacts to humans from exposure in areas of high human use such as trailheads. (Measured by number of high human use sites treated with chemicals)

4. Effects on Wildlife 4a: Concerns were expressed for effects of all herbicides on mammals and potential for poisoning foraging animals and birds (Measured by number of sites potentially treated with chemicals). 4b: Another issue involved effects on wildlife by loss of forage due to replacement of native forage species by exotic weed species. (Measured by number of Site Type 2 sites remaining untreated)

5. Maintenance of Native Plant Communities 5a: The first issue was potential loss of native plant communities or species if weeds are not treated in a timely manner. (Measured by number of Site Type 2 sites remaining untreated) 5b: A second issue concerned the effects of herbicides on forest health and non-target plants. (Measured by number of sites potentially treated with chemicals)

Issues considered but outside the scope:

Worker Exposure Issues- Concern was expressed for applicators in the form of direct exposure, adequate safety and training procedures, as well as storage and transport.
This issue has been addressed in the EIS for Managing Competing and Unwanted Vegetation (USDA, 1988) and is outside the scope of this analysis. Specific mitigation measures that tier to the EIS requirements will be used to ensure worker safety (see Table 6).

CHAPTER 2: DESCRIPTION OF PROPOSAL AND ITS ALTERNATIVES

Proposal and Goals

The proposal is to incorporate new information into the IWM program for the Willamette National Forest. There are several goals for the program:

1. Use the best methods available (under the EIS and Guide to Managing Competing and Unwanted Vegetation a handbook for Region 6 to use in implementing the EIS) to manage noxious weeds depending on their classification (new invader or established infestation), species biology, size of population, geographic location, potential for spread, other factors (such as presence of Threatened, Endangered, survey and manage, sensitive species, watershed values, Heritage sites) and budget;

2. Cooperate with adjacent National Forests (Mt. Hood, Deschutes, and Umpqua), BLM Districts, Oregon Department of Agriculture, Oregon Department of Transportation and Lane, Linn and Marion Counties in development of a consistent IWM strategy;

3. Ensure public involvement in all stages of development and implementation of an IWM plan;

4. Implement prevention of noxious weed establishment by educating employees, contractors and the public. Promote use of weed-free seed, feed, hay and straw. Use contracts and permit provisions that restrict introduction of weeds;

5. Ensure that noxious weeds are considered in project-level analysis for any ground-disturbing activity, such as emergency staging areas, trailheads, roadsides, campgrounds, gravel and borrow pits, and grazing allotments;

6. Continue on-going inventory for new infestations of species that are targeted as high priority for management and eradication, and

7. Follow procedures established in this plan for site-specific analysis of infestations including an inventory and follow-up monitoring form that will document successes and failures (see Appendix A: Inventory and Monitoring).

Weed species may be classified as one of three types: potential invaders, new invaders and established infestations. Potential invaders are those species that have not been detected on the Forest but have the potential to spread to the Forest. New invaders are noxious weeds that are in the early stages of invasion and have not yet naturalized to the point that resource damage is occurring. These species typically occur in limited, definable areas (see Table 2). These species receive the highest management priority. These are infestations which may be eradicated if action is taken in a timely manner. Established infestations are noxious weeds that have spread to the point that they have become naturalized and are causing unacceptable resource damage. Populations are spread throughout the Forest in disturbed areas. These are infestations that are not feasible to eradicate.

Noxious weeds on the Forest are classified as follows:

Table 1. Classification of Noxious Weeds on Willamette National Forest

Potential Invaders	New Invaders	Established Species
Leafy spurge	Spotted knapweed[1]	Bull thistle
Purple loosestrife	Diffuse knapweed	Canada thistle
Yellow starthistle	Yellow Toadflax	Scotch broom
Distaff thistle	* Dalmatian toadflax[2]	St. Johns-wort
Squarrose knapweed	* Giant knotweed	Tansy ragwort
	* Meadow knapweed	
	* Climbing nightshade	
	* Field Bindweed	
	* Evergreen blackberry[3]	
	* Himalayan blackberry	
	* False Brome	
	* Reed Canarygrass	
	* Sweetclover	
	* Houndstongue	

Information on the biology of each of the noxious weeds listed above is found in Appendix B. A detailed description of preferred habitat types, potential adverse effects to the forest and results of past control practices are presented on a species by species basis.

Damage Thresholds

The EIS directs the Forest to determine damage thresholds and strategies for managing noxious weed invasions. Damage thresholds--the point at which damage to the environment will initiate active management--have been set in the Forest Service Manual (2083. 1) and EIS, which direct infestation prevention, containment and suppression.

For potential invaders, there is no threshold to initiate activity; prevention is the strategy for management (see proposed forestwide standards and guidelines for all action alternatives). For new invasions where eradication is possible, the action threshold is **any detected infestation** and the strategy is early treatment. The preferred strategies for established infestations will be correction of high population levels and maintenance of low population levels because complete eradication is impossible.

Treatment Sites and Site Types

Each population of new invader noxious weed will be assigned a number. A site inventory and monitoring form will be filled out for each site. This form includes information necessary to conduct the 6-step analysis designated in the EIS: detect site, analyze site, select strategy, design project, action and monitor. This

[1] All populations but one of spotted knapweed are new invaders. The unique population is an established infestation because a number of biological control agents have been released there. The insects are able to reproduce at this "nursery" site; one of only a few in western Oregon. Due to its unique nature, the Oregon Department of Agriculture has requested we maintain this site as a biocontrol breeding area.
[2] All starred (*) species are those added since the 1993 Environmental Assessment.
[3] Populations of blackberry which are isolated from large populations and have 10 or fewer plants are termed new invaders.

analysis ensures that each population is adequately analyzed for the proper control method which is related to the number of plants, proximity of adjacent water or sensitive plants or animals and potential to spread to adjacent land (see goal #1 for the program).

Table 2 lists proposed treatment sites. The forty-nine sites in bold are those analyzed in the 1993 Environmental Assessment. An additional 156 sites have been documented since the 1993 IWM Plan was completed.

Five site types that have the potential for noxious weeds have been identified on the Willamette National Forest. Each site type has a distinctive combination of vegetative, soil and water characteristics that will influence the choice of control methods for the site.

Each noxious weed site will be placed within a site type and treated under the selected Alternative[4]

Site Type 1: Rocky, gravelly, historically bare ground sites on road shoulders, abandoned roads, quarries and gravel storage sites, and cutbanks. These sites have little to no competing vegetation.

Site Type 2: Roadsides, timber harvest landings and skid roads, meadows and plantations with moderate to highly competitive plant cover or the ability to revegetate a competitive cover.

Site Type 3: Wilderness; Threatened, Endangered or Sensitive Plant or Animal Site; Significant Heritage Site.

Site Type 4: Administrative sites with high human use: campgrounds, trails, trailheads, Ranger district compounds.

Site Type 5: Administrative sites with little human use: powerline corridors, ski areas in summer.

Riparian: Riparian areas may be found within any of site types 1-5. Definitions of these sites vary, depending on the Alternative. For all action Alternatives (2, 3 and 4), riparian sites are those which fall within Riparian Reserves as defined by the Northwest Forest Plan. See Table 2 for a list of riparian site types.

[4] Note that these site types differ slightly from the 1993 EA. Types 1-3 from 93 = Type1 in 99; Type 4 from 93=Type 2 in 99; Type 7 from 93=Type 3 in 99; in 93 riparian areas were a unique site type and in 99 Riparian Reserves can be part of any other site type; in 93 established weeds were a unique site type and in 99 they are treated through a Forest Plan amendment.

Table 2: Treatment Sites

Type 1:Roadside, quarry, road waste disposal, cutbank; little to no competing vegetation

Site#	Stream Class	Road/Milepost	Species	Abundance
BR2	1,2,4	19 MP 0.5-8.5	Spotted knapweed	1.00 ac
BR5	4	1993 MP 0.0-6.0	Spotted knapweed	0.01ac
BR6	2,4	19408 MP 0.0-7.0	Spotted knapweed	.01 ac
BR8	--	19402 MP 0.0-1.5	Spotted knapweed	.5 ac
BR10	4	15	Spotted knapweed	<100 plnt
BR13	2,4	1980/227 and 430/470	Spotted knapweed	<100 plnt
BR14	4	19/430 past 433	Spotted knapweed, Sweetclover	<25 plnt
BR15	--	1506/1508 MP 3.0	Spotted knapweed	>100 plnt
BR16	2,3	19 btw 1964 &1958	Spotted knapweed	1 plnt
BR17	4	1958 MP 5.0	Spotted knapweed	100 plnt
BR20	--	1508	Blackberry	<10 plnt
BR21	--	1517/655	Blackberry	10 plnt
BR22	4	1510 btw jnct with 622 and 545	Blackberry	3 plnt
BR23	--	1510/622	Blackberry	5plnt
BR24	--	1508 past jnct 412	Blackberry	<20 plnt
BR25	1,4	15/500	Blackberry	15 plnt
BR26	--	15/130/134	Blackberry	< 20 plnt
BR27	--	1506/1507/466 near junct 476	Blackberry	< 20 plnt
BR28	4	125/126	Blackberry	1 plnt
BR31	--	1501/198	Blackberry	5 plnt
BR32	--	1927/140 past junct 143	Blackberry	5 plnt
BR34	--	126-15-1510-1509-622	Spotted knapweed	10 plnt
BR35	--	126-26181410	Spotted knapweed	100 plnt
BR36	--	126-19-1993 10 mi up	Spotted knapweed	10 plnt
BR37	--	19-985-987 ½ mi up	Spotted knapweed	2 plnt
DE3	1,2,3,4	22 MP 56.17-61.55	Spotted knapweed	.125 ac
DE5	1,2,3,4	22 MP 61.55-81.74	Spotted knapweed	.25 ac
DE6	--	2266, MP 1.3	Spotted knapweed	.01 ac
DE7	4	2236 MP 2.0	Diffuse knapweed	.01 ac
DE8	--	2242 MP 2.0	Diffuse knapweed	.01 ac
DE9	4	2253, MP 0.2 quarry	Spotted knapweed	.25 ac
DE10	1	22 @ Marion Cr	Houndstongue	.001 ac
DE12	--	2267/2257 skid rd before 405	Knapweed	.10 ac
DE13	3	2223/535 MP 0.5	Diffuse knapweed	1 plnt
DE16	1	22, .5 mi E Whispering Falls CG	Blackberry	10 plnt
DE18	--	2207/175 1st 0.3 mi	Blackberry	3 plnt
DE19	--	2209/203	Blackberry	1 plnt
DE20	--	2209/207, 0.3 mi from jnct with 201	Blackberry	1 plnt
DE21	2	2207 MP 8.0	Blackberry	3 plnt
DE22	--	2209/201 MP 0.8	Blackberry	2 plnt
DE23	3,4	2212	Blackberry, Sweetclover	9 plnt
DE24	4	2212/634 MP 3.4, 3.7	Blackberry	10 plnt
DE25	--	2212/639 MP 0.9	Blackberry	1 plnt
DE26	1	22 dam to Detroit	Blackberry, Sweetclover	6 plnt
DE27	--	1003/305 MP 0.4	Blackberry	1 plnt
DE28	--	1003/409 MP 1.1	Blackberry	1 plnt
DE29	--	2231/701 MP 1.1	Blackberry	1 plnt
DE30	1	22 Detroit-Idanha	Blackberry	2 plnt

Site#	Stream Class	Road/Milepost	Species	Abundance
DE32	--	22-11-1168 1 mi up	Spotted knapweed	6 plnt
DE33	4	22-11-1168 junct 367	Spotted knapweed	30 plnt
LO2	--	5847/547	Spotted knapweed	.02 ac
LO5	4	5824/120 past 138	Meadow knapweed	.10 ac
LO7	3	1816/192; landing	Spotted knapweed	1 plnt
LO9	--	1802-164	False brome	500 plnt
MC2	1,2,3,4	126 MP 12.20-19.81	Spotted knapweed	0.20 ac
MC3	1	126 MP 11.69-12.2	Spotted knapweed	.5 ac
MC5	1&2	126 MP 0.0-11.59	Spotted knapweed	1.50 ac
MC7	1	2650	Spotted knapweed	.10 ac
MC8	4	20, 126 junct to Deschutes NF	Spotted knapweed	.75 ac
MC9	--	2654/796	Spotted and Meadow knapweed	20-50 plnt
MC10	--	2654/792	Spotted knapweed	20-50 plnt
MC11	--	126, 3 mi n 2664, ODOT storage	Spotted knapweed	100-200 plnt
MC12	4	126/612	Spotted and Meadow knapweed	10-30 plnt
MC13	2	2654 n of 786	Spotted knapweed	10-20 plnt
MC14	--	126/720/721	Spotted knapweed	20 plnt
MC15	1	126 spur n of Ollallie CG; disposal site	Spotted knapweed	50-100 plnt
MC16	4	2654/782 w of 773	Spotted knapweed	10-20 plnt
MC17	4	2653/2657/865/871	Spotted knapweed	10-20 plnt
MC18	4	2647 MP 2.0	Spotted knapweed	10-20 plnt
MC19	--	2643/450	Spotted knapweed	10-20 plnt
MC20	4	1993 past 315	Spotted knapweed	10-20 plnt
MC21	--	2647/535	Spotted knapweed	10-20 plnt
MC22	--	2643/484	Meadow knapweed	100 plnt
MC23	1	2638, e side	Spotted knapweed	10-20 plnt
MC24	4	2654/2655/505	Spotted knapweed	10-20 plnt
MC25	--	126/705/700/706	Blackberry	1 plnt
MC28	--	2643/410/411	Blackberry	3 plnt
MC34	--	126-2643-409 1 mi up	Spotted kanpweed	100 plnt
MC35	--	126-2643 just past 440	Spotted knapweed	10 plnt
MC36	--	126-2643-410	Spotted knapweed	1 plnt
MC37	--	126-2643-470-469 ½ mi up	Spotted knapweed	1 plnt
MC38	4	126-242	Spotted knapweed	100 plnt
OAl	1,2,3,4	58 MP 37.13-67.07	Spotted knapweed	0.20 ac
OA2	1	58 MP53	Spotted knapweed	0.30 ac
OA3	3,4	1929 MP 0.0	Spotted knapweed	0.01 ac
OA7	--	1931, .25 mi s Wall Cr.	Spotted knapweed	.01 ac
OA8	4	1910/ 683	Spotted knapweed	.01 ac
OA9	1	5875 MP .25	Diffuse knapweed	100 plnt
OA11	--	2618 junct 605/607	Dalmatian toadflax	1 plt
OA13	2	1927, opposite 017	Spotted knapweed	150 plnt
OA15	4	5871 past jnct 334	Blackberry	1 plnt
RI1	1,2	21/2135	Spotted knapweed; Diffuse knapweed	.25 ac
RI3		23 near Skipper Cr.	Spotted knapweed	2.00 ac
RI9	4	21, .25 mi past 2154	Spotted knapweed	.01 ac
RI10	3,4	2129/444	Yellow toadflax	.01 ac
RI11	--	2149/415	Yellow toadflax	.01 ac
RI16	--	2102 MP 9.0	Spotted knapweed	1 plnt
RI19	--	2154	Spotted knapweed	.01 ac
RI20	3	21, btw Bills Cr andLittle Pine Opening	Meadow knapweed	9 plnt
RI21	4	21, .3 mi n Secret CG	Meadow knapweed	200 plnt

Site#	Stream Class	Road/Milepost	Species	Abundance
RI22	1	21, w of Gravel Cr.	Meadow knapweed	4 plnt
RI23	--	21, .4 mi s 2143	Meadow knapweed	30 plnt
RI24	4	2124, .25 mi se 456	Yellow toadflax	300 plnt
RI26	--	2129 w of 429	Meadow knapweed	14 plnt
RI28	--	2302/558	Blackberry	5 plnt
RI29	--	476 on landing	Blackberry	10-20 plnt
RI30	2	2120/447	Blackberry	20-30 plnt
RI32	--	21, s MP 10	Blackberry	20 plnt
RI33	3	21 Packard Cr	Blackberry	50 plnt
RI34	--	2137, MP 6.4	Spotted knapweed	400 plnt
SH1	1,2,3,4	20 MP 44.0-56.6	Spotted knapweed, Blackberry and Reed canarygrass	.02 ac
SH2	2,3,4	20 MP 56.6-65.82	Spotted knapweed	1.10 ac
SH3	2,3,4	20 MP 65.82-80.82	Spotted knapweed and Reed canarygrass	.13 ac
SH8	--	2672/410, MP.25	Spotted knapweed	.01ac
SH10	2	2067 to Crescent Cr.	Spotted knapweed	.01 ac
SH11	--	2027/820	Spotted knapweed	.01 ac
SH12	2	11; 3.9 mi e WNF	Meadow knapweed and Reed canarygrass	1 ac
SH14	3	20, MP 66.7	Spotted knapweed: Meadow knapweed	90 plnt
SH15	3	2067, .5 mi n 560 waste disposal	Spotted knapweed	50 plnt
SH18	--	1598/212/215, .2 mi e junct 218	Meadow knapweed	80 plnt
SH19	2,3	11/1142	Blackberry	3 plnt
SH20	2	11 .25 mi e Bruler Cr.	Blackberry	5 plnt
SH21	3	1131 1 mi from 101	Blackberry	10 plnt
SH22	3	1133 MP 2.5	Blackberry	.10 ac
SH23	2	1131/101 just past junct 105	Blackberry	1 plnt
SH27	--	1133 MP1.0	Spotted knapweed	1 plnt
SH29	3	2022/2026/2820 2-3 mi	False crome	.10 ac
SH30	--	2041 MP7	Blackberry	1plnt
SH31	3	2047/2049 MP 7	Blackberry	4 plnt
SH32	--	2022/250 MP 1.0, 1.5	Blackberry	2 plnt
SH35	--	1133/306 MP 1.0	Meadow knapweed	100 plnt
SH36	1,2	20 w of Upper Soda	Spotted knapweed and Reed canarygrass	10 plnt
SH38	--	2044-230	Reed canarygrass	

Type 2: Roadside, meadows, landings and skid roads; vegetation or potential for vegetating

Site#	Stream Class	Road/Milepost	Species	Acreage
BR1	1,2,4	126 MP 44.17-48.30	Spotted knapweed	.25 ac
BR2	1,2,4	19 MP 0.6-8.5	Spotted knapweed	*[5]
BR3	1	19 MP 0.5	Spotted knapweed	1 acre
BR4	1,2,4	410 MP 0.0-1.6	Spotted knapweed	.35 ac
BR5	4	1993 MP 0.0-6.0	Spotted knapweed	*
DE1	1	22 MP 42.7-49.73	Spotted knapweed , Sweetclover	10 plnt
DE2	1,2	2223 MP1.0	Spotted knapweed, Sweetclover	0.01
DE11	2	22, 3 mi w Detroit	Spotted knapweed, Sweetclover	.01 ac
DE14	--	2234	Yellow toadflax	1/16 ac
DE35	4	22-10-1000-068-069 to end	Sweetclover	20 plnt
LO1	1,2,3,4	58 MP 19.92-31.28	Spotted knapweed, Sweetclover	0.10 ac
LO6	3,4	1816/176	Meadow knapweed	70+ plnt
LO8	4	1821 182 junct	False brome	50 plnt
MC1	1,2	126 MP 51.0-54.97	Spotted knapweed	.25 ac
MC5	1,2,3,4	126 MP 0-11.59	Spotted knapweed	*
MC6	2	2643 MP 0.0-0.5	Spotted knapweed	0.01 ac
MC26	1	2638/2639 before rd sign	Blackberry	10 plnt
MC31	1,4	126-2638 1 mi past 356	Spotted knapweed	1 plnt
MC32	--	126-2649 just past 688	Spotted knapweed	1 plnt
MC41	--	126-2633	Spotted kanpweed	25 plnt
MC43	1	126-730	Spotted knapweed	10 plnt
MC44	--	126-655-656	Spotted knapweed	5 plnt
OA1	1,2,3,4	58 MP 37.13-67.07	Spotted knapweed, Sweetclover	*
OA3	3,4	1929	Spotted knapweed	*
OA4	1,2	24 MP 0.0-1.0	Spotted knapweed	0.01 ac
OA 10	--	.25 mi w Rigdon Station	Giant knotweed	10 plnt
OA12	2	1927 to 607	Spotted knapweed	8 plnt
OA14	1,4	5893	Blackberry	2 plnt
OA16	--	5871/328	Blackberry	1plnt
OA17	--	5875/124	Blackberry	10-20 plnt
OA19	--	1930	Blackberry	10-20 plnt
OA20	4	5875	Blackberry	10-20 plnt
OA21	4	5877 MP 1.2	Blackberry	1 plnt
OA23	4	1930	Blackberry	10-20 plnt
OA24	3	58-5884 near end	Reed canarygrass	40 plnt
RI1	1,2	2135 MP 0.0	Spotted knapweed; Diffuse knapweed	*
RI2	2	23/422 MP 0.0-0.5	Spotted knapweed	0.01 ac
RI3	1,3	23, near Skipper Cr.	Spotted knapweed	*
RI6	1,2	2143-280	Diffuse knapweed	.01 ac
RI7	1,2	21, .5 mi s Little Pine Opening	Spotted knapweed	1 plnt
RI8	--	2129, .5 mi from junct 2120	Spotted knapweed	5 plnt
RI14	1,3	21 junct 2127	Meadow knapweed	10 plnt
RI15	1	2127/180 junct 188	Giant knotweed	10 plnt
RI17	2	2136, 2.5 mi s 2137	Yellow toadflax	.5 ac
RI31	--	5821, .25 mi s MP9	Blackberry	20 plnt
SH4	--	20/245	Yellow toadflax	.01 ac
SH6	--	2067 MP2	Yellow toadflax	.10 ac
Site#	Stream Class	Road/Milepost	Species	Acreage

[5] Starred abundances indicate the site has been already counted in another site type

SH7	1	2027	Spotted knapweed; Meadow knapweed	.01 ac
SH9	--	2027/810, MP .5	Giant knotweed	.10 ac
SH16	3	2022/2026/415 MP0.5	Meadow knapweed	.10 ac
SH17	--	2067/544	Meadow knapweed	20 plnt
SH24	1	Wiley Cr. Road	False brome	Acres
SH25	--	2025/510 MP 2.0	False brome	.10 ac
SH26	--	20/15/080 MP 2.0	False brome	.012 ac
SH28	--	2025/2027	False brome	.10 ac
SH34	--	2032/1509/525 junct	Spotted knapweed	5 plnt

