Chapter 3: Affected Environment and Environmental Consequences

Introduction

This Chapter describes aspects of the environment that may be affected by the Proposed Action and Alternatives. Also described are the environmental effects (direct, indirect, and cumulative) that would result from undertaking the Proposed Action or an Alternative. Together, these descriptions form the scientific and analytical basis for the comparison of the Alternatives described in Chapter 2.

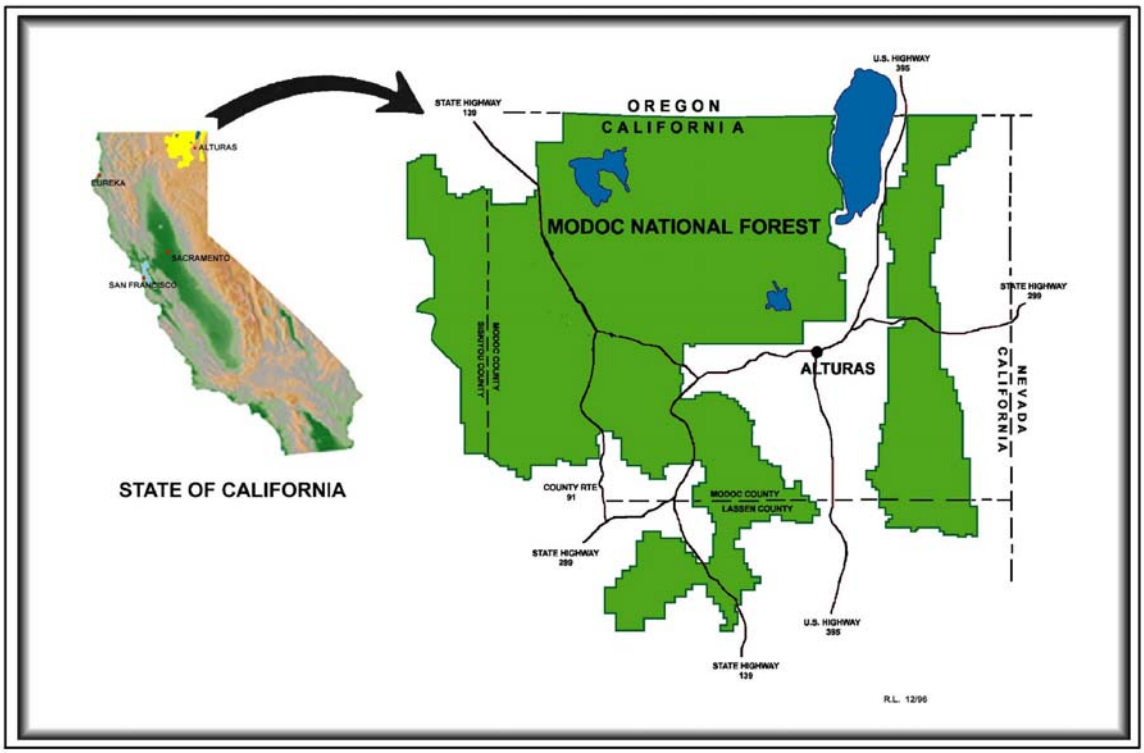
Changes from DEIS

The DEIS Chapters 3 and 4 were combined so the existing conditions for each resource area is followed by the consequences of implementing the various Alternatives.

General Setting

The area included in the analysis consists of Modoc National Forest System lands within Modoc, Lassen, and Siskiyou Counties. The Forest encompasses about 2 million acres on four Ranger Districts: Warner Mountain, Big Valley, Devil's Garden, and Doublehead. Of this, Forestlands actually total only 1.6 million acres while private landowners and other public agencies administer the remaining land. Elevations range from 4,000 to almost 10,000 feet above sea level.

Figure 3-1. Location Map of the Modoc National Forest



The eastern portion of the Forest consists of the southern portion of the Warner Mountain Range and is administered by the Warner Mountain Ranger District in Cedarville, California. The Warner Mountains are a westward-dipping range that extend north and south for 80 miles and are approximately 10 miles wide. The western face has moderate to steep slopes, while the eastern aspect is very steep and often precipitous. Elevations range from 5,000 feet to almost 10,000 feet at Eagle Peak, the Forest's highest point. The south-central portion of this district consists primarily of the South Warner Wilderness area, which encompasses over 70,385 acres of relatively undeveloped land.

At lower elevations, sagebrush, bunchgrass, and juniper are the common vegetative types. Higher elevations include meadows, mixed stands of ponderosa and Jeffrey pine, lodgepole and western white pine, and white fir with bitterbrush, mahogany, and sagebrush. Extensive aspen stands can be found scattered throughout the Warner Mountains at all elevations. Many creeks flow from the Warner Mountain Range into the North and South Forks of the Pit River, an important tributary to the Sacramento River.

The Devil's Garden is a relatively flat, volcanic plateau that encompasses the entire Devil's Garden Ranger District and parts of the Doublehead and Big Valley Ranger Districts. With an average elevation of 4,800 feet, the plateau covers approximately 700 square miles and supports the largest continuous stand of western juniper in the western United States. Other vegetation on the Devil’s Garden includes sagebrush, rabbit brush, and bunchgrass. The timbered lands are stands of eastside ponderosa pine and Jeffrey pine, mixed with white fir and incense cedar on the north slopes above 5,500 feet. Unique areas include the Devil's Garden Research Natural Area, and over 35,000 acres of expansive man-made and natural wetlands scattered throughout the District.

Beyond the juniper plateau to the west lie the Medicine Lake Highlands on the Doublehead Ranger District. This area includes geologic features of volcanic origin, such as numerous explosion craters, lava flows, and lava tube ice caves. The Highlands, an inactive broad shield volcano approximately 20 miles in diameter, rise 4,000 feet above the level of the surrounding plateau. They are considered an eastern extension of the Cascade Range that includes other volcanoes such as Mt. Shasta and Mt. Lassen.

Dominant vegetation on this part of the Forest includes sagebrush mixed with juniper, and ponderosa pine at lower elevations. Other vegetation found here includes mixed conifer and lodgepole pine Forests. This is the only area on the Forest where stands of red fir and hemlock can be found.

With elevations ranging from 4,500 to 7,800 feet, the topography of the southwest portion of the Forest on the Big Valley Ranger District is a mixture of basalt-capped plateaus and moderately steep mountainous uplands. Vegetation common at lower elevations includes sagebrush, juniper, bunchgrass, and bitterbrush. Ponderosa and Jeffrey pine, mixed with white fir and incense cedar, are found on north slopes above 5,500 feet. Most of the oak on the Forest grows on this district.

The climate for most of the Forest ranges from warm, dry summers to cold, moderately wet winters. Weather varies considerably with elevation, slope, aspect, and season. Precipitation ranges between 5 inches on the Madeline Plains to 35 inches per year in the Warner Mountains and the Medicine Lake Highlands, with an average annual precipitation of 12 inches. Snow provides anywhere from 25% to nearly all of the total precipitation, depending on the location. Prevailing southwest breezes blow daily, clearing the air, and bringing frequent weather changes.

Effects Analysis

The FEIS summarizes specialist reports, the human risk assessment, and herbicide information discussed in more detail in the FEIS Appendix Volume. The Appendix Volume and the Response to Comments Volume are incorporated by reference into this FEIS.

The FEIS effects analysis (as did the DEIS) is confined to the implementation of specific measures to control, contain, or eradicate noxious weed sites within the Modoc National Forest. Comments on the DEIS wanted the analysis to include the effects of prevention; education; research; inventory, mapping, and monitoring; cause of noxious weed spread; and/or other matters of noxious weed management which are contained in overriding Forest Service Management and Policy found in Forest Service Manuals, Handbooks, Policy, or Strategies, and outside the scope of this analysis.

Best Available Science

Comments received on the DEIS analysis indicated that the Forest needed to utilize the best available science, and undertake further analysis and data gathering.

This FEIS relies on the best available science, including peer reviewed journals, EPA documents, SERA reports, and other sources. The literature cited section of the FEIS indicates numerous documents were utilized and relied on in the analysis. DEIS Appendix E Herbicide Information and DEIS Appendix G – Weed Species Ecology and Impact provide the general public with an easy to read example of the literature available and utilized in the analysis.

The FEIS further clarifies and analyzes the effects of implementation of each of the Alternatives. The effects analyses have been conducted using the best available science as disclosed in the FEIS. In addition, public comments and additional scientific literature suggested through the public comment period were used in formulating the FEIS. The objective of the FEIS is to be

consistent with state and federal laws and regulations, and to disclose the effects of the Proposed Action and Alternatives.

Values vs. Science

Some of the comments on the DEIS displayed a bias that reflected personal values for no use of herbicides, or the aggressive use of herbicides. Both value-driven views referenced statements from various studies, reports, and journals. This FEIS is focused on displaying the effects of the Alternatives in an unbiased manner and does not address individuals or organizational values. The Record of Decision will display the rationale for the decision and how consideration of the values and comments were utilized in making the final decision.

Direct and Indirect Effects

Direct effects are caused by the action and occur at the same time and place as the action. Indirect effects are caused by the action and occur later in time or farther removed in distance, but are still reasonably foreseeable.

Direct and indirect effects analysis for each Alternative and each resource are based on descriptions of the Alternatives provided in Chapter 2, including the Design Standards for each Alternative, and implementation of the Modoc National Forest Integrated Weed Management Strategy of 2005.

Due to the way the inventory and mapping was done, treatment acres may be less than those indicated. This is mostly caused by areas of no or light weed infestation included within a weed location “polygon” in the GIS data. The minimum size of a GIS weed polygon is 0.10 acres, where the actual size might be one plant or a small patch.

Irreversible and Irretrievable Commitment of Resources

NEPA requires identification of irreversible and irretrievable commitments of resources. These effects are identified in resources where they may occur including: soils, vegetation, and wilderness and inventoried roadless areas.

Short-Term and Long-Term Effects

Unless otherwise specified, short-term effects are those that occur within three years after treatment, and long-term effects are those that occur in three to ten years after treatment.

Cumulative Effects

Cumulative impacts are impacts on the environment that result from incremental impact of an action when added to other past, present, and reasonably foreseeable future actions. For each resource, an analysis area was determined that could be used to adequately measure cumulative effects of the proposed Alternative. Unless otherwise stated, the cumulative effects area is the treatment area. Direct, indirect, and cumulative effects are limited to geographic and temporal scope of the project discussed above and in Chapter 1.

Past, Present and Reasonably Foreseeable Actions

The following actions were considered in cumulative effects analysis for each resource: Fuel Treatments and Fire, Range Management, Dam Construction and Maintenance, Recreation,

Timber Management and Vegetation Treatment, Reforestation, Road Management, Special Uses, and Past Noxious Weed Treatment. Below is a description of these actions. Reasonably foreseeable and present actions on national forest system lands considered in cumulative effects analysis are shown in Table 3-1a, which was developed by reviewing both the 2007 Program of Work and the Oct.-Dec. 2007 Schedule of Proposed Actions.

A GIS analysis of known weed occurrence locations in the noxious weed database in relation to the FACTS database was completed. In this analysis, all weed occurrences were queried to determine whether they are within ¼ miles of roads and waterways. Over 90% of known weed sites occur along roads. Of the 169,939 acres of land treatments on the Modoc National Forest, only 2.2% percent of these acres (3,770 acres) are infested with noxious weeds. Of these 3,770 acres, 3,717 acres are part of the large 5,658 acre dyer's woad infestation. The remaining 53 acres occur in other areas of past land treatments. This represents approximately 3/100s of a percent of the total acres of past land treatments. Over 90% of known noxious weed infestations occur along roads indicating that roads are the major vector for the introduction and spread of noxious weeds on the Forest.

Many actions carry a risk of spreading noxious weeds including timber management (site preparation, planting, thinning, harvesting), prescribed fire, juniper removal and aspen enhancement project, wetlands creation and maintenance and recreational site development and maintenance. Ground disturbance creates exposed soil and decreases native plant cover. Noxious weeds can colonize these disturbed areas. Equipment can move soil containing weed seeds from one area to another. Grazing has the potential to spread noxious weeds through vegetation trampling, herbivory and spreading seed through their hooves and hair. However, as previously mentioned the majority of known noxious weed sites on the Modoc NF occur along roads.

Additionally, the Modoc NF developed an Integrated Weed Management Strategy in 2005. This strategy outlines such things as prevention measures to consider during project implementation, educational activities, and inventory and monitoring the spread of weeds on the Forest. A Noxious Weed Risk Assessment (FSM 2081.03) is currently required for all projects on the Forest prior to implementation. Project analyses also consider the prevention practices listed in the Integrated Weed Strategy for inclusion in project design. Before this requirement, a number of forest activities contributed to the spread of noxious weeds due to the soil disturbance creating a good environment for noxious weeds. The spread of noxious weeds with projects has been greatly reduced by implementing practices that reduce the spread of weeds into new areas.

Fuel Treatments and Fire

Approximately 17,000 acres are proposed for fuel treatments per year across the Forest: 5,000 acres of prescribed burns and 12,000 acres of mechanical and physical fuel treatment. A list of present and reasonably foreseeable fuel projects are listed in Table 3-1a. The fuels program does not use herbicides for implementation.

Mechanical treatments, such as brush mowing and coniferous tree understory thinning, are less likely to have potential to spread noxious weeds. Activities associated with mowing are not likely to leave bare space upon completion of the project. Plus, areas will be mowed when there is less of a chance of equipment spreading seed. Understory thinning will have the guidelines stated in the Timber Harvest and Vegetation Management section.

Prescribed burns have a potential to increase noxious weeds on the Forest by creating bare ground where the weeds can get established and by potentially reducing native plant vigor.

Wildfire and associated suppression and rehabilitation measures also may provide both an excellent seed source and seed bed. There is no way of quantifying the location and extent of

future wildlife fires, therefore a determination of the cumulative effects of fire is not possible. One large known infestation of noxious weeds (5,658 acres of dyer's woad) is on a site where a wildfire burned. The weed was initially along a road in the fire area and spread after the wildfire created bare ground conditions where the weed could flourish.

Range Management

Grazing allotments occur across the Modoc National Forest; however, roughly 10% of these allotments are vacant and about 2% are in non-use. Approximately 122,500 animal unit months of grazing occurs annually. There is also one wild horse territory with approximately 425 head.

The range program does not use herbicides. Individual range management projects include installing cattle guards, fencing, developing water sources, and thinning juniper. Projects, such as fencing and juniper thinning, and administering permits (e.g., scheduling on and off dates) have restored riparian areas. A list of present and reasonably foreseeable range projects is included in Table 3-1a.

There is the potential for livestock grazing to spread noxious weeds through transporting seed in the animal's hair and creating bare ground by livestock gathering. If weed occurrences were adjacent , the bare ground could provide a seed bed. However, a GIS analysis of known weed occurrences shows that over 90% of the weed occurrences occur along roads.

Dam Construction and Maintenance

There are 152 dams and water impoundments on the Forest which serve several functions from livestock ponds, irrigation, recreation, and wildlife habitat, with 34 of these considered as dams by the State of California. Associated with irrigation dams are canals used to transport water. Dams, canals and impoundments, because they are areas of bare ground, can be sites of noxious weeds and susceptible to noxious weed infestations. Maintenance of these structures can spread noxious weeds to other areas of the Forest. Many of these structures are maintained by range permittees.

Recreation

On the Modoc National Forest, there are 34 developed campgrounds and several other developed sites, including boat launch facilities, trailheads, etc., and numerous dispersed recreation sites (primarily dispersed campgrounds). A list of present recreation projects is included in Table 3-1a. The recreation program does not use herbicides for treating weeds or other vegetation within recreation sites; rather, weeds are hand pulled.

Recreation use that has likely contributed the most to the spread of weeds is recreation users traveling Forest roads. There are no known weed occurrences within the noxious weed database for developed recreation sites; however, it is likely that noxious weeds do occur at some sites.

There are a variety of recreation associated activities that have the potential to spread noxious weeds including firewood gathering, mineral gathering, hiking, camping, off-highway vehicle use and horse use. The degree that these activities contribute to the spread of noxious weeds is likely relatively small compared to the primary source of known noxious weeds - vehicle travel on system roads.

The Modoc NF is beginning the process of designating motorized routes for off-highway travel. Approximately 491 miles of non-system roads have been identified. The Forest will work with the public to identify routes to add to system from the non-system routes while considering such things as impacts to wildlife, vegetation and the presence of noxious weeds, among other things.

Timber Harvest and Vegetation Treatments

Past vegetation management actions are tracked in the FACTS (Forest Activity and Tracking System) database. This database contains information about vegetation management activities back to 1954. Since 1954, there have been over 169,939 acres of vegetation treatments on the Forest. On average, 2,500 acres are harvested annually for saw logs with an additional 3,000 acres for wood fiber. Harvest prescriptions vary from clearcutting to understory thinning; however, clearcutting has been greatly reduced over the past ten years. Reasonably foreseeable actions timber harvest actions are displayed in Table 3-1c.

In the past, road construction was supported by timber harvest. The existing Forest transportation system was developed, in part, through the need to provide timber to the public after WWII. This trend continued until the late '70s or early '80s. Some weed sites have been identified in old landings that were created to deck logs after harvest to move along the Forest transportation system.

Following timber harvest, a fungicide, borax (trade name SPORAX) may be applied to pine stumps larger than 14 inches in diameter to inhibit the spread of *Heterobasidion annosum*, a tree disease spread through infected stumps and root contact. The use of borax is limited to tree stumps after harvest.

Noxious weed prevention measures are expected to significantly reduce the spread of noxious weeds during future timber and silvicultural activities. Noxious weed locations are presented as part of the planning process so that activities can avoid or mitigate the spread of noxious weeds (e.g., timing projects outside of high risk seasons). Logging systems design will maintain ground cover by minimizing ground disturbance and avoid opening up the overstory adjacent to noxious weed populations. Logging equipment will be washed to stem the transfer of noxious weeds (timber sale clause CT 6.343). Timber sale contract clauses C5.12 (Use of Road Purchaser), C5.4 (General and Special Maintenance Requirements), and C6.315 (Sale Operation Schedule) are used to keep vehicles and equipment out of high-risk areas during weed seed production periods.

The Sage Steppe Ecosystem Restoration Strategy, a reasonably foreseeable action, is a programmatic analysis for treating 1,254,200 acres of juniper on the Modoc National Forest, BLM Alturas Field Office and surrounding federal agencies that lie within the sage steppe ecosystem. Treatment would be through mechanical treatments, hand treatments or prescribed fire. This project consists of restoring sagebrush communities that have been invaded by juniper over the last 100-150 years.

Reforestation

Reforestation will occur as needed after wildfires or timber management. Past associated activities with replanting trees included the use of herbicides and/or mechanical and physical site preparation to reduce the competition for soil nutrients and sunlight from grasses and shrubs (release); another associated activity includes the use of strychnine for gopher control to reduce seedling mortality. Between 1979 and 1984, 5,122 acres were treated with herbicides for reforestation. The primary herbicide used was atrazine with 2, 4-D, Velpar L, and dalapon. The Forest has not used herbicides for reforestation since 1984. There are no projects identified in Table 3-1c to use herbicides for site preparation.

Strychnine has been and continues to be used for gopher control in plantations. This activity involves placing strychnine laced oats under the ground in burrows to control gophers.

Road and Right-of-Way Management

A system of federal, state and county highways provide access to the Modoc National Forest. Forest system roads are extensions of these highways, and provide access to and mobility within the Forest. Roads allow protection, management, use, and development of Forest resources on which local communities are dependent. The Forest road system consists of approximately 4,600 miles. Integrated with the system are over 300 miles of private roads. There are also approximately 525 miles of non-system roads on the Forest.

Roads and trails serve as primary corridors for movement of noxious weeds into non-infested sites, and are high- risk areas for invasion by new weed species. As mentioned previously, over 90% of known noxious weed infestations occur along roads indicating that roads are the major vector for the introduction and spread of noxious weeds on the Forest.

Management of weeds along roadsides is a high priority with the Forest. Noxious weed seeds are often brought to these areas by vehicles, people, and livestock. They can also be spread by road maintenance. Gravel and cinderpits that provide a source of materials used in road maintenance can be a source of noxious weeds. Noxious weed sites along roads can serve as sources to further spread of weeds into non-infested areas.

State and County Easements

Some 60 miles of State highway cross portions of the Modoc National Forest. The highway right-of-way is managed according to the terms of the specific easement and for the purpose of vehicle transportation. Vegetation management within the right-of-way is done according to the laws and regulations of the State of California and State standards for maintenance of a safe travel-way. Any application of herbicides within the right-of-way is included within the total application for the County.

The County of Modoc maintains about 1,040 miles of roadway through the Modoc National Forest. These roads are maintained by agreement with the Forest or as easements. The rights-of-way are maintained according to County standard and any application of herbicide is done in accordance with State law and regulation and is recorded in the total application within the County.

Railroads

Two railroads cross portions of the Modoc National Forest. Railroad rights-of way are embedded in the Forest and can be a source of weeds. The rights-of-way are owned by the railroad and herbicides are known to be periodically used for the control of vegetation. Herbicide use is reported in the total application within the County.

Special Uses

Approximately 325,000 acres of privately owned lands lie within the Forest boundary (2,000 acres state; 1,000 acres tribal; and 323,000 acres of land owned by companies and individuals).

The Modoc National Forest has a case load of about 160 special use authorizations annually for apiaries, ditches, dams, water sources, roads, recreational residences, utility transmission and communication sites, outfitters and guides, a ski hill, and miscellaneous permits. Special uses on the Forest encompass over 125,000 acres and result in a return of over $70,000 in fees to the U.S. Treasury. Special use permits authorize facilities and services necessary for public health, welfare, safety and security, such as communications sites for local 911 radio repeaters to support

local law enforcement and emergency response entities. Others provide basic needs such as power and telephone lines to private homeowners.

All new authorizations are issued with terms and conditions aimed at reducing potential spread of noxious weeds on the National Forest. Those conditions include but are not limited to cleaning of all vehicles prior to entry on National Forest lands, use of weed-free feed products, and reporting of noxious weed populations within the authorized area. All special use permits contain requirements for reporting and controlling noxious weeds.

The Modoc National Forest administers slightly over 3,000 acres authorized for the purpose of transmitting or distributing power in the form of electricity and natural gas. In many cases these acres overlap because power and pipeline facilities are located within designated corridors. These utility authorizations are governed by terms and conditions that require prior authorization for implementing vegetation management varying from grubbing to whole-tree removal and use of herbicides.

All power corridor authorized areas have been analyzed in separate environmental studies that include vegetation management required to be consistent with utility industry standard. Herbicides are currently approved for use on less than 10% of the authorized area in accordance with the standards set by environmental analysis and safety standards. The quantity of application is included in the Modoc County annual total. Inspection and reporting of herbicide application is the responsibility of the authorization holder under the terms and conditions of the authorization. The Forest does not routinely inspect these applications and reports of application are made to the County and State by the holder's qualified applicator.

Currently there is ongoing analysis for the vegetation maintenance for the U.S. Department of Energy's Western Area Power Authority Sierra Nevada Region (High Voltage Powerline Right-of-Way Vegetation Maintenance), including two 500-kV transmission lines through the Doublehead Ranger District. Their proposal includes the maintenance of vegetation within the right-of-way with manual (cutting, girdling, topping and trimming), mechanical (mowing) and herbicides. The proposal is to use these techniques to maintain 30 feet of clearance around each transmission tower or structure. They would use only herbicides that have been approved for use in ROW maintenance and registered for use in California by the Environmental Protection Agency. The herbicides proposed for use on federal lands are: Chlorsulfuron, Clopyralid, 2, 4-D, Dicamba, Glyphosate, Imazapyr, Oxyfluorfen, and Triclopyr.

The Modoc National Forest administers some 1,460 acres rented to public and private agencies for communications purposes. Over 900 acres of that is authorized to the Department of Defense for a radar installation. The remaining acres are within nine designated communications sites or are parallel to transportation, power line and/or pipeline facilities. These authorizations require prior approval for removal of vegetation, including use of herbicides. There have been no requests for herbicide application within these authorized areas in the last 5 years. Should herbicide application occur following written approval, inspection and reporting would be done by the authorization holder's qualified applicator to the County and State.

Past Noxious Weed Treatments and Adjacent Treatments

Prior to 2002, Modoc County Department of Agriculture treated weeds on the Forest through a Memorandum of Understanding. Billing records and correspondence between the Forest and Modoc County indicate treatments were done for about 30 years. Table 3-22 displays the previous treatment of noxious weeds with herbicides.

Based on a comparison of Forest Service annual pesticide-use reports for 2002 and 2003 and California Department of Pesticide Regulation reports for 2002 and 2003, the majority of

herbicides used on timberlands in the Modoc National Forest area are on private lands. The Forest has not been extensively involved in herbicide application in the last five years (for 2002, there was minor use for clopyralid, 2, 4-D, dicamba, glyphosate, and hexazinone, all for noxious weed control). From 2003 through 2007, no herbicides were applied on the Forest outside of existing permits. Tables F5-11, F5-12a, F5-12b in Appendix F displays the use of herbicides on public and private timberlands, rangeland, and road rights-of-ways, (the latter assumed to be primarily for noxious weed work) within the four-counties that make up the Modoc National Forest (Lassen, Modoc, Shasta, and Siskiyou Counties).

Other Federal Lands in California

The Modoc National Forest abuts the Klamath and Shasta-Trinity National Forests on the western flank. The Lassen National Forest administers some of these lands, and also has land that lies roughly 2 to 4 miles south of the Big Valley District.

Klamath National Forest-Goosenest District: Currently, their weed control activities have focused on survey, although they have done a small amount of mechanical treatments (less than 1 acre).

Lassen National Forest – Hat Creek District: There is roughly 40 acres on the areas adjacent to the Modoc National Forest that receives control for noxious weeds. The species targeted include dyer's woad, Scotch thistle, and squarrose knapweed.

Shasta-Trinity National Forest – McCloud District: There is no noxious weed control occurring on the portion of the District administered by the Shasta-Trinity National Forest at this time. There are roughly 10 acres of noxious weeds controlled on the portion of the District administered by the Lassen.

Additional lands administered by the federal government outside of Forest Service jurisdiction include 2 wildlife refuges, 1 national park, and 2 BLM resource areas. All of these agencies have noxious weed management programs in place, which include the use of herbicides. An estimation of these agencies programs is as follows:

Klamath Basin National Wildlife Refuge: The Klamath Basin has weed treatments both as part of their noxious weed eradication program as well as farming that occurs within its jurisdiction. On the Tule Lake unit there is roughly 20-30 acres that are treated with Rodeo in order to control purple loosestrife. In the Lower Klamath unit, there is another 50 acres of upland sites that are treated with Banvel and Round up to control pepperweed. There is no control occurring on the Clear Lake unit.

Modoc National Wildlife Refuge: Approximately 200 acres are treated annually to control scotch thistle. Rodeo, Roundup, 2, 4-D and other chemicals are applied by hand, ATV, and truck in addition to a limited amount of hand grubbing that occurs.

BLM-Alturas and Surprise Valley Offices: About 50 acres in Modoc County are treated annually for the control of primarily Scotch thistle and Mediterranean Sage. Both Telar and 2, 4-D are applied using both trucks and helicopters. There are approximately 425 acres of various weed occurrences on the BLM lands in Modoc and Lassen Counties that have been physically (which includes prescribed fire) or chemically controlled from 1997 to 2002; the vast majority is medusahead (410 acres out of 425 acres total). In May of 2007 the Alturas, Eagle Lake and Surprise Field Offices issued an Finding of no Significant Impact for treating 3,500 acres of exotic invasive plant species scattered over 3.34 million acres annual through a combination of manual, mechanical, chemical (ground and aerial applications), grazing, biological and prescribed fire methods.

Lava Beds National Monument: Weed treatments on the Lava Beds National Monument consist of a combination of mechanical and chemical treatment using Roundup. Weeds that can not be extracted by hand (using a pulaski) are sprayed by hand with Roundup. This occurs on approximately 170 acres. The main weed species of concern are: mullein, hoarhound mint, bull thistle, stinging nettle, and sweet clover.

Other Federal Lands within Oregon

Fremont National Forest: Currently, there are approximately 200 acres per year that are sprayed on the Fremont National Forest. Chemical control is focused on spotted knapweed, dalmation toadflax, and Canada thistle. The Forest also has a hand treatment program. The entire Forest encompasses 1.2 million acres.

BLM-Lakeview: This Resource Area uses both mechanical and physical, and herbicidal methods to treat various noxious weeds. There are approximately 250 acres of herbicide treatments that occur per year using picloram, glyphosate, and 2, 4D (amine). Herbicides are used to treat the following weed species: Russian knapweed, hoary cress, Mediterranean sage, Canada thistle, and medusahead. There is an additional 40 acres per year treated by mechanical and physical means to control musk thistle and Mediterranean sage. There are 3.2 million acres within the boundaries of this Resource Area.

Tribal Lands

The Pit River Tribe has a treatment program and trained crew that uses a combination of herbicide and mechanical and physical methods to control and eradicate noxious weeds from their lands.

State and Private Lands

There are roughly 10,000 acres a year that are treated with herbicides on private, commercial farm ground, and private forests for noxious weed treatment within Modoc County as a whole (Joseph Moreo, pers. comm.). In addition, 1,000 acres of regulatory noxious weed control occurs. Roughly 11 acres have been treated on the Ft. Bidwell Reservation; Mediterranean sage, scotch thistle, and dyer's woad were controlled using mechanical and physical means.

Table 3 – 1a. Present and Reasonably Foreseeable Actions

Activity	NEPA Project Name	District
Fuels	Ash Vegetation Treatment *	
Fuels	Crowder Block Wildlife Habitat Improvement Project (prescribed burns)*	DG
Fuels	Cedar Pass Forest Health*	WM
Fuels	Lassen Creek Watershed Forest Health and Restoration Project*	WM
Fuels	North Warner Roadside Safety Improvement Project *	WM
Fuels	Cal Pines Fuelbreak	BV
Fuels	Carey Vegetation Mgt	BV
Fuels	Hackamore Rx burn	DH
Fuels	OSU Sagebrush Fire Effects Study*	DH
Fuels	Bolan Rx burn	WM
Fuels	COTP Rx burn	BV
Fuels	Fandango Juniper removal & Underburn	WM
Fuels	Fender Rx burn	DG
Fuels	Lost Valley Mountain Fuels Reduction	BV
Fuels	Pull Plug Rx burn	DG
Fuels	Shin Rx burn	WM
Range	Bitterbrush Spring	BV

Activity	NEPA Project Name	District
Range	Blue Mtn. Juniper Thinning	DG
Range	Dry Lake pasture fence & cattle guard	DH
Range	Lone Spring	DH
Range	Devil's Garden 2007 Range NEPA (Reissue 4 Allotments)	DG
Range	Devils Garden Range Allotment Management Plans (Reissue 4 Allotments)	DG
Range	Everly Range Improvements	DG
Range	Turner Creek Habitat Improvement Project (fencing, removing encroaching conifers, and provide off-site livestock water)	DG
Range	Crumes and Tucker Grazing Allotment EA	DH
Range	Pothole Valley Spring Exclosures (fence construction)	DH
Range	Reissue 5 Allotments Doublehead R.D.	DH
Range	Reissue 6 Allotments Big Valley R.D.	BV
Range	Timbered Mtn. Juniper Thinning	DG
Range	Triangle Allotment Range Improvements	DG
Recreation	DG/WM Campground Vegetation Management	DG/WM
Recreation	Medicine Lake Interpretive Signing	DH
Recreation	East Creek Trailhead Improvement	WM
Reforestation	Badger 2	DG
Reforestation	Badger and Green Springs Sale Area Improvements	DG
Reforestation	Blue Bird	DG/DH
Reforestation	Blue Fire (tree planting and gopher baiting)	WM
Timber Harvest	Black Stain	BV
Timber Harvest	Blue Fire Salvage	WM
Timber Harvest	Cinder Corp	WM
Timber Harvest	Ditch	BV
Timber Harvest	East Bridge Fire Salvage	WM
Timber Harvest	Long Hill SSTS	BV
Timber Harvest	Lost	DG
Timber Harvest	Pull Plug	WM
Timber Harvest	Long Valley Biomass Fire Salvage	WM
Vegetation Treatment	Johnson Creek Fish Barrier Maintenance	BV
Vegetation Treatment	Sugar Hill FH	WM,
Vegetation Treatment	Bluebird Precommercial Thinning	DG/DH
Vegetation Treatment	Black Mountain Forest Health	DH
Vegetation Treatment	Day Bench Fuels Reduction	BV
Vegetation Treatment	Sage Steppe Ecosystem Restoration Strategy	FS/BLM/PVT
Vegetation Treatment	Cedar Pass Summer Lands Vegetation Management	WM
Vegetation Treatment	Clear Lake Quaking Aspen Restoration Project	DH
Watershed/Road Management	Parker Creek Slide Rehabilitation	WM
Watershed	Weed Valley & 4-Mile Dam Maintenance	DG
Wild Horses	Wild Horse Well Development	DG
Wildlife	Howard's Gulch Meadow Restoration	DG
Wildlife	BV Guzzler retrofit	BV
Wildlife	DG Guzzler retrofit	DG
Wildlife	DH Guzzler installation	DH
Wildlife	Howard's Gulch Meadow Restoration	DG
Wildlife	Mill Cr/Tamarack Aspen Release	WM
Wildlife	Pit River Worker's COOP	Forest
Wildlife	West Valley Juniper Thin	WM
Wildlife	Mountain Big Sage Maintenance Project	DH
Wildlife	Mt. Dome Feral Horse removal	DH
Wildlife	Rose Cr. Meadow Restoration	BV
Special Use Management	High Voltage Powerline Right-of-Way Vegetation Maintenance*	DH
Special Use Management	PacifiCorp Special Use Permit Update and Consolidation*	DH/WM

Activity	NEPA Project Name	District
Special Use Management	Briles Reservoir and Ditch Use Continuation (reissue permit)*	WM
Special Use Management	Fandango Pass Wind Energy Project*	WM
Road Management	Willow Creek Highway Safety Improvement (cut trees along road)*	BV
Road Management	BIA Road Improvement Lauer Reservoir Access*	DG
Road Management	Medicine Lake Highlands Motorized Wheeled Vehicle Restriction*	DH
Road Management	Briles Reservoir Access Road*	WM

* Projects listed on the 10/1/2007 to 12/31/07 Schedule of Proposed Actions for the Modoc National Forest

Table 3 – 1b. Present and Reasonably Foreseeable Timber Sales FY07 – FY09

Timber Sale Name	Ranger District
Tamarck Aspen	Warner Mountain
Raptor	Devil's Garden
F Reservoir	Devil's Garden
Crystal Fire Salvage	Doublehead
Warner Roadside	Warner Mountain
Bench	Doublehead
Hiway 139 Safety	Big Valley
Miller	Big Valley
Bluebird Biomass	Devil's Garden
Carr Juniper	Doublehead
Sunflower Cull	Warner Mountain
COTP Biomass	Doublehead
Rush 1 Phase I	Big Valley
Rush 1 Phase II	Big Valley
Trichnor	Devil's Garden
Craig	Devil's Garden
Turner	Devil's Garden
Deep Aspen	Warner Mountain
Bald Aspen	Warner Mountain
Grouser	Devil's Garden
Dry Aspen	Warner Mountain
Widow	Devil's Garden

Table 3 – 1c. Reasonably Foreseeable Timber Harvest Actions

Action	NEPA Project Name	Acres
Regeneration harvest	Ash Vegetation Treatment	1,070
	Clear Lake Aspen Regeneration Project	26
	OSU Sagebrush Fire-Effects Study	36
Commercial thinning	Ash Vegetation Treatment	5,100
	Rush2 Vegetation Treatment	3,997
	Fletcher Fire Salvage	99
Selective Thinning	Happy Sugar Pine	261
	Cedar Pass Forest Health	520
Clear Cutting	Fox Fire Salvage	20

Air Quality

Crisp, clean mountain air is a hallmark of the Forest, which is geographically within the Northeast Plateau Air Basin under the jurisdiction of County Air Pollution Control officers in

Lassen, Siskiyou and Modoc counties. The area designation for the project area, California National Ambient Air Quality Standards by Region 9 EPA, has been classified as "attainment or unclassified", also called non-attainment/maintenance. Federal actions are not subject to conformity determinations under 40 CFR93.

Air quality in the area is generally good, due to the remoteness and limited amount of development/activity taking place within the project area. Air pollution in the project area can come from a variety of sources, including vehicle travel along dirt and gravel roads, agricultural activities, and smoke from prescribed burns (both private and agency lands) and wildfires. Pollution from these sources would result in localized increases in fugitive dust that would be temporary and would not exceed air quality standards.

The South Warner Wilderness within the Forest and the Lava Beds Wilderness in the Lava Beds National Monument in the northwest corner of the Forest, are rated as Class I air shed areas. The rest of the Forest is designated Class II. In Class I areas, even a minimal change in air quality is considered significant, while Class II areas can have changes in air quality if they are the result of moderate, well-controlled growth.

The effects section below discusses the air quality concern that the FEIS should disclose the effects of herbicide Volatization caused by fire. Volatization is the converting of a normally solid or liquid material into a gas or vapor state. The potential effects of combustion products is common to all risk assessments of materials that might be subject to burning. The combustion products of burning wood and vegetation are respiratory irritants as well as carcinogens, and exposure to these combustion products should be avoided. There is no basis for believing that the presence of low or even high levels of Glyphosate or other herbicide residues would have a significant impact on this hazard (Dost 1982).

Direct and Indirect Effects

Physical Treatments (All Alternatives): The effect of all Alternatives on air quality would be increases in fugitive dust generated from the use of vehicles to get to infested sites and use of hand tools. Fugitive dust impacts would be temporary, small in scale, and quickly dispersed through the project area.

Gaseous emissions, including sulfur dioxide (S02), carbon monoxide (CO), oxides of nitrogen (NOx) and volatile organic compounds (VOCs), would result from combustion of fuel used during applications. The amount of gaseous exhaust emissions depends on size, age, and fuel efficiency of the engines. Sulfur dioxide emissions would be limited by using fuel that meets regulatory standards for the amount of contained sulfur. Other gaseous emissions would be minimized through proper operation and maintenance of engines. The amount of Hazardous Air Pollutants released during combustion of fossil fuels is very low and would pose no threat to health or environment.

Herbicide Treatments (Alternatives 2, 4, and 6): Air quality impacts from use of herbicides include drift and volatization are expected to be short-term and restricted to the localized area and time of treatment because of application prescriptions during conditions of low winds speed and moderate temperature. Impacts would be temporary, small in scale, and quickly dispersed throughout the area project area.

The application of herbicides would have short term minimal effects (odor) on the air quality immediately within and adjacent to application sites. During herbicide application spray drift of herbicides is possible. Studies show that during ground application (boom spraying from vehicles), greater than 90 % of the spray droplets are released on lands within the treatment area, with 10 % or less moving off-target. Of the 10 % that move off-site, most droplets deposit within

100 feet of the treatment area boundary (Felsot 2001). Note: Data for boom-sprayer application is for comparison purposes only. The Forest does not propose using boom sprayers. Wick and directed spray as called for in this project are expected to have a spray distance less than 25 feet.

Cumulative Effects

Other activities and natural occurrences (such as wildfire) will affect air quality during treatments in Alternatives 2-6. In all Alternatives, dispersion and the small amount of emissions produced by treatments at any given area will result in no noticeable increase in emissions within the airshed. The treatment methods proposed in Alternatives 2-6 would not result in a measurable air quality impact. The cumulative effects to air quality from the implementation of Alternatives 2-6 would be negligible. The effects to air quality from other activities such as prescribed fire or wildfire would be of more concern then the effects from the noxious weed treatment program. The noxious weed treatment program will not significantly add to the cumulative impacts to air quality. Since impacts will be distributed across the forest and over time, concentrations of air contaminants will not accumulate to the point of violating air quality standards for any area.

Consistency with Forest Plans and Other Laws and Policies

All Alternatives are consistent with Modoc NF Forest Plan standards and guidelines regarding air quality (Modoc NF Forest Plan 4-13 to 4-14). In addition, all Alternatives are consistent with the Federal Clean Air Act and air quality standards on the Forest will be maintained as acknowledged under standards set by the Federal Clean Air Act.

Fire and Prescribed-Fire Management

In response to the need to reduce the potential for catastrophic fires called for under the Sierra Nevada Forest Plan Amendment of 2004, the National Fire Plan, and the Healthy Forest Initiative, the number of acres treated for timber stand improvement and fuels reduction has increased from 11,200 acres projected in the 1991 Forest Plan, to over 17,000 acres annually.

Prescribed fire history is now tracked in the NFPORS database. In 2004, 3,634 acres were treated with prescribed fire, and in FY 2005; 2,202 acres were treated with prescribed fire. Prescribed fire treatments are applied across the Forest in all types of vegetation to reduce fuel buildup which could cause larger wildfires that are harder to control, or to improve wildlife habitat and/or range conditions.

Table 3 - 2. Occurences of Noxious Weeds within Prescribed Fire Underburning Projects

Year and Project Name	Acres	NW Species	NW Site ID	Population Size	Acres
04 Hackamore	263	Plumeless Thistle	DG001CAAC	>10	0.10
04 Hackamore	263	Scotch Thistle	DG029ONAC	50	0.10
05 Plum Valley	194	Scotch Thistle	WM051ONAC		0.12

The Modoc NF has a well-documented fire history, with fire records dating back to 1910. A review of fires from 1910 through 2003 indicates valuable trends. Fire suppression efforts were successful on 97% of fires (Size Classes A through D fires that are between .1 to 99.9 acres in size). Fires in Size Class E (100-299.9 acres) occur every year, Class F fires (300-4999.9) occur 1.6 times per year, and Class G fires (5000+) occur every three years. There is an even distribution of Class G fires ranging from 5,000 acres to 30,000 acres, then a significant jump to 80,000, 87,000 and 196,000 acres. These large fires occurred in 1910, 1941 and 1977, indicating a 30 to 40-year trend for large wildland fire disturbance events. An intersect of noxious weeds

occurrences with the Fire History data layer indicates 131 noxious weed sites occur within an area of historic burns.

The public concern for the disclosure of the effects fire would have on the volatization of herbicide residue is disclosed and discussed in the Air Quality Section, above.

Direct and Indirect Effects

Public comments expressed concern that wildland fire burning in areas that had been treated with herbicides would endanger the public and firefighters in the short term, through volatization of the chemicals. Products of combustion of wood and vegetation include particulate matter, oxides of nitrogen, carbon monoxide, and volatile organic compounds (VOCs). Other constituents of smoke include toxins such as benzene and formaldehyde, which are recognized as hazardous air pollutants by EPA and are carcinogenic (HFQLG SFEIS, page 285).

Degradation of herbicides over time would reduce the amount of Glyphosate, reducing the potential amount of products produced. Glyphosate residues on plants were reduced 90 % after 6-7 months, and 99 % after 10 months (Segawa et al, 2001). Additionally, not all of the herbicide would be converted to one product, further reducing potential exposure.

Based on very conservative assumptions (no degradation of herbicide, the entire amount of herbicide is converted to each possible product) phosphoric acid intake by firefighters at the maximum rate on this project is estimated at 0.08 mg per cubic meter (based on 0.02 mg per cubic meter per pound of Glyphosate per acre (Dost 1982)). This is a factor of 13 below the OSHA permissible exposure limit of 1 mg per cubic meter. Potential exposure to non-firefighters and terrestrial and aquatic environments would be reduced with distance from a fire, as smoke is diluted with air.

The potential effects of combustion products are common to all risk assessments of materials that might be subject to burning. The combustion products of burning wood and vegetation are respiratory irritants as well as carcinogens, and exposure to these combustion products should be avoided. There is no basis for believing that the presence of low or even high levels of Glyphosate residues will have a significant impact on this hazard (Dost 1982). “The combination of low herbicide application rates, environmental degradation, and thermal decomposition, coupled with natural ventilation in prescribed burning zone, precludes hazardous levels of airborne herbicide residues from forming.” (McMahon and Bush, 1992).

David Bakke, Forest Service Region 5 Pesticide-Use Specialist, prepared a PowerPoint presentation on “Prescribed Burning and herbicides, The Risk From Burning Herbicide-Treated Brush” in 2007. Based on review of published studies and Forest Service risk assessments completed in Region 5 and Region 8 he concluded:

- Herbicides will be present on fuels after application, although will decrease with time
- Burning will further reduce herbicide amounts, and dispersion in smoke will reduce concentrations in air
- There is no test evidence to suggest that workers in prescribed fires will be exposed to relevant concentrations of herbicides in smoke.
- Even under worst-case assumptions, exposure modeling results in measures of risk that are at acceptable levels.
- The compounds of concern during burning of treated vegetation for prescribed fire personnel are going to be the familiar ones (CO, CO2, particles, benzene, etc.) that come from burning vegetation.

Cumulative Effects

Due to the establishment of the National Fire Plan, the Modoc has increased its Fuels Treatment activities from 1,571 acres in FY2000 to 22,000 acres in FY2004. These treatments include physical, mechanical, and prescribed fire. Standard protocols are followed on all of these projects. There would be no cumulative effects from herbicide treatment on vegetation, if burned.

Soils and Water

The effect of invasive plant treatments on soil and water is of public concern. There is concern that herbicide treatment on riparian areas could adversely impact water quality and aquatic ecosystems.

The purpose of this section is to analyze, interpret and discuss potential effects of invasive plant treatments on soil and water resources, located on the Modoc National Forest. Design Standards (DS) were developed to minimize the effects of invasive plant treatments on these resources.

The Modoc National Forest is proposing to treat noxious weeds across the Forest by using herbicides, physical methods, and cultural treatments, or a combination of these approaches, over a 5- to 10-year timeframe (USDA Forest Service 2007). The noxious weeds are located in approximately 50 6th-field watersheds across the forest and could potentially affect 0.61 percent of soil map units located on the Modoc National Forest. Please refer to Table 3-3 and Appendix A for descriptions of the soil map units that have either sensitive or shallow soils on sites that contain noxious weeds. (Appendix A is part of the Watershed and Soils specialist report, found in Appendix T, Watershed and Soils, of this final EIS.)

The 39 5th-field watersheds that are proposed to be treated under this decision lie within the jurisdictional area of three different regional water boards (RWB): Central Valley, Lahonton and North Coast. There are 143 6th-field watersheds within the 39 5th-field watersheds. Approximately 80 percent of these 6th-field watersheds are located within the Central Valley RWB and the remainder is divided between the Lahontan and North Coast RWBs. Each RWB has a different water quality standard for pesticide delivery to the surface and ground waters, with the Lahonton RWB having a no-herbicide-detected standard. Standards for the other RWB are a limit of 0.07 mg/l for 2, 4-D and a limit of 0.7 mg/l for glyphosate. All three of the RWB Basin Water Quality Plans meet the State of California standard for water quality.

Analysis Area

The analysis area for direct and indirect effects is the Modoc National Forest and lands administered by the Forest. The total acreage within the Forest's boundary consists of approximately 2,029,647.7 acres. Of those acres, 1,679,007.3 are administered by the Forest Service, which is approximately 83 percent of the area. The Modoc National Forest is located in the extreme northeastern corner of California. The cumulative effects analysis area is comprised of the 39 5th-field watersheds that are either totally or partially found within the Forest's administrative boundary. Approximately 39 percent of the total area of these 39 5th-field watersheds is located within the Forest boundary.

Regulatory Framework

Federal Legislation

Federal and state laws, policies, and regulations control the use of herbicides on National Forest System lands, including the Clean Water Act and the Federal Water Pollution Control Act. Section 208 of the 1972 amendments to the Federal Water Pollution Control Act (Public Law 92-

500) specifically mandated identification and control of non-point source pollution. Clean Water Act Section 303(d) directs the State of California to list Water Quality Limited Water bodies (303(d)-listed streams) and develop total maximum daily loads (TMDL) to control the non-point source pollutant causing loss of beneficial uses.