Site Type 3: Wilderness, TES Sites, Heritage Sites

Site#	Stream Class	Special Feature	Species	Acreage
BR1	1,2,4	Heritage site	Spotted knapweed	*
BR2	1,2,4	Romanzoffia thompsonii and Carex scirpoidea	Spotted knapweed	*[6]
BR2-4	1,2,4	Heritage sites (6)	Spotted knapweed	*
BR16	2,3	Bull trout	Spotted knapweed	*
DE5	1,2,3,4	Heritage sites (10)	Spotted knapweed	*
DE10	1	Heritage site	Houndstongue	*
DE11	2	Heritage site	Spotted knapweed	*
LO1	1,2,3,4	Oregon chub	Spotted knapweed	*
MC1,2,5	1,2,3,4	Heritage sites (16) Survey and Manage	Spotted knapweed	*
MC7	1	Bull trout	Spotted knapweed	*
MC8	4	Heritage site	Spotted knapweed	*
MC11	--	Heritage site	Spotted knapweed	*
MC14	--	Heritage site	Spotted knapweed	*
MC15	1	Heritage sites (2) Bull trout	Spotted knapweed	*
MC31	1,4	Bull trout	Spotted knapweed	*
MC35	--	Heritage site	Spotted knapweed	*
OA1,2	1,2,3,4	Heritage sites (15)	Spotted knapweed	*
OA3	3,4	Heritage site	Spotted knapweed	*
OA11	--	Heritage site	Dalmatian toadflax	*
RI1	1,2	Heritage site	Spotted knapweed; Diffuse knapweed	.25 ac
RI6	1,2	Heritage site	Diffuse knapweed	.01 ac
RI7	1,2	Heritage site	Spotted knapweed	1 plnt
RI10	3,4	Peregrine falcon	Yellow toadflax	.01 ac
RI2	2	Heritage site	Spotted knapweed	0.01 ac
RI22	2	Heritage site	Meadow knapweed	*
RI26	--	Heritage site	Meadow knapweed	*
SH1,2,36	1,2,3,4	Heritage sites (11), Survey and Manage	Spotted knapweed	*
SH3	2,3,4	Heritage site	Spotted knapweed and Reed canarygrass	.13 ac
SH4	--	Heritage site	Yellow toadflax	*
SH12	2	Heritage site	Meadow knapweed	*
SH17	--	Heritage site	Meadow knapweed	*
SH26	--	Heritage site	False brome	*
SH37	--	Lycopodiella inundata		

[6] Starred abundances indicate the site has been already counted in another site type

Site Type 4: Administrative Sites with high Human use

Site#	Stream Class	Road/Milepost	Species	Acreage
BR5	4	1993 Echo Boaat Launch	Spotted knapweed	*
BR17	4	1958 MP 5.0 Dispersed campsite	Spotted knapweed	100 plnt
BR29	--	125 at Dam Lookout	Blackberry	10 plants
BR30	--	District Office	Blackberry; Scotch broom	2 ac
DE21	2	2207 MP 3.8 dispersed camp	Blackberry	*
DE31	---	District Compound	Scotch broom, Blackberry	2 ac
DE34	--	Maxwell Butte Trailhead	Spotted and Meadow knapweed	20 plnt
LO9	---	District Office	Blackberry	1 ac
MC27	---	District Compound	Scotch broom	2 acres
MC49	4	126-730; boat ramp	Spotted knapweed	300 plnt
MC55	--	Pacific Crest Trail Trailhead, hwy 20	Spotted knapweed	7 plnt
OA22	1,2	Rigdon District	Blackberry	2 ac
RI1	1,2	Dispersed Rec Site	Sweetclover	.25 ac
RI12	--	Packard Cr CG	Spotted knapweed	.01 ac
RI13	1	2100-156 Dispersed CG	Spotted knapweed	.01 ac
RI25	4	23/425 Vivian Lakes Trailhead	Spotted knapweed	5 plnt
RI27	1	Oakridge District	Blackberry	2 ac
SH33	--	District Compounds	Blackberry and Reed canarygrass	2 ac

Site Type 5: Administrative Sites with little human use

Site#	Stream Class	Road/Milepost	Species	Acreage
BR33	--	19/411; under powerlines	Scotch broom	130 ac
OA18	--	5876-137; powerline	Blackberry	5 plnt
RI18	--	23, .1 mi pasr Salt Cr. Bridge; under powerlines	Giant knotweed	.01 ac

Additional Sites For All Action Alternatives

Additional sites may be treated under this analysis. Because it is necessary to treat new invader weed populations before their populations expand uncontrollably, from 25 to a maximum of 40 new sites may be added forestwide on a yearly basis (the mean number of new sites/year has averaged 26). Sites will be documented using forms in Appendix A. New proposed sites (from previous year's surveys) will be published in the spring as a part of the annual Weed Trek newsletter. Each population will be analyzed for effects on resources and will be displayed in the newsletter. Most new sites are expected to be small manual control sites which can be treated under forestwide Standard and Guideline 259b, if adopted in this analysis (p. 16). Public comment on proposed sites and treatments will be solicited. If effects are found to be within the scope of this environmental document, sites will be added as addenda to this Environmental Assessment.

Alternatives

Alternatives for methods to implement strategies to control noxious weeds were developed using the control methods outlined in the EIS: manual, mechanical, biological, chemical, fire, and competitive plantings. (See Appendix C for explanation of control methods and their costs)

Alternative 1: No Action/Current Program

This alternative would result maintaining the methodology outlined in the 1993 Environmental Assessment. Approximately 50 sites, most along the major highway corridors, would be treated. Riparian areas, under this Alternative, are treated as a unique site type. They include all sites within 50 feet of water. Established weed infestations were also included as a site type in this analysis

Table 3: Available Weed Control Methods for New Invaders Under Alternative 1 By Site Type

Site Type	Site Description	Available Control Method
1	Roadside, quarry, roadside waste disposal, cutbank; little to no competing vegetation	No Action, Manual, Biological, Mechanical, Chemical-Rodeo
2	Roadside, disturbed, with competing vegetation; disturbed meadows; skid roads and landings	No Action, Manual, Biological, Mechanical, Competitive Planting, Prescribed Burning, Chemical-Rodeo, Tordon 22K
3	Wilderness, Threatened, Endangered or Sensitive Plant or Animal Site	No action, Manual, Biological
4	Administrative Sites with high human use: campground, trail, trailhead, District compound	This site type was not identified in the previous analysis
5	Administrative Sites with little human use: powerline corridor, ski areas in summer	This site type was not identified in the previous analysis
Established Infestations		Biological
Riparian	Within 50 feet of water	No action, Manual, Biological, Chemical- Rodeo wiped only

No Action, Manual, Biological and Mechanical can be used to eradicate or prevent spread of noxious weed populations at any site under this alternative. **Manual control** is hand-pulling, digging or cutting. It will be used to eliminate new infestations of annual species. Cutting can be effective on older Scotch broom plants (see Appendix B). Manual control is effective in preventing movement of seed. Under this alternative mulching is treated as a form of manual control. **Mulch** is use of a covering like black plastic or wood chips. This method smothers plants and is effective on small populations. **Biological control** utilizes insects that are natural predators of noxious weeds. Insects are not able to completely rid an area of noxious weeds, but they keep noxious weed populations from expanding over vast areas of land. Since noxious weeds are not native (introduced from Europe or Asia), these insect predators are not native either. The insects that are released (Appendix E) go through a rigorous testing process by U.S. Department of Agriculture's APHIS program to assure their effects are host-specific, attacking only the targeted noxious weed species. Biological control is appropriate for infestations that are well established or naturalized. **Mechanical control** is chopping or mowing plants to reduce or eliminate flower production. Some experimental mechanical treatments include infrared light and steam. This method is most effective on roadside right-of-way vegetation.

Other methods are proposed for only some site types and weed species. **Competitive Planting** is an

appropriate control method where it has been demonstrated that competing plants may survive. It is the use of seed mixes, shrub or tree plantings to outcompete or shade out weed populations. Competitive planting involves the seeding of grass species (preferably native) to create a site where it is difficult for noxious weed seedlings to become established. Road rights-of-way are examples of areas where this practice can be of benefit. **Prescribed Burning** is another method appropriate where there is enough vegetation to burn. Prescribed burning is localized use of fire to burn noxious weeds. This practice is most practical for some meadows. This treatment method would require additional environmental analysis if it were prescribed at a weed site.

Chemical methods would be used only on new invader species that do not respond well to other treatments as directed in the Record of Decision for the EIS (USDA, 1988; also see Appendix B). The herbicides Rodeo or Tordon 22K could be used, depending on the site type. Riparian populations within 50 feet of water could be wiped with Rodeo. Outside this 50-foot buffer, populations of new invaders could be sprayed with Rodeo in site types 1 and 2. Tordon 22K will only be used where there is competing vegetation (site type 2). Mitigation measures for herbicide use would be used to ensure safety of workers, adjacent residents, and the environment. No specific mitigation measures would be in place for fish species listed by the USFWS after May 1993, for survey and manage species or for Heritage sites because mitigation measures for these species or sites were not analyzed. Herbicide Information Profiles may be found in Appendix F.

Chemicals would be applied using a variety of methods. The most effective application method for the infestation will be used. Where the weeds exist in a riparian area, plants would be individually wiped to eliminate the potential for soil or water contamination. Where infestations are localized and small along roadsides backpack sprayers with handheld nozzles would be used. This method allows for spraying only the foliage of target plants. Where infestations are large, a truck-mounted or off-road vehicle sprayer may be used. A follow-up manual program will eliminate unsprayed plants and their seed production. Competitive plantings will follow along road rights-of-way where grass establishment is likely.

The additional 156 sites located since the 1993 EA would not be treated. New standards and guidelines will not be added to the Willamette Forest Plan. New weed species will not be addressed.

Proposed Forest Plan Amendments Common to All Action Alternatives (2, 3 and 4)

FW-259a: Every effort should be made to integrate prevention of noxious weed establishment and spread into all ground-disturbing projects. This shall include projects such as road construction and decommissioning, timber harvest, and proposed and active quarry sites. Specific actions should include but not be limited to:

- The Forest should use certified weed-free seed and mulch for all revegetation projects, roadside seeding and fire rehabilitation seeding. The preferred mix shall be comprised of weed-resistant native and non-invasive non-native species.
- The Forest shall initiate an education program for users and employees which state the detrimental effects of noxious weeds on ecosystems and how people are responsible for spreading weeds from place to place. This should include all contractors involved in ground-disturbing activities, wilderness users, hunters, dispersed campers, hikers and other groups identified as aiding movement of weeds.
- The Forest should use machine-cleaning provisions for ground-disturbing projects that use equipment that may be moved from infested areas onto the Forest (where the

Regional Office accepts provisions).

- The forest should use designated weed-free rock sources for any additional gravel needed for road construction and reconstruction.
- The Forest shall take every opportunity to close unnecessary roads in project areas to reduce weed travel corridors and revegetate the corridor once closed if needed.

FW 259b: Implementation of the Integrated Weed Management (IWM) program will allow for manual control (pulling and/or digging) of any noxious weed population within disturbed areas such as road prisms, trailheads, or landings on the National Forest at any time.

FW 259c- Implementation of the IWM program shall allow for release of biological control agents wherever established weed populations would support them. Agents released must be tested and sanctioned by the U.S. Department of Agriculture. Other control methods that can serve as alternatives to herbicides such as grazing or mechanical control may be conducted on established weed infestations if site-specific analysis of effects of those control methods is analyzed in an environmental document.

FW 259d- The following table shall be used to determine the appropriate action for new invader weed species in each site type: (see Tables under Alternatives 2-4).

Alternative 2

This Alternative responds to issues 1 and 3, chemical use on sites with high human use and high aquatic value areas (see definitions in Appendix D). For this alternative, the Integrated Weed Program for the Willamette National Forest would use the Northwest Forest Plan (1993) definitions for Riparian Reserves; sites identified as within these Reserves (Appendix D) will receive different treatments than those outside these Reserves (see Table 4).

Table 4: FW259d: Available Weed Control Methods for New Invaders Under Alternative 2 By Site Type

Site Type	Site Description	Available Control Method Non-Riparian Reserve	Available Control Method Riparian Reserve
1	Roadside, quarry, roadside waste disposal, cutbank; little to no competing vegetation	No Action, Manual, Biological, Mechanical, Mulch, Chemical-Rodeo	No Action, Manual, Mechanical, Mulch, Chemical-Rodeo in backpack outside 50 foot buffer only
2	Roadside, disturbed, with competing vegetation; disturbed meadows; skid roads and landings	No Action, Manual, Biological, Mechanical, Mulch, Competitive Planting, Prescribed Burning, Chemical-Rodeo, Garlon 3A	No Action, Manual, Mechanical, Mulch, Chemical-Rodeo in backpack outside 50 foot buffer only
3	Wilderness, Threatened, Endangered or Sensitive Plant or Animal Site; Heritage Site	No action, Manual, Biological, Mulch, Competitive Planting, Prescribed Burning, Chemical-Rodeo in Heritage sites only	Same as non-riparian
4	Administrative Sites with high human use: campground, trail, trailhead, District compound	No action, Manual, Biological, Mulch, Competitive Planting, Chemical-Rodeo in backpack on District compounds only	No Action, Manual, Mechanical, Mulch, Chemical-Rodeo in backpack outside 50 foot buffer only
5	Administrative Sites with little human use: powerline corridor, ski areas in summer	No Action, Mulch, Competitive Planting, Chemical- Rodeo, Garlon 3A	No Action, Manual, Mechanical, Mulch, Chemical-Rodeo in backpack outside 50 foot buffer only

Manual, Biological, Mechanical and Mulch can be used to eradicate or prevent spread of noxious weed populations at any site in this alternative (see Alternative 1 for explanation of control methods).

Chemical methods would be used only on newly invading species that do not respond well to other treatments as directed in the Record of Decision for the EIS (USDA, 1988; also see Appendix B). Mitigation measures for herbicide use would be used to ensure safety of workers, adjacent residents, and

the environment. Chemical use will be limited within riparian areas in all site types and in site types 3 and 4. No chemical control will be used within 50 feet of flowing streams, lakes, ponds or wetlands . In this alternative, the Willamette National Forest would use the EIS for Competing and Unwanted Vegetation guidelines for riparian areas (Chapter 2, page 106) which states that "as a minimum, the following unsprayed widths will be maintained…50 feet along all flowing waters. A distance less than 50 feet may be considered, depending on site specific factors such as slope, soil, climate, and risk of contamination" (USDA, 1988). Chemical control will be allowed outside this 50-foot buffer because it is the only treatment method which works on several new invader species. Chemical control will be allowed in Heritage sites (site type 3). Rodeo can be used on District compounds away from entrances to buildings and parking lots. This is the only place chemical use will be allowed in site type 4. Garlon 3A is proposed under this alternative as an alternative to Tordon. Both of these herbicides specifically target broadleaf plants and will not harm a competing stand of grass. Garlon was chosen because it does not exhibit several of the negative environmental effects that Tordon does (see Chapter 4). Garlon 3A will be available for use outside riparian areas in site types 2 and 5 only. Herbicide Information Profiles may be found in Appendix F.

Chemicals would be applied using a variety of methods; the most effective application method for the infestation will be used. Where infestations are localized and small along roadsides backpack sprayers with handheld nozzles would be used. This method allows for spraying only the foliage of target plants. Where infestations are large, a truck-mounted or off-road vehicle sprayer may be used. A follow-up manual program will treat unsprayed plants. Competitive plantings will follow along road rights-of-way where seed mix establishment is likely. Mitigation measures for herbicide application are found in Table 7.

Methods of control for new and established invaders will depend on a site-specific analysis (see Appendix A) including soil type, proximity to water, degree of infestation, and cost/benefit analysis.

Alternative 3

This alternative is meant to respond to issues 2, 4 and 5: economics and concerns about loss of wildlife forage and plant communities due to encroachment and competition from noxious weed species. In this alternative, the Integrated Weed Program for the Willamette National Forest would use the Northwest Forest Plan (1993) definitions for Riparian Reserves. Sites within 50 feet of water (within Riparian Reserves) may have chemical control in the form of weed wiping only (see Table 4).

Manual, Biological, Mechanical and Mulch can be used to eradicate or prevent spread of noxious weed populations at any site in this alternative. **Competitive Planting** and **Prescribed Burning** are appropriate only for site type 2. (See Alternative 1 for explanation of these control methods).

Chemical methods would be used only on new invading species that do not respond well to other treatments as directed in the Record of Decision for the EIS (USDA, 1988; also see Appendix B). Mitigation measures for herbicide use would be used to ensure safety of workers, adjacent residents, and the environment. Chemicals may be used in riparian areas; the only method of application would be wiping to avoid spray drift. Tordon 22 K, Rodeo and Garlon 3A will be available for use outside riparian areas (50 foot buffers). Rodeo would be used in all sites except where grasses function in excluding noxious weeds. Where competing vegetation exists, Tordon 22K or Garlon 3A would be used because they are selective for broadleaf species and will not kill the desired competing grasses. Tordon 22K will only be used on sites that have a large concentration of viable seeds in the soil. Herbicide information profiles are found in Appendix F.

Chemicals would be applied using a variety of methods; the most effective application method for the

infestation will be used. Weeds in riparian areas, would be individually wiped to eliminate the potential for soil or water contamination. Small, localized infestations along roadsides will be treated using backpack sprayers with handheld nozzle. This method allows for spraying only the foliage of target weeds. Large infestations may use a truck-mounted or off-road vehicle sprayer. A follow-up manual program will treat unsprayed plants. Competitive plantings will follow along road rights-of-way where seed mix establishment is likely. Mitigation measures for herbicide application are found in Table 7

Table 4: FW-259d: Available Weed Control Methods for New Invaders Under Alternative 3 By Site Type

Site Type	Site Description	Available Control Method Non-Riparian	Available Control Method Riparian
1	Roadside, quarry, roadside waste disposal, cutbank; little to no competing vegetation	No Action, Manual, Biological, Mechanical, Mulch, Chemical-Rodeo, Garlon 3A, Tordon 22K	No Action, Manual, Biological, Mechanical, Mulch; Chemical- weed wipe with Rodeo
2	Roadside, disturbed, with competing vegetation; disturbed meadows; skid roads and landings	No Action, Manual, Biological, Mechanical, Mulch, Competitive Planting, Prescribed Burning, Chemical- Rodeo, Garlon 3A, Tordon 22K	No Action, Manual, Biological, Mechanical, Mulch, Chemical- weed wipe with Rodeo
3	Wilderness, Threatened, Endangered or Sensitive Plant or Animal Site; Heritage Site	No action, Manual, Biological, Mulch, Competitive Planting, Prescribed Burning, Chemical-Rodeo in Heritage sites only	No Action, Manual, Biological, Mechanical, Mulch, Chemical- weed wipe with Rodeo in Heritage sites only
4	Administrative Sites with high human use: campground, trail, trailhead, District compound	No Action, Manual, Biological, Mechanical, Mulch, Competitive Planting, Prescribed Burning, Chemical- Rodeo, Garlon 3A, Tordon 22K	No Action, Manual, Biological, Mechanical, Mulch, Chemical- weed wipe with Rodeo
5	Administrative Sites with little human use: powerline corridor, ski areas in summer	No Action, Manual, Biological, Mechanical, Mulch, Competitive Planting, Prescribed Burning, Chemical- Rodeo, Garlon 3A, Tordon 22K	No Action, Manual, Biological, Mechanical, Mulch, Chemical- weed wipe with Rodeo

Alternative 4

This alternative responds to issues 1, 3, 4a and 5b: chemical use in high human use areas, high aquatic value areas, and inadvertent exposure of wildlife or non-target plants or fungi to herbicides. In this alternative, the Integrated Weed Program for the Willamette National Forest would use the Northwest Forest Plan (1993) definitions for riparian areas. No chemicals will be used in this alternative (see Table 6).

Table 6: FW-259d: Available Weed Control Methods for New Invaders Under Alternative 4 By Site Type

Site Type	Site Description	Available Control Method Non-Riparian	Available Control Method Riparian
1	Roadside, quarry, roadside waste disposal, cutbank; little to no competing vegetation	No Action, Manual, Biological, Mechanical, Mulch	Same as non-riparian
2	Roadside, disturbed, with competing vegetation; disturbed meadows; skid roads and landings	No Action, Manual, Biological, Mechanical, Mulch, Competitive Planting, Prescribed Burning	Same as non-riparian
3	Wilderness, Threatened, Endangered or Sensitive Plant or Animal Site; Heritage Site	No action, Manual, Biological, Mulch, Competitive Planting, Prescribed Burning	Same as non-riparian
4	Administrative Sites with high human use: campground, trail, trailhead, District compound	No Action, Manual, Biological, Mechanical, Mulch	Same as non-riparian
5	Administrative Sites with little human use: powerline corridor, ski areas in summer	No action, Manual, Biological, Mulch, Competitive Planting	Same as non-riparian

Manual, Biological, Mechanical and Mulch can be used to eradicate or prevent spread of noxious weed populations at any site in this alternative. **Competitive Planting** and **Prescribed Burning** are appropriate control methods for site type 2. (See Alternative 1 for explanation of these control methods.) **Chemical** methods would not be available in this alternative.

Methods of control for new and established invaders will depend on a site-specific analysis (Appendix A) including soil type, proximity to water, degree of infestation, and cost/benefit analysis.

Table 7: Mitigation Measures For Alternatives Which Use Chemicals (1, 2, 3)

Measures for all alternatives

All Mitigation measures stated in Chapter 4 of the EIS (USDA, 1988) and the amended Record of Decision for the EIS (USDA, 1992d).

Only the herbicides Rodeo (Alternatives 1, 2 and 3), Garlon 3A (Alternatives 2 and 3) and Tordon 22K (Alternatives 1 and 3) are proposed for use. Depending on a site-specific analysis, all new invader species may be sprayed. No population less than 25 plants will be sprayed except for new invading blackberry sites.

The three proposed herbicides will be applied at the lowest effective rate. All herbicide label guidelines will be followed.

Herbicides will be applied directly to target weeds using backpack sprayers on all except the largest sites. Weed wipers may be used in riparian areas in Alternative 3.

Where weeds compete with desired grassy vegetation, Tordon 22K(Alternatives 1 and 3) or Garlon 3A (Alternatives 2 and 3) may be used because these herbicides only affect broadleaf plants. Under Alternative 2, Garlon 3A will only be used in site types 2 and 5 if the sites are not in Riparian Reserves.

No herbicide application will be made when wind speed exceeds five miles per hour (to lessen drift) or if precipitation is expected within 24 hours.

No Tordon 22K or Garlon 3A applications will be made within 50 feet of streams, open water and wetlands including ditchlines with standing water (USDA, 1988). In Alternative 2, Rodeo may be used in Riparian Reserves only<u>outside</u> a 50-foot buffer zone. In Alternatives 1 and 3, Rodeo may be used within riparian buffers if site conditions (slope, soil characteristics) indicate that the risk of off-site movement is low. Weed wipers will be used in riparian buffers to eliminate chances for soil and water contamination.

All proposed herbicide applications will be coupled with an annual manual control follow-up to eliminate seed production on plants that may escape the initial application. In some cases, a single site may be sprayed twice if a significant number of weeds had not emerged by spray time (and manual follow-up is not time-effective).