In the State of California, the Central Valley, Lahonton and North Coast RWBs compile this information for each region. The information is then combined into a single report by the State Water Resources Control Board. The Safe Drinking Water Act and its 1996 amendments require states to delineate public water sources, to determine potential sources of contamination, and to determine the most susceptible areas at risk for contamination. This project would comply with the standards and criteria determined by each of the three regional water quality boards.

Forest Service-Related Regulation

The regulatory framework of the Modoc is guided by federal laws and regulations as well as direction from three separate forest plans. In general, the applications of these three guiding documents are as follows: the Big Valley Sustained Yield Unit is managed under the 1991 Modoc National Forest Land and Resource Management Plan (Forest Plan). The Medicine Lake Highlands are guided by the Northwest Forest Plan and the rest of the Forest is administered under the Sierra Nevada Framework amendment of 2004. Forest plan direction is found in the 1991 Modoc National Forest Plan, the Sierra Nevada Forest Plan Amendment (SNFPA) of 2004, and the plan referred to as the Northwest Forest Plan (USDA Forest Service 1991). Each of these guiding documents has differing direction for riparian areas. Management direction for soils, found in these three guiding documents, focuses on maintaining soil productivity and the restoration and maintainance of the physical, chemical and biological integrity of the Forest's waters, as directed by the Clean Water Act. For consistency in the Noxious Weed Treatment Project, the Forest Supervisor determined that the Sierra Nevada Forest Plan Amendment Record of Decision direction for riparian-area management will be followed Forest wide, since it provides the highest level of protection to the aquatic resource.

To help restore and maintain these aspects of water-related resources, riparian conservation objectives (RCOs) and aquatic conservation strategy objectives (ACSOs) were developed to provide specific management direction. This approach also supports the Forest's mission to provide habitat for riparian and aquatic-dependent species as directed by the National Forest Management Act, Organic Act, and Safe Drinking Water Acts.

Maintenance of soil productivity is essential to sustaining ecosystems and is mandated by every act of Congress directing national forest management. Region 5 Forest Service Handbook 2509.18.2 (USDA Forest Service 1995a) establishes regional objectives for the soils management program. The Modoc Forest Plan directs that soil productivity be maintained by applying guidelines to areas where management prescriptions are applied and that, as a minimum, 85 percent of areas affected by soil-disturbing activities will not exceed soil property thresholds, as defined in guidelines A-G. (Modoc National Forest Plan pages 4-21 to 4-22).

Methodology for Analysis

Design Standards were developed to ensure compliance with Region 5 direction, the Modoc National Forest Plan, the Sierra Nevada Framework, and the Northwest Forest Plan direction. Information used to develop these Design Standards include analysis of herbicide properties from SERA (Syracuse Environmental Research Associates, Inc.) risk assessments, soil characteristics and properties relative to herbicide properties and the proximity of treatment sites to streams. The acres to be treated under each Alternative by non-herbicide and herbicide methods, as well as types of herbicides used, were compared by Alternative.

Herbicide degradation in the environment is tied strongly to soils. The analysis focuses on herbicide application since this is the highest risk of the Proposed Actions. Main topics compared across the Alternatives are (1) the risks to soil biology, (2) soil and water interactions, and (3) vegetation cover and soil erosion.

The Forest Service has a contract with Syracuse Environmental Research Associates, Inc. (SERA) to conduct human health and ecological risk assessments. These assessments are for herbicides that may be proposed for use on National Forest System lands. The information contained in this report, and in the FEIS, relies on these risk assessments. Herbicide effects to stream aquatic resources were analyzed in risk assessments for each of the five herbicides included in the Alternatives. The risk assessments considered worst-case scenarios including accidental exposures and application at maximum reported rates. Although the risk assessments have limitations (see R6 2005 FEIS pages 3-95 through 3-97, and the Human Health section of the Modoc Invasive Weed FEIS), they represent the best science available.
The GLEAMS (Groundwater Loading Effects of Agricultural Management Systems) model examines the fate of herbicides in various soils under a variety of environmental conditions. This model was used for all the Forest Service SERA risk assessments. This is a well-validated model for herbicide transport and is the best available at this time. The SERA Risk Assessment analysis takes the herbicide concentration provided by GLEAMS and uses them in a dilution model for a stream or pond to get the water contamination rates for specific scenarios. The risk assessment model assumes broadcast treatment along a small perennial stream. The model ran a 10-acre square field as well as a treatment area modeled as 50 feet wide and 1.6 miles long (10 acres). The model also assumes even rainfall every 10 days. The herbicide concentration was very similar for both scenarios. Modeling 10 acres along a stream would overestimate herbicide in streams on the Forest as no broadcast of herbicide is proposed anywhere, and no herbicide distances are required on streams, which vary by Alternative. The SERA worksheets were adjusted for the application rates to be used under this project. While the parameters do not always accurately reflect parameters at treatment sites, using this approach is considered conservative because the infestations are scattered, streams have specific no-herbicide application distance Design Standards, and broadcast applications are not allowed.

For two sites, the GLEAMS-Driver 1.8 model was used because it allows the user to input more site-specific data, particularly local climate data and treatment acreage. The model is conservative and probably overestimates herbicide concentrations because it assumes broadcast application along a stream as opposed to the targeted treatment proposed with this project.

The risk assessments, interdisciplinary team discussions, and monitoring studies of herbicide use in forested areas were used to create Design Standards, particularly for no-herbicide application distances from surface water, to protect streams from potential adverse effects of treatments.

Affected Environment for Soil and Water Resources

Climate

The climate for most of the Forest ranges from warm, dry summers to cold moderately wet winters. Weather varies considerably with elevation, slope, aspect, and season. Winters are marked by the occurrence of frequent low-pressure systems and cooler temperatures reflect the influence of maritime polar air. Precipitation tends to be lighter on the Modoc Plateau, increasing in amount in the mountain areas and falls mainly as snow. Precipitation tends to taper off after March, as the flow pattern of storms shifts to the north, resulting in warm summers with light precipitation (USDA Forest Service 1983).

These patterns are reflected in the mean precipitation for Alturas, California. Mean precipitation is highest between the months of November through March, where the average precipitation is greater than 1 inch per month. The average annual precipitation is 12.2 inches per year. Correspondingly, the warmest months, which range from June through September, have the lowest precipitation averages for these months. During these months, the precipitation averages between 0.24 inches per month to a high of 0.99 inches per month (http://forest.moscowfsl.wsu.edu/cgi-bin/fswepp/rc/copypar.pl). Rainfall intensities vary from low to moderate. Rainfall intensities may vary from 1.4 to 3.0 inches for a two-year, 24-hour storm event, although the amount varies across the Forest (USDA Forest Service 1983).

Geology

The geology on the Forest has been influenced predominantly by faulting, volcanic activity, and erosion. From 60 million years ago to the present, the area has experienced volcanic activity. The Forest's three major geomorphic provinces evolved from these dominating geologic processes. The provinces are: the Cascade Range, Great Basin and Modoc Plateau (USDA Forest Service 1983).

The Cascade Range province is dominated by the Medicine Lake Highlands, which is a broad shield volcano, and considered to be active. It is currently among the top five candidates in California for future activity. Cinder cones are common and the associated bedrock is dominated by andesitic flows and pyroclastics. In recent geologic time, there has been additional activity resulting in domes and flows of rhyolitic obsidian, rhyodacites, and rhyolitic pumice. Basaltic lavas are also present, comprising a series of flows, such as the Modoc Basalt, Burnt Lava, and Black (Callaghan) and Point Pot Crater flows.

The Modoc Plateau province is relatively flat and the monotonous central portion of the survey area is called Devil's Garden. The area is capped by fissure erupted basalts that range in age from 25,000 to 20 million years ago and andesitic volcanic rocks are also present. Geologically recent basaltic cinder cones are scattered across the Plateau, and are generally associated with northwest-southeast trending faults.

The Basin and Range province is located around the Warner Mountain area, and reflects the extreme western extent of this province. Warner Mountain is formed by a westward-tilting fault block. Bedrock in this area is almost entirely volcanic in origin. Pyroclastics dominated the majority of the mountain range, with minor amounts of andesite and basalts, obsidian flows, rhyolitic rocks, volcanic mudflows and welded tuffs occurring. Sedimentary rocks of volcanic origin are present; glacial deposits may exist but have been difficult to identify. The Adin Mountains are also present in this province and represent a series of anticlines and synclines, which have been dissected by faults (USDA Forest Service 1983).

Soils

There are approximately 2 million acres of soils mapped within the Modoc National Forest. These soils have been grouped into 22 map units, each of which consists of numerous individual soils and a wide variety of land types (USDA Forest Service 1983). These soils reflect the region's ongoing volcanogenic history, and are derived primarily from basalts, andesite, tuff, pyroclastic pumice, cinders and volcanic ash, of various ages; although some other parent material is present.

Map units defined during soil mapping on the Forest, in the early 1980s, were grouped into seven general assemblages, reflecting differing landscapes and land capabilities. These assemblages and their characteristics are summarized below in Table 3-3, from the Modoc Soil Survey dated 1983.

Based on a review of Table 3-3, it is obvious that the parent material for soils on the Forest is volcanogenic in nature. Soils in the vicinity of the Warner Mountain Ranger District are generally more erosive then elsewhere on the Forest due to recent geologic uplift of area. On the Basalt Plateau, silica duripans are found under shallow soils in this area. Where these shallow soils directly overlie the underlying basalts, the duripans, once they are well developed, thick and highly cemented, function as a barrier to water moving from the soil horizon into the groundwater table

The seven general assemblages in Table 3-3, reflecting differing landscapes and land capabilities have been further subdivided into over 100 soil types and grouped into 207 soil mapping units (USDA Forest Service 1999). Within this survey, soils of concern were identified based on a soil's depth to bedrock, soil internal drainage, and permeability. Soil infiltration is a measurement of how quickly water can infiltrate into the soil from the surface, and soil drainage is a measurement of how quickly water can move through the soil profile. Soil permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Soil drainage is a measurement of the frequency and duration of periods of saturation or partial saturation during soil formation (Adams 2007a). A sensitive soil is defined as a soil with soil permeability of "moderately rapid" or greater, or soil drainage of "somewhat excessively drained" or greater.

Soils with the following characteristics were defined as of concern:

- Soils with a lithic or para-lithic contact (soil depth of less than 12 inches to bedrock) or a soil with a depth to bedrock of less than 20 inches. These soils are defined as "shallow"
- Soils with moderately rapid to rapid permeability
- Soils with ratings of somewhat excessive to excessive soil drainage
- Soils having maximum erosion hazard ratings of high to very high, and those with a runoff potential rating of high to very high.
- Those areas classified as rubble lands, lava fields and rock outcrops, due to high incidences of fracturing.

Table 3 - 3. Summary of map units and soil families on the Modoc National Forest

Map Unit	Soil Families	Parent Material	Geomorphic Position	Permeability Range	Maximum Erosion hazard Potential
Lower Elevation Predominantly Woodland Soils, Primarily 0-40% Slope	Lawyer-Elmore & Jacket-Deven-Hibner families	Basalt and volcanic tuff derived principally from basic igneous rock	Basalt plateaus and volcanogenic mountain uplands	Slow-Moderate	Low to High
Lower Elevation Rangeland soils, Primarily 0-40% slope	Bakeoven family-lava flow-Searles family; Puls-Indian creek-Simpson families; Deven-Bieber-Pass Canyon families; Gwin-Ruckles_Pass Canyon families; Supan-Los Gatos-Pass Canyon families; Deven-Keating-Pass Canyon families**	Basalt, cinder cones, tuff,	Basalt plateaus and volcanogenic mountain uplands	Very Slow to Moderately Rapid	Low to High
Predominantly Nearly Level Alluvial Soils That are Subject to Flooding	Aikman-Cardon family	Volcanogenic sediments	Clay basins and drainages of basalt plateaus	Very Slow	Moderate
Lower to Mid Elevation Dominantly Woodland Soils Which Have formed in Relatively Recent Volcanic Parent Materials	Alcot-Sadie-Germany deep families; Alcot-Holland families, pumice overburden; Lava flow-Germany family-Lithic Xerumbrepts; Stonewell-Yallani families; Stonewell-Yallani-Inville families, pumice overburden	Volcanic ash, cinders and recent pyroclastic material, basalt or andesite	Old alluvial fans on basalt plateaus and volcanogenic mountain uplands	Moderately Rapid to Rapid	Low to High
Mid Elevation Soils on Gently Sloping to extremely Steep Mountains in the Eastern Half of the Survey Area	Smarts-DeMasters-Patio families; Bertag-Smarts-Cavanaugh families; Anatone-Bearskin-Merlin families	Basalts, andesites or tuff	Mountain uplands	Slow to Moderate Slow	Moderate to High
High elevation Nearly Level to extremely Steep Soils on the Medicine Lake Highlands and on the Warner Mountains	Divers-Lapine-Kinzel families; Behanin deep-Gralic-Loberg families; Cheadle-Supervisor-Behanin families	Andesite, basalt, tuff cinders or obsidian	Higher elevations on both the Medicine Lake shield volcano and the Warner Mountain range	Slow to Rapid	Moderate to High
Miscellaneous Areas with Little or No Soil Present	Lava flow rock-Rock outcrop; Water	Vesicular basalt flows or obsidian	Medicine Lake Highlands, east side of the Warner Mountain range; Medicine Lake, Clear lake Reservoir and Big Sage Reservoir	Not Applicable	Not Applicable

** Approximately 85% of the acreage involved in this map unit is composed of shallow soils overlying a silica duripan, or over basal or tuff bedrock (USDA Forest Service 1983).

There are 127 soil map units rated as sensitive and/or shallow. They comprise 1,226,588 acres, or approximately 60.4 percent of the area within the Forest. This information is summarized in Appendix A to this report. (Appendix A is part of the Watershed and Soils specialist report, found in Appendix T, Watershed and Soils, of this final EIS.)

Based on Best Management Practices Evaluation Program (BMPEPs) for a multitude of projects including grazing, road maintenance, fuels reduction, timber harvest and prescribed fire, soils on the Modoc National Forest are meeting R5 soil quality standards and Modoc Forest Plan objectives (USDA Forest Service 2004). Soils are in a natural condition, with soil loss not greater than the soil quality standards and within acceptable levels as specified in the Modoc Forest Plan.

Soil Conditions within Treatment Areas

A GIS query of known weed occurrences in relation to the Forest Activity Tracking System (FACTS) data was completed. The analysis determined that over 90 percent of known weed locations are found within one-quarter mile of roads. These areas have highly disturbed soil conditions. Disturbance typically includes the loss or mixing of surface organics and mineral soil into subsurface mineral soil horizons. This is often due to soil displacement, and/or altered soil structure and porosity, as a result of mineral soil compaction. Conditions affecting vegetative growth, such as available moisture holding capacities and soil porosity, are likely to also have been altered. Because many invasive plants prefer disturbed sites, this creates conditions in which invasive species are able to out-compete native species.

Table 3 - 4. Range of size in invasive plant sites within the Modoc National Forest Boundaries

Size of Infestation	No. of Invasive Plant Sites	Percent of Inventoried sites
Less than 1 acre	652	94
1 to 5 acres	27	27
5 to 10 acres	6	<1
10 to 50 acres	8	<1
50 to 100 acres	0	<1
More than 100 acres	3	<1
Total	**696**[1]	**100%**

[1] Includes private lands

Ninety-four percent of the areas in which invasive species occur on the Modoc National Forest are less than 1 acre in size. The largest defined area of noxious weeds on the Forest is 5,657.8 acres infested with dyer's woad.

Infested sites not along roads can include areas burned by fires and areas where streams have acted as a corridor for movement of plants downstream. Burned areas lack plant cover, generally include disturbances from heavy equipment creating firebreaks, and can have changed soil properties from soil heating. Where streams have acted as a corridor for movement of invasive plants downstream, soils are fairly undisturbed.

As discussed above, there are approximately 2 million acres of soils mapped on the Modoc National Forest. Approximately 64 percent, or 1, 273, 954 of these acres, have soils that contain either a sensitive or shallow soil component. The known or identified noxious weed sites occur on 0.5 percent of the shallow and sensitive soils found on Forest (Adams 2007a).

Effect of Invasive Plants on Soils

Invasive plants can alter soil properties such as pH, nutrient cycling, and changes in composition or activity of soil microbes. Reductions in soil nutrient levels make it difficult for native plants to

compete with the invasive plants, and probably affect the soil biotic community health. However, the long-term effects of these changes are not known (USDA Forest Service 2006). As shown in Table 3-4, 94 percent of the sites are less than an acre, 27 percent are between 1 and 5 acres, and less than 1 percent are greater than 5 acres. See Appendix B of the Modoc Noxious Weed FEIS for more details on existing sites.

Soil and Water Interactions

Water infiltration rates and volumes can be reduced on weed-infested sites due to reduced cover (DiTomaso 2000). Significantly greater surface water runoff, indicating less infiltration, has been measured from spotted knapweed-dominated sites compared to adjacent native grass-dominated sites (Lacey, Marlow, and Lane 1989). Compaction, which is present in many weed-infested sites, also tends to reduce infiltration rates. Reductions in soil organic matter can also reduce the amount of water held in the soil profile, especially near the surface (Brady and Weil 1999, Tisdall and Oades 1982).

Vegetative Cover

Total vegetative cover may be reduced on weed-infested sites from that provide by native vegetation and can result in higher evaporation from exposed mineral soil on the surface (Lauenroth, et al. 1994). Soil water stored deeper in the profile may also be depleted more rapidly on sites where vegetative cover provided by weeds is dense and associated transpiration rates are high (Olson 1999).

Soil Erosion

Weed-infested soil has been shown to be more susceptible to erosion than soil occupied by native grass species (Lacey, Marlow, and Lane 1989). Soil erosion in a simulated rainfall test more than doubled in spotted knapweed-dominated rangeland areas when compared to natural bunchgrass/forb grasslands. This is primarily due to significantly lower infiltration rates and higher levels of bare ground on the knapweed-dominated site compared to the uninfested areas (ibid.).

Weeds are less able to dissipate the kinetic energy of rainfall, overland flow, and wind that cause soil erosion, primarily due to the loss of cover provided by native species on site (Torri and Borselli 2000, Fryrear 2000).

Soil Biota

Plants and mycorrhizal fungi are strongly dependent on each other, and species of fungi are associated with specific plants. Presence of non-native plants also leads to changes in the mycorrhizal fungus community (ibid.). These changes could increase the difficulty of reestablishing native vegetation after the invasive plants are removed.

Soil Nutrient Availability

Noxious weeds directly limit nutrient availability by out-competing native species for limited soil resources. Weeds have high nutrient uptake rates and can deplete soil nutrients to very low levels, especially in cases where weed species germinate prior to native species and exploit nutrient and water resources, before native species are actively growing (Olson 1999).

Spotted knapweed has been implicated in reducing available potassium and nitrogen (Harvey and Nowierski 1989). Potassium, nitrogen, and phosphorous levels were shown to be 44, 62, and 88 percent lower, respectively, in spotted knapweed-infested soil than in adjacent grass covered soil

(Olson 1999). Some invasive plants are allelopathic to other plants, and produce secondary compounds that can directly increase the population of soil microbes capable of metabolizing this compound, while decreasing the populations of other microbes (ibid.). Allelopathic is defined as suppression of growth of a plant by a toxin released from a nearby plant of the same or another species.

These changes will affect the soil food web and nutrient cycling, and may have impacts on the native plant community. Weed-infested areas may also indirectly limit nutrient availability as a result of soil erosion from compacted conditions or reduced effective cover. Erosion selectively removes organic matter and the finer sized soil particles that store nutrients for plant use, leaving behind soil with a reduced capacity to supply nutrients.

Water Resources

Overall Watershed Conditions

Stream surveys and stream condition assessments have been conducted since the completion of the 1991 FEIS and Forest Plan for the Modoc National Forest. Stream surveys and condition assessments have been completed for other analyses from 1995 to the present, both at the project level and cumulative effects levels. Based on gathered information, and the completion of the Modoc NF Watershed Condition Assessment (2001), Forest watersheds are hydrologically stable, with isolated stream reaches that have bank erosion, due to the effects of activities related to Forest management. These reaches were noted to have sustained periods of flow. In addition, review of data mentioned above indicates the majority of streams are considered to be in proper functioning condition (PFC) (Brady and Weil 1999).

Water quality and riparian condition are the two elements potentially affected by invasive plant treatments. The approximately 6,908.4 acres of invasive plants identified for treatment are scattered across the Forest in 29 of 39 5th-field watersheds. Of the 6,908.4 acres identified as having invasive plants, 136.5 acres, or 1.4 percent, are located within areas identified as part of critical aquatic refuges. An additional 2.8 percent of the acres infested with noxious weeds are located within riparian conservation areas.

Water Quality

As stated on page 3, water quality in California is regulated by the Clean Water Act and the Regional Water Boards (RWBs) identify and establish beneficial uses for surface and groundwater. Each RWB has developed water quality control plans, also known as basin plans, which provide the basis for protecting water quality in the state of California. Included in each plan are water quality objectives, which the RWB has determined will ensure reasonable protection of beneficial uses identified by the RWB for surface and groundwater (http://www.waterboards.ca.gov/northcoast/programs/basinplan/basin.html).

The three RWBs that include various parts of the Modoc National Forest include the Central Valley Regional Board in areas that drain to the Pit River, the North Coast Regional Board in Klamath Basin lands, and the Lahontan Regional Board in Great Basin lands (Figure 2).

By direction of the Clean Water Act, where water quality is limited, state agencies develop total maximum daily load (TMDL) plans to improve water quality to support the beneficial uses of water. For water-quality-limited streams on National Forest System lands, the Forest Service provides information, analysis, and site-specific planning efforts to support State processes to protect and restore water quality.

The most recent listing was approved for the state of California in 2002, which compiles all the information from each regional water board[3]. GIS data from the State was downloaded and reviewed in context of the Forest boundary and defined areas of noxious weed concentrations. No impaired stream reaches were found to be within defined noxious weed sites on the Forest.

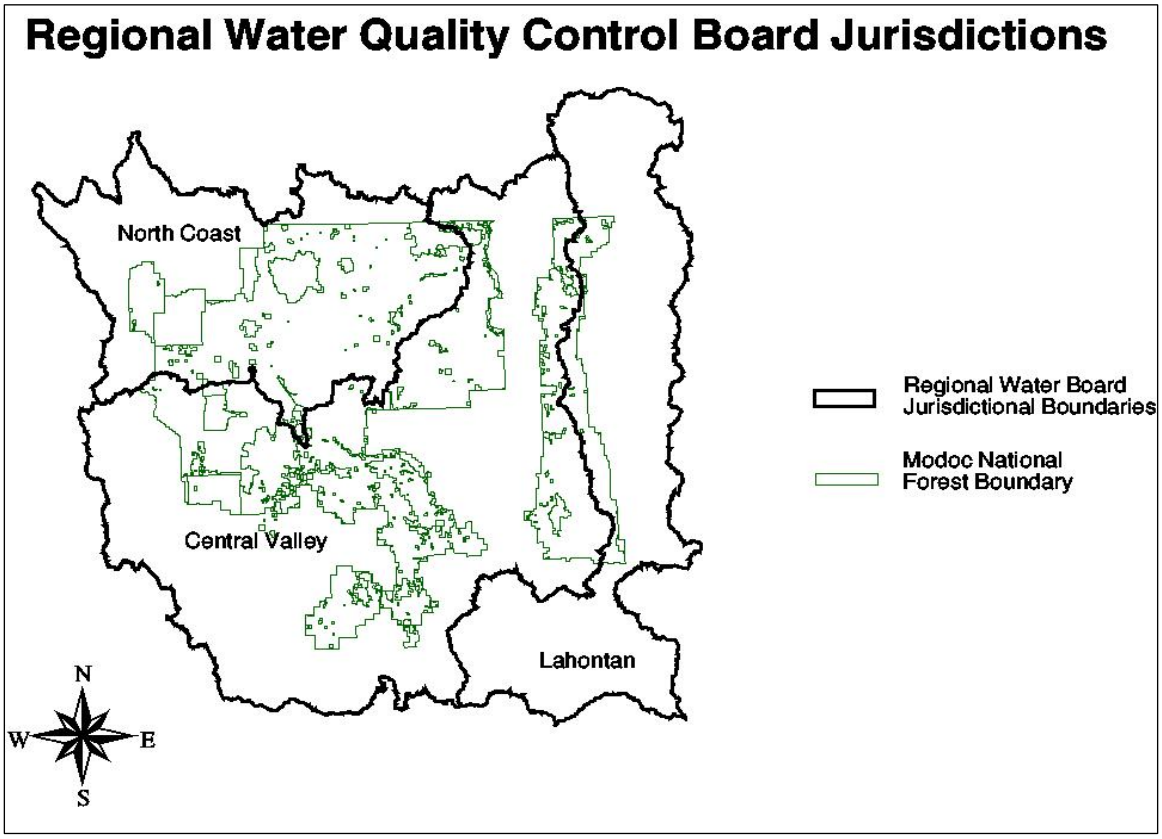


Figure 3-2. Regional Water Quality Control Boards and Their Jurisdictions on the Modoc NF

Water Quantity and Timing

There are approximately 5,922.2 miles of stream within the boundaries of the Modoc National Forest. Of these, 3,229.3 miles are seasonally flowing, which equates to 55 percent of the total stream miles within Forest boundaries. Approximately 36 percent, or 2,114.9 miles, are seasonally flowing, and 9 percent of the stream miles, or 578 miles, are perennial. The majority of the seasonally flowing streams flow during spring snowmelt, and are predominantly dry in later summer and fall. The exception is that flow can occur following a major precipitation event (Adams 2007a).