Documentation must clearly demonstrate that herbicide applications are achieving a high degree of effectiveness in reducing weed densities over a five-year period (Appendix A).

Applications will only be allowed during the months of June-October when the plants are most susceptible to the effects of herbicides and when the chance of rain after application is very low.

No herbicide applications will be allowed in areas where threatened, endangered, or sensitive species are known to exist except when the weed infestations occur on road shoulders or related rights-of-way sites such as gravel piles and/or quarries away from natal areas.

Public announcement of proposed herbicide application would be published in local papers one month in advance of application. Proposed treatment areas will be posted one week in advance of herbicide treatment to inform the public. Signs will be removed one week following application.

Herbicide transport, mixing and use would be governed by these rules:

1.Carry only enough herbicide daily to cover proposed treatment sites for that day. Mix only the amount of solution needed to complete daily treatments.

2. Herbicide containers must be secured and prevented from tipping during transport.

3. Emergency spill equipment must be on hand to adequately deal with the amount of herbicide concentrate being transported. Spill plans and protocol are handled from the Supervisor's Office Engineering Department and will be developed before any proposed treatment is carried out. This information must be available in every treatment vehicle.

4. All worker safety equipment and regulations would be used and followed as label directions, OSHA regulations, Department of Transportation and Forest Service guidelines. There are no exceptions.

5. Materials Safety Data Sheets, Forest Service Information Packets covering each herbicide transported must be in each project vehicle at all treatment times and made available to interested publics on-site.

6. Documentation must follow each daily application to ensure that records are completed. If workers are exposed to chemicals, a R6-FS-2100-10 Health Effects Reporting form must be filled out. Regional Vegetation Management Reporting must be made annually to the Regional Office.

Measures Added Since 1993 EA (Applicable to Alternatives 2 and 3 only)

No weed control treatments will occur within ¼ mile (non-line of sight) or ½ mile (line of sight) of an active bald eagle nest during the reproductive season, January 1-August 31. If weed treatments must be performed prior to August 31 to be effective, implement them after eagle nestlings have fledged, or after a District Wildlife Biologist has determined the nestlings are no longer at risk if adults leave the nest for a reasonable period of time (by late summer, foraging adults may spend an hour or more away from the nest). Where applicable, and pending consultation with a District Wildlife Biologist, manual or chemical (backpack or wipe) treatments may take place within ¼ mile of an active eagle nest during the restriction period, provided the crew size does not exceed 2 people and the duration does not exceed 4 hours per 24 hour period.

No mechanized treatments will occur within ¼ mile of known spotted owl activity centers or unsurveyed owl habitat during the spotted owl reproductive period, March 1-September 30. Treatments may be implemented during this period if a wildlife biologist determines that young owls have fledged or the pair is non-nesting. Where applicable, and pending consultation with a District Wildlife Biologist, treatments may take place within ¼ mile of an active nest during the restricted period, provided the activity does not exceed the ambient noise leve**br** the duration does not exceed ½ hour per 24 hour perio**dr** is after June 30 (July 15 at high elevations).

All management activities that may disturb nesting peregrine falcons will be restricted during the breeding season, January 1 to July 31. Restriction periods will be adhered to until any young have fledged, and will include the period when young are still within the nest area and dependent on prey delivered by the adults. Foot and vehicle entry into the primary nest management zone (1/2 mile around the site) will be prohibited during this time. Mechanized weed control will not be conducted within the secondary nest zone (1.5-mile radius around the primary nest zone). Restrictions may be waived by the District Ranger if the site is unoccupied or if nesting efforts fail and there is no possibility of re-nesting.

Sites with soils exhibiting very rapid infiltration and excessive drainage will not be treated with Garlon 3A in Alternative 2 or Garlon 3A or Tordon 22K in Alternative 3.

An archaeologist should determine whether any treatment site proposed for mechanical treatment should be classified as Site Type 3 because of the presence of heritage resources. Mechanical control at these sites may be restricted. Consultation with local federally recognized tribes and native traditional practioners for all new sites as well as those encompassed in this analysis is necessary to identify traditional cultural properties.

No herbicide treatment will be used within 200 feet of a known survey and manage site or a sensitive plant site. A system of markers will be used to warn applicators of no-spray zones.

Alternatives Considered But Not Analyzed

The interdisciplinary team initially proposed an Alternative 2b. This alternative responded to issues 1 and 3: chemical use areas of high human use and in high aquatic value areas (see definitions in Appendix D). In this alternative, the Integrated Weed Program for the Willamette National Forest would use the Northwest Forest Plan (1993) definitions for riparian areas. Sites identified as riparian and sites identified as high human use will have no chemical control. This alternative was not considered in detail because during the analysis process, it became very clear that because of the number of sites within Riparian Reserves(all major road corridors parallel riparian areas), the impacts of this alternative on soil, water, fish, wildlife, botanical resources and cultural sites/recreational sites would not differ significantly from Alternative 4, no chemical use.

Comparison of Alternatives

Each of the Alternatives addresses one or more issues. Each issue was given a unit of measure to evaluate the alternative's responsiveness to the issue. Most were simple counts of sites receiving a specific treatment. The economic analysis was completed using the proposed number of chemical treatment sites and comparing the cost of chemical with manual control. It was assumed that sites with less than 25 plants would be controlled with means other than chemical (except for blackberries) for all Alternatives. Since these sites would be equal in cost for all alternatives, they were not used in the analysis. The costs listed here are not complete; travel and time were omitted from the analysis. The number of sites with potential for chemical use in site type 2, sites with competing vegetation, was used as a measure for loss of wildlife forage and native plant habitat. It is unknown how many sites in Alternatives 2 and 3 would not be treated with chemicals because of other environmental concerns but it was approximated at 5.

Table 8. Comparison of Alternatives: Responsiveness to Issues

	Unit of Measure for Issue	Alternative 1: No Action	Alternative 2: Limited Chemical Treatment	Alterative 3: All Available Methods	Alternative 4: No Chemical Treatment
Issue 1: Water Quality and Aquatic Species	Number of Riparian Reserves with potential herbicide use	38 Rodeo within 50' buffer; Tordon 22K or Rodeo outside buffer	108 Rodeo only outside 50 foot buffer	108 Rodeo only within 50-foot buffer; Tordon 22K, Rodeo or Garlon 3A outside buffer	None
Issue 2: Economics	Number of acres of potential herbicide use x cost chem ($38/ac) or manual ($215/ac) treatment	8.64 acres potential chem use; $328.32	27.35 acres potential chem use; $1039.30	27.35 acres potential chem use; $1039.30	27.35 acres manual control: $5880.25
Issue 3: Human Health	Number of High Human Use sites with potential herbicide use	1	13 Rodeo only	13 Rodeo, Tordon 22K or Garlon 3A	0
Issue 4a: Herbicide Effects on Animals and Issue 5b: Loss of Non-Target Plants	Number of sites potentially treated with chemicals	41 Rodeo, Tordon 22K available	161 Garlon 3A-36 (non-riparian) Rodeo- 125	161 Rodeo, Garlon 3A and Tordon 22K available for use	0
Issue 4b: Loss of forage for wildlife and Issue 5a: Loss native Plant Communities	Number of site type 2 sites receiving treatments which do not control the spread of target species	0 +/- 5	0 +/- 5	0 +/- 5	34 sites (3.4 acres)

CHAPTER 3: AFFECTED ENVIRONMENT

Vegetation

Site Type 1: Rocky, gravelly, historically bare ground sites on road shoulders, abandoned roads, quarries and gravel storage sites, and cutbanks. These sites have little to no competing vegetation.

Type 1 sites exhibit limited vegetative development; plants which grow here are predominantly non-native weedy species which are adapted to tolerate drought stress caused by rapid water infiltration. Species diversity is low; few species can cope with these harsh environments.

Conditions will always exist that favor the presence of competing and unwanted vegetation because current management maintains them in this state.

Many sites are constantly disturbed; roadside maintenance and quarrying may occur annually. Along highway corridors, knapweed may be the only species able to withstand the annual covering of seeds by traction-aiding gravel and the rapid leaching of water through the profile. In cutbank habitats, soils may be constantly moving and eroding due to gravity and limit the establishment of plant roots to bind the soil.

No natural controls exist on these sites. Management actions are limited to stopping the establishment and spread of weed infestations. Annual roadside maintenance activities musr be permitted.

Site Type 2: Roadsides, timber harvest landings and skid roads, meadows and plantations with moderate to highly competitive plant cover or the ability to revegetate a competitive cover.

Type 2 exhibits a variety of vegetation types. Habitats can consist of grasses or can include herbaceous, shrubby or woody vegetation. Sites are often disturbed, components are often early seral, disturbance-tolerant species. Species diversity is higher than in type1.

Often conditions exist which favor the presence of competing and unwanted vegetation. Many roadside habitats are constantly disturbed by annual maintenance activities. Timber harvest plantations have been disturbed by past management. However, some natural, undisturbed habitats are susceptible to weed invasion. Some natural meadow communities are susceptible to invasion because native species have different biological life histories than weedy species. Weedy plants can germinate early and use all available resources (water, nutrients, light) before the native species are able to use them.

Some management activities are available to prevent the spread of weeds at these sites. Rapid revegetation of newly harvested timber sale landings and skid roads, preferably with native seed mixes or plants, will prevent weed establishment. Seeding roadsides and meadows once weed control treatments have been successful may also help prevent further establishment of weedt species.

Site Type 3: Wilderness; Threatened, Endangered or Sensitive Plant or Animal Site; Significant Heritage Site.

Type 3 habitats are quite diverse. Habitats in wilderness areas range from high elevation subalpine forests to meadows, lava plains and sand blowouts. Diversity tends to be low in unproductive sites such as lava and cinder and higher in meadow habitats. Other sites may be forested or open canopies. Non-forested habitats normally have a higher diversity of species than forested sites.
Some of these sites are pristine and have not been affected by past management. However, there are some

exceptions. Many of the high elevation meadows were grazed by sheep in this century. Many of these sites have yet to fully recover native vegetation. Weeds may be spread in the Wilderness by hikers, hunters and horse packers. Timber harvest and road building may contribute to some infestations in Threatened, Endangered or Sensitive plant or animal sites. Human activity may transport weeds into cultural sites. Many cultural sites are adjacent to roads.

Some weed treatment activities are appropriate for these sites. Education of Wilderness user groups will be the best method to prevent infestations in high elevation sites. Some specific revegetation of high elevation meadows may be an option.

> **Site Type 4**: Administrative sites with high human use: campgrounds, trails, trailheads, Ranger District compounds.

Native vegetation in these sites is often plentiful, but sites may be trampled and compacted just by normal use (campgrounds, trails and trailheads, dispersed campsites). Many District compounds have landscaped vegetation or open non-vegetated areas that may provide little competition.

Closing these types of Administrative site is not an option. Education of Forest user groups about the ways they can spread weed seeds through their boots, camping gear, bicycles, vehicles and All Terrain vehicles is the best management tool to prevent spread of weeds.

> **Site Type 5**: Administrative sites with little human use: powerline corridors, ski areas in summer.

Type 5 vegetation is composed of woody trees and shrubs in powerline rights-of-way. Vegetation is often composed primarily of Scotch broom. These sites must be constantly trimmed to avoid contact of vegetation with powerlines, the species that would naturally shade out weedy species are not allowed to grow. Ski runs and other special use sites are covered under this site type. No known noxious weed sites occur in these areas. These sites are also trimmed to keep competing vegetation away from ski runs or cell phone repeaters.

Options for weed management of these sites exist when special use permits come up for renewal. The Forest Service can negotiate weed control as a part of the permit. Control of weeds on these sites is outside the scope of this document. A separate environmental document that complies with the Region 6 EIS and accompanying Mediated Agreement needs to be completed.

> **Riparian**: Riparian areas may be found within any of site types 1-5. Definitions of these sites vary, depending on the alternative. For all alternatives riparian sites are those which fall within Riparian Reserves as defined by the Northwest Forest Plan. See Table 2 for a list of riparian site types.

Riparian vegetation is unique in that it is composed of an understory herbaceous layer and an overstory of deciduous trees and often a coniferous tree component. Disturbance, combined with a deciduous canopy, provides an opportunity for weed invasion. In early spring weeds can germinate and grow prior to leafing out of the canopy. Many sites feature saturates soils, which most weedy species cannot tolerate. Exceptions include blackberry and giant knotweed.

In most riparian weed sites some management activity has created the conditions which made it possible for weeds to invade such as compacting soils or removal of native vegetation This occurs along roadsides and timber harvest roads and landings. In some areas human use has contributed to invasion by noxious weeds. For example there is a relatively high human use of undeveloped “dispersed” sites for day and overnight use along the riparian areas of streams. Humans not only contribute to these sites being in a state of disturbance, they also directly transport weed seeds and vegetative fragments into these areas from other sources on their vehicles,

boats, clothing, yard debris, and domestic animals. Revegetation directly following project implementation or site restoration, such as competitive plantings along roadsides or in disturbed areas are viable methods to prevent further spread or initiation of infestation.

Fish and Wildlife

The analysis area for this analysis includes roadsides, quarries, road waste disposal areas, cutbanks, road rights of way, Administrative sites and limited riparian areas that occur on all districts of the forest (site types 1-5). The roadways pass by or through a variety of habitats, including riparian areas, lakes, reservoirs, meadows, lava fields, forests of all age classes, and rock outcrops. These areas may be providing habitat for numerous fish and wildlife species. The Willamette National Forest contains at least 30 species of fish and over 260 species of wildlife.

Few of these species rely exclusively on habitat provided by the often sparsely vegetated, highly disturbed areas immediately adjacent to roadways, and none are known to use habitat invaded by the noxious weed populations discussed in this analysis. However, many species do live in areas adjacent to roadsides or they may occasionally use roadside habitat, so the alternatives proposed in this analysis have the potential to affect these species. Riparian areas provide habitat for an abundance of species, and many species are uniquely dependent on riparian habitat associations. Activities proposed by this analysis may have the potential to affect riparian associated species.

Wildlife

The Willamette National Forest provides habitat for 13 Threatened, Endangered, or Sensitive (TES) animal species (see Table 9). Two species, the red-legged frog and spotted frog, may be found in riparian habitats within or adjacent to the proposed treatment areas. All Forest Service activities that may disturb TES species or their habitats must be analyzed through the Biological Evaluation process to assure that activities will not jeopardize continued survival of the species or impact their habitats.

Table 9. Threatened, Endangered, and Sensitive Wildlife Species on the Willamette National Forest

Species Name	Status
PEREGRINE FALCON	E
NORTHERN SPOTTED OWL	T
NORTHERN BALD EAGLE	T
CANADA LYNX	P
RED-LEGGED FROG	S
SPOTTED FROG	S
NORTHWESTERN POND TURTLE	S
GREATER SANDHILL CRANE	S
FERRUGINOUS HAWK	S
HARLEQUIN DUCK	S
PACIFIC WESTERN BIG-EARED BAT	S
WHITE-FOOTED VOLE	S
CALIFORNIA WOLVERINE	S

There is a very remote possibility that Canada lynx would be affected by noxious weeds or their management. The Canada lynx is currently very rare and uses habitats which have low potential for weed infestations. Red tree voles live in tree canopies and are virtually unaffected by activities which do not affect tree species composition or structure. The great gray owl requires older mature tree stands for nesting and natural or human made openings proximate for small mammal prey production (pocket gophers). The four mollusk species are forest floor associated therefore maintaining down woody material is crucial. Two of the species are fairly common in surveyed areas (*Megomphix hemphilli and Prophysaon coeruleum*), and 2 are rare or have not been found on forest (*Pristiloma articum crateris and Prophysaon dubium).*

Table 10. Survey and Manage Wildlife Species

Species	Survey Strategy
Canada Lynx	3[7]
Red Tree Vole	2
Great Gray Owl	surveys and protection buffer for sites
Mollusk species(4)	2

The Willamette has seen extensive clearcutting in the last 30-40 years which has imperiled many species which are dependent on large contiguous blocks of late successional habitat or species which are easily isolated by fragmentation due to limited mobility. Road densities across the Forest are relatively high and have contributed to diminished functionality of LSRs as well as most lands needed for habitat connectivity. Northern spotted owl numbers continue to decline as the recovery of habitat in LSRs will be a long term process. The Northern goshawk is uncommon and occupies more open older forests and can benefit from thinning activities as well as non-stand replacing fires. The Great gray owl is found in higher elevation fragmented habitat and has likely increased in density due to clear cutting as at least 75% of known pairs on the forest are associated with recent clearcuts. Peregrine falcon territories were unknown on forest in 1989 and since then 19 have been documented which are monitored each year. The species is slated for delisting under the ESA and as a requirement of that process are to be monitored for 5 years. The Forest has 8 known bald eagle territories and 13 potential

[7] See Appendix D for definitions of survey strategies and protection buffers

territories. These territories are monitored annually by Anthony and Isaacs and have been slighty increasing in numbers at least for this period of years.

It is unknown to what extent big game species (deer and elk) utilize noxious weed species for forage or larger weed species like scotch broom or non-native blackberries for cover. Big game species do not forage along major highway corridors. It is known that at elk numbers are steady to increasing.

Currently about 117 weed sites intersect with riparian habitat and one overlaps important primary threatened, or endangered species habitat.

Fish

The Willamette National Forest currently has four fish species listed under the Endangered Species Act. The Oregon chub (*Oregonicthys cramer*), which is listed as Endangered and historically inhabited slough type waters with extensive aquatic vegetative cover along the mainstem Willamette River, is now restricted primarily to areas along Lookout Point Reservoir and the Middle Fork Willamette River above the reservoir on National Forest System lands. Bull trout (*Salvelinus confluentus*) are listed as Threatened and the range of their currently occupied habitat includes the McKenzie River drainage, except Blue River watershed above Blue River Dam, and the upper Middle Fork Willamette River above Hills Creek Dam. The Upper Willamette spring chinook and the Upper Willamette winter steelhead have been recently listed as Threatened. These two species occupy a wider range of the Forest streams than bull trout or Oregon chub and can be found in most larger tributaries below Army Corps of Engineer dams. Willamette spring chinook and winter steelhead adults are transported above Foster Dam with juvenile passage possible due primarily to spill over the dam. Spring chinook and winter steelhead are also transported and released above Fall Creek dam with some passage and survival of juveniles below the dam. Adult spring chinook surplus to hatchery needs are also transported above Cougar and Hills Creek dams, where the juveniles cannot pass back below the dams with any significant survival, but the adults spawn and their carcasses and offspring contribute to restoration of the biotic ecosystem above the dams.

Many other species of coldwater fishes are native to the streams of the Willamette NF including rainbow trout, cutthroat trout, five species of sculpins, mountain whitefish, squawfish (now called pike minnows), suckers (*Catostomus spp*), dace, chiselmouth, redside shiner, and lamprey. The range of the fishes which are more tolerant of warmwater, such as squawfish and redside shiners, has extended where previous management (such as harvest of riparian forest) has led to warmer instream temperatures. In addition summer steelhead have been introduced into drainages of the Willamette and are now naturalized or have a significant hatchery component in the larger tributaries such as the Santiam, McKenzie, and Middle Fork Willamette drainages. Brook trout have also been introduced into high mountain lakes of the Forest and occupy some of the upper elevation stream and river systems. Cutthroat trout occupy the greatest amount of stream habitat on the Forest as they occupy small headwater tributaries, are also found in the larger mainstem rivers, and occupy a subset of the lakes within the Forest.

Introduced warmwater fishes are also prevalent in Forest streams, primarily in the reservoirs and portions of the lower large tributaries. Species include smallmouth bass, largemouth bass, bluegill, black crappie, white crappie, pumpkinseed, brown bullhead, yellow bullhead, and bullhead catfish.

Table 11. Threatened, Endangered and Sensitive Fish Species on the Willamette National Forest

Species Name	Status
OREGON CHUB	E
BULL TROUT	T
SPRING CHINOOK	T
WINTER STEELHEAD	T

Approximately 117 known weed sites occur within Riparian Reservesas defined by the Northwest Forest Plan. Some sites may be in true riparian habitat within the reserve or in habitat that would be considered as upland habitat within the area defined as Riparian Reserves for the NW Forest Plan (e.g. Reserves with fish bearing streams are approximately 340 feet wide and Reserves with permanently flowing non-fish bearing streams are approximate 170 feet wide on the Forest). Weed sites do occur adjacent to water (stream, lake, or reservoir) occupied by listed or sensitive fish species. Specific examples are McKenzie site #15, which is near Olallie Creek (occupied by bull trout) and areas along Highway 58 adjacent to habitat occupied by Oregon chub. The number of sites within watersheds (not necessarily adjacent to an occupied stream) where ESA consultation is conducted for bull trout include 33 sites on McKenzie Ranger District; 20 sites on Blue River Ranger District, and 25 sites on the Middle Fork Ranger District above Hills Creek Dam.

Botany

Sensitive Plants

Thirty-seven sensitive plants from the Regional Forester's list are cited as potentially occurring or documented on the Willamette National Forest (see Table 12). Four sensitive plant species have the potential to grow in Type 1 rocky, gravelly sites.*Aster gormanii* grows on high elevation dry, east-facing scree and bedrock. Three rock-dwelling ferns are on the sensitive plant list.*Polystichum californicum, Asplenium septentrionale* and *Pellaea andromedaefolia* These are sites where all of the established weeds, even without human disturbance.

Other sensitive plants live in site type 2.*Romanzoffia thompsonii, Lewisia columbiana var. columbiana Arabis hastatula* and *Allium campanulatim* grow in moist rock garden habitats. These species may have roads dissect their habitats. Site BR2 is adjacent to a population of *Romanzoffia*. In forested habitats,*Cimicifuga elata* grows in association with Douglas fir, bigleaf maple and swordfern on north-facing slopes at low to moderate elevations.*Astragalus umbraticus* grows in the understory of Douglas fir with *Psoralea* as a common associate. *Poa laxiflora* is associated with open coniferous/deciduous woods adjacent to riparian areas. These species found in forested habitats could potentially be affected by adjacent infested plantations. Most established weed infestations are associated with harvested sites but the roadrunning new invaders such as spotted, diffuse and meadow knapweed are also be located in this site type. False brome, a species of the forest understory, would be a potential threat to these species.

Two sensitive species are known to occur in Wilderness (site type 3).*Calamagrostis breweri* and *Gentiana newberryi.* Most weed speciescan not tolerate the severity of environmental conditions that native plants can, with the heavy snowpack and short growing season. However, spotted knapweed has been documented along Highway 242, a potential threat to the gentian population. Spotted knapweed is also known from some trailheads in the Santiam pass area.

One population of*Cimicifugaelata* is known to grow along a trail (site type 4).

No sensitive plant habitat has been found associated with powerline rights-of-way, recreational ski areas or special use sites.

A number of sensitive plants can be found in riparian areas; many of these species survive only in very shaded sites. This is the habitat type that giant knotweed invades. *Huperzia occidentalis* grows adjacent to streams in old growth forests. *Botrychium minganense* and *B. montanum* grow in swampy areas dominated by western red cedars. Both *Poa laxiflora* and *Cimicifuga elata* mentioned above as being potentially found in type 2 habitats are associated with riparian areas. *Ophioglossum vulgatum* is found in dried creek floodplains and lakeside areas, often under Douglas spiraea, ash, alder or other riparian vegetation. *Corydalis aqua-gelidae* is a streambank species.

There are a number of sensitive species that are found in extremely wet habitats. Reed canarygrass is located along a trail in SH37, potentially affecting *Lycopodiella inundata* in the future. Purple loosestrife is a wetland species and is found on the potential invader list. Other potential species at risk include: bog species, *Oxypolis occidentalis, Scheuchzeria palustris* and *Utricularia minor*; saturated meadow species, *Carex livida, Carex sciproidea var stenochlaea* and *Coptis trifolia*, ephemeral pool species, *Montia howellii*, and lakes and ponds, *Wolffia columbiana*.

Table 12. Threatened, Endangered, and Sensitive Plant Species on the Willamette NF

Species	Occurrence On WNF	ONHDB Status	Oregon State Status	Federal Status
Agoseris elata	S	2		
Allium campanulatum	S	4		
Arabis hastatula	D	1		
Arnica viscosa	S	2		
Asarum wagneri	D	4		
Asplenium septentrionale	S	2		
Aster gormanii	D	1	C	SoC
Astragalus umbraticus	D	4		
Botrychium minganense	D	2		
Botrychium montanum	D	2		
Botrychium pumicola	S	1	T	SoC
Calamagrostis breweri	D	2		
Campanula scabrella	S	None in Oregon		
Carex livida	S	2		
Carex scirpoidea var. stenochlaea	D	New Oregon site		
Cimicifuga elata	D	1	C	SoC
Coptis trifolia	S	2		
Corydalis aqua-gelidae	D	1	C	
Delphinium oreganum	D	1	C	
Frasera umpquaensis	D	1	C	SoC
Gentiana newberryi	D	2		
Hieracium bolanderi	D	4		
Huperzia occidentalis	S	2		
Lewisia columbiana	D	2		
Lycopodiella inundata	D	2		
Montia howellii	D	1	C	SoC
Ophioglossum pusillum	D	2		
Oxypolis occidentalis	D	4		
Pellaea andromedaefolia	S	2		
Poa laxiflora	S	4		
Polystichum californicum	D	2		
Romanzoffia thompsonii	D	1		
Scheuchzeria palustris	D	2		
Sisyrinychium sarmentosum	S	1	C	
Utricularia minor	D	2		
Wolffia borealis	S	2		
Wolffa columbiana	S	2		

Willamette National Forest: **S** = Suspected **D** = Documented ; Oregon Natural Heritage Program (ONHP): **1** = Taxa endangered/threatened throughout range. **2** = Taxa endangered/threatened in Oregon but more common or stable elsewhere **4** = Watch List
Oregon State Status: **T** = Threatened **C** = Candidate; Federal Status: **SoC**-Species of Concern (former Candidate Species)

Survey and Manage

A number of survey and manage species are located within five of the proposed noxious weed sites. All of these species are associated with forested stands of old growth, not roadside rights-of way (Table 13).

Pithya vulgaris and *Gelatinoduscus flavidus* are rare cup fungi which fruit on twigs and foliage of true firs and Alaska yellow cedar, respectively. They typically fruit near or under melting snow banks. *Otidea onotica* is another rare cup fungus only known to be associated with conifer forests. *Leucogaster microsporus* is a rare false truffle associated with the roots of Douglas fir and western hemlock at moderate elevations in the Cascades. *Mycena quinaultensis* is a gilled mushroom which grows in gregarious clusters on senecent conifer needles, or uncommonly on decayed wood, in conifer forests (Castellano and O'Dell, 1997). Maintence of hosts and avoiding ground-disturbing activities which could adversely affect mycorrhizal connections or coarse woody debris and litter substrates is important in maintaining viability of these species.

Nephroma occultum and *Pseudocyphellaria rainierensis*, as well as all the other survey and manage lichens known to occur in stands adjacent to weed treatment sites, are closely associated with old-growth forests in the western hemlock or silver fir zones. Fourteen survey strategy 4 (general regional survey) lichens were located in two air quality monitoring plots, adjacent to sites MC1 and MC5. All are epiphytic, which means they subsist in the tree canopy and get all of their nutrients and water through the air. Maintenance of substrate trees is key to the survival of these species. These species have no special management requirements so are not listed in Table 13.

Table 13. Survey and Manage "Plant" Species Documented in Weed Site Buffers on the Willamette National Forest

Species	Organism Type	Survey Strategy[8]	Weedsite
Pithya vulgaris	Rare cup fungus	1,3	SH3
Nephroma occultum	Rare Nitrogen-fixing Lichen	1,3	SH1
Pseudocyphellaria rainierensis	Rare Nitrogen-fixing Lichen	1,2,3	SH1
Leucogaster microsporus	Rare false truffle	1,3	SH1
Gelatinodiscus flavidus	Rare cup fingus	1,3	SH1
Otidea onotica	Rare polypore fungus	3	MC2
Mycena quinaultensis	Uncommon gilled mushroom	1,3	MC2

Soil and Water Resources

The project includes many soils found on the Willamette National Forest. Soil types may be referenced using the Soil Resource Inventory for the Willamette National Forest: soil types mapped on USGS quadrangle maps and accompanying descriptions (Legard and Meyer, 1973). Parent material, surface and subsoil type, bedrock, slope, elevation, accompanying vegetation and drainage and permeability characteristics are described.

Soil types and their characteristics for sites scheduled for treatment are listed in Appendix F. Each noxious weed site will be identified to SRI. This information will be used with other information on the site to determine appropriate treatment. Sites with very rapid infiltration and excessive drainage will not be treated with Garlon 3A in Alternative 2 or Garlon 3A or Tordon 22K in Alternative 3.

[8] Survey Strategies and protection buffer status were conferred on species in the Record of Decision for forests within the range of the northern spotted owl (1993). Please refer to Appendix D for survey strategy and for protection buffer definitions.

Two features of soil types are important in noxious weed treatment and relate to hydrology: infiltration and drainage. Infiltration rates for soils at treatment sites range from slow to very rapid. Drainage can range from poorly drained to excessively drained.

The Forest provides high quality water for many beneficial uses designated by the Oregon Water Resources Department for the Willamette River Basin and its tributaries. Recognized beneficial uses include public domestic water supply; private domestic water supply; industrial water supply; irrigation; anadromous fish passage, salmonid fish rearing and spawning; resident fish and aquatic life; fishing; boating; and water contact recreation.

The State of Oregon has established groundwater quality protection rules (OAR 340-40) which are the requirements for federal agencies such as the U.S. Forest Service. The state may establish concentration limits for substances which may cause pollution, such as herbicides. Factors to be considered include the potential for health risks caused by exposure to the substance and its degradation products. The state uses "Maximum Measurable Level" to establish allowable concentrations of contaminants or substances of concern.

Chemical substances proposed for use by the Willamette NF to treat weeds (Garlon 3A, Rodeo and Tordon 22K) do not have active ingredients that have established contaminant reference levels by the state. The Forest has purposely chosen to propose use of chemicals that are of less concern to human health and do not contain the organic substances subject to the state's reference levels of concern. Despite this, the chemicals and many of their undisclosed inert ingredients proposed for use under this analysis are of concern to human health if used in a manner that causes prolonged exposure or direct contact.

There is no map of hydrologic conditions on the Forest to determine sites where groundwater is near the surface. Referencing USFWS wetland maps can help determine if sites are wet year-round. Roughly half of the sites are to be treated are at least partially within Riparian Reserves (Table 2).

Heritage Resources

Heritage resources, or historic properties, are known throughout the Willamette National Forest. The forest's current inventory lists over 2000 archaeological sites and historic structures. Although not specifically identified at this time, traditional cultural properties (places where indigenous people practice cultural activities) may also exist within the forest. All federal projectsmust be evaluated for their potential to affect significant historic properties and traditional cultural properties, as per the National Historic Preservation Act (NHPA), and adverse effects must be mitigated. This analysis defines proposed treatment sites which contain significant historic properties (those which meet criteria for listing on the National Register of Historic Properties {NRHP}) as Site Type 3. An archaeologist should determine whether any proposed mechanical treatment site should be classified as Site Type 3 because of the presence of heritage resources. Consultation with local federally recognized tribes and native traditional practioners is necessary to identify traditional cultural properties.

Sites otherwise defined as Type 1 or 2 have the potential to harbor significant historic properties in the form of historic abandoned roads or buried archaeological sites. Archaeological sites have been identified in association with some rock quarries. Often sites are exposed by roads and are evident in cutbanks, landings, or unsurfaced roadbeds. Meadow areas are considered an indicator of high probability for locating archaeological and historic sites.

Similarly, sites otherwise defined as Type 4 are often associated with conditions considered to be indicators of a high probability for heritage resource locations. Many heritage sites are associated with campgrounds,

trails and trailheads. Like other site types, those otherwise defined as Type 5 may also contain historic properties and would be evaluated prior to treatment.

Administrative and Recreation Sites

A number of administrative sites are listed as proposed treatment sites in this analysis. All Ranger District offices are listed. These sites are landscaped and weeded around the entrances of the compounds where visitors frequent. Areas such as fence lines around the compounds and roadsides within the compound have Scotch broom, reed canarygrass or blackberry infestations. No chemical treatment is proposed near entrances or parking lots of District compounds. In other areas, chemical treatment may be proposed, including established infestations.

Other Administrative sites are site type 5; there are 3 powerline rights-of-way with noxious weeds. At one site, BR33, this analysis proposes a trial mowing program. The other sites may be treated with herbicides.

Several recreation sites have new invading species that need to be treated. Examples include boat launch, a dam lookout, four dispersed recreation sites, a campground and a trailhead. Undoubtedly these infestations have come from visitors in their vehicle tires or in mud on their boots. These are sites where manual control would be used. Educational prevention materials are also very important at these sites to inform the public that they can transport weed seeds and propagules and what they can do to prevent movement such as cleaning vehicles and boots.

CHAPTER 4: ENVIRONMENTAL CONSEQUENCES

Alternative 1: No Action/Current Program

This Alternative would result maintaining the treatments and methodology in the 1993 Environmental Assessment. Approximately 50 sites, mostly along the major highway corridors, could be treated. Although prevention is the preferred alternative, there would be no new standard and guideline outlining specific actions the Forest will take to avoid the spread. Standard and guideline 254 would still require analysis of weed prevention in projects. Educational activities would continue. A variety of control methods are proposed for use including manual, mechanical, biological, prescribed burning, competitive planting and chemical. The chemical Rodeo could be used within riparian areas (50 foot buffer width) using a wand with an absorbent end that is used to wipe plants. Outside these riparian buffers, Rodeo could be used in site type 1-4 (roadsides, quarries, and plantations). Tordon 22K is also available for use in site type 2 where there is competing vegetation. Specific mitigation measures for T&E fish would not be implemented because these species were listed by USFWS after 1993. The survey and manage standards and guidelines from the Northwest Forest Plan did not exist in 1993; these species are not addressed. Riparian Reserve allocations from the Northwest Forest Plan were not in existence. Heritage sites were not treated in detail in the previous analysis. New information on the environmental effects of Tordon 22K was not available in the previous analysis.

Vegetation

Untreated Sites

Changes to vegetation would differ between habitat types. One hundred fifty-six sites of new invaders would not be treated; no new invaders would be added to the Forest list. All site types would experience increases in noxious weeds. Type 1 sites are highly disturbed and consist of non-native weedy species. Additional noxious weed invasions would decrease species diversity in these sites as weeds dominate. Type 2 sites (disturbed but vegetated, riparian and special habitats) would experience the most harm as native, desirable species would be outcompeted by the aggressive noxious weed species. This will result in a reduction of species diversity.

Most invading noxious weed species are found along roadsides, but infestations spread rapidly. The Mt. Hood National Forest has heavy infestations of knapweed in clearcuts. This could affect natural plant succession. Knapweed also has the ability to move into undisturbed areas such as meadows, especially where burrowing mammals are present, and Natural Area Preserves (WSU, 1992). This could result in the displacement of native plant species and disruption of community types, especially in non-forested habitats because knapweeds will form pure stands, eliminating native vegetation.

Treated Sites

Control methods proposed in this alternative for the original 50 sites range from very specific to non-specific on target vegetation. Manual and biological controls are very specific and therefore will have little to no effect on non-target vegetation. Mechanical control (mowing, burning or steaming) is not specific to certain plants and can have a short-term effect on non-target vegetation. For each of these mechanical controls, it has been demonstrated that effects are short-term and non-persistent, including weed species. Mulching is not specific and can affect non-target vegetation. It is most appropriate, therefore, when there is little to no competing vegetation on site or where weed populations are small and limited in size. Competitive planting is most appropriate where there is existing grass-dominated vegetation to compete

with invading weeds. Non-native species used for revegetation which move off-site could adversely affect native vegetation so native seed mixes are preferable. Prescribed burning is not specific and can affect non-target vegetation. Most native vegetation in the western Cascades is adapted to fire which has been a natural disturbance within the ecosystem. Even so, if this method is used, it is recommended that the effects on non-target vegetation as well as target vegetation be analyzed prior to the project and monitored following the burn (ie a site-specific analysis is required).

Two chemicals will be used in this alternative: Rodeo and Tordon 22K. Rodeo is a non-selective herbicide that is most appropriate to use where there is no competing vegetation. It does not readily translocate, this chemical could also be used within Riparian Reserves inside a 50-foot buffer using a weed wiper to avoid spray drift. Tordon 22K would be used on site type 2 where competing vegetation dominates. This chemical was chosen for use because it also leaves a residual in the soil that can kill germinating seedlings.

Rodeo is a broad-spectrum, non-selective, non-residual herbicide (which means it kills all plants and does not leave a residue in the soil). There are no inert ingredients in this formulation; it is composed of 53.5% glyphosate and 46.5% water. It is absorbed by foliage and translocated to underground roots and rhizomes (USDA, 1988). Effects of herbicides may be seen in 2-4 days in annuals and 10 or more days in perennials. The effects are wilting, yellowing and browning (USDA, 1981a).

Rodeo can kill all varieties of plants: deciduous brush (salmonberry, cascara, cherry, ocean spray, thimbleberry, hazelnut, elderberry, vine maple), hardwoods (red alder, bigleaf maple, poison oak may survive), evergreen shrubs (manzanita, madrone, salal), grasses, sedges and other herbaceous plant species. Conifers such as Douglas fir, noble fir, grand fir, and Sitka spruce may experience tip dieback of 3-12 inches at concentrations greater than 3/4 lb./acre (USDA 1981a; Worthington and Walker, 1983). Summer dormancy of plants often imparts resistance to Rodeo as plants are inactive. Many perennial trees and shrubs (such as blackberry) only translocate the chemical in September and October, before the onset of winter dormancy (G. Miller, pers. comm.). Rodeo must directly contact foliage; uptake of the chemical via roots is not possible.

Primary hazards to non-target vegetation are unintended direct spray and spray drift. Unintended treatment has the potential to cause a localized change in species diversity and abundance as well as total cover, number of individuals, age class distribution of species and structure of the overall vegetation in the treated area. In a study using a tractor-mounted sprayer, Marrs et al (1991) found agricultural plants located 4 meters downwind showed a 12% decrease in yield when glyphosate was sprayed during wind speeds of 4-9 mph. Cox (1995) notes seedlings mortality at 20 meters (66 feet) using tractor-mounted sprayers. Backpack spray is expected to target specific weed plants with less potential for drift. To mitigate for these effects in Riparian Reserves, no treatment will occur within 50 feet of water. No spray will occur when wind speeds exceed 5 miles per hour. Backpack spray will be used on all but the largest sites. The State of Oregon will certify chemical applicators. Non-target plants will not be treated. Handling, transport and storage would follow the directions of the EIS that are designed to minimize the potential for spillage.

Direct effects to non-target plants from exposure to contaminated soil are expected to be minimal because Rodeo is tightly adsorbed to soil particles and it is degraded quickly within the soil (SERA, 1996a). Cox (1995) notes that in one of four European soils tested, glyphosate desorbed or unbound from the soil and translocated through the soil profile. This seems to be a rare exception and is not the general mode of action (USDA, 1996). Effects from volatilization are also expected to be negligible (SERA, 1996a).

Several studies have documented that glyphosate can reduce the nitrogen-fixing activity in soils (Cox, 1995). This is how nitrogen becomes available to plants. This issue may be of concern in site type 2 where

there is potentially competing vegetation. Potential effects on nitrogen-fixing bacteria will be mitigated b spraying only target plants using backpack sprayers.

The surfactant, LI700, is proposed for use in conjunction with Rodeo, The EPA has classified two of the chemical constituents as 4A- minimal concern and 4B- current use patterns in pesticide practices will not adversely affect public health and environment (SERA, 1997). The third constituent was not sufficiently described in the Material Data safety Sheets or Technical Data for the EPA to identify its specific constituents, so it has no rating. Surfactants are used to make the herbicide more effective; it would obviously have a negative effect on non-target vegetation from direct spray or drift.

The formulation of Tordon 22K proposed for use is Tordon which affects only woody and broadleaf plants. All inert ingredients have not been revealed, so possible hazards to the environment cannot be fully characterized. Absorption of the herbicide is through the roots, foliage and bark. Microbial degradation in the soil is slow, but breakdown is rapid in sunlight (USDA, 1988). This herbicide leaches rapidly and can affect non-target plants whose roots grow adjacent to those of target species (USDA, 1992c). EPA characterizes Tordon 22K as having “extreme phytotoxicity”, meaning that drift or runoff present serious hazards to non-target plants (Cox 1998).

This herbicide is effective in controlling Canada thistle, leafy spurge, Russian knapweed (USDA, 1988), spotted and diffuse knapweed (Lacey et al., 1992). It also affects woody broadleafs (e.g.maple, cherry, aspen, cottonwood, birch, rose and poison oak), most conifers, and herbaceous broadleafs.

Knapweed control has been documented as occurring within 2-3 years at 1/4 to 1/2 lbs/acre (Beck) and from 2-5 years in gravelly soils or areas of high precipitation (Lacey et al., 1992). This means that herbicide may need to be applied more than once to eliminate knapweed populations. Control is most effective when plants are sending up flowerheads.

Effects on non-target species, direct application and spray drift, would be partially mitigated by measures shown in Chapter 2 such as restriction of application to backpack sprayers and restriction of treatment to times when wind speed is less than 5 miles per hour and no rain is predicted within the next 24 hours. Herbicide application could affect non-target vegetation that is adjacent to target plants. Cox (1998) notes that EPA’s Ecological Effects Branch characterizes Tordon 22K as a chemical with extreme environmental risk, namely of drift or runoff. In one study, Tordon 22K was translocated from leaves treated with a wick and released into the soil profile. This could cause a change in species diversity and abundance as well as total cover, number of individuals, age class distribution of species and structure of the overall vegetation along treatment corridors. Individual weeds would be sprayed using backpack sprayers to localize the application. This herbicide will not be used in riparian areas because of the potential to leach.

Tordon 22K has been tested for its effects on nitrification; it inhibits this essential process performed by nitrogen-fixing bacteria (Cox, 1998). Sites where Tordon 22K would be used, quarries and waste areas and unvegetated roadsides (site type 1) where soil persistence is desired to kill seedlings, would not have desirable native plant species with nitrogen-fixing nodules. However, site type 2 could have native legumes or alders which would be negatively affected if Tordon 22K leached into the profile from target applications.

Chemical applications would reduce the expansion of knapweed infestations along major transportation corridors and closed roads. This would reduce the risk of this species moving into pristine natural habitats such as meadows, Research Natural Areas and Wilderness areas where the desired species composition is that of only native species.

If herbicide applicatiol were to occur with a high frequency, herbicide residue could build up in the soil, increasing the area in which non-target species are affected. A high frequency of application could also inhibit revegetation measures or prevent recruitment of native vegetation by hindering seedling establishmentThe Willamette NF would minimize this problem by limiting herbicide application to once a year.

Monitoring and documentation must demonstrate efficacy in reduction of weed populations if chemical control methods are used.

Wildlife

Untreated Sites

There are no known direct effects to fish and wildlife species related to untreated noxious weed infestations. The weed species discussed in this document are not known to be toxic to wildlife. There is the potential for indirect and cumulative impacts. There is a general relationship between plant and wildlife species diversity: habitats with higher plant diversity usually support a greater diversity of wildlife. Under alternative 1,most noxious weed infestations will continue to grow, potentially out-competing native vegetation and changing habitat composition and structure. Plant species diversity will be reduced in infested areas, potentially resulting in reduced wildlife diversity particularily impacting those species which are more specialized.. Habitat reduction or degradation, caused by significant changes in plant communities because of competition from noxious weed invasions, could occur. Although this is currently occurring in a limited area on this Forest, the infestations will spread, as the habitats move to a more homogeneous condition across the landscape, potentially disrupting a wide range of habitats. The noxious weed species currently of concern are not known to be a high quality, important food source for any wildlife species, but these weeds do have the potential to out-compete high quality food sources. This could result in a decrease in the availability of high quality forage in localized areas such as meadows. This would be of a great concern in riparian areas, which receive a disproportionately higher wildlife use when compared to the percentage of landscape they occupy.. Site types 1-6 receive some wildlife use, especially in early successional stages of clearcuts. Decreases in species diversity in these areas would still be of some concern. The presence of weeds next to habitat edges in timber harvest areas, power corridors and roads tends to extend edge effects into more desirable interior habitats.

Treated Sites

Alternative 1 has the potential to directly affect wildlife through disturbance caused by activities near sensitive breeding or rearing areas. Mowing of ditches in the springtime could disturb open habitat ground nesting birds and remove cover from burrow-dwelling animals. The noise disturbance associated with mechanical removal could potentially affect sensitive breeding sites for spotted owls peregrine falcons or bald eagles. Activities in these sensitive areas will be seasonally restricted. Mechanical removal involving heavy equipment could cause habitat degradation by compaction or sedimentation. If mechanical treatments resulted in increased sedimentation into streams, habitat quality could be reduced for some species of fish, waterfowl, and amphibians. Compaction could reduce the availability of below-ground habitat, important to small mammals and sensitive amphibians. Mechanical removal should be limited to areas that would not have this effect.