Twenty of the 39 watersheds involved with the Forest produce a cumulative annual yield of 565,800 acre-feet of water per year. This does not include water yield from private lands found with the Forest boundary (USDA Forest Service 1999).

The amount of water that runs off these watersheds is related to the type of precipitation events (snowmelt versus rainfall) and rainfall intensity. High-intensity and short-duration summer

[3] http://www.waterboards.ca.gov/rwqcb5/water_issues/tmdl/impaired_waters_list/index.html

storms have a tendency to yield more runoff than fall and winter storms. As the runoff increases, so does the energy to erode hillsides and transport sediment to the stream network.

Channel Morphology

Stream surveys and stream condition assessments have been conducted on selected perennial streams on the Forest. Specified and approved stream survey protocols have been used to complete stream condition assessment, including stream condition inventory (SCI), Pfankuch ratings, and proper functioning condition (PFC).

The results of stream condition assessments indicate that the majority of streams surveyed are considered to be "in equilibrium" with their geomorphic setting and are considered to be in proper functioning condition. Some channels are considered to be "functioning at risk" due to land management activities on the Forest based on their PFC ratings. Hardcopies of data collected from 1995 to the present are on file at the Forest Supervisor's office in Alturas, California (Adams 2007b).

Those streams that are in the functioning-at-risk category are considered to be affected by site-specific disturbances. Localized disturbances are more related to site-specific impacts from logging and related infrastructure, such as landings, temporary roads, and skid trails. Additional causes of site-specific disturbances included livestock grazing, road construction, and wildfire (Adams 2007a).

Riparian and Wetland Conditions

Native riparian vegetation plays a key role in forming aquatic habitat for fish and other aquatic species. Roots help stabilize stream banks, preventing accelerated bank erosion and providing for the formation of undercut banks, important cover for juvenile and adult fish. Riparian areas with native vegetation supply downed trees (large wood) to streams. Riparian vegetation stabilizes stream banks, and serves as a filter to prevent the runoff of soil into streams. Riparian vegetation also provides large and small wood to streams, adding to habitat complexity, and providing cover and food sources for aquatic organisms. Aquatic ecosystems have evolved with certain vegetation types; invasive plants do not necessarily provide similar habitat.

The 1991 FEIS to the Modoc Forest Plan states that there were almost 19,000 acres of riparian area found on the Forest. It states that 13, 473 of these acres were adjacent to streams, 2, 803 acres adjacent to springs and seeps; 122 acres adjacent to lakes and 2,583 acres were adjacent to wet meadows. The FEIS indicates that approximately 60 percent of riparian areas were located in the Warner Mountain District, with 20 percent in the Devil's Garden District, and only 10 percent each on the Big Valley and Doublehead Districts. Five hundred fifty-two miles of stream were found to contain riparian habitat. Riparian vegetation was described to consist of three primary types: grass-forb understory with a willow midstory and no overstory (which was defined as the most common); a grass forb understory with no midstory or overstory (generally associated with wet meadows); and a conifer overstory with mixed-deciduous midstory and an understory, associated with perennial streams, particularly at high elevations (USDA Forest Service 1999). The FEIS also states that at the time of publication there was approximately 233 wetlands covering approximately 35,000 acres of Forest Service administered lands.
The 2004 amendment to the Sierra Nevada Framework defines two areas of interest: riparian conservation areas and critical aquatic refuges. Riparian conservation areas (RCAs) are defined areas buffering streams.

The delineations of Riparian Conservation Area for this FEIS from the Sierra Nevada Forest Plan Amendment FEIS Record of Decision (USDA Forest Service Pacific Southwest Region 2004 p.42) are as follows:

Perennial Stream RCA: 300 feet on each side of the stream, measured from the bank full edge of the stream.

Seasonally Flowing Stream RCA (includes intermittent and ephemeral streams): 150 feet on each side of the stream, measured from the bank full edge of the stream

Special Aquatic Feature RCA (includes lakes, wet meadows, bogs, fens, wetlands, vernal pools, and springs): 300 feet from edge of feature or riparian vegetation, whichever width is greater.

For this FEIS, the terms RCA and Streamside Management Zone (SMZ) are interchangeable. See definition of Streamside Management Zone in the glossary.

The primary role of Critical Aquatic Refuges (CARs) is to preserve, enhance, restore or connect habitats for aquatic or riparian dependent species at the local level and to ensure the viability of these species. In many cases, CARs support the best remaining populations of native fish, amphibian, and plant species whose distributions have been substantially reduced elsewhere in the Sierra Nevada. CARs primarily protect occupied habitat of threatened, endangered, or sensitive animal species.[4]

Since the 2004 direction applies to this project, acreages for CARs and RCAs were determined at the time of this report being written. Based on currently available GIS data, analysis determined that there are approximately 127,716 acres of defined CARs within the Forest, 226,693.7 acres of RCAs associated with streams, and 117, 285.9 acres associated with meadows, lakes and springs. Wetlands are often used for recreation and are at risk from invasive plants, such as knotweeds that colonize areas downstream of the original infestation along a stream. Wetlands can be inundated with water year-round, and others are wet only seasonally. Areas that are wet only seasonally can be infested with upland species as well as those species adapted specifically to wetland areas.

Existing conditions for CARs and RCAs were documented in the FEIS for the Forest Plan. It indicated that in the past, logging practices, road construction, and improper grazing practices contributed to riparian and wetland area degradation. Forest riparian areas were described as generally lacking the desired vegetation expressions to achieve overall management objectives. Riparian areas were noted to not have improved where livestock grazing was season long and where few or no structural improvements had been made. However, from 1995 to the present, surveys have been completed and a WSA completed. Results indicate that a majority of streams surveyed were considered in proper functioning condition (PFC). Watersheds are considered hydrologically stable. However, isolated reaches were noted where there was stream bank erosion or other types of site-specific disturbance are present. Periods of elevated stream flow were also noted (Adams 2007b). Where riparian vegetation is present and that reach has been documented as in PFC, riparian also would be considered in PFC. Data is on file at the Supervisor's Office in Alturas, California.

Lakes and Floodplains

Lakes and floodplain areas are often popular for recreation. As a result, these areas are at risk from invasive plants brought in by visitors, as plant parts and seeds can be carried downstream of the original infestation at high flows.

There are numerous lakes and reservoirs that total an estimated 18,115.6 acres, based on current GIS data. GIS layers of floodplains were not available for the Forest and they are not discussed in

[4] http://www.fs.fed.us/r5/rsl/projects/frdb/layers/cars.html

the Forest Plan. However, perennial streams of lower gradients often have floodplains associated with them.

Existing-condition information for lakes and floodplains is absent in the 1991 FEIS. However, as discussed above, data has been collected from 1995 to the present and the Watershed Condition Assessment for the Modoc National Forest was completed by Sue Becker et al. in 2000. Watersheds are considered hydrologically stable, and many stream reaches are in PFC.

For those stream reaches involving watersheds that have received a PFC rating, it can be inferred that their floodplains are functioning properly. Data is on file at the Supervisors Office in Alturas, California.

Municipal Watersheds and Domestic Water Supplies

A municipal supply watershed is one that serves a public water system as defined in Public Law 93-523 (Safe Drinking Water Act) or as defined in State safe drinking water regulations. No formal municipal watersheds or whole communities use water on-Forest. There are, however, several domestic water users scattered throughout or downstream from the Forest on numerous streams (USDA Forest Service 1991). While not a formal municipal watershed, the Fort Bidwell Indian Community gets drinking water from an area on National Forest System land. Through formal consultation with the Fort Bidwell Indian Community Council (April 6, 2006), the Forest agreed not to use herbicides to treat noxious weeds in the area of concern that supplies the community with drinking water. This area of concern is depicted on the map in Appendix N of the Noxious Weed FEIS. At this time, noxious weeds have not been identified in this area of concern. Further consultation would continue to identify suitable treatment methods under Early Detection-Rapid Response if sites are identified in the future.

Alturas is the only incorporated town in Modoc County that is adjacent to the Forest boundary. The water supply for Alturas comes from groundwater wells. Neither the State Water Resources Control Board nor the Central Valley and North Coast Regional Waterboards identify any municipal watersheds on the Forest.

The California Department of Water Resources (DWR) sampled for herbicide contamination in the Pit River near Alturas, California. The results of the water quality monitoring for the years of 2001 to 2005 is summarized below in Table 3-5. The results of the monitoring shows that while Glyphosate, Tricloypr, 2, 4-D and Dicamba were found in the water samples for the Pit River and the North Fork of the Pit River, none of the samples exceeded the “reporting limit”. The reporting limit triggers a report by the sampling agency to the EPA via the State or Regional Water Boards.

Table 3 - 5. Result of Water-Quality Monitoring on the Pit River (Lebeouf 2005)

Monitoring Results: 2001 through 2005-Pit River, North Fork, Station # A1210000			
Chemical	**Reporting Limit (ug/L)**	**Results Reported**	**Did the sample exceed the Reporting Limit?**
Dicamba	<0.1	<0.1	N
Glyphosate	<25	<25	N
Tricloypr	<0.1	<0.1	N
2, 4-D	<0.1	<0.1	N

Roads

GIS analysis of known weed occurrences showed that over 90 percent of known weed occurrences are found along roads. In conducting the analysis, a distance of 1,320 feet (1/4 mile) was analyzed along system roads.

For this project, roads within Riparian Conservation Areas are considered hydrologically connected to streams. The total number of miles of forest road, user-created roads, and railroads within the project area totals an estimated 3,900 miles, based on current GIS. In RCAs associated with streams, there are an estimated 578.0 miles of road, or 15 percent of the total road miles. In RCAs associated with springs, lakes, and reservoirs, there are an estimated 248.3 miles or 6.4 percent of the total road miles. Miles of road within noxious weed polygons, on the forest, total 26.6 miles, which is less than 1 percent of the total road miles.

Water Resources within Riparian Conservation Areas and Critical Aquatic Refuges

Invasive Plants within Riparian Conservation Areas and Critical Aquatic Refuges

Tables 3-6 and 3-7 (below) show acres of invasive plants within RCAs and CARs of both perennial and seasonally flowing streams. None of these species is considered specifically riparian. Canada thistle can be found in riparian areas as can Scotch thistle and spotted knapweed. Scotch thistle and spotted knapweed can also be found in wet meadows. The other noxious weed species listed in Tables 3-6 and 3-7 are generally forest and upland species. However, spotted knapweed may be found in both moisture loving areas and more forested and upland settings.[5]

Canada thistle, spotted knapweed and Dalmatian toadflax have either all or most of their acreage within RCAs associated with perennial streams. dyer's woad, Klamathweed, musk thistle, and Scotch thistle have most of their acreages within RCAs associated with seasonally flowing streams (Tables 3-6 and 3-7).

Table 3 – 6. Documented Invasive Plant Acres Within RCAs on the Modoc National Forest

Primary Invasive Plant	Acres within Perennial Stream RCAs	Acres within Seasonally Flowing Stream RCAs	Total Acres in RCAs
Canada Thistle	1.2	7.7	8.9
Crupina	5.8	29.3	35.2
Dalmatian Toadflax	23.9	32.2	56.1
Diffuse Knapweed	1.2	1.1	2.3
Dyer's Woad	3.7	16.3	20.0
Klamathweed (St. Johnswort)	0.1	0.5	0.6
Mediterranean Sage	4.7	0.8	5.5
Scotch Thistle	3.8	27.7	31.4
Spotted Knapweed	1.1	0.1	1.2

[5] http://www.cal-ipc.org/ip/inventory/weedlist.php

Primary Invasive Plant	Acres within Perennial Stream RCAs	Acres within Seasonally Flowing Stream RCAs	Total Acres in RCAs
Yellow Starthistle	1.1	0.0	1.1
Musk Thistle	0.0	0.4	0.4
Total	46.6	116.1	162.7

There are three critical aquatic refuges on the Forest. Mill Creek 1 has no identified invasive weed sites. The sites within riparian areas of Goose Lake and Turner Creek CARs are shown below in Table 3-7.

Table 3 - 7. Documented Invasive Plant Acres Within CARs on the Modoc National Forest

Primary Invasive Plant	Perennial Stream Acres within Goose Lake CAR	Seasonal Stream Acres within Goose Lake CAR	Seasonal Stream Acres within Turner Creek CAR	Total Acres within CARs	% Acreage Associated with Perennial Streams	% Acreage Associated with Seasonal Streams
Canada Thistle	0.2	0.0	0.0	0.2	100.0	0.0
Dalmatian Toadflax	23.9	19.1	0.0	43	55.6	44.4
Dyer's woad	0.1	12.2	0.0	12.3	0.8	99.2
Klamath Weed	0.0	0.0	0.1	0.1	0.0	100.0
Musk Thistle	0.0	0.0	0.3	0.3	0.0	100.0
Scotch Thistle	0.1	0.7	0.1	0.9	11.1	88.9
Spotted Knapweed	0.1	0.0	0.0	0.1	100.0	0.0

While most invasive plants first occupy disturbed sites, once established, any of these species can begin to invade undisturbed sites (Stohlgren et al. 1999).

Noxious weed acreage comprises 0 - 2.3 percent of the area of 5th-field watersheds (Table 3-8). Twenty-eight out of 39 5th-field watersheds involved within the Forest's boundary, or 71 percent, have some acreage involved with noxious weeds. However, only two watersheds or 0.05 percent of the total number of watersheds, have acreages totaling greater than 1 percent of the 5th-field watershed's total acreage (table3-8). For Copic Bay watershed, the large percentage of infestation is due to the large dyer's woad site, which consists of 5,676.5 acres. For Round Valley watershed, the large percentage of infestation is due to the Common Crupina site that is on both public and private land.

As treatments under this project would take place only on National Forest System lands, watershed involvement was reassessed by considering only those acres within the Forest boundary. When considering only those lands within the Forest boundary, by 5th-field watershed, then only the Copic Bay watershed has greater than 1 percent of its land infested with noxious weeds. This is due to one large dyer's woad-infested site.

Temperature - While invasive plants may provide some shade, they are replacing native forbs and grasses that are better bank stabilizers and promote narrower and deeper channels. Stable banks tend to provide more shade and consequently keep stream water temperatures lower.
Sediment - There are 8.8 acres of spotted knapweed and 4.1 acres of diffuse knapweed identified for treatment on the Forest. There are 1.1 acres of spotted knapweed within RCAs associated

with perennial streams and 0.1 acre within RCAs associated with seasonally flowingstreams. Diffuse knapweed acreage is not associated with either RCAs or CARs. Lacey et al. (1989) reported higher runoff and sediment yield on sites dominated by knapweed versus sites dominated by native grasses.

Table 3 - 8. Acres Infested by Invasive Plants for Whole 5th-Field Watersheds

5th-field Watershed Name	Hydrologic Unit Code	Acres	Infested Acres	Percentage of Entire 5th-field Watershed Infested
Ash Valley-Cottonwood Creek	1802000212	102250.9	9.8	0.0
Big Valley	1802000217	87632.0	3.0	0.0
Boles-Fletcher Creek	1801020401	216746.0	3.9	0.0
Canby-Pit River	1802000209	157640.0	28.8	0.0
Canyon Creek	1802000207	61749.4	0.4	0.0
Clear Lake	1801020403	143249.0	0.2	0.0
Clover Swale Creek	1802000208	57672.8	0.4	0.0
Copic Bay	1801020411	243169.6	5676.5	2.3
Goose Lake East Shore	1802000103	156132.8	133.3	0.1
Goose Lake West Shore	1802000104	96239.2	1.6	0.0
Horse Creek	1802000301	164558.4	3.5	0.0
Jess Valley	1802000201	64125.0	1.3	0.0
Juniper Creek	1802000216	50660.3	9.5	0.0
Lower Alkali Lake	1808000103	133914.8	0.1	0.0
Lower Ash Creek	1802000215	84393.1	3.7	0.0
Lower South Fork Pit River	1802000203	139538.5	0.3	0.0
Middle Alkali Lake	1808000102	240481.2	0.9	0.0
North Fork Pit River	1802000204	139287.9	2.7	0.0
North Fork Willow Creek	1801020402	90356.0	0.6	0.0
Rattlesnake Creek	1802000205	124105.7	0.8	0.0
Round Valley	1802000213	60382.3	770.1	1.3
Taylor Lake	1802000211	235602.2	883.7	0.4
Tule Lake Sump	1801020410	127974.8	0.1	0.0
Turner Creek	1802000210	49069.5	3.3	0.0
Upper Alkali Lake	1808000101	201463.6	19.8	0.0
Upper South Fork Pit River	1802000202	208686.0	6.4	0.0
Warm Springs Valley	1802000206	44037.9	28.5	0.1
Willow Creek	1802000214	49869.2	0.9	0.0

Table 3 - 9. Acres Infested by Invasive Plants for National Forest System Land by 5th-Field Watersheds

Fifth Field Watershed Name/Clipped to FS boundary	Hydrologic Unit Code	Watershed Acres	Infested Acres	Percent Watershed Within Forest That Is Infested
Ash Valley-Cottonwood Creek	1802000212	42543.0	9.8	0.0
Big Valley	1802000217	9554.3	3.0	0.0
Boles-Fletcher Creek	1801020401	216746.0	3.9	0.0
Canby-Pit River	1802000209	109690.8	28.8	0.0
Canyon Creek	1802000207	16276.8	0.4	0.0
Clear Lake	1801020403	109940.6	0.2	0.0
Clover Swale Creek	1802000208	41637.3	0.4	0.0
Copic Bay	1801020411	222634.5	5676.2	2.5
Goose Lake East Shore	1802000103	67613.9	133.2	0.2
Goose Lake West Shore	1802000104	49473.1	1.6	0.0
Horse Creek	1802000301	18440.0	3.5	0.0
Jess Valley	1802000201	64125.0	1.3	0.0
Juniper Creek	1802000216	33326.0	9.5	0.0
Lower Alkali Lake	1808000103	21967.9	0.1	0.0
Lower Ash Creek	1802000215	14842.0	3.5	0.0
Lower South Fork Pit River	1802000203	28964.5	0.3	0.0
Middle Alkali Lake	1808000102	41512.8	0.8	0.0
North Fork Pit River	1802000204	64273.3	2.6	0.0
North Fork Willow Creek	1801020402	62555.5	0.6	0.0
Rattlesnake Creek	1802000205	114438.0	0.8	0.0
Round Valley	1802000213	47791.3	182.5	0.4
Taylor Lake	1802000211	201380.3	878.8	0.4
Tule Lake Sump	1801020410	84210.1	0.1	0.0
Turner Creek	1802000210	49069.5	3.3	0.0
Upper Alkali Lake	1808000101	42668.0	17.4	0.0
Upper Lost River	1801020404	30723.4	2.0	0.0
Upper South Fork Pit River	1802000202	69890.0	2.3	0.0
Warm Springs Valley	1802000206	7665.1	3.0	0.0
Willow Creek	1802000214	33936.1	0.9	0.0

Channel Morphology and Riparian Condition

In the Forest, there are approximately 46.6 acres of noxious weeds associated with perennial streams, and 116.2 acres associated with seasonally flowing streams in RCAs. In CARs there are approximately 24.4 acres found associated with perennial streams in the Goose Lake CAR, while 32 acres are associated with seasonally flowing streams. In the Turner Creek CAR there is only 0.5 acre associated with seasonally flowing streams and there is no perennial stream association.

Native riparian vegetation plays a key role in forming aquatic habitat for fish and other aquatic species. Tree roots help stabilize stream banks, preventing accelerated bank erosion and providing for the formation of undercut banks, important cover for juvenile and adult fish. Riparian areas with native vegetation supply downed trees (large wood) to streams. In turn, downed trees in streams influence channel morphology characteristics such as longitudinal profile; pool size, depth, and frequency; channel pattern; and channel geometry. Turbulence created by large wood increases dissolved oxygen in the water needed by fish, invertebrates, and other biota. Invasive plants could slow down or prevent the establishment of native trees, decreasing or delaying the future supply of large wood in stream channels (USDA Forest Service 2005)

While invasive grasses and forbs would not directly replace riparian shrubs, in degraded areas where shrubs are no longer present, invasive plants can occupy sites and out-compete native vegetation, limiting opportunities for native shrubs to reoccupy the site.

Lakes and Wetlands

There are 153,187 acres of RCAs surrounding wet meadows, lakes, and springs. Within these areas, approximately 128 acres of invasive plants have been identified. Of these, approximately 66 are near lakes, 11 are near springs, and 40 are in meadows. Many of the lakes and springs are within the larger Dalmatian toadflax treatment area.

Table 3 - 10. Documented Invasive Plant Acres Within Lake, Spring, or Wet Meadow RCAs

Invasive Plant	Acres
Canada Thistle	10.8
Crupina	0.7
Dalmatian Toadflax	98.4
Dyer's woad	3.0
Klamath Weed	0.3
Mediterranean Sage	5.3
Musk Thistle	1.1
Scotch Thistle	8.3
Spotted Knapweed	0.0
Squarrose Knapweed	0.1
Yellow Starthistle	0.1
Total	128.0

General Watershed Function

Water temperature regimes promote recovery or enhancement of riparian vegetation. Management activities provide high levels of protection to streams, stream banks, riparian areas, and wetlands. Riparian areas in less than desirable condition have been improved to provide for riparian-dependent resources. These improvements have resulted from better control and

administration of livestock use in riparian areas, reduced timber harvest in forested riparian areas, and more roads being closed or obliterated.

Watershed and fisheries habitat improvement projects have been completed on priority streams, and riparian hardwood communities have been increased or reestablished. Bank stability, water quality, fish and wildlife habitat, recreation opportunities, and aesthetics have improved. Streamside vegetation is more diverse and abundant with native species. Any significant change in total stream flow or timing of high and low flow has primarily been a result of naturally occurring events and conditions.

Design Standards and Monitoring

Design Standards

Design Standards were developed for each of the proposed Alternatives. Design Standards are developed to reduce or eliminate impacts related to analysis issues and affected resources areas, and are incorporated as an integrated part of the Proposed Action and any action Alternatives.

While developing the Design Standards for the Proposed Action and the other action Alternatives, the following soil and water quality characteristics were considered:

- Soil permeability of moderately rapid to rapid (herbicide)
- Soil drainage of somewhat excessively drained to excessively drained (herbicide).
- Soil depth of less then 20 inches to bedrock when a silica duripan does not underlie the soil (herbicide).
- Unique or specialized land forms such as rubble land, rock outcrop, lava flows and saturated water tables (herbicide).
- Distance to High Water Mark of streams, lakes, ponds, springs and meadows from the application of herbicides
- Mobility of herbicides and considering the method of application within 100 feet of High Water Mark of streams, lakes, ponds, springs and meadows (herbicide).
- Maximum soil erosion hazard rating of high or very high and water runoff potential (herbicide and physical).

The Design Standards are listed in Tables 3-11 through 3-13. Alternatives 2 and 4 share the same Design Standards, while Alternatives 3 and 5 share similar Design Standards. The Design Standards for Alternative 6 apply to that Alternative alone, and Alternative 1 is the no-action Alternative. They are based on Best Management Practices (BMPs) that have proven to be effective under similar circumstances and conditions (Bakke 2001, USDA Forest Service 2004), and best available science. Implementation of Design Standards would be mandatory for the Alternative selected. This would ensure that treatments would have effects within the scope of analysis.

Table 3 - 11. Design Standards Pertinent to Soil or Water Resources Under Alternatives 2 and 4

Design Standard	Soil and Water Design Standard	Purpose of Design Standard	Source of Design Standard
DS-14	Water: Annually the amount of physical disturbance and/or herbicide application would be limited to no more than 15% of each 6th Field Sub-watershed.	To reduce the potential for indirect or cumulative effects to 6th field watersheds	Modoc Forest Plan Pg 4-22, S&G Soils #2
DS-15	The specified distances for perennial streams, lakes and special aquatic features is 300 feet and 150 feet for seasonally flowing streams, both of which are consistent with Riparian Conservation Areas as defined the Sierra Nevada Framework (SNF) ROD, 2001. For the Noxious Weed FEIS, the designated zone for all SMZs is the Riparian Conservation Areas (RCAs) on the Modoc National Forest. See the definition for Riparian Conservation Area in the glossary. Therefore, for the Noxious Weeds FEIS, the terms SMZ and RCA are interchangeable. For the purpose of noxious weed treatments, SNF RCA standards will apply forest wide. Within these prescribed RCAs, limited hand treatments may occur for a distance of 10 feet outward from the edge of the High Water Mark.	To protect water quality and stream health from the potential indirect and cumulative effects of proposed noxious weed treatment	Modoc Forest Plan as Modified by the 2002 Amendment to the Sierra Nevada Framework
DS-16	The RCAs will be maintained with 50% of the acreage of the RCA as undisturbed; disturbance will be limited to no more than 25% of the acreage of the inner half of the RCA.	To protect water quality, stream health and runoff patterns of the RCAs from potential indirect and cumulative effects related to proposed noxious weed treatments.	BMP 1.8 Designation of Streamside Management Zones BMP Stream Course and Aquatic Protection 1.19 (FSHB 2509.22)
DS-17	Water - RCA Treatments: Herbicide treatment within the Riparian Conservation Areas (RCAs) will be as follows: -From the High Water Mark outward to 10 feet, no herbicide use (only Physical Methods). -From a distance of 10 feet to the outer edge of RCAs for Seasonally Flowing or Perennial Streams, only Aquatic Glyphosate may be applied by wicking it onto the plant. -From the outer edge of RCAs for Seasonally Flowing or Perennial Streams, glyphosate, clopyralid, dicamba, and triclopyr may be applied. -2, 4-D will not be applied within 1,000 feet of the High Water Mark of Seasonally Flowing or Perennial Streams.	To protect water quality from the potential contamination of the water column from the application of those herbicides with the identified potential to move off site and adversely affect soil or water quality.	Developed via IDT discussion to tier to BMP 5.12: Streamside Wet Area Protection During Pesticide Spraying; 1, 000 ft distance from surface or live water developed in consultation with USFWS.
DS-20	Soils: Areas with bare soil resulting from noxious weed treatments that are greater than ¼ acre in size will be assessed for need for rehabilitation.	To provide guidance for assessing treated areas for rehabilitation	BMP 5-4: Revegetation of Surface Disturbed Areas Soil S&G E, Chapter 4 Modoc Forest Plan Regional Soil Quality Standards, FSHB 2509.18
DS-22	Annually the Forest Hydrologist, Watershed Specialist or Soil Scientist determines the location of the noxious weed occurrence to be treated to determine if the site to be treated is located on sensitive or shallow soils. If it is determined that the site to be treated contains sensitive or shallow soils then either DS 23 or 24 would be applied, depending on Alternative selected.	To provide guidance in protecting shallow and sensitive soils and water quality	BMP 5.7: Pesticide Use Planning Process; BMP 5-8: Pesticide Application According to Label Directions and Applicable Legal Requirements (FSHB 2509.22)

Design Standard	Soil and Water Design Standard	Purpose of Design Standard	Source of Design Standard
DS-23	Soils: On noxious weed sites identified as having sensitive soils and/or shallow soils, do not use herbicides with high leaching potential to treat noxious weeds.	To prevent or mitigate the incorporation of pesticides into groundwater	BMP 5.7: Pesticide Use Planning Process; BMP 5-8: Pesticide Application According to Label Directions and Applicable Legal Requirements (FSHB 2509.22)
DS-25	Soils: On those sites with soils identified as having a high or very high erosion potential or a rapid or very rapid risk to runoff do not use Physical and Physical+ methods to treat noxious weeds when the fire weather forecast for the next 24 hours states there is a likely chance of thunderstorms (generally 60-70% or greater as defined by the National Weather Service).	To protect Soil Quality Standards soil productivity and soil hydrologic function	Region 5 Soil Quality Standards FSHB 2509.18 S&G #1, Modoc Forest Plan Chapter 4
DS-29	Herbicides: When applying herbicides within RCAs, from the High Water Mark outward to a distance of 25 feet, all directed spray must be done in a downward direction. In addition, when the height of a weed is greater than 36 inches, the weed will be laid on the ground and sprayed in a downward direction. This will minimize herbicide drift and confine the herbicide to the drop zone of the individual weed plant being treated. Beyond 25 feet within RCAs and outside of RCAs, herbicides will be applied by on-the-ground applicators directly spraying or wicking the target noxious weed. Spraying will be done in a downward direction to the extent possible.	To control drift within the inner third of the RCA	BMP 5-12: Streamside Wet area Protection During Pesticide Spraying BMP 5-13: Controlling Pesticide Drift During Spray Application Modoc Forest Plan Water S&G's 1 and 2
DS-34	Control of Drift or Herbicide Migration: All herbicide application will follow EPA approved label directions in regards to control of drift of herbicides during spraying. These directions have specific wind speeds and air temperatures for application of each herbicide. In addition, applicators will utilize droplet size and spray pressure to insure droplets do not travel outside of the drip line target plant.	To control drift of herbicides	BMP 5-8: Pesticide Application According to Label Directions and Applicable Legal Requirements

Table 3 - 12. Design Standards Pertinent to Soil or Water Resources Under Alternatives 3 and 5

Design Standard	Soil and Water Design Standard	Purpose of Design Standard	Source of Design Standard
DS-14	Water: Annually the amount of physical disturbance and/or herbicide application would be limited to no more than 15% of each 6th Field Sub-watershed.	To reduce the potential for indirect or cumulative effects to 6th field watersheds	Modoc Forest Plan Pg 4-22, S&G Soils #2
DS-15	The specified distances for perennial streams, lakes and special aquatic features is 300 feet and 150 feet for seasonally flowing streams, both of which are consistent with Riparian Conservation Areas as defined the Sierra Nevada Framework ROD, 2001. RCAs contain Streamside Management Zones (SMZs) which are defined in the 1991 Modoc Land and Resource Management Plan. Within these prescribed RCAs, limited hand treatments may occur for a distance of 10 feet outward from the edge of the High Water Mark.	To protect water quality and stream health from the potential indirect and cumulative effects of proposed noxious weed treatment	Modoc Forest Plan as Modified by the 2002 Amendment to the Sierra Nevada Framework
DS-16	The RCAs will be maintained with 50% of the acreage of the RCA as undisturbed; disturbance will be limited to no more than 25% of the acreage of the inner half of the RCA.	To protect water quality, stream health and runoff patterns of the RCAs from potential indirect and	BMP 1.8 Designation of Streamside Management Zones BMP Stream Course and

Design Standard	Soil and Water Design Standard	Purpose of Design Standard	Source of Design Standard
		cumulative effects related to proposed noxious weed treatments.	Aquatic Protection 1.19 (FSHB 2509.22)
DS-20	Soils: Areas with bare soil resulting from noxious weed treatments that are greater than ¼ acre in size will be assessed for need for rehabilitation.	To provide guidance for assessing treated areas for rehabilitation	BMP 5-4: Revegetation of Surface Disturbed Areas Soil S&G E, Chapter 4 Modoc Forest Plan Regional Soil Quality Standards, FSHB 2509.18
DS-21	Soils: Areas with bare soil created by the treatment of noxious weed, the site would be evaluated for rehabilitation (Alternative 5).	To ensure that the treatment of noxious weeds is not creating open areas or bare areas for spread of noxious weeds.	BMP 5-4: Revegetation of Surface Disturbed Areas Soil S&G E, Chapter 4 Modoc Forest Plan Regional Soil Quality Standards, FSHB 2509.18
DS-25	Soils: On those sites with soils identified as having a high or very high erosion potential or a rapid or very rapid risk to runoff do not use physical methods to treat noxious weeds when the fire weather forecast for the next 24 hours there is a likely chance of thunderstorms (generally 60-70% or greater as defined by the National Weather Service).	To protect Soil Quality Standards soil productivity and soil hydrologic function	Region 5 Soil Quality Standards FSHB 2509.18 S&G #1, Modoc Forest Plan Chapter 4
DS-29	Herbicides: When applying herbicides within RCAs, from the High Water Mark outward to a distance of 25 feet, all directed spray must be done in a downward direction. In addition, when the height of a weed is greater than 36 inches, the weed will be laid on the ground and sprayed in a downward direction. This will minimize herbicide drift and confine the herbicide to the drop zone of the individual weed plant being treated. Beyond 25 feet within RCAs and outside of RCAs, herbicides will be applied by on-the-ground applicators directly spraying or wicking the target noxious weed. Spraying will be done in a downward direction to the extent possible.	To control drift within the inner third of the RCA	BMP 5-12: Streamside Wet area Protection During Pesticide Spraying BMP 5-13: Controlling Pesticide Drift During Spray Application Modoc Forest Plan Water S&G's 1 and 2

Table 3 - 13. Design Standards Pertinent to Soil or Water Resources Under Alternative 6

Design Standard	Soil and Water Design Standard	Purpose of Design Standard	Source of Design Standard
DS-14	Water: Annually the amount of physical disturbance and/or herbicide application would be limited to no more than 15% of each 6th Field Sub-watersheds.	To reduce the potential for indirect or cumulative effects to 6th field watersheds	Modoc Forest Plan Pg 4-22, S&G Soils #2
DS-15	The specified distances for perennial streams, lakes and special aquatic features are 300 feet and 150 feet for seasonally flowing streams, both of which are consistent with Riparian Conservation Areas as defined the Sierra Nevada Framework (SNF) ROD, 2001. For the Noxious Weed FEIS, the designated zone for all Streamside Management Zones is the Riparian Conservation Areas (RCAs) on the Modoc National Forest. See the definition for Riparian Conservation Area in the glossary. Therefore, for the Noxious Weeds FEIS, the terms SMZ and RCA are interchangeable. For the purpose of noxious weed treatments, SNF RCA standards will apply Forest wide. Within	To protect water quality and stream health from the potential indirect and cumulative effects of proposed noxious weed treatment	Modoc Forest Plan as Modified by the 2002 Amendment to the Sierra Nevada Framework

Design Standard	Soil and Water Design Standard	Purpose of Design Standard	Source of Design Standard
	these prescribed RCAs, limited hand treatments may occur for a distance of 10 feet outward from the edge of the High Water Mark.		
DS-16	The RCAs will be maintained with 50% of the acreage of the RCA as undisturbed; disturbance will be limited to no more than 25% of the acreage of the inner half of the RCA.	To protect water quality, stream health and runoff patterns of the RCAs from potential indirect and cumulative effects related to proposed noxious weed treatments.	BMP 1.8 Designation of Streamside Management Zones BMP Stream Course and Aquatic Protection 1.19 (FSHB 2509.22)
DS-18a	Water - RCA Treatments: Within the Riparian Conservation Areas (RCAs) outside of the Lahontan Regional Water Board area of jurisdiction, herbicide treatments will be as follows: -From the High Water Mark outward, aquatic formulations of Glyphosate may be used in RCAs for Seasonally Flowing or Perennial Streams (as well as Physical (+) Methods. -From a distance of 10 feet from the High Water Mark outward to the outer edge of RCAs for Seasonally Flowing or Perennial Streams, Glyphosate and Amine forms of 2, 4-D may be used. -From 25 feet from the High Water Mark outward to the outer edge of RCAs for Seasonally Flowing or Perennial Streams, Chlorsulfuron, Dicamba, Clopyralid, Triclopyr; and Tank Mixes 1 and 2 with only amine forms of 2, 4-D. -From 100 feet from the High Water Mark outward to the outer edge of RCAs for Seasonally Flowing or Perennial Streams, Chlorsulfuron, Dicamba, Clopyralid, Triclopyr; and Tank Mixes 1 and 2 with either ester or amine forms of 2, 4-D.	To protect water quality from the potential contamination of the water column from the application of those herbicides with the identified potential to move off site and adversely affect soil or water quality.	Gill, R., 1993. Letter from California Regional Water Quality Control Board - Lahontan Region to Diane K. Henderson, Forest Supervisor on Noxious Weed Control EIS. Nov. 4, 1993.
DS-18b	No more than 10 percent of the acreage with RCAs for the Frog Waterhole (6th Field HUC 180200021103) and RCAs for lakes found within Clarks Valley (6th Field HUC 18020030106) would be treated with herbicide each year, from the edge of the High Water Mark for a distance of 100 feet. When applied from the High Water Mark to a distance of 25 feet from water, herbicides would be applied by wicking them directly on the plant.	To protect water quality and avoid cumulative effects.	Developed by Peter Adams, Forest Hydrologist
DS-19a	In the areas under the Lahontan Water Quality Control Board jurisdiction (see Figure 3-2), with Alternative 6 no herbicide treatment will occur from the High Water Mark for a distance of 10 feet. From a distance of 10 to 100 feet from the High Water Mark, only aquatic glyphosate will be used. At a distance greater than 100 feet from the High Water Mark, the other herbicides shown in the Alternative may be applied.	To meet Lahontan RWB Objective of No detectable Pesticides in the water column.	BMP 1.19 Stream course and Aquatic Protection
DS-19b	Do not use herbicides to treat noxious weeds in the Area of Concern that supplies the Ft. Bidwell Reservation with drinking water (see map in Appendix N). If weeds become established in the future, consult with the Ft. Bidwell Tribe to determine suitable treatment methods under Early Detection – Rapid	To protect water quality from the potential contamination of the water column from the application of those herbicides with the identified potential to	P. Adams and D. Meza, 2006

Design Standard	Soil and Water Design Standard	Purpose of Design Standard	Source of Design Standard
	Response.	move off site and adversely affect soil or water quality.	
DS-20	Soils: Areas with bare soil resulting from noxious weed treatments that are greater than ¼ acre in size will be assessed for need for rehabilitation.	To provide guidance for assessing treated areas for rehabilitation	BMP 5-4: Revegetation of Surface Disturbed Areas Soil S&G E, Chapter 4 Modoc Forest Plan Regional Soil Quality Standards, FSHB 2509.18
DS-21	Soils: Areas with bare soil created by the treatment of noxious weed, the site would be evaluated for rehabilitation (Alternative 5).	To ensure that the treatment of noxious weeds is not creating open areas or bare areas for spread of noxious weeds.	BMP 5-4: Revegetation of Surface Disturbed Areas Soil S&G E, Chapter 4 Modoc Forest Plan Regional Soil Quality Standards, FSHB 2509.18
DS-22	Annually the Forest Hydrologist, Watershed Specialist or Soil Scientist determines the location of the noxious weed occurrence to be treated to determine if the site to be treated is located on sensitive or shallow soils. If it is determined that the site to be treated contains sensitive or shallow soils then either DS 23 or 24 would be applied, depending on Alternative selected.	To provide guidance in protecting shallow and sensitive soils and water quality	BMP 5.7: Pesticide Use Planning Process; BMP 5-8: Pesticide Application According to Label Directions and Applicable Legal Requirements (FSHB 2509.22)
DS-24a	Soils: Treatment of noxious weeds on sensitive and/or shallow soils utilizing herbicides other than glyphosate will not exceed 1 acre per 6th field sub-watershed on an annual basis.	To reduce the potential for an indirect or cumulative effect to soil and watershed resources from the treatment of noxious weeds.	FSH 2509.18 R5 Supplement No. 2509.18.95-1 (R5 Soil Quality Standards)
DS-24b	Soils: Limit annual herbicide treatments in 6th field sub-watersheds to no more than 10% of the acreage of the 6th field sub-watershed.	To reduce the potential for an indirect or cumulative effect to soil and watershed resources from the treatment of noxious weeds.	FSH 2509.18 R5 Supplement No. 2509.18.95-1 (R5 Soil Quality Standards)
DS-25	Soils: On those sites with soils identified as having a high or very high erosion potential or a rapid or very rapid risk to runoff, do not use Physical+ methods to treat noxious weeds when the fire weather forecast for the next 24 hours there is a likely chance of thunderstorms (generally 60-70% or greater as defined by the National Weather Service).	To protect Soil Quality Standards soil productivity and soil hydrologic function	Region 5 Soil Quality Standards FSHB 2509.18 S&G #1, Modoc Forest Plan Chapter 4
DS-29	Herbicides: When applying herbicides within RCAs, from the High Water Mark outward to a distance of 25 feet, all directed spray must be done in a downward direction. In addition, when the height of a weed is greater than 36 inches, the weed will be laid on the ground and sprayed in a downward direction. This will minimize herbicide drift and confine the herbicide to the drop zone of the individual weed plant being treated. Beyond 25 feet within RCAs and outside of RCAs, herbicides will be applied by on-the-ground applicators directly spraying or wicking the target noxious weed. Spraying will be done in a downward direction to the extent possible.	To control drift	BMP 5-12: Streamside Wet area Protection During Pesticide Spraying BMP 5-13: Controlling Pesticide Drift During Spray Application Modoc Forest Plan Water S&G's 1 and 2
DS-34	Control of Drift or Herbicide Migration: All herbicide application will follow EPA approved label directions in regards to control of drift of herbicides during spraying. These directions	To control aerial drift of herbicides	BMP 5-8: Pesticide Application According to Label Directions and Applicable Legal

Design Standard	Soil and Water Design Standard	Purpose of Design Standard	Source of Design Standard
	have specific wind speeds and air temperatures for application of each herbicide. In addition, applicators will utilize droplet size and spray pressure to insure droplets do not travel outside of the drip line target plant.		Requirements

Note: In the areas under the Lahontan Water Quality Control Board jurisdiction (see Figure 3-2), with Alternative 6 no herbicide treatment will occur from the high-water mark for a distance of 10 feet. From a distance of 10 to 100 feet from the high-water mark, only aquatic glyphosate will be used. At a distance greater than 100 feet from the high-water mark, the other herbicides shown in the Alternative may be applied.

The distances shown below by Alternative are summarized from the above Design Standards for all Alternatives that allow herbicide use.

Table 3 - 14. Summary of Distances from High Water Mark for Herbicide Use

Herbicide	Distance from High Water Mark (feet)			
	Alt 2	Alt 4	Alt 6	Alt 6 within CARs
Aquatic Glyphosate	10	10	High Water Mark	High Water Mark
2-4-D (amine form)	1000	1000	10	100
2-4-D (ester form)	1000	1000	100	100
Non-aquatic Glyphosate	150/300[1]	150/300[1]	10	100
Dicamba	150/300[1]	150/300[1]	25	100
Clopyralid	150/300[1]	150/300[1]	25	100
Triclopyr	150/300[1]	150/300[1]	25	100
Chlorsulfuron	None Allowed	None Allowed	25	100
Mixture 1 (Chlorsulfuron + 2, 4-D)	None Allowed	None Allowed	25	100
Mixture 2 (Dicamba + 2, 4-D)	None Allowed	None Allowed	25	100

Note: In the areas under the Lahontan Water Quality Control Board jurisdiction (see Figure 3-2), with Alternative 6 no herbicide treatment will occur from the high-water mark for a distance of 10 feet. From a distance of 10 to 100 feet from the high-water mark, only aquatic glyphosate will be used. At a distance greater than 100 feet from the high-water mark, the other herbicides shown in the Alternative may be applied.

[1]150 ft. for seasonally flowing streams/300 ft. for perennial streams

These Design Standards are assumed to protect the treatment areas presently inventoried as well as new or previously undiscovered infestations that would be treated using the range of methods described in detail in the Proposed Action of the *Modoc National Forest Noxious Weed Treatment Project FEIS*. The intent of the Early Detection/Rapid Response approach is to treat new infestations when they are small so that the likelihood of adverse treatment effects is minimized. The approach is based on the premise that the impacts of similar treatments to similar acreages are predictable, even though the precise location or timing of the treatment may be unpredictable.

Herbicide use would become more restrictive as treatment occurs closer to water. Design Standards within RCAs and CARs were developed based on label advisories, interdisciplinary

team discussions ((Table 9, Table 10, Table 11, Bakke 2001) SERA risk assessments, and monitoring results from previous monitoring for Region 5.

Monitoring

The Modoc National Forest Noxious Weed Treatment Project FEIS Appendix H documents, in detail, the monitoring approach that will be used for both implementation and effectiveness monitoring (USDA Forest Service 1991, Appendix H-Monitoring). Implementation monitoring would determine whether the selected Alternative was implemented as directed, and whether the objectives and priorities were realistic and achievable. Effectiveness monitoring would determine if the treatments were effective in meeting the planned objectives.

It would also determine if the noxious weeds were continuing to spread beyond the control actions and if treatment methods were effective in preventing the spread of noxious weeds into traditional Tribal gathering areas.

Table 3 – 15. Summary Comparison of Alternatives

Alternative Features	Alt 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6
Number of herbicides used	0	5	0	5	0	6+ 2 mixes
Containment versus eradication at large sites	-	no	no	no	yes	yes
Early Detection/Rapid Response	no	no	no	100acres/year 200 acres total	100acres/year 200 acres total	100acres/year 200 acres total
Treatment Methods	**Sites/Acres**	**Sites/Acres**	**Sites/Acres**	**Sites/Acres**	**Sites/Acres**	**Sites/Acres**
physical	20-30	161/31	494/5993	161/31		
Physical+					527/139	116/19
Physical or chemical		333/5961		333/5961		371/116
chemical		42/907		42/907		46/65
Total pounds of herbicide used	0	3,341-15118 lbs ae		3,341-15118 lbs ae		137-1832 lbs ae
Goats	0	0	0	0	5/41	5/41
Total Acres Treated	**20-30**	**6899**	**5993**	**7099**	**480**	**541**

Note: In the areas under the Lahontan Water Quality Control Board jurisdiction (see Figure 3-2), with Alternative 6 no herbicide treatment will occur from the high-water mark for a distance of 10 feet. From a distance of 10 to 100 feet from the high-water mark, only aquatic glyphosate will be used. At a distance greater than 100 feet from the high-water mark, the other herbicides shown in the Alternative may be applied.

Environmental Consequences

Explanation of Proposed Action and other Action Alternatives

Six Alternatives have been proposed for analysis. The characteristics of each Alternative are summarized in below:

Alternative 1

A forest-wide noxious weed program would not be implemented.