The use of biological controls, competitive plantings, and hand pulling of individual plants should not

negatively affect any fish or wildlife species. Competitive planting of palatable, high quality species may increase the availability of food sources in the analysis area. The use of biological controls is not expected to disrupt native insect populations. All introduced insect species are tested for host-specificity, and they have not been found to compete with native species. The use of fire is limited to site type 2: vegetated roadsides and meadows. Most of the concerns discussed above for mechanical treatments apply to the use of fire. Removal of vegetation could affect ground nesting birds and small mammals in treated areas. Drift from smoke could affect sensitive natal areas. Fire will be restricted from use in sensitive areas. Alternative 1 could have a beneficial effect on fish and wildlife because of the reduction of the potential for loss of species' diversity in infested areas.

Chemical herbicides have the potential to directly affect wildlife through direct contact with treated vegetation, other animals, soil, or water that has been contaminated; direct contact with spray either on the skin, through inhalation, or ingestion; and through the loss of food sources. There has been little research done on direct effects of Rodeo to wildlife species. The consequences of herbicide effects on wildlife species must generally be extrapolated from effects shown to laboratory animals. No significant direct effects have been discovered on laboratory avian and mammalian species tested. Morrison and Meslow in 1984 concluded that data on toxicity of herbicides to wildlife reveal that both the acute and chronic doses are well above levels found in the environment under normal field application rates. These generalizations are not backed up, however, by any laboratory or field research on the effects to amphibians, reptiles, and many invertebrates. The EPA identified one endangered toad and one beetle that could be jeopardized by Rodeo application (EPA 1986), and their reasoning could be extrapolated to other amphibians and beetles. Limited research on the effects of herbicides on invertebrates have found varying effects. Santillo et al. (1989) found fewer invertebrates on clearcuts treated with Rodeo, but they assumed this was caused by reductions in plant food sources. Kreutzweister et al. (1989) suspected that Rodeo treatments increased the drift response of *Gammarus* species and *Paraleptophlebia* species. Buhl et al. (1989) found Rodeo was practically non-toxic to the midge *Chironomus riparius*. The EPA has stated that the Rodeo formulation is practically non-toxic to aquatic invertebrates (EPA 1986).

Research indicates that use of these herbicides (Rodeo and Garlon 3A) in the Willamette National Forest's riparian systems has the potential to negatively affect sensitive, riparian-associated fauna, which includes the red-legged frog and spotted frog if accidental release via transportation spills or misapplication of herbicides occurs. This could occur following direct contact with herbicides or because of the potential reductions in the availability of invertebrate prey. This alternative recommends the use of Rodeo in site types 1,2,4 and 5, which includes riparian areas, ditches where run-off may travel to riparian areas, and areas that may contain small puddles which can be habitat for the frog species. Mitigation of potential effects to invertebrates will include a 50-foot buffer from riparian areas. The use of Rodeo on site types 1,2,4 and 5 that do not have the potential for run-off or puddling will have no impact on wildlife, including TES species. Because of the limited knowledge of the direct affects of herbicide application on wildlife species, and indications that these herbicides may diminish health in small mammals, natal areas for TES species, such as the spotted owl, should not be treated because of the potential for a reduction in the prey base (see mitigation measures outlined above).

An additional chemical, which may be used under this alternative, is Tordon 22K. Chemical herbicides have the potential to directly affect wildlife through direct contact with treated vegetation, other animals, soil, or water that has been contaminated; direct contact with spray either on the skin, through inhalation, or ingestion; and through the loss of food sources. There has been very little research done on direct effects of Tordon 22K to wildlife species. The consequences of herbicide effects on wildlife species must generally be extrapolated from effects shown to laboratory animals. The EPA and manufacturer differ in results from laboratory tests; the EPA found that the chemical is somewhat toxic, especially when inhaled (Cox, 1998).

There is some concern about animals that drink water near Tordon 22K treatment sites as this chemical is easily translocated. To mitigate these concerns, Tordon 22K will not be used in any riparian area. A thorough literature search did not uncover any documentation on the effects of these herbicides on amphibians or reptiles. McCaffrey and Callihan (1988) found that Tordon 22K had no effect on invertebrates associated with spotted knapweed. The USFS stated in Tordon 22K's Herbicide Information Profile that application may be a hazard to some endangered invertebrates if it is applied to areas where they live.

Fish and Water

Untreated sites

There are no known direct effects to fish species related to untreated noxious weed infestations. In a worse-case scenario, some species of noxious weeds could crowd out native plant regeneration along streams, lakes, rivers, and reservoirs, eventually decreasing the amount of small and large wood and detritus which add critical organic material to stream ecosystems. Riparian habitat is a primary source for instream large wood which provides instream cover, sorts bedload sediments, catches spawning gravels, and scours pools. Smaller plants such as shrubs, forbs, and grasses in the riparian area also provide leaves, insects, and shade to the stream.

Treated Sites

Manual methods such as hand pulling small populations of weeds would not affect aquatic resources on the scale of disturbance expected to result from such actions. If hand pulling is expected or observed to create large amounts of bare ground within riparian areas, or areas subject to overland flow which would reach streams or lakes then mulching or other best management practices are needed to prevent soil erosion.

Biological control, due to the extensive and intensive testing of introduced organisms, is expected to have a negligible to low risk to aquatic resources.

Mechanical methods such as mowing do not create significant areas of bare soil disturbance. Mowing could be of concern (e.g. loss of shade and/or loss of cover) along significant spawning or rearing streams, especially where roads cross or are adjacent to fish bearing streams. Damage to vegetation has been caused by ODOT mowing outside the road right-of way adjacent to bull trout spawning habitat on the Willamette NF, for instance. Normally such damage would be avoided by using proper equipment operation procedures and guidance. Increased awareness of these sensitive areas is occurring as part of the Endangered Species Act consultation with U.S. Fish and Wildlife Service.

Competitive planting is compatible with aquatic values and would be expected to have no effect on fishes or macroinvertebrates.

Prescribed burning could carry a risk to aquatic values only under certain scenarios of escaped fire situations and excessive burn temperatures. Aquatic systems of the Cascade mountains evolved with fire in the environment, and in most situations prescribed burning would be expected to have minimal negative effect on fishes and other aquatic species. Since most streams in the Cascades are nutrient limited, prescribed burning within watersheds could result in small pulses of nutrients to stream ecosystems, which could be beneficial.

Direct effects on aquatic species from chemicals require that the organism and chemical(s) come into

contact, and that the chemical be taken up by the organism and moved to a site of biochemical action in a large enough quantity to cause an effect (Norris et al. 1991). The greatest hazard from use of chemicals as proposed in this analysis is from direct adverse toxic effects on non-target organisms caused by exposure in the aquatic environment. The chemical would have to reach the water through one or more of the following routes (drift, mobilization in ephemeral stream channels, overland flow, leaching, or accidental spill). Because aerial application is not proposed or allowed under this analysis there is a greatly reduced risk of drift reaching aquatic ecosystems in significant amounts. The 50-foot buffer along streams that is proposed as a wipe only zone reduces the risk of small amounts of drift reaching the aquatic environment. Overland flow is possible where chemicals are used on bare or heavily compacted soils, but the relatively rapid breakdown of Rodeo reduces the risk of it persisting and entering the aquatic environment. Bioaccumulation factors of chemicals, such as Rodeo which has a relatively high water solubility, are relatively low in comparison to DDT, carbaryl, and atrizine (chemicals not being proposed for use), which cause larger risks to organisms along the food chain (Norris et al. 1991).

Because Rodeo strongly attaches to soil particles indiscriminately and has a low potential for leaching in the soil, it would have little effect on water. It may take anywhere from a month to a year for the microfauna in the soil to break down the chemical, without adversely affecting the soil organisms. Indirect application methods should be avoided in areas where the water table is at or near the surface. This is especially true within the riparian sites.

The EPA has recorded Tordon 22K as slightly toxic to most species of fish (Cox 1998). However, Tordon 22K is toxic to juvenile fish at much lower concentrations, with 0.9ppm shown to have reduced the lenth and weight of rainbow trout and up to 0.8 ppm in simulated field conditions reducing the weight and length of cutthroat trout fry (Cox 1998). Roadside spraying (of Tordon 22K) incidents in Montana ¼ mile upstream from a fish hatchery with rain occurring within a few days of spraying resulted in significant death and damage to trout in the hatchery.

In general, lethal levels of Rodeo and Tordon 22K for fishes are higher than the concentrations that have been found in waterways following spraying (Morgan et al. 1992). Because of its water solubility, Tordon 22K is extremely mobile in soils, readily leaches, and can be carried by surface run-off. Davis et al. (1968) found 0.37ppm in streams after 2 storms occurred following application to rangeland riparian vegetation. The LC50 for fish has been recorded as low as 4.0 ppm, though reduced fry survival and lake trout growth was seen at levels as low as 35.0 ppb (Woodward 1976). In general, studies have found Tordon 22K to be present in all streams which flow near or through treated areas (Norris). Rodeo is often the herbicide of choice for treatments of riparian areas. Direct application into the water to control aquatic vegetation is a common practice throughout the country.

Research and information on the individual chemicals indicates that use of these herbicides in the Willamette National Forest's riparian systems has the potential to negatively impact listed fish species, including bull trout and Oregon chub, as well as other aquatic organisms if they become exposed to the herbicides and/or their inert ingredients.

Botany

Untreated Sites

If weed infestations continue to expand untreated, they could move into sensitive plant habitats. Few of the sensitive plants are pioneer, disturbance-tolerating species, and most (if not all) would be outcompeted if noxious weeds invaded the habitat. A similar effect could occur with survey and manage plant species which are ground-dwelling such as mosses and liverworts. Of particular concern are the potential threat of knapweeds to *Gentiana newberryi* along Highway 242 and reed canarygrass to *Lycopodiella inundata* in Gordon Meadows.

Treated Sites

Weed infestations could adversely affect the viability of populations of sensitive plants on the Willamette National Forest. One population of *Romanzoffia thompsonii* and *Carex scirpoidea var stenochlaea* grows within BR2 corridor where spotted knapweed is present. Knapweed encroachment on the population could outcompete this diminutive annual for water and sunlight necessary for photosynthesis. This Alternative would propose to treat this site with manual methods. Buffers for the sensitive plant population are not specifically prescribed in this Alternative. Survey and Manage species are not addressed under this alternative; herbicides may be used to treat weeds adjacent to these populations. Tordon 22K would be used in this Alternative. It is known that this chemical adversely affects mycorrhizal fungi (see discussion under vegetation).

Soil Resources

Untreated Sites

Not treating 150 additional known sites would permit noxious weed dominated sites to exist and continue to incur direct effects on soil resources. Although no additional disturbance would occur on the sites as a result of treatments, the current levels of compaction, lack of organic litter and duff would persist on these disturbed sites. Lacey et al. (1989) showed that runoff and sedimentation rates were higher for sites dominated by spotted knapweed as compared to native vegetation. Direct effects on soil structure and pH could occur over time as a result of the different type of biomass produced, although research quantifying these changes is limited (Deschutes NF, 1998).

Treated Sites

There would be no potential risk of contaminating soil resources from any control method except chemical. Manual and mechanical control of plants would cause minimal, short-term disturbance of soil and undetectable impacts to surface runoff. These negative effects may be outweighed by addition of plant biomass left on-site (unless flowering or fruiting), contributing to soil organic matter and available nutrients. Mulching and competitive plantings would contribute organic matter to the soil. Competitive plantings along roadsides would reduce the area open for soil erosion into riparian areas. Prescribed low-intensity burns may have a potential for minor, localized soil erosion, but are not expected to be severe as long as the fire is not in a highly erodable area or on a steep slope. Release of biological control agents is not expected to cause any direct impact to the soil. The addition of biological control agents that are soil-dwelling such as root-feeders, may have small localized effects but information on this topic is not available in the literature.

Rodeo is highly soluble in water (Worthington and Walker, 1983). Rodeo strongly adsorbs onto soil particles and thus is usually described as having a low potential for leaching (Worthington and Walker, 1983; Cox, 1991). Studies also have shown that initial inactivation of Rodeo occurs through rapid adsorption to soil particles (USDA, 198 la). Whether through adsorption or absorption it is clear that to a certain extent Rodeo becomes inactive by combining with soil particles.

Decomposition of Rodeo is predominantly by microbial activity (Worthington and Walker, 1983), with the majority of studies indicating no adverse effects to soil microorganisms (USDA, 1992b). The half-life of Rodeo, the time it takes for the original application amount to decrease by one-half, ranged from 36 to 63 days in EPA tests. Other studies have shown residual chemical in the soil ranged from 152 days to 335 days with the variation thought to be in response to the quantity and type of microorganism present in the soil (Cox, 1991). No effect on microbial biomass, respiration or bacterial:fungal ratio was found by Wardle and Parkinson (SERA, 1996a). Stratton and Stewart (1992) found that there was no significant impact of Rodeo on bacterial, fungal or actinomycete populations at rates up to 100 times field application.

A second herbicide proposed for use in this Alternative is Tordon 22K. This herbicide is very soluble in water and has the potential to leach into groundwater depending on the character of soil and on the weather conditions. Tordon 22K chemically attaches to clay particles and organic matter in soils, decreasing the potential for leaching to a moderate level and increasing its persistence in the soil. Where soils are loamy-sand to sand, light textured, and have a high permeability, Tordon 22K moves readily through the soil thus creating a high potential for groundwater contamination.

Sunlight and microorganisms do not readily breakdown Tordon 22K and thus it tends to be persistent in the soil (Cox, 1998). Decomposition of Tordon 22K is also aided under acidic soil conditions (USDA, 198lb). Environmental conditions with the greatest potential for leaching Tordon 22K to groundwater are soils that have a low organic content, an alkaline pH, high permeability, loamy-sand to sandy or light texture, and are present in areas of high rainfall conditions. Under favorable environmental conditions Tordon 22K has been found to have a half-life of less than one month, and, under and conditions, a half-life of greater than four years.

With Tordon 22K there are two soil conditions that create strong concerns. The first is when the soils are highly permeable, such as the loamy sands to sandy and light textured soils. These conditions are most often found adjacent to inland water bodies, shallow water tables, streams and rivers. The second is where there is fractured bedrock at or close to the surface providing a conduit for translocation of the chemical to groundwater (Oliver, 1989).

Application of all chemicals would occur during the dry season when there would be a reduced chance of rain to leach herbicides through the profile. Applications would be directly to target plants to avoid soil contamination except where densities are too high to use backpack sprayers along roadsides. Application on soils with rapid drainage and highpermeability should be avoided during the wet part of the year to limit chances of leaching. Since the half life of Tordon 22K in the soil is only one month, chances of leaching during the summer are minimal. When water bodies, streams, rivers or high water tables are nearby, Tordon 22K will not be used. Effects to soil will be for a minimal period of time; microorganisms are not adversely affected by this chemical.

Heritage Resources

Untreated Sites

Effects of untreated noxious weed infestations would be limited to potential impacts to the cultural landscape of significant historic properties as associated with the intrusion of non-native species or changes to the historic conditions. Such infestations could be considered an adverse effect to qualities of significance of an historic property. Infestations in sites which were previously used for collection of foodstuffs would be considered adverse effects, also.

Treated Sites

Because this Alternative does not adequately address heritage resources, the potential for adverse direct effects to heritage resources resulting from treating known sites could be significant. Of particular concern are mechanical control treatments in areas known to contain significant heritage sites.

Administrative and Recreation Sites

These sites were not analyzed in the 1993 Environmental Assessment. Established infestations within Ranger District compounds will increase. No experimental treatment of Scotch broom will occur under the powerline corridors. The boat launch site (BR5) may be the only recreational site treated.

Alternative 2

In Alternative 2, an Integrated Vegetation Management Program would be instituted. The Forest would follow the Region 6 EIS, placing priority prevention measures. Four new Forest Plan standards and guidelines would be adopted (p. 14-15,17).

All sites would be identified and, depending on site characters, the best treatment method to control the weed species would be selected. Manual, biological, and mulching treatments would be available methods to choose for all sites. Competitive plantings could be used for all sites but type 1 (quarry, roadside) where this method would be inappropriate because plantings wouldn't work. Prescribed burning would be available in site types 2 and 3 where vegetation may respond to this treatment method (this would need a separate NEPA analysis). Chemical control would differ between non-riparian and riparian. In non-riparian, Rodeo and Garlon 3A would be available except in areas of high human use (site type 4). In riparian areas and site type 4 Rodeo would be applied by backpack only outside a 50-foot riparian buffer. Effects on all parts of the natural environment are analyzed in Chapter 4 of the EIS (USDA, 1988).

Vegetation

Control methods proposed in this alternative range from very specific to non-specific on target vegetation: manual, biological, mechanical, mulching, competitive planting, prescribed burning have all been addressed in Alternative 1

Two chemicals are proposed for use in this alternative: Rodeo and Garlon 3A. Rodeo is a non-selective herbicide that is most appropriate to use where there is no competing vegetation. Because it does not readily translocate, this chemical would also be used within Riparian Reserves outside of a 50-foot buffer (see Table 10 for number of riparian sites/site type). Because Garlon 3A is a selective herbicide that only affects broadleaf species, it would be used where there is a competing stand of grass, outside of Riparian

Reserves and 200 feet from environmentally sensitive areas such as sensitive plant sites or survey and manage populations.

Table 10. Number of Sites Within Riparian Reserves and Outside Riparian Reserves By Site Type

Site Type	Riparian	Non-Riparian
1	72	61
2	36	19
3	1	0
4	8	7
5	0	3

An analysis of the effects of Rodeo on vegetation is included in Alternative 1. Garlon 3A is a selective herbicide that is used to control woody plants and broadleaf weed species. It does not affect grasses at recommended rates (USDA, 1996). This formulation includes triclopyr salt (44%), emulsifiers, surfactants, water and ethanol. It' mode of action is like the plant hormone auxin, causing uncontrolled growth until vital function can no longer be maintained (SERA, 1996b). Garlon 3A is absorbed by green bark, leaves, roots and cut surfaces of plants and accumulated in the growing part (meristem) of the plant (USDA, 1996).

Non-target broadleaf species are at risk from unintentional direct spray and spray drift. In a worst case scenario, detectable damage from drift could occur up to 68 ft downwind; ground application drift is predicted at 0.9-2.1 m at an average wind speed of 7.6 km/hr (SERA, 1996b). The same mitigation measures as mentioned above for Rodeo will decrease impacts. It is assumed that application rates proposed by the Forest Service will not leave soil residues that would damage non-target plants, although experiments have shown other forms of Garlon to decrease germination and plant growth for up to 80 days (SERA, 1996b). The Herbicide Information Profile states that Garlon 3A is highly soluble. The probability of leaching increases as soil organic content decreases (this is what it bonds to in the soil) and microbial activity decreases (USDA 1996).

Both herbicides have demonstrated negative effects on mycorrhizal fungi (Swadener, 1993; Cox, 1995). Since mycorrhizal fungi are associated with trees that do not grow along road shoulders, there are no expected adverse effects of Rodeo on these species at treatment sites. Where survey and manage mycorrhizal fungi are known to exist, buffers from chemicals will be 200 feet (see botany section). Because Garlon 3A can translocate, especially in sites which are low in soil organic matter (road shoulders), there is a chance of adversely affecting mycorrhizal fungi in localized areas adjacent to Garlon 3A application sites. It is recommended that mitigation include use of this herbicide in only very restricted areas outside of Riparian Reserves.

Chemical applications would reduce the expansion of the three knapweed species (spotted, meadow and diffuse) infestations along major transportation corridors and closed roads. This would reduce the risk of these weeds moving into pristine natural habitats such as meadows, Research Natural Areas and Wilderness areas.

If herbicide application were to occur with a high frequency, herbicide residue could build up in the soil, increasing the area in which non-target species are affected. A high frequency of application could also inhibit revegetation measures or prevent recruitment of native vegetation by hindering seedling

establishment. The Willamette NF would minimize potential problems by limiting herbicide applications to once a year. Monitoring and documentation must demonstrate efficacy in reduction of weed populations for this control method to be used

Wildlife

Effects on wildlife from direct effects through disturbance would be similar to those outlined under Alternative 1.

Herbicides in riparian systems have the potential to negatively impact sensitive, riparian-associated fauna, which includes the red-legged frog and spotted frog, if accidental release via transportation spills or misapplication of herbicides occurs. This could occur following direct contact with herbicides or because of the potential reductions in the availability of invertebrate prey. This alternative recommends the use of Rodeo in site types 1,2,4 and 5, which includes riparian areas, ditches where run-off may travel to riparian areas, and areas that may contain small puddles which can be habitat for the frog species. Mitigation of potential effects to invertebrates will include a 50 foot buffer from riparian areas. The use of Rodeo on site types 1,2,4 and 5 that do not have the potential for run-off or puddling will have no impact on wildlife, including TES species. Because of the limited knowledge of the direct affects of herbicide application on wildlife species, and indications that these herbicides may diminish health in small mammals, heavily utilized natal areas for threatened species, such as the spotted owl, should not be treated because of the potential for a reduction in the prey base (see mitigation measures Table 7).

Garlon 3A is placed in Toxicity Category III (Caution) by the EPA (Swadener, 1993). It is slightly toxic to mammals and birds and practically non-toxic to bees (USDA, 1996; USDA, 1992) In mammals most, but not all,of the chemical is excreted in urine. However authors of the study concluded that Garlon 3A has a low potential to accumulate upon repeated exposure (USDA, 1996). Swadener (1993) notes that persistence of the chemical within treated vegetation might pose a threat to herbivorous wildlife. To avoid potential for contact, this chemical will only be used along gravel rights of way and human made rock piles where there is no competing vegetation (only the weeds exist there), outside of Riparian Reserves.

Studies have shown that application of herbicides over large areas can significantly alter the composition of the wildlife community because of changes in vegetative structure. Because the proposed treated areas are small, significant changes in habitat that could indirectly effect wildlife are not expected. Rodeo does not accumulate in the soil. Garlon 3A will be used only in areas that do not function as habitat for wildlife. Cumulative effects on the treated sites are not expected.

Fish and Water

The effects of manual, biological control, mechanical, competitive planting and prescribed burning on fish and water resources is outlined in Alternative 1.

The greatest hazard from use of chemicals as proposed in this analysis is from direct adverse toxic effects on non-target organisms caused by exposure in the aquatic environment. The chemical would have to reach the water through one or more of the following routes (drift, mobilization in ephemeral stream channels, overland flow, leaching, or accidental spill). Because aerial application is not proposed or allowed in this analysis, the risk of drift reaching aquatic ecosystems in significant amounts is reduced. The 50-foot buffer along streams that is proposed as a no-spray zone reduces the risk of drift reaching the aquatic environment. Overland flow is possible where chemicals are used on bare or heavily compacted soils, but the relatively rapid breakdown of Rodeo reduces the risk of it persisting and entering the aquatic

environment. Bioaccumulation factors of chemicals, such as Rodeo and Garlon 3A which have relatively high water solubility, are relatively low in comparison to DDT, carbaryl, and atrizine (chemicals not being proposed for use), which cause larger risks to organisms along the food chain (Norris et al. 1991).

Use of Garlon 3A is restricted to Site Types 1, 2, and 5 under Alternative 2, and would be used at least 50 feet from water where its selectivity for broadleaf plants is desirable to maintain competing grasses. The toxicity of Garlon 3A to aquatic species is largely determined by the formulation with an LC_{50} (the concentration that kills 50 percent of a group of test animals) for salmon of 1.4 ppm. of Garlon 4; 7.8 ppm. for Garlon 3A acid; and 275 ppm. for Garlon 3A (Swadener 1997). Many of the "inert" ingredients in Garlon 3A are trade secrets of DowElanco and are not publicly known. Kerosene, ethanol; diesel oil, ethylenediamine tetraacetic acid (EDTA) may be used as inert ingredients. Diesel oil, for example is highly toxic to freshwater fishes.

Rodeo strongly attaches to soil particles indiscriminately and has a low potential for leaching in the soil, it would have little effect on water. It may take anywhere from a month to a year for the microfauna in the soil to break down the chemical, without adversely affecting the soil organisms. Indirect application methods will be avoided in areas where the water table is at or near the surface such as Riparian Reserve sites.

Botany

Effects on sensitive and survey and manage plant species would be similar to those on vegetation described above. Extensive mitigation measures will be applied. No chemical control will be used in documented sensitive plant or survey and manage plant species sites. Where survey and manage populations are located along long weed corridors on Highways 20 and 126, a buffer of at least 200 feet (similar to riparian buffers) from chemical control areas will be marked to maintain integrity of the habitat of these species. Management recommendations (REO, 1998a) for the survey and manage fungi are to protect populations to maintain viability. This includes maintenance of microhabitat, minimizing soil disturbance, and maintenance of host trees (as many of these species are mycorrhizal fungi in the soil attached to host trees and dependent on their host for subsistence). Garlon 3A was found to be toxic to mycorrhizal fungi in several studies (Swadener, 1993). This herbicide should not be used within 500 feet of survey and manage buffers. Rodeo was found to inhibit growth of mycorrhizal fungi at very low concentrations (Cox, 1995). Use of this herbicide should be limited to outside a 200 foot buffer to avoid effects of drift.

Soil Resources

Effects on soil resources of treatments such as manual, biological, competitive planting, mulching and mechanical control are similar to Alternative 1. The effects of Rodeo on soil resources are also analyzed under this alternative.

Another herbicide that is proposed for very limited use under this alternative is Garlon. Garlon 3A decomposition in the soil is primarily microbial and can be very rapid if warm, wet conditions exist (USDA, 1996). Half-life, the time it takes for the original application amount to decrease by one-half, is reported as several months in western Oregon (USDA, 1996; Swadener, 1993). In a study on soil profiles, half-lives are reported at 10 days at 2 and 20 cm depth and 39 days at 60cm depth in clay loam soils (Johnson and Lavy, 1994). In western Oregon, traces of Garlon 3A were found over a year after application at soil depths of 30-45 cm, where microbial activity is minimal (Swadener, 1993). This points to the fact that this herbicide should not be used where there is potential to leach because it persists within the soil profile when moved from the zone where it is degraded.

Garlon 3A does not appear to have an adverse effect on soil microorganisms. Garlon 3A had no effect on microbial species at concentrations of up to 500ppm (USDA, 1996).

Soil adsorption is low for Garlon 3A, which means it doesn't bond well in the soil. This means that is may be leached from the soil profile. Mitigation measures in this analysis which address these potential concerns include no use of Garlon 3A in riparian areas and no treatment of sites where rain is forecast in the next 24 hours. Due to the possibility of leaching, it would be ill-advised to use this herbicide in any Riparian Reserve.

Given the mitigation measures, there should be no indirect effects on the soil or water resource from this Alternative. There could be cumulative effects on groundwater if application continues over a long period of time and the aquifer does not have adequate time to flush itself. This is assuming that rain has flushed the chemical out of the soil before the chemical has been broken down by soil organisms. Since the annual amount of chemical used in the past is less than 5 gallons, chance of aquifer contamination is minimal.

Heritage Resources

All treatment options could be considered under this alternative, including prescribed burning for Site Type 3, which includes heritage resources by definition. Selection of a treatment method when historic properties are present should consider the qualities of the properties significance. In most cases, manual methods and biological controls should have no effect, but monitoring may be appropriate for some sites when manual control is recommended. Special measures would be needed to mitigate potential effects of a prescribed burn treatment or manual controls involving digging. Chemical treatments would not be appropriate in areas of traditional cultural use by indigenous people. Treatment of Site Types 1, 2, 4, and 5 should have no effect on heritage resources.

Administrative and Recreation Sites

Sites with a lot of human use could receive no action, manual, biological, mulch, competitive planting and chemical treatment methods. Rodeo would be available for use outside a 50 foot riparian buffer. If chemicals are used on District Compounds, all entrances to buildings should be buffered from treatment to avoid contact with the public or employees. No chemical treatment is recommended for other sites with high human use. Follow-up with educational materials at sites where weeds are manually controlled at campgrounds or trailheads will inform public of measures they can take to prevent reintroduction.

Administrative sites with little human use, powerline rights of way, may be treated with all the controls listed above, plus Garlon 3A outside a 50 foot buffer. The Scotch broom site (BR 33) is proposed for mechanical control only.

Alternative 3

In Alternative 3, an IWM Program would be implemented, using a full array of control methods. There would be cooperation between the forest and adjacent federal and state agencies. All laws and MOUs would be honored. The forest would implement the Region 6 EIS, placing priority prevention measures. Four new Forest Plan standards and guidelines would be adopted (p. 14-15, 19).

All sites would be identified and, depending on site characters, the best treatment method to control the species would be selected. Manual, biological, and mulching treatments would be available methods to

choose for all sites. Competitive plantings would be available for all sites but type 1 (quarry, roadside) where this method would be inappropriate. Prescribed burning would be available in site types 2 and 3 where vegetation may respond to this treatment method (this would need a separate NEPA analysis). Chemical control would be available in all sites except type 3 (Wilderness, Threatened, Endangered or sensitive plant or animal habitat, significant heritage sites). Chemicals Rodeo, Garlon 3A and Tordon 22K could be used, depending on the site evaluation. Within 50 feet of water only Rodeo would be available for use and the only method of application would be weed wipers to avoid drift. Effects on all parts of the natural environment are analyzed in Chapter 4 of the EIS (USDA, 1988).

Vegetation

The effects of Alternative 3 on vegetation would be the same as Alternatives 1and 2.Three chemicals are proposed for use. Tordon 22K and Garlon 3A would be used to control new infestations in areas where there is competing grassy vegetation (site type 2) or where there is a heavy seed bank which needs a persistent chemical to control newly-germinated seedlings (site type 1: quarries and waste disposal sites). These chemicals will not be used within riparian areas.

Each additional site treated with Garlon 3A has the potential to adversely affect mycorrhizal fungi in site type 2 because of its potential for movement within the soil. Each additional site treated with Tordon 22K has the potential to inhibit nitrogen-fixation in sites where these species exist. The high potential for Tordon 22K to become mobile in the soil is of great concern as an indirect effect on non-target species.

Chemical applications would reduce the expansion of knapweed infestations along major transportation corridors, closed roads and quarry/dump sites.

If herbicide application were to occur with a high frequency, herbicide residue could build up in the soil, increasing the area in which non-target species are affected. A high frequency of application could also inhibit revegetation measures or prevent recruitment of native vegetation by hindering seedling establishment. The Willamette NF would minimize potential problems by limiting herbicide applications to once a year. Monitoring and documentation must demonstrate efficacy in reduction of weed populations for this control method to be used

Wildlife

Alternative 3 utilizes all methods. See the wildlife discussion under Alternative 1 and 2 for effects from mechanical, manual, biological control, fire, competitive plantings and the chemicals Rodeo, Tordon 22K and Garlon 3A.

Research indicates that use of these herbicides in the Willamette National Forest's riparian systems has the potential to negatively impact sensitive, riparian-associated fauna, which includes the red-legged frog and spotted frog. This could occur following direct contact with herbicides or because of the potential reductions in the availability of invertebrate prey.To mitigate for potential effects on amphibians and invertebrates, Tordon 22K is proposed for use on site types 1,2 4 and 5 outside of riparian areas. This includes disturbed roadsides that may include ditches with habitat for sensitive invertebrates. Because of the limited knowledge of the direct affects of herbicide application on wildlife species, and indications that these herbicides may diminish health in small mammals, heavily utilized natal areas for threatened species, such as the spotted owl, should not be treated because of the potential for a reduction in the prey base (see mitigation measures in Table 5).

Studies have shown that application of herbicides over large areas can significantly alter the composition of the wildlife community because of changes in vegetative structure and composition. Because the proposed treated areas are small, significant changes in habitat that could indirectly effect wildlife are not expected. The proposed herbicide Rodeo does not accumulate in the soil. Garlon 3A and Tordon 22K may accumulate but cumulative effects on the treated sites are not expected because they will be treated once a year.

Fish and Water

See the fisheries discussion under Alternatives 1 and 2 for effects from mechanical, manual, biological control, prescribed fire, competitive plantings and chemicals. The EPA has recorded Tordon 22K as slightly toxic to most species of fish (Cox 1998). However, Tordon 22K is toxic to juvenile fish at much lower concentrations, with 0.9ppm shown to have reduced the lenth and weight of rainbow trout and as little as 0.8 ppm in simulated field conditions reducing the weight and length of cutthroat trout fry (Cox 1998). Roadside spraying (of Tordon 22K) incidents in Montana ¼ mile upstream from a fish hatchery with rain occurring within a few days of spraying resulted in significant death and damage to trout in the hatchery.

Because of its water solubility, Tordon 22K is extremely mobile in soils, readily leaches, and can be carried by surface run-off.

Research and information on the individual chemicals indicates that use of these herbicides in the Willamette National Forest's riparian systems has the potential to negatively impact listed fish species, including bull trout and Oregon chub, as well as other aquatic organisms if they become exposed to the herbicides and/or their inert ingredients.

Botany

Effects on botanical resources are the same as Alternative 2. No chemical control is available for use in documented sensitive plant or survey and manage plant species sites. Where survey and manage populations are located along long weed corridors on Highways 20 and 126, a buffer of at least 200 feet (similar to riparian buffers) from chemical control areas treated with Rodeo and 500 feet from areas treated with Garlon 3A or Tordon 22K to maintain integrity of the habitat of these species. Management recommendations (REO, 1998a) for the survey and manage fungi are to protect populations to maintain viability. This includes maintenance of microhabitat, minimizing soil disturbance, and maintenance of host trees (as many of these species are mycorrhizal fungi in the soil attached to host trees and dependent on their host for subsistence).

Soil Resources

Effects on soil resources using manual, biological, mechanical, mulch, prescribed burning and competitive planting and chemical control using Rodeo, Tordon 22K and Garlon 3A are the same as Alternatives 1 and 2.

The greater the number of sites treated with Garlon 3A and Tordon 22K, the greater potential for persistence in the soil. In some situations it may be desirable (to kill seedlings as they emerge from the soil bank) to have some persistence, but the longer these chemicals are not broken down, the greater chance they will be leached during the rainy season.

There should be no indirect effects on the soil or water resource from this Alternative. There could be

cumulative effects on groundwater if application continues over a long period of time and the aquifer does not have adequate time to flush itself. This is assuming that rain has flushed the chemical out of the soil before the chemical has been broken down by soil organisms. Since the annual amount of chemical used in the past is approximately 3 gallons, chance of aquifer contamination is minimal.

Heritage Resources

Again, potential effects of this alternative on heritage resources would be the same as Alternatives 1 and 2 discussed above. Selection of treatment should consider the properties of the heritage resource.

Administrative and Recreation Sites

Administrative and Recreation sites would be treated, under this alternative, with the most effective method to control the new invading species. These methods may include chemicals in heavily used areas such as campgrounds and trailheads. Potential impacts would be mitigated through signs designed to let users know prior to and after treatment (see mitigation measures Table 6).

Alternative 4

Alternative 4 would develop an IWM program using all control methods except chemicals. The forest would follow the Region 6 EIS, placing priority prevention measures. Four new Forest Plan standards and guidelines would be adopted (p. 14-15, 20).

All sites would be identified and the best treatment method to control the species would be selected, depending on site characters. Manual, biological, and mulching treatments would be available methods to choose for all sites. Competitive plantings would be available for all sites but type 1 (quarry, roadside) where this method would be inappropriate. Prescribed burning would be available in site types 2 and 3 where vegetation may respond to this treatment method (this would need a separate NEPA analysis). Chemical control would not be available in any site.

Populations of new invaders proposed for treatment would most likely not be eradicated because the most effective control method, herbicides, would not be available. Populations of new invaders would increase in size because the seeds accumulate in the soil (seed bank) and would germinate. Also, if plants are not pulled at the correct time of the year, new seeds can be distributed. Additional effects on all facets of the environment are analyzed in Chapter 4 of the EIS (USDA, 1988).

A process of selecting treatment sites would need to be developed to prioritize funds and high risk sites based on threatened resource values. High priority sites would be areas with high human use (potential for spread) , areas adjacent to sensitive or survey and manage plants and areas near Wilderness, Research Natural Areas, Special Interest Areas and native meadows.

Vegetation

The effects on vegetation would differ depending on which noxious weed is present. Species on the potential invader list would be addressed through the active prevention program. Species established would be treated with biological control agents. However, new infestations of species that can only be eradicated using chemical treatments would continue to colonize both disturbed and undisturbed areas.

The increase in new invading weed species, specifically spotted, meadow and diffuse knapweed that

dominate infestations forestwide, would be devastating. Knapweed populations could alter ecosystem functions and lower species diversity. This would be especially degrading for meadows, Research Natural Areas and Wilderness areas that contribute significantly to biodiversity on the forest.

Control methods considered in this alternative would have similar effects on vegetation as discussed under Alternative 1 (without the discussion of herbicides). No control methods proposed in this Alternative would have cumulative effects to vegetation.

Wildlife

Effects on wildlife would be similar to the untreated sites in Alternative 1. Reduction of habitat structure and composition would reduce wildlife species. Wildlife with specialized habitats would be at the highest risk. Movement of noxious weeds like knapweed into meadow habitats could severely reduce available forage. Reed canarygrass will certainly not provide the same quality of forage for elk as the diverse assemblage of native species at Gordon Meadows, for example.

Control methods considered in this alternative would have similar effects on vegetation as discussed under Alternative 1 (without the discussion of herbicides). No control methods proposed under this Alternative would have cumulative effects to wildlife if mitigation measures in Table 5 are followed.

Fish and Water

Use of manual (e.g. hand pulling), biological (e.g. approved insects), mechanical (e.g. mowing), and mulching methods to eradicate new populations of noxious weeds or reduce established invaders has a very low risk of affecting aquatic organisms or water quality. The small amount of risk associated with such activities is primarily due to any soil disturbance which could take place as part of the action. In the Biological Assessment submitted to the U.S. Fish and Wildlife Service for bull trout within the Willamette Province the effects determination for these activities to control noxious weeds was rated as May Affect, Not Likely to Adversely Affect (NLAA) because of negligible potential to degrade water quality. However all actions must comply with the 1988 FEIS for Managing Competing and Unwanted Vegetation (Armantrout et al. 1998) and the mitigation measures identified in this Environmental Assessment.

…..Botany

None of the control methods would adversely affect sensitive plant or survey and manage populations. Sites with sensitive and survey and manage plants automatically fall into type 3. As roadside weed populations increase in number and density, the corresponding increase in seed production will increase the likelihood that weeds will invade adjacent, undisturbed habitats. Roadside weed populations in the vicinity of these rare species will be high priority for manual control, but these weeds cannot be eradicated manually. Thus, the risk to sensitive and survey and manage plant populations from invading weeds are higher in this Alternative than others.

Soil Resources

This alternative would permit noxious weed-dominated sites where they currently exist , continuing to incur direct effects on soil resources because control methods allowed under this Alternative will fail to eradicate weeds. Although no additional disturbance would occur as a result of treatment, the current level of compaction, lack of organic litter and duff would be maintained on these disturbed sites. The effect of erosion on soil resources may be significant in meadows and Wilderness areas if spotted knapweed moves

off the main highway corridors and outcompetes native bunchgrass plant communities. Direct effects on soil structure and pH could occur over time (Deschutes NF, 1998).

Heritage Resources

Potential effects to heritage resources resulting from the implementation of this alternative would be the same as those discussed above for the other action alternatives. Treatment would be selected on a case-by-case basis in consideration of the qualities of any identified heritage resource.

Administrative and Recreation Sites

Recreation sites would be treated with manual control methods, as these would be high priority to treat due to potential for movement. Administrative sites may or may not be treated. Powerline rights-of-way would have low priority for treatment because sites are disturbed and will continue to be trimmed under the powerline.

Other Environmental effects

The following issues were not identified as key issues during scoping, but are required by law to be evaluated (40 CFR 1502.06):

Air Quality

The only treatment method which could affect air quality is controlled burning. No burns are being analyzed in this Environmental Assessment.

Social Opportunities

The only treatment that could affect recreation would be herbicide application in site type 4 (Administrative Sites and High Human Use) because people visit these sites. Most recreation occurs on trails in the interior sections of the forest and in riparian areas. The only riparian chemical treatment proposed would be limited use of Rodeo wiped on target plants. Sites will be posted prior to and after treatment to inform recreational users the site has been treated with herbicides. There should be no significant effect on recreational opportunities or visitors. Mountain bikers do ride along the road but will not come into direct contact with application sites.

Irreversible and Irretrievable Commitment of Resources

These have been addressed previously within this chapter.

Short-term and Long-term Effects

These have been addressed previously within this chapter.

Effects on Consumers, Civil Rights, Minority Groups and Women

There will be no significant effect on these groups of people or on civil rights. Any reduction in the incidence and invasion of noxious weeds has the ability to benefit consumers by keeping productive land in use for desired native or non-native vegetation (e.g. forests or commercial crops).

Effects on American Indian Rights

There will be no effect on American Indian rights. Extensive scoping has resulted in support for the control of noxious weeds on the Forest, using all control methods. Consultation with federally recognized tribes will continue as treatment programs are developed, in order to ensure protection of traditional cultural areas.

Effects on Farmland, Rangeland and Forestland

No farmland or rangeland will be directly affected by this project. Early treatment and the prevention of the spread of noxious weeds on the Forest is expected to help reduce the incidence and spread of noxious weeds onto farmlands and rangelands which are vulnerable to these invasive species. In addition education and awareness efforts aimed at the public will also benefit other land owners, both private and public, who inevitably are susceptible to noxious weed invasions. Effects on forestland are addressed earlier in this Chapter.

Effects on Wetlands and Floodplains

These sites are addressed as riparian throughout this document. Effects of each alternative on riparian areas have been previously addressed.

Effects on Cultural Resources

All proposed treatments have been analyzed for effects on Cultural (Heritage) Resources within the document. Specific treatment areas will be evaluated for the presence of significant historic properties.

Effects on Threatened and Endangered Species

There are no threatened or endangered plants on the Willamette National Forest. Effects on T & E animals and fish have been previously addressed in this Chapter.

Indirect, Cumulative and Unavoidable Effects

There will be no significant effects to soil, water, fisheries, wildlife, vegetation or other components of the environment from any of the proposed Alternatives.

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Appendix A: Inventory and Monitoring

The enclosed inventory form will be filled out for all new invader noxious weed species and sites. This form includes all the information necessary to make a determination of site type and potential control methods including weed species and abundance, habitat type and associated vegetation, proximity to water and soil description. Control methods will be chosen from the list of potential methods in FW Standard and Guideline 259-d

Followup monitoring for new invaders will occur on an annual basis. Monitoring will be stratified into two types, depending on the size of the new invader populations and the control method.

- For alternatives 2 and 3: For large populations where herbicide treatment has been determined to be the most effective control method, herbicide use on each site will be tracked. This will demonstrate whether herbicides are effectively controlling populations as the amount used will correlate with the number of plants present. Herbicide use will be tracked in a database. The baseline data will be entered from treatments beginning in 1999 or 2000. If herbicide use does not decrease on each site and does not demonstrate effectiveness after a 5-year period, alternative methods will be investigated. This data will be published in the yearly issue of Weed Trek.

- For alternatives 2, 3 and 4: Small populations which are manually or mechanically controlled, an annual monitoring report consisting of effectiveness of treatment and reporting numbers of plants or percent cover remaining. Only sites which are visited the following year will be reported. District Botanists will be responsible for this reporting by December 31 of the year following treatment. This data will be published in the yearly issue of Weed Trek.

Willamette NF
Noxious Weed Sighting Form

Site Number _____ Watershed _____

Date Reported _____ County_____

Township _____ Range_____ Section _____

Directions_____

_____

_____

_____

Site Type _____ Reported by _____

Weed Species _____ Abundance_____ ac/plt (circle one)

Habitat Description_____

_____

Elevation _____ft Slope_____% Aspect N/S/E/W (circle one)

Adjacent Stream Class_____ Distance to Water_____ ft

Soil Description _____ % Bare ground _____

Treatment Prescribed and Reasons _____

_____

_____

_____

Remarks _____

_____

_____

Appendix B: Biology of Noxious Weed Species and Their Control Histories

Species Documented on Willamette NF

Spotted Knapweed ***Centaurea maculosa*** **Asteraceae** **New Invader**

Description: Spotted knapweed is a biennial or short-lived perennial forb in the aster family. Plants have pink flowerheads with black-tipped bracts.

Habitat: Spotted knapweed is most commonly found on dry gravelly or sandy soils, especially those associated with glacial outwash. Knapweeds prefer open canopies to shade. Knapweed is very competitive on disturbed dry to mesic sites because of its ability to germinate in a wide range of conditions, its early spring growth (Losensky, 1974) and its ability to reproduce vegetatively (Watson, 1974). Spotted knapweed has been observed in a wide range of elevations, 30-1200 m, (Watson, 1974) and precipitation zones, 8-80" annually (Lacey et al., 1992). Forests in Region I have proposed a risk rating for the susceptability of habitats types to noxious weed dominance. Habitats noted for high susceptabilities include: mountain and foothill grasslands, dry bunchgrass/Douglas fir, spiraea and kinnikinnick dominated habitats (Losensky, 1987). In Washington spotted knapweed grows in forest habitats of Douglas fir/shrub and Ponderosa pine/bunchgrass (Roche, 1991). These habitats are similar to Willamette's high elevation forested and dry meadow and rock garden habitats. Approximately 3,000 acres are infested in eastern Oregon.

Impacts: It is estimated that spotted knapweed invasion of bunchgrass habitats will result in loss of 220 elk per year due to decreases in Montana's winter range. It is also causing an increase in runoff and sediment yield because weeds do not bind the soil as well as bunchgrasses (Lacey et al., 1992).