Alternative 2

Under this Alternative, the Modoc National Forest proposes to treat noxious weeds using herbicides and physical methods over a five-year time frame. The annual combination of methods used would vary depending on noxious weed species, distance from water or other sensitive areas, and the most economical and efficient treatment methods available. There would be no aerial spraying of herbicides and there would be no herbicide use within 10 feet of water. Listed below are features of Alternative 2:

- Between 300 to 1,500 acres would be treated annually for the next five years.
- A total of 536 sites would be treated.
- Physical methods would be used at 161 sites (31 acres) that are less than 10 feet from any water source to include manual hand pulling, digging, grubbing, and hoeing.
- Use of physical and/or herbicide methods on 333 sites (5,961 acres) located greater than 10 feet from any water source targeting nonrhizomatous noxious weed species.
- Treatment using herbicide would occur on 26 sites (2.4 acres) located greater than 10 feet from any water source and comprised of rhizomatous species.
- Partial treatment would occur on 16 sites of rhizomatous species that have some acreage within 10 feet of water. On these 16 sites, the acreage within 10 feet of water would not be treated and the acreage that is further than 10 feet from water would be treated with aquatic glyphosate (904.3 acres).
- No treatment would occur at five sites (0.45 acres). These sites are comprised of rhizomatous species and are within 10 feet of water.
- Herbicides would be applied by directed spray and wicking treatments.
- Herbicides include: Clopyralid, Dicamba, Glyphosate, Triclopyr, and 2, 4-D.
- Herbicide treatments would include use of surfactants and dyes. Surfactants increase the absorption of herbicide by the weeds, and dyes assist the applicator in efficiently treating target weeds.

Alternative 3

Alternative 3 does not include the use of herbicides. Listed below are features of Alternative 3:

- Treating between 300 to 1,500 acres annually for the next five years,
- Treatment using physical methods to include manual hand pulling, digging, grubbing, and hoeing would occur on 494 sites (5,993 acres).

- No treatment would occur on 47 sites (916 acres) as these sites are comprised of rhizomatous species and physical methods are ineffective in treating rhizomatous species.

Alternative 4

Alternative 4 focuses on providing flexibility in physical and herbicide treatment methods for current occurrences and expanding or new infestations of noxious weeds. Alternative 4 includes an Early Detection - Rapid Response Strategy not included in Alternatives 2 and 3. Listed below are features of Alternative 4:

- Treating a total of 6,899 acres at 536 sites over the next 10 years (average annual 500-1,500 acres)
- Physical treatment methods would be utilized at 161 sites (31 acres) that are less than 10 feet from any water source.
- Use of physical and/or herbicide methods on 333 sites (5,961 acres) located greater than 10 feet from any water source and with nonrhizomatous noxious weed species.
- Treatment with herbicides would occur on 26 sites (2.4 acres) located greater than 10 feet from any water source and comprised of rhizomatous species.
- Partial treatment would occur on 16 sites of rhizomatous species that have some acreage within 10 feet of water. On these 16 sites, the acreage within 10 feet of water will not be treated and the acreage that is further than 10 feet of water would be treated with aquatic glyphosate (904.3 acres).
- No treatment would occur at five sites (9 acres). These sites are comprised of rhizomatous species and are within 10 feet of water.
- Herbicides would be applied by directed spray and wicking treatments.
- Herbicide treatments include: Clopyralid, Dicamba, Glyphosate, Triclopyr, and 2-4-D.
- Herbicide treatments in Alternative 4 would include use of surfactants and dyes. Surfactants increase the absorption of herbicide by the target weeds, and dyes assist the applicator in efficiently treating target weeds.
- An Early Detection - Rapid Response Strategy would be implemented in this Alternative. This strategy would provide the opportunity to treat new sites of the identified species that have developed, existing sites that have expanded, and new sites of new noxious weeds using the same treatments as outlined for the noxious weed species identified, provided that environmental effects are within the Design Standards, and effects analyses are reflected in this FEIS. Proposed treatment under Early Detection – Rapid Response would be capped at 200 acres over the life of the Alternative with no more than 100 acres being treated in any given year. The rationale for this cap is to provide limited flexibility to treat new and/or expanding weed sites while remaining within the range of effects as displayed in this analysis.

Alternative 5

Alternative 5 provides a non-herbicide Alternative with additional non-herbicide treatments, and an Early Detection - Rapid Response Strategy. Alternative 5 includes additional manual treatment methods not included in Alternatives 2 and 3. Alternative 5 includes an Early Detection - Rapid Response Strategy. Under Alternative 5, only the perimeter of a 5,658-acre site (DH013ISTI) of dyer's woad would be treated with physical methods. Listed below are features of Alternative 5:

- Utilize non-herbicide methods to eradicate, control, or contain approximately 280 acres at 532 inventoried sites of noxious weed species.
- There is potential to treat 5 sites (41 acres) using goat grazing. These sites may alternatively be treated using physical methods.
- Treatment using physical+ methods, including manual hand pulling, grubbing, hoeing, clipping (including use of hand-held string trimmers), and mulching/tarping would occur on 527 sites (139 acres).
- There would be limited treatment to contain infestations on 9 sites (6,728 acres). These sites include the large dyer's woad site (5,658 acres), one crupina site (159 acres) and seven sites of rhizomatous noxious weeds (913 acres). The common crupina site is part of a larger site on adjacent private lands (an additional 586 acres). Limited treatment of these sites is expected to be 100 acres. Design Standards have been implemented in determining the treatment method that these acres will receive. These sites are comprised of rhizomatous species and are greater than 0.10 acre. Physical methods are not as effective in treating rhizomatous species as herbicides, thus treatment goals would only include containment of the current infestation.
- An Early Detection - Rapid Response Strategy would be implemented in this Alternative. This strategy would provide the opportunity to treat new sites of the identified species that have developed, existing sites that have expanded, and new sites of new noxious weeds using the same treatments as outlined for the noxious weed species identified, provided that environmental effects are within the Design Standards, and effects analyses are reflected in this FEIS. Proposed treatment under Early Detection – Rapid Response would be capped at 200 acres over the life of the Alternative with no more than 100 acres being treated in any given year. The rationale for this cap is to provide limited flexibility to treat new and/or expanding weed sites while remaining within the range of effects as displayed in this analysis.

Alternative 6

Alternative 6 proposes use of additional herbicide formulations, while treating fewer acres with herbicides, and proposes additional manual treatment methods. Alternative 6 provides the opportunity to use an additional herbicide (chlorsulfuron) and two mixtures of herbicides not included in Alternatives 2 and 4. Alternative 6 also includes the additional manual treatment methods and the Early Detection - Rapid Response Strategy included in Alternative 5.

Under Alternative 6, only the perimeter of a 5,658-acre site (DH013ISTI) of dyer's woad, the 159-acre (BV001CRVU2) Common Crupina and the 851 acre Dalmatian toadflax (WM003LIDA) sites would be treated with either herbicide or physical methods. Physical methods are physical treatments which include manual hand pulling, grubbing, hoeing, clipping (including use of hand-held string trimmers), and mulching/tarping. Under Alternative 6, the Modoc National Forest proposes to treat noxious weeds over a ten-year time frame. Listed below are features of Alternative 6:

- Treating approximately 341 acres (541 inventoried sites).
- Treatment using physical+ methods, including manual hand pulling, grubbing, hoeing, clipping (including hand-held string trimmers), and mulching/tarping would occur on 116 sites (19 acres).
- Treatment using physical methods listed above and/or herbicides would occur on 371 sites (116 acres).

- Treatment using herbicide methods would occur on 46 sites (65 acres).
- There is potential to treat five sites (41 acres) using goat grazing. These sites may alternatively be treated with physical and/or herbicide methods.
- Limited treatment methods along major travel ways to reduce potential for spread would occur on three sites (5,658-acre dyer's woad site, 159 acre common crupina site, and 850 acre Dalmatian toadflax site). These sites would be treated around the borders to contain the infestations. The estimated number of acres treated would be 100 acres along the borders. These treatment acres are estimated proportionally to the size of the current inventoried acres for these three sites.
- Herbicide treatments include: Chlorosulfuron, Clopyralid, Dicamba, Glyphosate, Triclopyr, 2-4-D, and two herbicide mixtures (Mix 1: Chlorosulfuron + 2, 4-D, and Mix 2: Dicamba + 2, 4-D).
- No 2, 4-D treatments would be applied to noxious weed occurrences greater than 2 acres in size.
- Herbicide treatments in this Alternative would include use of surfactants and dyes. Surfactants increase the absorption of herbicide by the target weeds, and dyes assist the applicator in efficiently treating target weeds.
- Herbicide treatments would be the primary treatment for rhizomatous species.
- An Early Detection - Rapid Response Strategy would be implemented in this Alternative. This strategy would provide the opportunity to treat new sites of the identified species that have developed, existing sites that have expanded, and new sites of new noxious weeds using the same treatments as outlined for the noxious weed species identified, provided that environmental effects are within the Design Standards, and effects analyses are reflected in this FEIS. Proposed treatment under Early Detection – Rapid Response would be capped at 200 acres over the life of the Alternative with no more than 100 acres being treated in any given year. The rationale for this cap is to provide limited flexibility to treat new and/or expanding weed sites while remaining within the range of effects as displayed in this analysis.
- In the areas under the Lahontan Water Quality Control Board jurisdiction (see Figure 3-2), with Alternative 6 no herbicide treatment will occur from the high-water mark for a distance of 10 feet. From a distance of 10 to 100 feet from the high-water mark, only aquatic glyphosate will be used. At a distance greater than 100 feet from the high-water mark, the other herbicides shown in the Alternative may be applied.

Effects on Soil and Water Resources

The following sections discuss the general effects of physical + and herbicide treatments on soil and water resources. Specific differences in Alternatives are detailed after the general discussion.

Effects to Soils

General Effects of Physical Treatment

Physical treatments are proposed under all Alternatives. Proposed physical treatments are hand pulling, grubbing, digging and hoeing. Physical methods are proposed under Alternatives 5 and 6, and include the clipping of the seed head or plant including using a hand-held string trimmer as well as mulching and tarping.

The overall impacts of these activities are low. These methods would temporarily decrease ground cover, leading to incremental effects from erosion or slight decreases in soil moisture from ground cover reductions. These methods would not lead to adverse effects on soils since soil organic matter would be supplemented from cut vegetative material. These methods would also loosen small amounts of soil at the surface, potentially increasing the chance of localized erosion. This is a very minor and temporary effect and changes would be within the natural range of variability. The use of hand-held string trimmers would not contribute to soil disturbance.

The proposed manual treatments result in an input of dead root material, in the form of dead roots into the soil. As the roots are broken down in the soil food web, nutrients are released. The use of hand clipping would also provide organic material, in those cases where the whole plant is cut and dropped to the ground. Rainfall may cause these nutrients to be lost to surface runoff or to groundwater. Where bare soils occur, if they are combined with high nutrient levels, these areas may provide ideal conditions for the establishment of many invasive species. However, in lower intensity infestations, non-target vegetation could provide erosion control as well as a seed source for establishing native vegetation. In areas with larger amounts of bare soil (0.25 acre), Alternatives 2 and 4 Design Standards would require restoration activities to be considered in order to reestablish native vegetation. The intent is to reestablish competitive local, native vegetation post-treatment in areas of bare ground, to control soil erosion and provide native competition to invasive plant seeds.

Removal of plant roots would break mycorrhizal hyphae in the soil and probably cause a transient reduction of mycorrhizal function. Studies on crop plants have shown that leaving an undisturbed mycorrhizal network in the soil after harvest (e.g. zero-till agriculture) increases the nutrient uptake of the subsequent crop (Evans and Miller 1990). Establishment of native plants may be more successful on undisturbed soil. Indirect negative impacts from manual control could be attributed to soil disturbance and opening of the canopy (understory or depending on the species). This could cause minor and transient shifts in microsite conditions such as reduction in soil moisture, disruption of mychorrhizal associations, and cause an increase in surface temperatures. As the treatment areas associated with this project are generally in previously disturbed sites, treatment would improve the condition of the site by allowing reestablishment of native vegetation.

Physical treatments may slightly increase the potential for delivery of fine sediment to streams the year after treatment. Removal of surface cover could cause minor localized erosion trapped by surrounding vegetation for approximately one season until vegetation becomes reestablished.

Using hand-held string trimmers would not create any additional soil impacts. The use of truck-mounted pressurized sprayers (See Chapter 2, Figure 2-1 of this FEIS) off-road has the potential to compact soil. Soil compaction eliminates soil pores and so reduces water infiltration, aeration, and the ability of plants to root effectively. While the relative amounts of physical treatments vary between the Alternatives, the treatments are similar; therefore differences in terms of intensity or duration of effects from such treatments have no substantive differences.

General Effects of Cultural Treatments

Cultural treatments can include grazing, mulching, tarping, fertilizing and reseeding. Grazing can be effective in reducing a large infestation or eliminating a smaller infestation (Tu et al. 2003). By treating the invasives with grazing first, the intent is to lower impacts on the site from subsequent treatments.

Tarping would shade or heat the soil to kill undesirable plants. This would only be used in small treatment areas, as this method is most effective in damp soils (Tu et al. 2003). The dry conditions found on the Modoc are not conducive to widespread use of this method (Table 2-2,

Modoc Noxious Weeds FEIS). Mulching would also be used only on small areas. It is not used on larger areas to avoid impacts to desirable vegetation. Fertilizing and reseeding would help encourage the growth of desirable vegetation.

General Effects of Herbicides on Soils

Chemical treatments may affect soils directly by having short-term adverse impacts on certain soil microbes and indirect impacts from losses in vegetative cover. Most of the proposed chemicals are decayed primarily by soil microbes. Only Chlorsulfuron is mainly degraded through hydrolysis (Table 3-15a). Results from field and laboratory testing are mixed, since soil conditions are highly variable. In general, herbicides decay over time; therefore, effects are reduced when microbial metabolic rates are highest (such as during spring when adequate warmth, moisture, and microbial substrate are abundant).

The effect of a chemical treatment on the soil depends on the particular characteristics of the chemical used, how it is applied, and the physical, chemical, and biological condition of the soil medium. In general, primary herbicide routes in soil are leaching, hydrolysis, and adsorption/desorption onto soil particles, and biological degradation. Appendix E of the Modoc Noxious Weed FEIS contains a summary of the factors limiting herbicide treatments, including soil-related factors such as drainage and permeability. Soil characteristics affect the herbicide residency time through drainage and adsorptive capacities. Highly drained soils have greater propensity to transfer herbicides to groundwater stores. Organic rich soils and finer texture soils have higher adsorption potential for holding herbicides. Herbicides will vary in the degradation potential based on their chemical structure and the biological potential of the soil.

Overall, the proposed herbicide types and application rates are low enough to facilitate decay by soil microbes. The proposed herbicide use would have a low risk for soils since the bulk of treatments focus along roads, where soils are unproductive and soil communities are uniform. Soil attributes at greatest risk from chemicals include damage to soil organisms and erosion from removal of ground cover.

The overall effect to soils from proposed treatments is low due to a very limited application of herbicides (see descriptions of the Alternatives in Chapter 2). A more extensive discussion of the individual herbicide properties can be found in Appendix E of the Noxious Weed FEIS.

Below is a brief summary, for each chemical proposed for use detailing each chemical's behavior in soils, including permeability and drainage:

2, 4-D: 2, 4-D is degraded in soils primarily by microbes. Studies indicate that the size of the microbial population, the concentration of 2, 4-D and the ratio of the two factors determine the 2, 4-D degradation rates (Hemmett and Faust 1969). Soil conditions that enhance microbial populations (i.e. warm and moist) facilitate 2, 4-D degradation rates (Foster & McKercher 1973). Wilson et al. (1997) found that adequate soil moisture was the most influential parameter affecting the degradation rates.

Lag times of up to eight weeks during which 2, 4-D degradation is slow, have been reported following the first application of 2, 4-D to soil (Audus 1960). Most formulations of 2, 4-D do not bind tightly with soils and have the potential to move down into the soil column. 2, 4-D is considered to be highly mobile and is prone to move off site in surface runoff and subsurface flow (Tu et al. 2003). T he EPA reports that 2, 4-D is broken down into inert particles by soil microbial activity and that within 7 days following application, 2, 4-D has low soil persistence (Tu,M, Hurd, C & J.M. Randall 2001). The half-life in soil is less than 7 days. Soil microbes are primarily responsible for its disappearance. Despite its short half-life in soil and in aquatic environments, the compound has been detected in groundwater supplies in at least five states and

in Canada. Very low concentrations have also been detected in surface waters throughout the U.S (Weed Control Methods, The Nature Conservancy, April 2001).

Chlorsulfron: Chlorsulfron should not be applied to soils when they are saturated or when they are subject to periods of intense rainfall, as this chemical is degraded mainly through hydrolysis Drift potential is high during a surface inversion (Source- Specimen Label Telar DF (EPA Reg. No. 352-522).

Tank mix of 2, 4-D and chlorsulfron should not be applied to saturated or coarse textured soils or when intense rainfall (summer thunderstorm) is likely to occur within 7 days of application. Both of these chemicals are highly mobile and can be transported by surface runoff into the streams and lakes.

Clopyralid: Clopyralid is relatively persistent in soil and is degraded by soil microbes. It is not susceptible to photo or chemical degradation. Clopyralid does not bind strongly with soil particles. Once it has been applied, it rapidly disassociates, becoming extremely soluble in water and does not bind strongly with soil particles (Shang and Arshad 1998). This means that Clopyralid has the potential to be mobile, and could contaminate ground and surface waters via leaching. The average half-life of Clopyralid is one to two months but can range from one week to one year depending on the soil type, temperature, and rates of application. Clopyralid should not be applied to areas where soils are very permeable and the water table is shallow. Because Clopyralid is highly soluble in water, there is a potential for it to move off site during summer thunderstorm activity where there are high-intensity and short-duration precipitation events (Tu et al. 2003). From the specimen label for Transline, Clopyralid should not be applied where soils have a rapid to very rapid permeability or the depth to groundwater is shallow (EPA Reg. No. 62719-259 revised 07-26-99).

Dicamba: Dicamba is not adsorbed by most soils. It is highly mobile and is moderately persistent in most soils. Dicamba has a half-life of 1 to 6 weeks in soil with degradation due to soil microbial activity. The rate of degradation of Dicamba is slower at low temperature and low soil moisture (Pesticide Fact Sheet prepared by Information Ventures, Inc.). Dicamba can be introduced to groundwater and surface water during application or in combination with 2, 4-D on sensitive or shallows soils, which can introduce the active ingredient into the groundwater table.

Glyphosate: Glyphosate is highly water soluble but unlike most water-soluble herbicides has a very high adsorption capacity. Once Glyphosate contacts soil it is rapidly bound to soil particles rendering it essentially immobile (Roy et al. 1989a, Feng 1990).

Unbound or free Glyphosate molecules are degraded at a steady and relatively rapid rate by soil microbes. Because glyphosate binds strongly to soils, it is unlikely to enter waters through surface or subsurface runoff except when the soil itself is washed away by runoff, and even then, it remains bound to soil particles and unavailable to plants (Rueppel et al. 1977, Malik et al. 1989).

Triclopyr: Microbial metabolism accounts for a significant percentage of Triclopyr degradation in soils. In general, warm moist soils with a high percentage of soil organic matter will support the largest microbial populations and the highest rate of metabolism. The reported half-life of Triclopyr in soil varies from 3.7 to 314 days depending on specific soil and environmental conditions (Newton et al. 1990). Coarse textured soils that are highly permeable may therefore retain Triclopyr but most studies have found that Triclopyr does not tend to move in significant quantities below the top 15 cm (0.5 inches) of soil (Norris et al. 1987, Newton et al. 1990, Stephenson 1990, and Johnson et al. 1995a).

From the specimen label for Garlon 3A (EPA Reg. No. 6271937) treatment of aquatic weeds can result in oxygen depletion or loss due to the decomposition of dead plants. To minimize this hazard, do not treat more then one-third to one-half of the water area in a single operation.

Garlon 4 includes kerosene as an inert ingredient. Triclopyr is active in the soil and adsorbed by clay particles and organic matter in the soil. Microorganisms degrade Triclopyr and it has a relatively short half-life of 46 days under ideal conditions (warm moist soil conditions). It is highly mobile and is moderately persistent in most soils. The rate of degradation of Dicamba is slower at low temperature and low soil moisture (Pesticide Fact Sheet prepared by Information Ventures, Inc.).

Tank Mixes: 2, 4-D is proposed to be applied in combination with Chlorsulfron as **Tank Mix #1** or in combination with Dicamba as **Tank Mix #2**. 2, 4-D is identified by the EPA as having characteristics that make it an herbicide with a high leaching potential and very water-soluble thereby making it subject to movement by runoff when applied adjacent to or near water.

Chlorsulfron should not be applied to soils when they are saturated or when they are subject to periods of intense rainfall. Tank Mix #1 is highly mobile and is moderately persistent in most soils.

Application of Banvel (dicamba) or in combination with 2, 4-D on sensitive or shallows soils can introduce the active ingredient into the groundwater table. Tank Mix #2 should not be applied to saturated or coarse textured soils or when intense rainfall (summer thunderstorm) is likely to occur within 7 days of application. Both of these chemicals are highly mobile and can be transported by surface runoff into the streams and lakes. 2, 4-D is proposed to be applied within the RCAs either alone or in combination with Dicamba as a Tank Mix#1 or in combination with chlorsulfuron as Tank Mix #2.

Chlorsulfuron should not be applied to soils when they are saturated or when they are subject to periods of intense rainfall. Tank mix of 2, 4-D and chlorsulfuron should not be applied to saturated or coarse textured soils or when intense rainfall (summer thunderstorm) is likely to occur within 7 days of application. Both of these chemicals are highly mobile and can be transported by surface runoff into the streams and lakes (SERA. 2004 and 1999).

Dicamba is not adsorbed by most soils. It is highly mobile and is moderately persistent in most soils. Application of Dicamba or in combination with 2, 4-D on sensitive or shallows soils can introduce the active ingredient into the groundwater table. Clopyralid has been identified as extremely water-soluble and has a high potential for mobility and leaching into the soil profile. It is not approved for application on or near water.

Clopyralid should not be applied to areas where soils are very permeable and the water table is shallow. The usage of this herbicide in areas where soils are considered to be sensitive, shallow depth or where the water table is shallow may result in groundwater contamination. Because Clopyralid is highly soluble in water, there is a potential for surface waters to be contaminated if Clopyralid is applied directly to bodies of water or wetlands (Tu et al. 2003).

Triclopyr (Garlon 3A) has been identified for treatment of aquatic weeds associated with impounded waters (i.e. lakes, ponds and reservoirs) but not free flowing streams. This herbicide has properties and characteristics associated with chemicals detected in groundwater. The usage of this herbicide in areas where soils are considered to be sensitive, shallow depth or where the water table is shallow may result in groundwater contamination. Triclopyr binds to clay (fine textured soils) and organic matter and is highly mobile (SERA 2003f).

Herbicide Effects to Soil Organisms

The low application rates and type of herbicides proposed in general have a low impact on soil organisms. At high rates, Triclopyr (Garlon, Access) can affect soil microbes and may adversely affect some fungi and algae. Effects are short term and transitory since effects decrease with time as the herbicides degrade. Dicamba and 2, 4-D may also affect mycorrhizal fungi at high rates.

Functional groups of microbes that have similar metabolic pathways as the target weeds would be most sensitive to the herbicides. However, collective adverse effects of the proposed herbicides on soil microbes are hard to predict, given the diversity of the soil community and varying resistance to the particular herbicides. For example, some laboratory studies found glyphosate adversely impacted several types of microbes, although populations rebounded quickly (Tu et al. 2003). Similarly, Busse et al. (2001) found no long-term impact on microbial communities when using glyphosate on ponderosa pine plantations.

Ultimately, soil microbes facilitate the degradation of the herbicides by using the herbicides as growth substrate, co-metabolizing, polymerizating, accumulating, or altering the chemical structure by influencing the pH of the soil environment (Bollag and Liu 1998). The residency times shown in Table 3-15a are a gross collective function of average soil types, application timing and frequency, and finally the unique chemical structure.

Soil Cover

The treatment of sites with herbicides could also indirectly affect site productivity in the short term through changes in total organic production on site and annual input into the soil. Chemically treated plants would die and become incorporated into the soil as organic matter during the first years following treatment. Annual input in subsequent years would be limited by the number of non-target species interspersed between invasive plants or the rate at which vegetation returned to the site.