*Control Methods:*Control methods vary in their effectiveness. Manual hand-pulling is most effective during the early bud stage, before flowering. However, spotted knapweed can resprout from the crown if the whole taproot is not removed (Wilson, 1991). Pulling plants may also create a seed bed for weeds found in the soil seed bank (Engeland, 1988). Mowing has been used to reduce annual seed production, but cannot eliminate infestations (Lacey et al., 1992). Chemicals such as Tordon 22K (Harris, 1979), 2,4-D and Dicamba (Wilson, 1991) have been used to treat spotted knapweed. Application is best in early June when knapweeds are in the vegetative rosette stage and non-target broadleaf plants have not yet emerged. Control time varies; seedlings will reinvade sites if they are not revegetated with competing plants. A variety of biocontrol agents have been introduced in Oregon (Appendix E). It is still uncertain whether these species are effective in controlling populations.

Diffuse Knapweed ***Centaurea diffusa*** **Asteraceae** **New Invader**

Description: This weed is a biennial with white flowerheads. Bracts surrounding the flower have a rigid central spine. Diffuse knapweed does not often reproduce vegetatively.

Habitat: This plant is found in drier habitats than spotted knapweed. It has been documented from 150-900 m in elevation (Watson, 1974). It prefers open canopy and well-drained soils. In Montana, foothill grassland, bunchgrass and spiraea and kinnikinnick-dominated sites are most vulnerable to infestation (Losensky, 1887). In Washington, diffuse knapweed grows from scab/sage to bitterbrush/needle-and-thread grass to mid or upper elevation forests (Roche, 1991). These would corrrespond to dry forested and non-forested habitats in Willamette NF. There are 1.2 million acres infested with diffuse knapweed in eastern Oregon.

Impacts: Diffuse knapweed has, because of its spiny flowerheads, caused mechanical damage to grazing animals. Spiny plants may also adversely affect recreational experiences.

Control Methods: Control methods used for diffuse knapweed are the same as spotted knapweed. Manual control may work better on diffuse knapweed because it is a biennial. Crested wheatgrass, sheep fescue, orchard grass, and thickspike wheatgrass have been competitively planted in areas previously infested with diffuse knapweed (Larson and McInnis, 1989; Berube and Myers, 1982). Crested wheatgrass competes best in dry habitats in British Columbia where knapweed seedling establishment is water-limited. The other grasses had differing success in controlling knapweed in Union County, Oregon. Diffuse knapweed can be grazed by sheep and goats if tethered near populations (IVM, 1997a). Mowing may actually stimulate diffuse knapweed growth, especially in wet areas (IVM, 1997a). Chemicals have been used to control this species.

Meadow Knapweed ***Centaurea pratensis*** **Asteraceae** **New Invader**

Description: Meadow knapweed is a hybrid between brown knapweed, *C. jacea*, and black knapweed, *C. nigra*. It is a fertile perennial with rose-purple flowers and metallic golden bracts with serrated edges.

Habitat: This plant is a native of Europe. Its preferred habitat is mesic grasslands at lower to middle elevations or other relatively moist sites. At present, meadow knapweed is found between the Coast and Cascade Ranges from British Columbia to northern California (Roche, 1991). It occupies roadsides, waste areas and is increasing its dominance in pastureland.

Control Methods: See spotted knapweed for control methods.

Canada thistle ***Cirsium arvense*** **Asteraceae** **Established Infestation**
Bull thistle ***Cirsium vulgare*** **Asteraceae** **Established Infestation**

Description: Canada thistle is a perennial species with horizontally-spreading roots and purple flowers. Males and females are found on separate plants. Bull thistle is a biennial from a fleshy taproot that produces reddish flowers.

Habitat: Thistles are found throughout the state of Oregon and in a wide range of habitats: roadsides, ditches, riparian areas, cultivated fields, clearcuts and old burn piles. Thistle occurrence is strongly correlated with disturbance and will normally be replaced or overtopped by the native plant community or replanted trees within 5 years if the site remains undisturbed (Losensky, 1987). Thus, they present a low risk of infestation in forested communities.

Control Methods: Canada thistle has been controlled using mowing before the bloom stage in western Oregon. Manual removal is difficult; incomplete pulling of the root system allows regeneration. Alfalfa and forage grasses have been used to contain (not eradicate) Canada thistle outside Oregon. Biological control (Appendix E) agents are very limited; impacts of biocontrol agents in most areas of Oregon is negligible (G. Miller, pers. comm.), The herbicide 2,4-D has been used but does not give good control, but Roundup, Tordon and Stinger give excellent control.

Bull thistle may be susceptible to handpulling or hoeing early in the spring, prior to bolting (and seed formation). The biological control agent *Urophora stylata* has been established in Oregon. Herbicides Dicamba, MCPA, Picloram and 2,4D have been used to control this species (Sheley, 1994).

Scotch Broom ***Cytisus scoparius*** **Leguminosae** **Established Infestation**

Description: Scotch broom is a deciduous shrub that was introduced as an ornamental on the coast of Oregon and has since moved inland to colonize the western slope of the Cascade range, the Willamette Valley and the Coast Range.

Habitat: Brooms are successful invaders because of their ability to fix nitrogen, giving plants advantages on nutrient-poor sites, and because of seed production and seed longevity (Miller, 1991). Scotch broom will invade disturbed areas such as roadsides, gravel pits, pastures, fields and clearcuts.

Impacts: This plant is considered noxious because it may compete with young trees in plantations for essential nutrients, such as phosphorous, without donating any of the nitrogen produced until plants are dead and decaying. Scotch broom can also completely exclude forage species in pasture situations (Miller, 1991). Its height interferes with user safety on rights-of-way by reducing sight distance.

Control Methods: Control methods for scotch broom include manual grubbing and mechanical flailing, but this must be done annually because this simply maintains plants at a juvenile stage. Ability to resprout is a function of age; older woody plants may succumb to manual control (Zielke et al., 1992; Miller, 1991). Prescribed burning may cause resprouting and provides ideal germination conditions. This results in a reduction of the seed bank. Densities can be reduced after 3 years of burning (IVM, 1997b). Bark stripping (girdling) is a method to use when the site is steep, erosion is a possibility and roots are needed to stabilize the soil (IVM, 1997b). Goats and sheep graze tops of young plants but broom is slightly toxic and unpalatable to most livestock (IVM, 1997b). Herbicides have been used to control scotch broom in tree plantations. Competitive planting of grasses in road rights-of-way may exclude scotch broom. Biological control agents have been released throughout the state.

Tansy Ragwort ***Senecio jacobaea*** **Asteraceae** **Established Infestation**

Description: Tansy is a biennial or short-lived perennial which was introduced to Oregon in the early 1900s. It spreads mostly by seed, but has a limited ability to resprout from underground stems.

Habitat.- This weed is widely established west of the Cascades in Oregon and is moving east over the crest of the Cascades. Tansy most commonly invades pastures, but may also be found in disturbed roadsides or clearcuts and undisturbed meadows. In Montana it is associated with riparian habitats (Losensky, 1987).

Impacts: This plant experienced a population explosion that peaked in the 1970s. Concern was largely directed at livestock because tansy causes chronic toxicity in cattle, horses and swine (Coombs et al., 198lb).

Control Methods: Manual and mechanical controls have been used to reduce infestations. Hand-pulling and mowing are practical where there are occasional scattered plants, but the practice must be repeated where there is a seed bank. Chemicals such as 2,4-D, Picloram, Dicamba and Garlon 3A have been used, but grazing restrictions apply. Retreatment is often required. Competitive plantings and sheep grazing may effectively reduce tansy densities. Biological control agents have been used since the 1960s and are responsible for a population decrease of 90% since the 1970s (Coombs et al., 198 lb).

St. John's-Wort ***Hypericum perforatum*** **Hypericaceae** **Established Infestation**

Description: St. Johns-wort, also known as Klamath weed or goat weed, is a perennial with a woody base which is capable of vegetatively reproducing via underground stems or runners as well as sexually reproducing by seed.

Habitat: This plant is found throughout the western United States. It is an aggressive pioneer species that prefers sandy to gravelly soil and can colonize pastures, meadows, roadsides and clearcuts. The presence of a dense tree canopy reduces reproduction significantly (Losensky, 1987).

Impacts: It poses the greatest threat to dry and mesic meadow communities on the Willamette National Forest because it can spread vegetatively and displace natives. St. Johns-wort is also poisonous to livestock, causing sun sensitivity in light-colored animals (Hawkes et al., 1985).

Control Methods: Mowing, plowing, pulling and burning have been unsuccessful. These techniques reduce competitors and do not rid the site of underground stems that can resprout. Herbicides have been used on small isolated populations. Biological control has been successful in reducing population densities. Success of competitive plantings has been variable (Losensky, 1987).

Yellow Toadflax ***Linaria vulgaris*** **Scrophulariaceae** **New Invader**

Description: Yellow toadflax is a perennial plant with a woody underground base capable of reproducing to form dense clonal colonies. Flowers are yellow and resemble snapdragons with a large spur.

Habitat: Yellow toadflax is native to southeastern Europe. It was introduced as an ornamental and is still marketed as such. This plant prefers warm moist to dry sites. Dark conditions appear to limit this species (Sheley, 1994). It is frequently found on roadsides and pasturelands throughout temperate regions of the United States; sites are characteristically disturbed and open.

Impacts: This plant can be a serious localized problem when it displaces forage and native vegetation (Sheley, 1994). Yellow toadflax contains a poisonous glucoside which may cause breakdown of liver cells in livestock (Butler and Burrill, 1994).

Control Methods: This plant is difficult to control using manual and mechanical methods because of its extensive underground root system. Prescribed burning can result in increased vegetative shoot production. Competitive planting is mandatory to avoid reinfestation. Biological controls have met with limited success. Chemical control has been effective in some areas using Picloram or Dicamba.

Dalmatian Toadflax ***Linaria dalmatica*** **Scrophulariaceae** **New Invader**

Description: This is a perennial forb in the snapdragon family. It has heart-shaped blue-green leaves on its upright stems. Plants spread by creeping underground stems and seed. Root buds can produce new, independent plants. Flowers are yellow with an orange center and long spur. Flowers may be produced the first year..

Habitat: Dalmatian toadflax is native to the mediterranean regions of Europe and was introduced to North America as an ornamental. Habitats include sandy or gravelly soils along roadsides, in mountain meadows and rangeland, mainly west of the Cascades in Oregon.

Impacts: This species is highly competitive where summer moisture is limited. It infests areas of low competition in annual grass and bunchgrass-dominated communities. Some wildlife will browse toadflax. Soil erosion and surface runoff may be increased on sites where native communities are displaced (Sheley, 1994).

Control Methods: Manual control can be effective for small infestations in sandy or wet soils. However, this method may take 5 years to remove plants and an additional 10-15 years to remove the seed bank (Sheley, 1994). Mechanical control only works to control flower production. Competitive plantings are important because seedlings are poor competitors for soil moisture. Prescribed burning will not control roots or kill buried seed. No effective biological controls exist. Chemical controls include Picloram and Dicamba (Sheley, 1994).

Houndstongue ***Cynoglossum officinale*** **Boraginaceae** **New Invader**

Description: This plant is a herbaceous biennial or short-lived perennial in the borage family which reproduces by seed. It has reddish-purple flowers. Seeds are the main dissemination until seeds have spines which readily attach themselves to animal fur.

Habitat: It colonizes open forest, road shoulders and riparian areas in Montana (Losensky, 1987). In British Columbia it forms dense monocultures in disturbed habitats, preferring forest openings. It is shade-tolerant but not drought-tolerant (Upadhyaya and Cranston, 1991).

Impacts: Nutlets attach to livestock and create marketing problems in British Columbia. There are also reports of livestock poisonings by alkaloids found in this plant (Upadhyaya and Cranston, 1991).

Control Methods: Manual cutting reduces but does not eliminate seed production (Upadhyaya and Cranston, 1991).. Bioloigcal control is being pursued in Canada. The most promising biological control agents include two root-feeding beetle species: *Ceutorhynchus cricige*r and *Longitarsus quadriguttatus* Chemicals picloram, chlorosulfuron and 2,4-D have been used to control houndstongue (Upadhyaya and Cranston, 1991).

Knotweed ***Polygonum sacchalinense*** **Polygonaceae** **New Invader**
Polygonum cuspidatum **Polygonaceae** **New Invader**

Description: Knotweeds are tall perennial species which emerge from creeping rhizomes. They have large heart-shaped leaves that turn yellow in the fall. Although they produce an inflorescence, seeds are not produced outside of their native habitats. Stems resemble bamboo. The primary mode of reproduction is fragmentation of rhizomes which can wash downstream or be transported in fill dirt (Seiger, 1995).

Habitat: This Asian species was introduced as an ornamental. Large infestations in the Oakridge/Westfir area can be traced to landscaping from homes. This species thrives in wet areas and can tolerate gravel bars as well as good soil. Some populations have entered the Forest as dumped yard debris. Knotweed requires high light conditions.

Impacts: This species is a very good competitor in riparian areas. It has taken over miles of stream

understory on the Siuslaw National Forest. Early emergence and great height give it the ability to shade out and displace native understory populations of plants on which native animals survive (Seiger, 1995)

Control Methods: . Digging tends to spread rhizome fragments (Seiger, 1995). Cutting stems may be a useful tool but research has shown that a minimum of four cuts per growing season is needed to decrease the belowground biomass (Seiger and Merchant, 1997). Since the plant can sprout from 7 grams of rhizome, eradication may take a long time. Shading combined with cutting may be useful in small stands (Seiger, 1995). Chemical control using glyphosate, dicamba and picloram have been effective (Seiger, 1995).

Climbing Nightshade *Solanum dulcamara* Solanaceae New Invader

Description: This species is a woody, climbing or trailing vine. The plant has a creeping underground rhizome. Leaves are arrow-shaped. Flowers are purple with a black center. It produces poisonous (to humans) red berries which birds readily disperse.

Habitat: This is another European native that was introduced as an ornamental. It is fairly adaptable to habitat but needs water.

Control Methods Manual control is effective in only reducing flowering of this species; it quickly regenerates from rhizomes. Mechanical control is not ideal because this method also only reduces flowering; trailing growth habit can escape the mowing blades or weedeater. Chemical control has been used on this species in garden and farming situations.

Field Bindweed *Convolvulus arvensis* Convolvulaceae New Invader

Description: This plant is a perennial weed which grows an amazingly extensive root system (up to 10 feet in depth!). Its growth form is prostrate and twining, although it can make its way up other plants and choke them out. It has a white morningglory-shaped flower. It reproduces from both seed and rootstock. Lateral roots can develop separate plants if detached from the main root (Fisher et al., date unknown)

Habitat: Bindweed can tolerate any soil or habitat except extremely wet or shady sites (Hawkes et al., 1985). It is typically a weedy pasture species from the valley that has found its way up into the Forest.

Control Methods:: Manual and mechanical control methods have not proven very valuable in keeping this species from expanding. The deep rooting system allows for easy resprouting. The growth habit is too low for mowing or weed-eating. Chemicals have been effectively used to control this species in farming situations

Himalayan Blackberry Rubus discolor Rosaceae New Invader/Established
Evergreen Blackberry Rubus laciniatus Rosaceae New Invader/Established

Description: Himalayan and evergreen blackberry are rhizomatous perennial shrubs. They both have prickly stems. Both blackberry species have a 5-parted leaf. Himalayan leaves have gently serrated margins while evergreen blackberry has very roughly serrated margins. Evergreen blackberry does not die back; it is not deciduous like Himalayan blackberry

Habitat: Both blackberry species are ubiquitous in the Pacific Northwest. They survive from the Willamette Valley up to alpine regions. They are most dense in riparian areas at low elevations on the

Willamette NF. They are spreading to higher elevations. Small, localized populations are being analyzed as new invaders on the Forest.

Impact: Blackberry species are notorious competitors, They can completely displace natural plant communities and make access to areas by humans impossible.

*Control Methods:*Cutting of blackberries is a short-term solution which must be done on a repeated basis because shoots resprout. Mowing is a method conducted after cutting which must also be done repeatedly. Grazing is an experimental control method appropriate for outlying populations that can provide enough forage to keep animals alive. Glyphosate has been used effectively on stems after cutting in the fall (Miller, pers. comm.)

Reed Canarygrass ***Phalaris arundinacea*** **Gramineae** **New Invader**

Description: Reed canarygrass is a rhizomatous perennial grass. It is a Eurasian grass whose variegated forms are sometimes used as an ornamental landscaping species. It is widespread from Alaska across Canada, south to all but the eastern United States (Hitchcock and Cronquist, 1973).

Habitat: This species inhabits seasonally moist meadows, roadside ditches and lake and reservoir perimeters. It is common in the valley but is moving up in elevation and has begun invading pristine meadow habitats (OA24, SH37).

Impact: Reed canarygrass creates monocultures where it grows. It has the ability to outcompete native vegetation wherever it invades.

Control Methods: Control of small populations of reed canarygrass may be achieved through manual methods if all root shoots are removed from the site. Mulching with black plastic is another alternative for small sites or could be a follow-up technique after digging. Control methods along roadsides might include localized use of glyphosate.

False Brome ***Brachypodium sylvaticum*** **Gramineae** **New Invader**

Description: False brome's seed head looks like a brome's with large, awned spikelets. Leaf blades differ from the natives in that they are lighter in color and hairy on the edges. Leaf blades are also quite thick (4-10 mm broad).

Habitat: This grass grows in an open or closed canopy. It is a superior competitor, creating monocultures where it grows.

Impact: This species is introduced from Europe. From the Flora of the Pacific Northwest, we know this species was found near Corvallis in the 1970's (Hitchcock, 1973). Since that time it has managed to become the dominant understory at McDonald State Forest. It has moved from the Corvallis area and is found up Highway 20 and Highway 58. There are probably more populations of this species than we know about at the moment.

Control: Manual control, digging, may be effective when populations are small. Mowing would be effective in keeping seeds from being produced, but this species is rhizomatous, spreading easily without seed. Chemical control is an option.

Sweetclover ***Melilotus* spp.** **Leguminosae** **New Invader**

Description: There are two sweetclover species documented on the Forest. *Melilotus alba* is a white-flowered form and *M. officinalis* is a yellow-flowered form. Both are Eurasian in origin. They produce very tall taprooted plants with trifoliate leaves.

Habitat: The sweetclover species are most abundant along gravled highway road shoulders, gravel pits and on timber harvest landings.

Impact: This species is a safety risk along many highway corridors as its tall stature can hide safety rails along road shoulders. It is easily spread in contaminated gravel.

Control: *Melilotus* has been controlled by mowing or weedeating by ODOT along highway corridors but these methods of control are temporary and, in some cases, very dangerous. Manual control has proven difficult to impossible in compacted soils.

Noxious Weeds Not Documented on Willamette NF

Gorse ***Ulex europaeus*** **Leguminosae** **Potential Infestation**

Gorse is a spiny shrub which can form impenetrable thickets. Flowers are yellow and pea-shaped. Gorse has become a serious problem in sandy coastal areas of Oregon. There was one population on the Blue River Ranger District on the Willamette National Forest which has been eradicated. This plant poses potential problems as related to reforestation because of its growth habit. Once established, it is very difficult to eradicate. It is also a fire hazard because of the large amount of fuel contained in its branches (Hawkes et al., 1985) Control methods have included manual grubbing and mechanical mowing, but these treatments must be continually repeated because of regrowth. Prescribed burning has been conducted on gorse in the Siuslaw NF and it was found to encourage seedling germination. The most encouraging control method is biological control. A spider mite, *Tetranychus lintearis* is making its way up and down the coast of Oregon.

Leafy Spurge ***Euphorbia esula*** **Euphorbiaceae** **Potential Infestation**

Leafy spurge is a perennial which spreads by woody underground stems and has many branches which end in a yellowish-green cluster of petal-like structures. Seeds can float and germinate in water. It is usually found along stream banks or in pasture or rangeland. Distribution in increasing across eastern Oregon.

Purple Loosestrife ***Lythrum salicaria*** **Lythraceae** **Potential Infestation**

Purple loosestrife is a perennial that spreads by both underground stems and seeds. It is found in marshes, wet areas, streams and ditches both east and west of the Cascades.

Yellow Starthistle ***Centaurea solstitialis*** **Asteraceae** **Potential Infestation**

Yellow starthistle is a bushy annual or biennial with yellow flowers and sharply spiny-tipped bracts. It is found along roadsides, waste areas and in pastures in Jackson, Josephine and Douglas counties of Oregon. One site occurred along Highway 58 between Eugene and Oakridge but the population has been eradicated.There are 10 mllion acres of this species in California.

Distaff Thistle ***Carthamus lanatus*** **Asteraceae** **Potential Infestation**

This plant is a very spiny annual with yellow flowers borne in the axis of a bract of spines. Plants prefer pastureland and roadsides. Currently only Douglas county is infested in Oregon.

Squarrose Knapweed ***Centaurea virgata ssp. squarrosa*** **Asteraceae** **Potential Infestation**

This is a perennial with multiple stems which emerge from a stout taproot. Flowers are purple to pink. It differs from diffuse knapweed in that the terminal spine of the bract curves backward and the flower head is deciduous. This species prefers dry, rocky terrain and inhabits Ponderosa pine, juniper, white oak and rabbitbrush, wedgeleaf ceanothus and manzanita-dominated habitats. It is only known from Grant County, Oregon (Roche, 1991) and Mt. Hood National Forest in Oregon.

Appendix C Control Methods and Cost/Benefit Analysis

Manual

Mulching: Mulching has been proposed as a method to prevent weed establishment. While mulching is very useful in horticultural situations or on sites where individual plants need to be protected from encroachment by competitors, its usefulness in extensive weed sites is limited. Drawbacks include: (1) volume of certified weed free mulching materials needed, (2) inability to maintain the integrity of a mulch layer over a large area which is being constantly disturbed, (3) annual application necessary, (4) ineffective on many weed species. Different mulches cost different amounts. Steer mix (compost and manure runs $40/ton (R&S Outdoor Supply 7/20/98) and it takes approximately 4 tons of mulch to cover an acre. Straw costs $2.50/bale (American Feed & Farm 7/20/98) and approximately 150 bales are needed to cover an acre. A wood chipper which chips up to 8 inch in diameter material costs $175/day to rent (Springfield Rentals 7/20/98). These costs do not include hauling, grinding (for wood chips) and application labor. Mulching is cost-effective on small, localized sites which would have to be repeatedly treated with manual control over a long period of time (due to seed bank).

Plastic Mulching: Many of the same problems encountered with natural mulches also apply to plastic sheeting. If the integrity of the plastic layer is jeopardized by wind, deer hooves, rodents, falling limbs or humans, weeds quickly reestablish themselves. This is especially true if competing vegetation has been removed by tarping. Cost runs around $4,000/acre (G. Miller, pers. comm.) and if the material is not biodegradable, removal must follow treatment. Again, this method is most appropriate for small, localized infestations.