Physical Properties of Herbicides

Factors that determine the fate of herbicides in soil include mobility and degradation. Herbicide degradation over time is a result of physical and chemical processes in soil and water. Herbicide fate in soil is determined by herbicide characteristics such as adsorption, solubility, degradation, and volatility. Soil characteristics such as organic matter, pH, temperature, moisture content, clay content, and microbial degradation can modify certain properties of herbicides such as mobility in soils and half-life (time it takes for half the amount of chemical present to breakdown). General characteristics for the proposed herbicides are displayed in Table 3-15a. Many of the proposed herbicides are highly soluble in water. In general, this is often taken as an indicator of the mobility of the chemical in soils. There are exceptions, however. Glyphosate, while having a high solubility, also binds tightly with soil particles, and because of this it has low mobility. Herbicides with high mobility potential and long half-lives have a greater potential for leaching into near-surface groundwater.

Water

Streams are complex and dynamic systems that reflect the balance between stream flow, sediment input and substrate/bank composition. As stated on page 12, riparian condition and water quality are the two elements potentially affected by invasive plant treatments.

General Effects of Non-herbicide Treatment

Physical treatments generally consist of grubbing, digging or pulling weeds. If weed seeds are present, the weeds would be bagged and taken off site. Removal of soil cover would be very small under these circumstances. However, there could be small localized areas of erosion and subsequent sediment input to the stream. Such effects would be transitory and too small to measure.

Pulling weeds along stream banks could also destabilize the banks in highly localized areas. In general, weeds provide very little stabilization for stream channels. Any localized effects would be expected to last only a season until vegetation becomes reestablished at these sites. Other physical treatments within riparian areas could accelerate sediment delivery to streams through ground disturbance. Most of the treatment areas are previously disturbed roadways and trails so additional ground disturbance would not be a significant change from the existing condition. Modification of surface ground cover can change the timing of runoff, but given the small areas of treatment, any changes would be transitory and too small to measure.

General Effects of Herbicide Treatments

None of the Alternatives have the potential to influence stream flow and channel morphology due to the small portion of any watershed that would be treated. Treating invasive plants would improve riparian stability where invasive plants have colonized along stream channels and out-competed native species. All invasive plant treatments carry some risk that removing invasive plants could exacerbate stream instability; however, the restoration plan accounts for these areas and prescribes mulching, seeding and planting as needed to revegetated riparian and other treated areas.

Table 3 – 15a. Herbicide Properties Compiled from the Region 6 Invasive Plant FEIS (USDA Forest Service 2005b), SERA Risk Assessments and The Nature Conservancy Weed Manual (Tu et al. 2003)

Herbicide	Toxicity to Soil Microbes	Potential Mobility[1]	Water Solubility[1]	Degradation path and half life[2]	Activation Mechanism[2]
2, 4-D	Effect to 3 species of ectomychorrhizal fungi in laboratory experiments (Estok et al., 1989) Inhibits growth of some soil algae at 1 mg/L. Mycorrhizal fungi less sensitive; little effect at 10 ppm, substantial inhibition at 1000 ppm. (SERA, 1998, 2, 4-D)	Highly mobile	High to low depending on form	Soil microbes 7 days reported by EPA 1-30 days in SERA risk assessments	Plant growth regulator
Chlorsulfuron	Low	High Very high in clay soils	Very High	Hydrolysis 37-168 days	Acetolactate synthesis inhibitor (Selective: controls broadleaves and some grasses)
Clopyralid	Low	Very high especially in sandy soils	High	Soil microbes 14 to 29 days	Plant growth regulator (Very selective to broadleaves; post emergent)
Dicamba	Transitory effects at high concentrations	High	High	Soil microbes 1-30 days	Plant growth regulator
Glyphosate	Low	Low	Very High	Soil microbes 30 to 60 days	Inhibits 3 amino acids and protein synthesis (Non-

					selective; quickly absorbed by leaves with rapid movement through plant; no root absorption)
Triclopyr	Inhibits algae at low rates Toxic to fungi at high rates.	Very High	Medium	Soil microbes 46 days	Plant growth regulator (Absorbed thru roots, foliage and green bark)

[1] Mobility and water solubility categories from Shauwna Bautista, R6 invasive plant specialist, and are general breakdowns, not a definitive classification.
[2] Deschutes-Ochoco Invasive Plant EIS Soils Report, 2006.

A primary issue for this analysis is the potential for herbicides to enter streams and impact aquatic organisms. This section describes how Design Standards minimize the possibility that herbicides would enter water and impact water quality. The overall effect to soils from proposed treatments is low due to a very limited application of herbicides (see descriptions of the Alternatives in Chapter 2).

Drift, Runoff and Leaching

The routes for herbicide to contaminate water are direct application, drift into streams from spraying, runoff from a large rain storm soon after application, and leaching through soil into shallow groundwater or into a stream. This section addresses each of these delivery routes.

No direct application of herbicide to water is intended in any Alternative. No emergent plants would be treated under any Alternative.

Effects from drift, runoff, and leaching were considered in the herbicide risk assessments, assuming broadcast treatments occurring directly adjacent to streams. The Groundwater Loading Effects of Agricultural Management Systems (GLEAMS) model was used to estimate the amount of herbicide that may potentially reach a reference stream via runoff, drift and leaching in a 96-hour period, assuming broadcast treatments on a 50-foot strip along about 1.6 miles of perennial stream. SERA risk assessments evaluated the hazards associated with each herbicide based on the concentrations of herbicide predicted by the GLEAMS model using these parameters. The risk assessment worksheets used in this project (SERA worksheets) overestimate the herbicide concentrations that would plausibly enter most streams from this project for three reasons: 1) The worksheets do not take into account a “no herbicide use” area within an RCA; 2) The estimate for the rainfall is generic and is not adjusted to the dry conditions found on most of the Forest; 3) The model assumes broadcast treatments along the stream versus the wicking and targeted spray treatments proposed under this project. The results from the SERA worksheet are found below in Table 3-16.

Wicking and targeted spray treatments allowed with this project are inherently far less likely to deliver herbicide to water than broadcast treatments because the herbicide is applied to individual plants, so drift, runoff, and leaching are greatly minimized. Small amounts of some herbicides can trans-locate from the plant to the soil or an adjacent plant, but the concentration of herbicides that may be delivered to streams from this mechanism is much less than GLEAMS predictions (P. Adams 2007), which models broadcast spraying of herbicide next to the stream without a no-spray area within the RCA.

Monitoring Studies

Berg's (2004) compilation of monitoring studies on herbicide treatments with various distances from streams in which herbicide spraying is not allowed, showed that any distance helps lower the concentration of herbicide in streams adjacent to treatment areas. In California, distances between 25 and 200 feet generally had no detectable concentrations of herbicide in monitored streams with detection limits of 1-3 mg/m^3 (ibid).

The USGS, in partnership with the Oregon Department of Transportation, studied runoff of herbicides along roads (Wood 2001). The study was conducted on runoff associated with several herbicides (including glyphosate) along a road in western Oregon simulating rainfall at 1/3 inch an hour at 1, 7 and 14 days after treatment. Samples were collected at the shoulder of the road and found concentrations of nearly 1,000 parts per billion (ppb) of glyphosate on the road shoulder that could potentially leave the road shoulder. In the fall, the road was again sprayed and the ditch line of the road was checked during natural rainstorms for three months. Glyphosate was not found at the shoulder, ditch line, or stream. This study indicates that the greatest risk of herbicides moving off site is from large storms soon after herbicide application.

Table 3 - 16. Herbicide and Application Rates with Peak Water Concentrations Generated in SERA Worksheets (worksheets can be found in the project record)

Herbicide	Range of Application Rates (per acre)	Range of water concentration rates (per pound per acre)	Range of Water concentrations (mg/l)	Average water concentration (mg/l)
Chlorsulfuron	0.56-1 ounce	0.01-0.2	0.007-0.0125	0.0047
Clopyralid	0.13-.25 pound	0.005-0.07	0.00065-0.0175	0.005
2, 4-D	0.5 to 2 pounds	0.13-0.42	0.065-0.84	0.22
Dicamba	0.25 to 2 pounds	0.00006-0.01	0.000015-0.02	0.003
Glyphosate	0.75 to 3.75 pounds	0.001-0.4	0.001-1.5	0.05
Triclopyr	0.5 to 1.5 pounds	0.001-0.4	0.0005-0.6	0.09

Berg (2004) reported that herbicide applied in or along dry, seasonally flowing stream channels may enter streams through runoff if a large rainstorm occurred soon after treatment. This risk is minimized if seasonally flowing channels have no spray areas within the RCAs, as would occur under the action Alternatives. If a large rainstorm occurs after herbicide application, sediment contaminated by herbicide could be carried into streams. As most herbicide application occurs in the late spring through the early fall, which is the driest time of the year, the probability of a large rainstorm soon after application of herbicides is low at any particular site.

Region 5 Monitoring

Water quality monitoring in R5 from 1991 to 1999 occurred on multiple projects in the Regional Forests. Most projects were for control of non-conifers in conifer plantations. The Angeles monitoring included an invasive weed project within riparian areas (USDA Forest Service 2001).

Glyphosate was used in four Forests on eight projects. With no spray areas as narrow as 10 feet, Glyphosate was found to be non-detectable in collected samples with levels of detection between 9 and 24 parts per billion (ppb; some samples gave no level of detection). On the Angeles National Forest, Aquatic Glyphosate was used within the channel for control of aquatic plants. In this instance, one out of 12 samples had a concentration above the level of detection of 9 ppb. This sample had 15 ppb a quarter of a mile downstream of the treatment site (USDA Forest Service 2001).

Triclopyr was used on five projects on three Forests. Where Triclopyr was used with no spray areas of 10-15 feet, there were 3 projects where detections occurred. The levels of detection ranged between 0.1 to 1 ppb where specified. One detection of 82 ppb was determined to be from not establishing a no spray area on a seasonally flowing channel. The other detection was on a project with no spray areas of 10 feet; it had detection during winter storms of 0.63 ppm (parts per million) and 0.6-0.7 ppm. Another project with no spray areas of 15 feet had a single detection of 1 ppb (USDA Forest Service 2001).

Accidental Spills

Concentrations of herbicides in the water as a result of an accidental spill depend on the rate of application and the stream ratio of surface area to volume. The persistence of the herbicide in water depends on the length of stream where the accidental spill took place, velocity of stream flow, and hydrologic characteristics of the stream channel. The concentration of herbicides would decrease rapidly downstream because of dilution and interactions with physical and biological properties of the stream system (Norris et al.1991).

Accidental spills are not considered within the scope of the project. Design Standards would reduce the potential for spills to occur, and if an accident were to occur, minimizes the magnitude and intensity of impacts. An herbicide transportation and handling plan is a project requirement. This plan would address spill prevention and containment.

Lakes, Wetlands and Floodplains

Herbicides affect lakes and wetlands differently than streams. Dilution by flow or tributary inflow is generally less effective in lakes. Dilution is partially a function of lake size, but dilution could be rapid in small lakes with large water contributing areas. Decreases in herbicide concentration in lakes, ponds, and other lentic water bodies are a function of chemical and biological degradation processes or preferential adsorption of the herbicide into the lake sediments rather than from dilution. As no emergent treatments are proposed, the primary pathways for herbicide to enter lakes would be from drift or runoff.

Some invasive plants may grow in wetlands or near lakes and reservoirs. A large rain event after treatment could carry herbicide into water resulting in minor amounts of herbicide contacting surface water.

Emergent Vegetation

There is no treatment of emergent vegetation proposed under any Alternative.

Municipal Watersheds

There are no municipal watersheds within 13 miles downstream of the project area. However, the Fort Bidwell Indian Community water source would be protected under an agreement between the Forest and the Tribe. Design Standard 19b requires that no herbicide be used for noxious

weed treatments in the area above the water source. A map of this area of concern is found in Appendix N of the Modoc Noxious Weed FEIS.

Comparison of Alternatives

Alternative 1 – No Action

Direct and Indirect Effects to Soils

There could be a short-term (1 to 2 years) reduction in soil cover for the areas treated. This localized reduction in cover would increase treated areas vulnerability to soil erosion. The effects would be minimal given the poor quality of groundcover provided by the invasive species proposed for treatment, the scattered nature of the treatments and the small amount of land treated.

Adverse impacts to soils may occur where some noxious weeds are left to populate. Alternative 1 would only treat 20 to 30 acres per year. Specific changes to soil nutrient regimes are associated with large spotted knapweed infestations (Lejeune and Seastedt 2001), allelopathic influences (Bais et al. 2003), in addition to changes in surface hydrology where the plant communities are moved from bunchgrass-dominated to taproot-forb-dominated (Lacey 1989). Similarly, the influx of cheatgrass (*Bromus tectorum*) can alter soil dynamics with changes in structure, nutrient pulses and soil moisture status (Norton et al. 2003). These changes may be coincident with the long-term shifts from perennial grasslands to annual grasslands as documented in California (D'Antonio and Vitousek 1992). Other noxious weed species may have similar impacts as demonstrated by Vinton and Burke (1994) where fertilization caused long time shifts to favor weedy forb species.

Adverse tradeoffs with Alternative 1, in this case the risk of no treatment, would be highest for *Centaurea spp.* and others that can spread into relatively undisturbed grasslands (see Tyser and Key 1988). These tradeoffs are weighed by addressing spread rate versus the impact from treatment (D'Antonio et al. 2004), especially in regards to affecting non-target plant species (see Ortega 2005b).

Cumulative Effects

This Alternative is covered under other NEPA projects. Treatments would occur on an extremely small percentage of any watersheds in the Project Area. Direct and indirect effects are so insignificant and temporary that treatment under No Action could not plausibly contribute to significant cumulative effects.

Alternative 2

Direct and Indirect Effects to Soils

Thirty-one acres are proposed for physical treatment only. Effects of physical treatments on small scattered treatment sites would be similar to those discussed under general effects and are expected to be minor and transitory as the treatment sites are small and dispersed across the Forest.

Herbicide treatments only are proposed for 907 of the total 6,908 acres inhabited by invasive plants (Table 3-16). Up to 5,961 acres would be treated with either physical or herbicide methods. Approximately 300 to1,500 acres of treatment are expected to occur in any one year do to budget constraints.

One risk from herbicide use is from herbicide contact with soil affecting soil productivity by inhibiting the growth of soil organisms. Dicamba, Triclopyr and 2, 4-D all have potential to inhibit soil organisms at high rates, with less inhibition at normal application rates. These changes are temporary as the organisms rebound and the herbicides degrade.

This risk would be minimized by Design Standard 29, which requires direct spray to the plant or patch of plants, or to wick the herbicide directly onto the plant. This would minimize drift off site as well as minimize the amount of herbicide in contact with soil. This target spray technique also avoids spraying desirable vegetation, leaving it as a seed source to reseed treated areas.

Approximately 90 percent of the sites are within a quarter mile of roads. Soil communities along roads are largely uniform and disturbance oriented; therefore, impacts to soil organisms are not anticipated.

Cumulative Effects

Most of the five herbicides used under this Alternative do not negatively affect soil organisms at typical application rates and would not affect soil productivity. Cumulative soil productivity is protected due to the fact that the application methods proposed under Design Standard 29 requires a targeted spray or wicking directly onto the plant to minimize herbicide contact with soil protecting soil organisms and therefore soil productivity. Soil cover is protected by Design Standard 20 rehabilitation activities. Design Standard 14 requires that physical disturbance or herbicide treatments be limited to no more than 15 percent of any 6th-field watershed to minimize cumulative effects from treatments.

Alternative 2 is unlikely to have significant effects to soil and therefore is unlikely to approach a threshold of concern, so would not contribute to significant cumulative effects. No adverse cumulative effects are expected from implementation of this Alternative.

Alternative 3

Direct and Indirect Effects to Soils

This Alternative includes only the physical methods of controlling invasive plants discussed above under general effects of physical treatment. As rhizomatous species are not effectively treated without herbicides, 47 sites occupying 916 acres would be dropped and not treated allowing for the further spread of these invasive plants.

Up to 494 sites (5,993 acres) would be treated with physical methods over a 5-year time period. There would be more soil disturbance under this Alternative than under Alternative 2, as the primary methods are pulling, digging, grubbing and hoeing to remove invasive species. This is still a small amount of disturbance in any one area, as 94 percent of the sites are less than 1 acre in size (Table 3-4). The sites are generally not a solid infestation of invasive plants but are often a mixture of invasives and more desirable plants. Only the noxious weeds would be removed, leaving the desirable vegetation for soil cover to protect the site from erosion, as well as for a seed source. The effects of treatment at any site are expected to be short-term, lasting only a year or so until the site is revegetated.

Cumulative Effects

Treatments are primarily pulling noxious weeds, which is a fairly low impact activity. Treatments would take place on between 300 and 1,500 acres a year. Given the cost of treating by pulling weeds, probably the number treated would be closer to 300 acres a year. These acres would be scattered across the Forest. Design Standard 14 requires that physical disturbance or herbicide

treatments be limited to no more than 15 percent of any 6th field watershed to minimize cumulative effects from treatments.

Alternative 4

Direct and Indirect Effects to Soils

The effect of this Alternative would be the same as for Alternative 2 except this Alternative would be implemented over a 10-year timeframe and would include Early Detection –Rapid Response. This would allow for a longer time period to control the weed infestations and would give the Forest the flexibility to treat 100 acres of new infestations a year with a cap of 200 acres of new infestations treated for the life of the project.

Cumulative Effects

Cumulative effects would be similar to those discussed under Alternative 2.

Alternative 5

Direct and Indirect Effects to Soils

Overall, there would be fewer disturbances with Alternative 5 than for Alternative 3 because fewer acres would be treated. A total of 480 acres would be treated out of the 6,908 acres of inventoried weeds. All the sites would receive some treatment. Nine sites would receive only limited treatment. These sites are the dyer's woad site (5,658 acres) of the larger common crupina site (159 acres), the Dalmatian toadflax site (850 acres) and seven smaller sites of rhizomatous noxious weeds (913 acres).

Most of the treatment effects are the same as discussed under general effects of physical treatments and those discussed under Alternative 3. However, this Alternative has more physical treatments available than Alternative 3. These treatments are generally not soil-disturbing activities and they include mulching/tarping and cutting the plant, including using a hand-held string trimmer.

This Alternative includes potentially using goat grazing for five sites totaling 41 acres. The sites range in size from 4 to 25 acres and are occupied by musk thistle or scotch thistle. By itself, it will not eradicate weeds but when combined with other treatments can be effective at controlling invasive species. Grazing can be effective in reducing a large infestation or eliminating a smaller infestation (Tu 2003). Potentially, goats would be used on the site first and herbicide could be used for follow-up on the smaller number of remaining plants.

Early Detection-Rapid Response (for 100 acres a year with a project cap of 200 acres total) is allowed for sites similar to those presently included for treatment under this Alternative. Design standard 22 requires that the Forest soil scientist or hydrologist annually verify treatment locations to ensure proper Design Standards are used for each site.

Cumulative Effects

Cumulative effects are similar to those discussed under Alternative 3. As no significant direct or indirect effects are expected under this Alternative, no significant contribution to cumulative effects is expected.

Alternative 6

Direct and Indirect Effects to Soils

Alternative 6 treats only 541 acres, far fewer acres than proposed for Alternatives 2 (6,899) and 4 (7,099). Therefore, there would be less overall disturbance under this Alternative. Up to 541 acres would be treated under this Alternative. As with the previous Alternative, the three largest sites would have only the perimeter of the sites treated. The physical treatments would be the same as discussed above under Alternative 5. One hundred and sixteen sites totaling 19 acres would be treated with physical+ methods with 371 sites totaling 116 acres treated with either physical methods or herbicide.

This Alternative allows use of chlorsulfuron. This herbicide has low potential to affect soil organisms. This herbicide targets broadleaf vegetation leaving grasses unaffected. This Alternative also allows the use of two mixtures of herbicides. As noted under General Herbicide Effects dicamba, Triclopyr and 2, 4-D have temporary effects on soil organisms. Herbicide is proposed for only 46 sites on 65 acres. DS-24a restricts use of herbicides (except glyphosate) to 1 acre per 6th field a year on sensitive or shallow soils. This could allow minor amounts of herbicide to leach into shallow aquifers. This effect is likely to be small given the dry climate and the small acreage of this type of soils proposed for treatment.

This Alternative treats fewer acres with both herbicides and with physical treatment than the other Alternatives that allow herbicide use. All treatment sites would be evaluated for rehabilitation on a site-by-site basis. Given the few acres treated, the scattered nature of the treatments, and the use of Design Standards, this Alternative is unlikely to have noticeable effects.

Cumulative Effects

Cumulative effects are similar but much more limited than those discussed under Alternative 2.

Effects to Water Resources

Alternative 1

Direct and Indirect Effects

Under this Alternative, no Forest-wide management of invasive plants would occur. Under this Alternative, 20 to 30 acres would be treated by physical means each year.

Invasive plants would continue to grow on sites where their treatment is currently not authorized by NEPA analysis. Invasive plants are often less effective for stream bank stabilization than deeper rooted native plant species. Most invasive plants also provide less stream shading than native hardwoods and conifers.

Alternative 2

Direct and Indirect Effects

Up to 150 acres of treatment, including chemical treatment, could take place in stream RCAs. In reality, most of these areas have only discontinuous infestations of invasive plants, but, as acres of infestations change year to year; analysis is done as if all the land within a treatment area were infested.

None of the treatments are extensive enough under any Alternative to affect peak flows, low flows, or water yield. Methods used for treatment would have negligible effect on water infiltration into soil and associated surface runoff as discussed in the general effects section and the soils section above. No 5th-field watershed has more than 2.5 percent proposed for treatment; most have well under 1 percent (Table 3-8). This amount is much too small an area to show effects to flows from treatment.

The sites identified below in Table 3-17 are the larger invasive plant sites on the Forest. All the sites identified are listed in Appendix B of the Modoc Noxious Weed FEIS.

Table 3 - 17. Larger Invasive Sites on the Forest

Species	ID Number	Town-ship	Range	Section	Site Acres	Acres Within RCAs	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6
Canada Thistle	WM009CIAR4	T47N	R15E	27	9.99	9	PT-H	NT	PT-H	LT	H
Crupina	BV001CRVU2	T40N	R10E	36	158.65	35	P	P	P	LT	LT
Dalmatian Toadflax	WM003LIDA	T46N	R14E	13	44.57	27.2	PT-H	NT	PT-H	LT	H
Dalmatian Toadflax	BV006LIDA	T42N	R6E	28	850.82	98.4	PT-H	NT	PT-H	LT	LT
Dyer's woad	DH013ISTI	T43N	R7E	7	5657.75	1.4	P or H	P	P or H	LT	LT
Dyer's woad	WM002ISTI	T46N	R15E	5	12.65	5.1	P	P	P	P+	P+ or H
Dyer's woad	WM004ISTI	T47N	R15E	32	12.27	2.4	P	P	P	P+	P+ or H
Scotch Thistle	BV284ONAC	T39N	R10E	8	16.3	15.9	P	P	P	G or P+	G or P+ or H
Scotch Thistle	WM004ONAC	T45N	R15E	14	9.72	0	P or H	P	P or H	G or P+	G or P+ or H

P - Physical: hand pulling, hoeing, grubbing

P+ - Physical+: hand pulling, hoeing, grubbing, clipping seed head or plant, trimming with hand-held string trimmers, mulching/tarping

H - Herbicide

NT - No Treatment

LT - Limited Treatment: perimeter treatment only to contain infestation

G - Goat Grazing

PT-H - Partial Treatment of site with herbicides

Generally, small areas would be treated along streams. Thirty-one acres of physical treatment are proposed within 10 feet of streams in RCAs scattered across 161 sites. Treatment would be

discontinuous and limited at any one site. As most invasive plants provide little shade, removal of these plants is unlikely to have any measurable effect to stream temperature. Where manual methods remove invasive plants near streams, there could be minor loss of ground cover and soil disturbance leading to erosion and a minor localized increase in fine sediments particularly if vegetation is removed from stream banks. This increase is not considered significant as it would only last a season or two until vegetation became reestablished. Many treatment sites are small and would reseed naturally with existing native vegetation. Restoration would occur on sites greater than ¼ acre lacking native vegetation seed source to ensure revegetation occurs and erosion is controlled.