Hand Pulling/Grubbing/Digging Manual control is an important part of integrated weed control programs. In situations where weed populations are small, comprised of annual or biennial weeds, and where the seed bank is small, manual control can be effective. In large or older infestations, success will be limited by existing seed bank and labor. Manual control is not effective on perennials like spotted knapweed. Cost for manual control can reach $215/acre for knapweed (Wasco County Weed Control, 1992). Manual control is appropriate for small infestations and, with mulching, can be quite effective.

Cutting: This method is primarily effective on woody plants such as Scotch broom. It involves cutting of the woody stem of the plant at ground level using saws, loppers, clippers, etc. It is effective on localized populations. For Scotch broom, it is only effective on older plants. Cost for a recent cutting contracts have run $100-200/acre. The best time of the year to cut brush is fall when plants have little stored energy to help them resprout (IVM, 1997b). Cutting must usually be repeated or followed by other treatments. Control of blackberries would include first cutting canes, then dabbing herbicide on emergent stumps in the fall.

Mechanical

Mowing: Mowing is most useful in maintenance programs in rights-of-way or in preventing the first flush of flowering of noxious weeds. More than one application is often necessary because of regrowth. Plants can adapt to mowing by tillering (sending out stems underground) or by producing multiple flower stems which radiate out horizontally beneath the mowing height. These are difficult to reach without mowing down to the ground. Mowing costs average $87.45/acre plus a $1600 mobilization fee (L.Tennis, pers. comm.).

*Infrared Treatment:*The practice of infrared treatment is most useful along roadside corridors. A device is mounted to a truck and the vegetation is burned with a propane torch which heats plant cells causing them to burst (IVM, 1994b). Treatment must occur in spring due to fire danger. Treatments occur at 2-3 week intervals. A support truck with water follows the truck with the propane burner to assure no fires linger. The drawbacks of this treatment include killing of associated vegetation, lack of supply of companies (one is located in Eugene) which perform this function, and the manpower necessary to ensure fire prevention. This method was used experimentally by Oregon Department of Transportation (ODOT) in 1997. A heavily vegetated area in the Eugene vicinity took 8 treatments along roadsides to kill the target vegetation. Problems included killing upper layers of vegetation that shielded target plants and regrowth following treatment. In a test roadside near Grant's Pass, infrared treatment worked better. Only 4 treatments effectively reduced flowering of target plants. This treatment is more effective on seedlings which have little root reserves for regrowth; heavy infestations of older plants have reserves which allow resprouting following treatment (Rob Edgar, pers comm.). If this were conducted on roadsides with competing vegetation, follow-up seeding would need to occur immediately after treatment. Cost for the ODOT contract was 13 cents/meter plus a $700 mobilization fee which is equivalent to $210 per road mile (Rob Edgar, pers.comm). This method would be most appropriate to use along road corridors which do not have any competing vegetation (site type 1) but is not recommended in this analysis because of the need for repeated treatment.

Steam Treatment Steam treatments are similar to infared in that the equipment is truck-mounted and the treatments are conducted along road corridors.A 300 gallon tank feeds water into a diesel-powered engine which heats water to 200-220 degrees farenheit. Drawbacks are similar in that the treatment is short-term; perennial plants with sufficient roots resprout 2-3 weeks following treatment. Steam treatment needs a water source. No companies in Oregon offer this type of treatment. Steam treatment has been used experimentally by California Department of Transportation (Chris Eliott, pers. comm). A company from New Zealand,Waipuna Systems, conducted a trial for California Department of Transportation (CalTrans) in which they noted 18 days after treatment that plants resprouted following treatment. They concluded it would be too expensive to repeat treatments and also voiced concerns over air quality from diesel engines used to heat water (Caltrans, 1993). The system was also investigated but not implemented by the Confederated Tribes of the Warm Springs because equipment was too costly (Mike Perkins, pers, comm.). Cost estimates were not available; it is assumed that cost would be similar to or greater than infared given the fact that the equipment would need to come from California and that the equipment must move very slowly. This treatment is not recommended in this analysis because of need for repeated treatments.

Chemical

*Chemical Control:*Chemical control has become a tool in vegetation management because of its versatility, lower initial treatment cost/acre, relatively fast action, ease of application, and success in controlling difficult perennial weeds. The drawbacks to this method include a potential over reliance on this method, human and environmental concerns, offsite movement and intrusion and the short-lived nature of its benefits. The cost of applying chemicals to control the main target species, knapweed, vary according to spray method. Truck mounted sprayers cost approximately $38/acre (Wasco County Weed Control, 1992). Backpack spraying is projected to be higher due to increased labor. This method must be repeated over time as many of the chemicals used do not leave a residue which will kill germinating seedlings. However, we have documented significant reductions in the amount of chemicals used along Highways 20 and 22 from the initial spray year (1995 through 1998).

Biological

*Biological Control:*Biological control agents are insects that are natural predators on noxious weeds in their countries of origin. This means that both the noxious weed and its biocontrol agent may be from Europe or from Asia. Biocontrol agents are tested for host-specificity in their native country and are tested in the U.S. to make sure insects will not attack food crops, related American species or other groups of plants. Once a biological control agent has been deemed host-specific and capable of affecting the target plant, an Environmental Impact Statement is produced, reviewed and submitted to an oversight committee. If approval is granted, the bioagent is collected and transported to a quarantine facility where it is examined for internal and external parasites. Bioagents certified as clear are then shipped to cooperators and released. This method of control is used primarily for established weed populations whose eradication is not feasible. Biocontrol agents are slow-acting because it takes time for insect populations to increase to a level where they can control weed spread. Usually more than one insect is used on a weed species because of the specificity of action of the biocontrol agent. A root boring moth, a root weevil, several species of seed head fly and seed head weevils can work together to control the expansion of weed populations. Some biological control agents never survive the wet western Cascade environment. This is a long-term control method. Cost is $150-250/release, each release covers 16 acres (T. Butler, pers.comm), cost runs from $9-16/acre.

Competitive Planting

*Competitive Planting:*The practice of competitive planting is one which goes in tandem with a number of other control methods. Basically it is seeding of treated sites to prevent reinfestation. Cost for native mixes are expensive at the moment ($15/lb for native grass seed) for large areas. Non-native or mixed native/non-native mixes will be used until natives become cost-effective. Current seeding costs run $ 3/lb (Gray's Garden Center, 7/20/98) @ 17.25#/acre= $51.75/acre.

Prescribed Burning

Prescribed burning This treatment method is burning of native grassland or prairie communities to kill weed species. Potential problems with this method include issues of air quality and smoke management and difficulty of timing. Cost per acre varies between $50and $125/acre (P. McCulley, pers. comm.) Cost is dependent on number of people, distance from roads, time of year and size of area. This method is most appropriate for mesic to dry meadows. Prescribed burning may create perfect seed beds for weed species with airborne seeds such as thistles.

Grazing

Grazing: Grazing is a biological alternative to mowing. It can be used to slow plant development and seed formation and gradually deplete root reserves (IVM, 1997b). Grazing is not appropriate for heavily used highway corridors because of the potential for animals or tenders to get hit by vehicles. Weed populations need to be dense enough to allow a tethered animal to survive. Neither the Forest nor our cooperators have used this method so exact cost is unavailable. However, cost should be competitive as compared to other methods: a flat rate plus transportation for the tender to move the animal(s) from place to place.Grazing is most appropriate for large infestations of, for example, blackberry, off major highway corridors.

Appendix D: Definitions

High Aquatic Value Area—any stream, wetland, lake, pond or water feature used by aquatic species

High Human Use Site—A site with high human use including developed recreation sites such as traila and trailheads, campgrounds, boat launches and dam lookouts as well as Ranger District offices.

Integrated Vegetation Management—use of an integrated approach to manage undesirable weed infestations. This usually entails using several control methods simultaneously. Approaches are site-specific. For example, a small population in site type 2 (with potential for competing vegetation) is manually controlled, covered with mulch and then competitively planted a year or two later. Or a large population is spot-sprayed with herbicide and remaining plants are manually controlled one month later. When this large population becimes small enough o handle with manual control, chemicals will no longer be used on the site.

Naturalized—a population of plants is naturalized when it is considered part of the natural assemblage of plants. An example of naturalized plants are oxeye daisy, chamomile or Scotch broom.

Noxious weed—any weed designated by the Forest that is injurious to public health, recreation, wildlife, botanical resources or habitat.

Protection buffer—/additional standards and guidelines from th eNorthwest Forest Plan specifically to protect rare and locally endemic species in the upland forest matrix. Unmapped Late Successional Reserves are to be created around known locations.

Riparian—As specified in the EIS for Managing Competing and Unwanted Vegetation (II-106), 50 feet along all flowing waters (rivers and streams) and 100 feet along lakes and wetlands

Riparian Reserve land allocation designated by the Northwest Forest Plan. Includes an area along streams, wetlands, ponds and lakes and unstable and potentially unstable areas where riparian-dependent resources receive primary emphasis. Buffers differ depending on whether streams are permanent fish-bearing (350 ft), permanent non-fish-bearing (150 ft), intermittent streams (100 ft) or wetlands less than 1 acre (to the edge of the riparian vegetation).

Survey and Manage a set of standards and guidelines meant to provide benefits to amphibians, mammals, mollusks, bryophytes, vascular plants, fungi, lichens and arthropods associated with late successional old-growth ecosystems. Sites located in this analysis will be buffered if they are relocatable. The standards and guidelines contain four components (quotations are directly from USDA, 1994):

1. Manage Known Sites—"In most cases the most appropriate action will be protection of relatively small sites on the order of tens of acres…For some species,,,the appropriate action will include the use of specific management treatments such as prescribed fire. These are the species thought to be truly rare.
2. Survey Prior to Ground-Disturbing Activity—"Surveys must be completed prior to ground-disturbing activities in fiscal year 1999 and later…Management standards will be

developed to manage habitat for species on sites where they are located…"

3. Extensive Surveys "Conduct extensive (broad, regionwide) surveys for the species ro find high-priority sites for species management…for species whose characteristics make site and time-specific surveys difficult…" (e.g. fungi).
4. General Regional Surveys The objective is to survey for these species to acquire additional information and to determine necessary levels of protection. /surveys are to be broad and regioanl in scope, These species are more common old-growth associated species or species whise taxonomic status is confused.

TES- Threatened, Endangered or Sensitive plants or animals. Threatened or Endangered status are legal terms designated by the US Fish annd Wildlife Service or National Marine Fisheries Service (for anadromous fish) under the Endangered Species Act. Sensitive species are rare species designated by the Regional Forester as part of the Forest Service Manual.

Appendix E: Biocontrol Agents In Western Oregon

Noxious Weed	Control Agent	Activity	Date Introduced
Bull thistle	Urophora stylata	Seed head gall fly	1988
	Vanessa cardui	Defoliating butterfly	native
Canada thistle	Rhynocyllus conicus	Seed head weevil	1979
	Urophora cardui	Stem gall fly	1980
	Ceutorhyncus litura	Crown/root weevil	1981,1988
	Vanessa cardui	Defoliating butterfly	native
Diffuse knapweed	Urophora affinis	Seed head gall fly	1975
	Urophora quadrafasciata-	Seed head gall fly	1979
	Bangasternus fausti	Seed head weevil	1985
	Metzneria paucipunctella	Seed head moth	1981
Gorse	Exapion ucilis	Seed weevil	1956
	Agonopterix nervosa	Shoot tip moth	accidental
	Tetranychus lintearius	Spider mite	1994
Meadow Knapweed	Metzneria paucipunctella	Seed head moth	1981
	Urophora quadrifasciata	Seed head gall fly	1979
St. Johnswort	Chrysolina hyperici	Defoliating beetle	1947
	Chrysolina quadrigemina	Defoliating beetle	1948
Scotch broom	Agnopterix nervosa	Shoot tip moth	accidental
	Leucoptera spartifoliella	Twig miing moth	1970
	Apion fusicrostre	Seed weevil	1983
Spotted knapweed	Urophroa affinis	Seed head gall fly	1975
	Urophora quadrifasciculata	Seed head gall fly	1979
	Metzneria paucipunctella.	Seed head moth	1981
	Agapeta zoegana	Root boring moth	1987
	Cyphocleonus achates	Root weevil	1993
	Terellia virens	Seed head fly	1993
	Larinus minutus	Seed head weevil	1992
	Bangasternus faustii	Seed head weevil	1989
	Larinus obtusus	Seed head weevil	1994
Tansy Ragwort.	Tyria jacobaeae	Defoliating moth	1960
	Pegohylemyia seneciella	Seed head fly	1966,1976
	Longitarsus jacobaeae	Root boring/defoliating flea beetle	1971
Yellow toadflax	Gymnetron antirrhini	Seed head weevil	accidental

Appendix F: Herbicide Information Profiles

Available in hard copy only. Call Jenny Lippert at 541 465-6321 for copies.

Appendix G: Weed Site Soil Types by Willamette NF Soil Resource Inventory Code

Weedcode	SRI Type
BR-1	15,2,203,21,235
BR-2	13, 15, 16, 162, 164, 2, 210, 203, 210, 210U, 252, 3, 301, 44, 441, 55 ,6 ,601 ,603
BR-3	15
BR-4	15,16,2,441,62
BR-5	164,203,301S
BR-6	13, 16, 164, 2, 203, 210, 23, 3, 441
BR-8	15,23,301
BR-10	201, 212, WA
BR-13	13
BR-14	162,203,210
BR-15	13,23
BR-16	164,17,64
BR-17	602
BR-19	203,210
BR-20	13
BR-21	25
BR-22	201
BR-23	201
BR-24	255
BR-25	15,203
BR-26	201
BR-27	212,25
BR-28	212
BR-29	201
BR-31	212
BR-32	15,21
BR-33	15
BR-34	201
BR-36	602, 15
BR-37	616
DE-1	16, 3, 6
DE-2	164,6
DE-3	13, 15, 16, 162, 164, 21 OU, 255, 3, 441, 6, 602, 61 OU, 614, 64
DE-5	15, 16, 164, 23, 252, 3, 4, 44, 441, 5, 6, 602, 614, 615, 62, 66, 68, 69, 85
DE-6	66
DE-7	19,210
DE-8	13
DE-9	3,64
DE-10	16
DE-11	164,3,441,6
DE-12	67
DE-13	3,602
DE-14	15
DE-16	16,614
DE-18	13
DE-19	3,602,61
DE-20	602,6l0U,75
DE-21	210U
DE-22	16,210
DE-23	132, 201, 203, 210, 210U
Weedcode	**SRI Type**

DE-24	201,3,301,8
DE-25	201,301
DE-26	201,602
DE-27	212
DE-28	132
DE-29	210,212
DE-30	16,162,6
DE-32	614, 55
DE-33	614, 55
DE-34	66
DE-35	132
LO-1	1, 142, 15, 15W, 168, 2, 21, 212, 23, 235, 25, 3, 335, 602, 7, WA
LO-2	201S,23
LO-5	313
LO-6	35
LO-7	212
LO-8	235
LO-9	235, 212, 25, 33, 233
MC-1	15,616
MC-2	15, 3, 610U, 616, 66
MC-3	15, 66, WA
MC-5	15, 3, 4, 6, 602, 61, 616, 62, 66, WA
MC-6	15, 616
MC-7	1 5
MC-8	3,68,69,81,82
MC-9	13
MC-10	13
MC-11	4
MC-12	602,616
MC-13	16,23
MC-14	66
MC-15	15,66
MC-16	23
MC-17	66
MC-18	616, 66
MC-19	66
MC-20	203
MC-21	614, 616, 66
MC-22	66
MC-23	614
MC-24	66
MC-25	16
MC-26	15
MC-28	14
MC-31	15, 61
MC-32	WA, 66, 616
MC-34	66
MC-35	66
MC-36	66, 616
MC-37	64
MC-38	610U
MC-41	235
MC-43	616
MC-44	66
MC-49	WA
MC-55	82

Weedcode	SRI Type
OA-1	13,15,15W, 16, 162, 23, 233, 3, 301S, 335, 56, 571, 6, 602, 61, 616, 9, 91, 93, 94, 941, 95
OA-2	15,23,614
OA-3	23,6
OA-4	15,212
OA-4A	15
OA-7	23
OA-8	201,212
OA-9	15,33
OA-10	15,212
OA-11	614
OA-12	15
OA-13	23
OA-14	56
OA-15	313
OA-16	233,335
OA-17	35
OA-18	233
OA-19	602
OA-20	313
OA-21	13
OA-22	15,235
OA-23	602,64
OA-24	66
RI-1	15,212,7
RI-2	91,95
RI-3	15,168
RI-6	15,233P
RI-7	335
RI-8	201,6
RI-9	56,57
RI-10	164,6,616
RI-11	1,602
RI-12	35
RI-13	15, 15W
RI-14	15W, 335
RI-15	15W, 356
RI-16	233
RI-17	15,233
RI-18	15,16
RI-19	914
RI-20	15,313,335
RI-21	15,233P
RI-22	15,201
RI-23	203,233P
RI-24	164,616
RI-25	914
RI-26	233P,316
RI-27	15, 15W, 23, 602
RI-28	335
RI-29	313
Weedcode	**SRI Type**
RI-30	21
RI-31	201, WA
RI-32	3, WA

RI-33	203
RI-34	313,602
RI-35	203, 15
SH-1	13,132,15,16,162,164,19,201,21,210, 212, 23, 233,235,252,255,3,335,35,441,55,6,602,616,66,7,8
SH-2	13,132,15,16,162,164,201,21,210,212,23,233,252,255,3,335,35, 441,55,8
SH-3	164, 3, 4, 5, 6, 616, 62, 66, 75, 85
SH-4	13,7
SH-6	66
SH-7	16
SH-8	44,66
SH-9	233
SH-10	44,6
SH-11	201,212,23
SH-12	203
SH-14	66
SH-15	6,66
SH-16	132
SH-17	614,66
SH-18	6,75
SH-19	16,203,61OU
SH-20	235
SH-21	203
SH-22	203
SH-23	1 6
SH-25	132,201,212
SH-26	6,602,615
SH-27	14,203
SH-28	132
SH-29	201
SH-30	13,164, 6
SH-31	212
SH-32	13, 212
SH-34	233,6
SH-35	203
SH-36	15,16,201,203,210, 23
SH-37	6, 63
SH-38	19, 301

Note: Sites BR30, DE31, LO9, MC27 and SH33 have no Willamette National Forest Soil Resource Inventory Code because the Ranger District offices are not on Forest Service Land. SH24 is located on a road outside FS property that leads into the Forest. BR35 is on Rossboro land adjacent to the Forest (private).

Key To Soil Units

Soil No.	Description	Infiltration	Drainage
001	rock outcrop	NA	NA
002	rock outcrop, volcanic breccias and tuffs	N/A	N/A
003	side slopes (talus, rock outcrop, avalanche chute)	rapid to none	NA
004	lava flows	NA	NA
005	cinder cones	rapid	excessive
006	Wetlands	rapid to moderate	poor
007	dry non-forested	NA	NA
008	brecia/tuff	rapid	excessive
009	andesite, basalt, breccia	rapid	excessive
013	gravelly loam over gravelly silt or silty clay loam	rapid	well
014	shotty loam and silt loam over -silt, silty clay or clay loam	rapid	well
015	loam over gravel	rapid	well
016	gravelly and sandy loam over gravelly, cobbly loam	rapid	well
017	thin sandy loam over gravelly cobbly sandy loam	Rapid to very rapid	Well to excessively
019	thin gravelly loam over gravelly cobbly loam	Rapid to very rapid	Well-drained
021	gravelly loam over gravel and clay loam	rapid	well
023	shotty loam over clay and silty clay loams and clay	moderate	moderate
025	loam and clay loam over clay and silty clay loams and clay	moderate to rapid	moderate
031	gravelly and gravelly cobbly loams and clay loams	very rapid	excessive
033	loam and silt loam over clay loam	moderate to rapid	moderate
035	clay loam over clay and clay loam	moderate to slow	poor
044	thin gravelly or shotty loam over gravelly or cobbly loam and sandy loam	Moderate to very rapid	Well-drained
055	gravelly loams and loams over silt loams, silty clay loams and clay loam	Rapid	Well-drained
056	pumice over a gravelly, cobbly or clay loam	rapid	well
057	pumice and ash over gravelly sandy loam	Rapid	Well to excessive
061	gravelly loam over a gravelly or cobbly loam	rapid	well to excessive
062	cindery gravelly loamy sand	Rapid	Excessive
064	gravelly, sandy loam and loam over gravelly, cpbbly sandy loam or loam	rapid	well to excessive
066	fine sandy loam over gravelly cobbly sandy loam or loam	rapid	well
067	sandy loam and loam over gravelly and cobbly sandy loam	rapid	well to poor
068	sand and loamy sand over sand and cinders	very rapid	excessive
069	fine sand over sand and glacial till	very rapid	excessive
075	gravelly fine sandy loam over gravelly sandy and fine sandy loam	Rapid	Well-drained
081	loamy sand over gravelly loamy sand	Very rapid	Excessive
082	sand and ash over sand and loamy sand	very rapid	excessive
085	sand over sand and cinders	Very rapid	Excessive
086	thin sands over sand and cinder	very rapid	Excessive
091	cobbly sandy loam over cobbly stony or sandy loams	rapid to very rapid	Excessive
093	pumice and ash over gravelly sandy loam and loam	Very rapid	Well to excessive
094	pumice and ash over gravelly sandy loams and loams	very rapid	excessive
095	pumice and ash over gravelly sandy loams and loam	rapid	well
132	60% 13, 40% 23		
142	60% 14,40% 23		
161	60% 16,40% 61		
Soil No.	**Description**	**Infiltration**	**Drainage**
162	60% 16,40% 23		
163	60% 16,40% 33		

164	50% 16, 50% 44		
167	60% 16, 40% 64		
168	50% 16, 50% 21		
201	60% 21, 40% 31		
202	60% 21, 40% 61		
203	35% 21, 35% 31, 30% 16		
210	60% 21, 40% 2		
212	60% 21,40% 23		
233	60% 23, 40% 25		
235	60% 23, 40% 25		
236	60% 23, 40% 16		
252	60% 25, 40% 13		
255	60% 25, 40% 35		
256	60% 25, 40% 16		
301	60% 31,40% 21		
313	50% 31, 50% 33		
316	40% 31, 60% 61		
333	60% 33, 40% 23		
335	50% 33, 50% 35		
337	70% 33, 30% 61		
356	60% 35, 405 16		
441	50% 44, 50% 21		
571	50% 57, 50% 61		
601	70% 61,30% 31		
602	60% 61,40% 21		
603	40% 61, 30% 21, 30% 31		
610	60% 61,40% 1		
614	50% 61, 50% 64		
615	60% 61, 40% 44		
616	35% 61, 35% 16, 30% 21		
825	70% 82,30% 85		
914	60% 91, 40% 94		
941	60% 94, 40% 91		
WA	Water		

W= wet S= southerly U= unsuited soil for timber harvest