No herbicide would be used within 10 feet of streams. Aquatic Glyphosate, licensed for use in water, would be used within RCAs of 150 feet for seasonally flowing streams, and 300 feet for perennial streams. Glyphosate tends to bind strongly to soils and would move only if the soil particle was carried into water. The spray methods used would be targeted spray or hand application of herbicides to the target plants. Drift would be minimal under these circumstances and risk to native riparian vegetation is small. Spot treatments would also remove less vegetation than broadcast treatments so there is less potential for erosion. There are approximately 40 acres of treatment within 10 feet of water scattered across the Forest. Under this Alternative, only the non-rhizomatous acres would be treated with manual methods.

The other herbicides would not be used within RCAs. No spray areas of 150 feet on seasonally flowing streams and 300 feet on perennial streams would protect water quality. These no spray areas are considered adequate to minimize herbicide concentrations in water because, no spray area studies in forested areas (Berg 2005, USDA Forest Service 2001) show that no spray areas greater than 25 feet commonly lower herbicide concentrations below any threshold of concern and often below detectable limits. For 2, 4-D, a 1,000-foot no-spray distance from streams is required under Design Standard 17.

Design Standards also minimize the chance of herbicides reaching streams or wetlands through drift, runoff, or leaching into soils. Design standard 23 prohibits use of the more mobile herbicides on shallow or sensitive soils. This would protect groundwater, particularly in areas of the Forest where shallow soils cover fractured bedrock.

Where physical methods remove invasive plants near streams, there could be minor loss of ground cover and soil disturbance leading to localized erosion, and a minor localized increase in fine sediments, particularly if vegetation is removed from stream banks. This increase is not considered significant as it would only last a season until vegetation became reestablished. Many treatment sites are small and would reseed naturally with existing native vegetation. Where more than a ¼ acre site has bare soil from treating invasives, Design Standard 20 requires the site be assessed for rehabilitation. Rehabilitation would allow sites lacking a native vegetation seed source to be revegetate to control erosion.

Specific Sites

Some of the larger sites were looked at more closely for effects. These sites are listed in Table 3-17. Alternative 2 allows only aquatic glyphosate within RCAs and requires a 10-foot, no-herbicide-use area for both perennial and seasonally flowing streams. Under Alternative 2, three of the nine treatment areas shown in Table 3-17 would be treated with aquatic glyphosate outside the 10-foot no spray area. Glyphosate adheres well to soil and is the least mobile of the herbicides proposed under this project. The large Common Crupina site, the Scotch Thistle site with almost 16 acres in RCAs and two dyer's woad sites of approximately 12 acres apiece would all be treated with physical treatments.

Site WM009Ciar4 is infested with Canada Thistle. This site is in section 27 just south of Mill Creek. The site is almost entirely within either a lake or spring RCA or a seasonally flowing stream RCA. The entire polygon is approximately 10 acres with 9 acres within the RCA of a lake, spring, or seasonally flowing stream RCA. This site is within the Lahonton Regional Water Board, which allows only aquatic glyphosate application by wicking directly to the plant at least 10 feet from the stream or water feature. Given these tight constraints, it is unlikely that adverse effects would occur from this treatment.

The large dyer's woad site (DH013ISTI) would be treated either physically or with chemicals. This site has a seasonally flowing drainage to the south side of the treatment area. This treatment is unlikely to affect water quality because only 1.4 acres of the site is within the seasonal stream RCA.

For the large Dalmatian toadflax site,(BV006LIDA) the 850 acre site has a series of small ponds, wetlands and meadows scattered around the site. The individual RCAs range in size from the approximately 35-acre meadow to a 1-acre lake. This area has 64 acres within RCAs with a set of small lakes and 34 acres within a meadow. Approximately 14 acres are in the inner 100 feet of the RCAs. This site receives an average of 20 inches of precipitation a year. Outside the RCA any of the other herbicides can be used, with 2, 4-D having an additional no spray area of 1,000 feet from the high-water mark.

Given that only aquatic glyphosate would be used in RCAs and 2, 4-D has a 1,000-foot no spray area from use near water, it is impossible for the concentrations to approach those calculated in Table 3-16 for any herbicide except glyphosate. Glyphosate application was modeled with the GLEAMS-Driver model with site-specific parameters for a small lake and a small stream (Table 3-18).

The parameter changes for this model included a yearly rainfall of 21 inches a year and a 16-acre treatment site. This is a conservative model because it models as if broadcast spray occurred up to the edge of the stream and the highest possible application rate was assumed. In reality, there is a 10-foot no spray area, and no broadcast spraying occurs. Instead, the herbicide is applied directly to the plant by wicking it onto the plant. This would keep herbicide from contacting either desirable plants or contacting soil. Modeling results in Table 3-18 show water concentrations below any level of concern. Given these results and the conservative use of herbicides with this Alternative, adverse effects from herbicide use are unlikely under this Alternative.

Table 3 - 18. GLEAMS-Driver Model Results with Site-Specific Climate and Acre Data

Herbicide	Acres treated	Yearly Average Rainfall (inches)	Low Herbicide Concentration in Water (mg/l)	Median Herbicide Concentration in Water (mg/l)	High Herbicide Concentration in Water (mg/l)	EPA Drinking Water Maximum Contaminant level (mg/l)	Modeled Feature
glyphosate	16	21	0.014	0.015	0.025	0.7	stream
glyphosate	16	21	0.0091	0.011	0.012	0.7	pond

Roads

There are 26.6 miles of road within treatment areas. Of these, only 3 miles (11 percent) are within RCAs. There is an additional 0.8 miles of road within RCAs associated with ponds, lakes and

wetlands within treatment areas. Roads and their associated ditch lines are often connected to streams and during storm events can carry herbicide to streams. However, as only targeted spray techniques would be used, very little herbicide applied to the soil would be available for transport to streams.

Lakes, Wetlands and Floodplains

There are approximately 128 acres of treatment proposed within RCAs of wetlands, lakes, ponds, or reservoirs on the Forest. The main invasive plants found at these sites are Dalmatian toadflax (98.4 acres), Canada thistle (10 acres) and Scotch thistle (8.3 acres).

Most of these treatment acres are near the High Reef area just south of Lava Lake in the largest treatment area for Dalmatian toadflax. There are 98 acres of noxious weeds in eight polygons ranging in size from 0.3 acres to 34 acres. These are all part of a large 851-acre treatment area of Dalmatian toadflax. Under this Alternative most of this site would be treated with herbicides except for the infestations within 10 feet of the High Water Mark. Because Dalmatian toadflax is a rhizomatous species, these acres would not be treated. This leaves plants for reinfestation of the site. The infested areas 10 feet away from water would be treated with aquatic glyphosate within the RCA and potentially other herbicides outside the RCA. Glyphosate is the herbicide that most strongly adheres to soil and is unlikely to move into water in any significant amounts. Even where soil particles move into water the glyphosate preferentially stays on the soil particle (SERA 2003b). As only aquatic glyphosate can be used with the RCAs, it is unlikely that the other herbicides would be of concern for water resources.

While the Design Standards make it highly unlikely that herbicide concentration in water would reach a level of concern, high rainfall soon after application could deliver herbicide to a lake or pond. To model this scenario, the risk assessment worksheet (SERA worksheet) was run for specific rainfall for glyphosate (only herbicide that is allowed within RCAs). No concentrations of concern were reached for any herbicide (Table 3-18). Use of Design Standards discussed above further lowers potential for higher concentrations of herbicides near the lakes. Therefore, treatments are unlikely to affect functioning of wetlands or water bodies or to contribute to significant adverse effect on beneficial uses.

To control the infestation, the treatments would continue over several years, with fewer acres needing treatment each year. Wetlands would be treated using non-herbicide methods where such treatments are likely to be effective.

Alternative 3

Alternative 3 uses only physical treatments. Under this Alternative rhizomatous species would not be treated because physical methods are not effective on these species. There would be more ground disturbance under this Alternative than under Alternative 2.

Direct and Indirect Effects

Under this Alternative, up to 494 sites totaling 5,993 acres could be treated over 5 years. The 47 sites (916 acres) of rhizomatous infestations would not be treated. The primary treatments would be pulling, hoeing, and grubbing weeds. Within 10 feet of water, there are 31 acres at 161 sites of potential physical treatment. Physical treatment close to water is more likely to lead to additional sediment input to streams than treatment farther from the streams.

Alternative 3 increases the risk of trampling and instability of stream banks due to its reliance on non-herbicide treatments, particularly in areas where invasives grow directly along stream banks. This would be a short-term effect until revegetation occurred. The risk of long-term adverse

effects from these treatments is low. Invasive plants provide little shade; therefore, removing them would not lead to a measurable change in temperature. In the long term, temperature would be improved on streams currently impacted by invasive plants. The treatments proposed are unlikely to result in significant amounts of decaying plants or nutrients entering a stream at one time, and therefore, no measurable effect to oxygen levels is anticipated.

Alternative 4

Direct and Indirect Effects

The effects from treatment under this Alternative are the same as for Alternative 2, except that EDRR could take place under this Alternative and treatments would occur over a 10-year time frame.

Alternative 5

The effects of this Alternative are the same as for Alternative 3, except that this Alternative includes additional physical treatments, use of grazing and Early Detection-Rapid Response. The additional physical treatments include cutting weeds, mulching, and tarping. These are not considered ground disturbing and would have minimal effects to treated sites.

Grazing is proposed for 5 sites, including two Scotch thistle sites shown in Table 3-17. These sites are approximately 10 and 16 acres in size. The 10-acre site is dry, but the 16-acre site is within the RCA of a seasonal stream. As long as the goats are moved in a timely manner, using goats for grazing noxious weeds can be an effective way to weaken or kill plants to make the site smaller for further treatment with other methods (Tu et al. 2003).

Alternative 6

Alternative 6 allows the most flexible use of herbicides. It includes the use of chlorsulfuron and herbicide mixtures. Mix 1 is Dicamba and 2, 4-D, and Mix 2 is Chlorsulfuron and 2, 4-D. Alternative 6 proposes smaller stream no-spray areas than Alternatives 2 and 4 (Table 3-13). As under Alternative 2, herbicide exposure levels for both the public and for workers executing treatment activities would not exceed acceptable levels of risk to human health for all herbicides proposed for use (Bakke 2005). The use of proper personal safety equipment, training, and supervision for all weed-treatment crews would be required to reduce the potential for injuries to workers.

Glyphosate is the only herbicide proposed for use when spraying within 10 feet of bankfull along stream channels. Glyphosate is highly water-soluble but because it adheres tightly to soils is unlikely to be carried into a stream unless the soil particle is carried into the stream. This is unlikely to happen during the late spring or summer, when herbicides would be applied, because there is less rain in the summer and more vegetation growth to hold soil particles in place. However, large thunderstorms capable of moving sediment occasionally occur in the summer. It is impossible to predict where these would occur. If glyphosate is carried into a stream by runoff, it would preferentially bound with the soil particle over partitioning into water (SERA 2003b).

Herbicides entering surface water through surface runoff are also expected to be minimal, since targeted spraying techniques would be used to apply herbicide. This would minimize the amount of herbicide reaching the ground surface as well as minimize the potential for herbicide drift.

Site-specific Analysis

The three largest sites listed in Table 3-17 would get limited treatment under this Alternative. The crupina site, a Dalmatian toadflax site, the large dyer's woad site, and six smaller sites (not listed in Table 3-17) would get limited treatment around the edges of the sites and along major roads, to keep the noxious weeds from spreading. The total estimated treatment for these sites is 100 acres. The Dalmatian toadflax site has an additional mitigation allowing treatment of only 10 percent of the acreage within the inner 100 feet of RCAs to occur annually, to protect water quality. Where treatment may occur, wicking the herbicide directly onto the plant is the required application type.

The two smaller dyer's woad sites, as well as the 44-acre Dalmatian toadflax site shown in Table 3-17, are within the Goose Lake CAR. To protect TES aquatic species, only aquatic glyphosate is allowed within 100 feet the High Water Mark of streams (Design Standard 11). Given these requirements, adverse effects from treatments are unlikely.

The 10-acre Canada thistle site is within the Lahontan Regional Water Board (LRWB) plan area. Within the LRWB area, no treatments would occur from the high-water mark for a distance of 10 feet; only aquatic glyphosate would be used from 10 to 100 feet of the high-water mark; further than 100 feet from the high-water mark, the other herbicides displayed in the Alternative may be applied. Aquatic glyphosate is used by wicking it directly onto plants. This would allow the project to meet the LRWB Basin Water Quality Standard for zero detection of herbicide in streams. The 9.7-acre Scotch thistle site is not near water; therefore, treatment of this site would have no impact on water quality.

In the areas under the Lahontan Water Quality Control Board jurisdiction (see Figure 3-2), with Alternative 6 no herbicide treatment will occur from the high-water mark for a distance of 10 feet. From a distance of 10 to 100 feet from the high-water mark, only aquatic glyphosate will be used. At a distance greater than 100 feet from the high-water mark, the other herbicides shown in the Alternative may be applied.

One reason why the restrictions on herbicidal treatments in the area under the jurisdiction of the Lahontan Water Board are different, is that the eastern slope of the Warner Mountains is the most highly erosive and steep area on the Modoc National Forest.

Two of the sites with larger treatment acres in RCAs were modeled using the GLEAMS-Driver model. The 16.3-acre Scotch thistle site is located along Messenger Creek, which is a seasonal stream. The site was modeled with the GLEAMS-Driver with a rainfall of approximately 21 inches a year and 16 acres of treatment. The other site modeled was the Canada thistle site with 33 inches of rain and 10 acres of treatment to match the treatment site. The herbicides that could potentially be used at these sites were modeled. Even when modeled at the highest allowed application rate, using broadcast application up to the edge of a stream, no concentrations were over a level of concern. In reality, 2, 4-D is not allowed on sites over 2 acres in size and would not be used at either of these sites.

Table 3 - 19. GLEAMS-Driver Model Parameters and Results

Herbicide	Acres	Rainfall	Soil Type	Soil Depth	Lower concentration (mg/l)	Median Concentration (mg/l)	Upper Concentration (mg/l)	EPA Drinking Water Maximum Contaminant level (mg/l)
glyphosate	16	21	loam	24	0.014	0.015	0.025	0.7
dicamba	16	21	loam	24	0.0074	0.0083	0.009	-
2, 4-D	16	21	loam	24	0.0075	0.008	0.013	0.07
glyphosate	10	33	loam	24	0.023	0.024	0.058	0.7
dicamba	10	33	loam	24	0.012	0.013	0.060	-
clopyralid	10	33	loam	24	0.0016	0.003	0.026	-
chlorsulfuron	10	33	loam	24	0.00038	0.00041	0.00057	-
Triclopyr	10	33	loam	24	0.0094	0.011	0.031	-

When all the acres of infestations within the inner 100 feet of RCAs were totaled by watershed, there were less than 15 acres infested within 10 feet of any RCA, and only 116 acres total within the inner 100 feet of the RCA . This is a small amount of disturbance, given the scattered nature of the treatments.

Table 3 – 20. Acres of Infestations Within 100 Feet of Streams, Lakes, Springs or Meadows, by 6th-Field Watershed

Watershed Hydrologic Unit Code	Watershed Name	Infested Acres within 10 feet of streams, lakes, springs and meadows	Infested Acres within 25 feet of streams lakes, springs and meadows	Infested Acres within 50 feet of streams lakes, springs and meadows	Infested Acres with 100 feet of streams lakes, springs and meadows
180102040103	Mosquito Creek	0.29	0.49	0.81	1.38
180102040106	Fairchild Swamp	0.11	0.23	0.34	0.47
180102040204	Lower North Fork Willow Creek	0	0	0.03	0.19
180102041102	Spaulding Butte	0	0	0	0.25
180102041105	Knobcone Butte	0.01	0.03	0.07	0.10
180102041106	Double Head Mountain	0.03	0.06	0.08	0.08
Subtotal	North Coast RWB	0.44	0.81	1.33	2.47
180200010303	North Fork Cottonwood Creek	0.65	1.64	3.26	6.55
180200010304	Willow Creek	0.27	1.31	2.70	5.78
180200010305	Lassen Creek	1.87	4.63	9.23	18.83
180200010306	Ross Creek	0.06	0.16	0.24	0.30
180200010307	Davis Creek	0.02	0.05	0.14	0.28
180200010403	Corral Creek	0.01	0.03	0.07	0.10
180200020103	Southern Jess Valley	0.09	0.23	0.44	0.76

Watershed Hydrologic Unit Code	Watershed Name	Infested Acres within 10 feet of streams, lakes, springs and meadows	Infested Acres within 25 feet of streams lakes, springs and meadows	Infested Acres within 50 feet of streams lakes, springs and meadows	Infested Acres with 100 feet of streams lakes, springs and meadows
180200020202	Parsnip Creek	0.06	0.16	0.18	0.18
180200020203	Warm Creek	0.11	0.25	0.46	0.87
180200020207	Crooks Canyon	0.03	0.08	0.10	0.10
180200020303	Fitzhugh Creek	0	0	0.10	0.08
180200020401	Headwaters North Fork of Pit River	0	0	0.02	0.09
180200020402	Joseph Creek	0.09	0.22	0.42	0.64
180200020403	Thoms Creek	0	0	0.01	0.19
180200020504	Baker and Thomas Reservoir	0	0	0.02	0.11
180200020903	Canby-Pit River	0.48	1.03	1.98	4.66
180200020904	Stone Coal Creek	0.47	1.03	1.90	4.08
180200020906	Roberts Reservoir-Pit River	0.02	0.04	0.09	0.10
180200021001	Washington Creek	0.03	0.06	0.10	0.10
180200021002	Upper Turner Creek	0.05	0.06	0.12	0.19
180200021003	Hulbert-Turner Creek	0	0	0.03	0.10
180200021101	Kephart Creek	0	0	0	0.01
180200021103	Frog Waterhole	2.80	4.55	7.53	13.69
180200021203	Upper Ash Valley	0	0.05	0.14	0.29
180200021204	Cottonwood Creek	0.36	0.63	1.07	1.37
180200021205	Lower Ash Valley	0.10	0.21	0.41	0.53
180200021301	Rush Creek	2.35	5.94	11.96	23.85
180200021302	Messenger Gulch	1.72	4.01	7.39	13.35
180200021303	Upper Dutch Flat Creek	0	0	0.28	0.30
180200021304	Lower Dutch Flat Creek	0	0	0.05	0.10
180200021401	Upper Willow Creek	0	0	0	0.04
180200021401	Lower Willow Creek	0.10	0.10	0.10	0.10
180200021501	Butte Creek	0.07	0.09	0.10	0.17
180200021503	South Big Swamp	0	0	0	0.01
180200021601	East Fork Juniper Creek	0.05	0.13	0.25	0.35
180200021602	South Fork Juniper Creek	0.38	0.87	1.56	2.69

Watershed Hydrologic Unit Code	Watershed Name	Infested Acres within 10 feet of streams, lakes, springs and meadows	Infested Acres within 25 feet of streams lakes, springs and meadows	Infested Acres within 50 feet of streams lakes, springs and meadows	Infested Acres with 100 feet of streams lakes, springs and meadows
180200021603	Lower Juniper Creek	0	0	0	0.03
180200021704	Lower Big Valley	0.03	0.08	0.10	0.10
180200030101	Van Sickle Lake	0.01	0.04	0.08	0.10
180200030105	Wagontire Creek	1.00	1.16	1.34	1.92
180200030106	Clarkes Valley	0.04	0.10	0.16	0.20
Subtotal	Central Valley RWB	13.32	25.94	54.13	103.29
180800010102	Bidwell Creek	1.00	2.51	5.08	10.36
180800010201	Northwest Shore Middle Alkali Lake	0.01	0.03	0.14	0.43
180800010202	West Shore Middle Alkali Lake	0	0.01	0.05	0.11
Subtotal	Lahontan RWB	1.01	2.55	5.27	10.90
Totals		14.77	29.3	60.73	116.66

Critical Aquatic Refuges (CARs)

Where aquatic TES species are present, larger no-spray areas would be used as shown in Table 3-7. No herbicides would be used within 10 feet of a stream's High Water Mark, and only aquatic glyphosate would be used within 100 feet of the stream. This additional protection makes it exceedingly unlikely that herbicides would reach any threshold of concern in these areas.

For the treatments within the Lahonton Water Board area, no herbicide treatment would take place within 10 feet of a stream. Only aquatic glyphosate could be used within the RCA using wicking to apply the herbicide directly to the plant.

Table 3 – 21. Noxious Weed Sites and Infested Acres Within RCAs of the Lahonton Water Board

Weed ID	Weed Name	Acres	SMZ Type
WM001CIAR4	Canada Thistle	0.10	Seasonal Stream
WM002ONAC	Scotch Thistle	0.10	Seasonal Stream
WM003CIAR4	Canada Thistle	0.06	Seasonal Stream
WM003CIAR4	Canada Thistle	0.10	Perennial Stream
WM003CIAR4	Canada Thistle	0.09	Meadow
WM006CIAR4	Canada Thistle	0.10	Seasonal Stream
WM007ISTI	Dyer's woad	0.45	Seasonal Stream
WM009CIAR4	Canada Thistle	8.04	Lake
WM009CIAR4	Canada Thistle	6.16	Spring
WM009CIAR4	Canada Thistle	8.42	Seasonal Stream
WM009ISTI	Dyer's woad	1.21	Perennial Stream
WM010ISTI	Dyer's woad	0.83	Perennial Stream
WM014ISTI	Dyer's woad	0.75	Seasonal Stream

Weed ID	Weed Name	Acres	SMZ Type
WM017ONAC	Scotch Thistle	0.10	Seasonal Stream
WM017ISTI	Dyer's woad	0.10	Seasonal Stream
WM018ISTI	Dyer's woad	1.13	Perennial Stream
WM018ISTI	Dyer's woad	1.12	Seasonal Stream
WM019ISTI	Dyer's woad	0.10	Perennial Stream
WM022ONAC	Scotch Thistle	0.15	Perennial Stream
WM025ONAC	Scotch Thistle	0.10	Perennial Stream
WM025ONAC	Scotch Thistle	0.10	Seasonal Stream
WM027ONAC	Scotch Thistle	0.10	Perennial Stream
WM027ONAC	Scotch Thistle	0.08	Seasonal Stream
WM036ONAC	Scotch Thistle	0.10	Perennial Stream
WM037ONAC	Scotch Thistle	0.14	Perennial Stream
TOTALS		29.73	

Note: For the Noxious Weed FEIS, the designated zone for all SMZs is the Riparian Conservation Areas (RCAs) on the Modoc National Forest. See the definition for *Riparian Conservation Area* in the glossary. Therefore, for the Noxious Weeds FEIS, the terms SMZ and RCA are interchangeable.

Early Detection-Rapid Response

Early Detection-Rapid Response is part of this Alternative. Under this approach, new or currently unknown infestations may be treated using the range of methods analyzed in the Modoc Noxious Weed FEIS 2008, on sites similar to those presently proposed for treatment. Design Standards limit types of treatments and types of herbicides by aquatic risk within RCAs and would minimize the risk of treating these new or undiscovered infestations.

Cumulative Watershed Effects

A watershed cumulative impact can be defined as the total impact, positive or negative, on runoff, erosion, water yield, floods, and/or water quality that result from the incremental impact of a Proposed Action, when added to other past, present and reasonably foreseeable future actions occurring within the same natural drainage basin, or watershed (CEQ 1997).

The cumulative effects analysis area for this project is comprised of the 29 5th-field watersheds that are either totally or partially found within the Forest's administrative boundary. Cumulative effects information for this report is primarily derived from Chapter 3 of the FEIS. Additional sources of information are referenced accordingly.

Past, Present and Foreseeable Actions

For a complete list of all past, present, and reasonably foreseeable actions, please refer to the beginning of Chapter 3.

Past Noxious Weed Treatments and Adjacent Treatments

Prior to 2002, Modoc County Department of Agriculture treated weeds on the Forest through a Memorandum of Understanding. Billing records and correspondence between the Forest and Modoc County indicate treatments were done for about 30 years.

The Modoc National Forest contains Modoc, Lassen and Siskiyou counties. Pesticide application data is summarized annually by the California Department of Pesticide. The Department produces a report each year summarizing pesticide use by category, total pounds of pesticide applied,

number of treatments, acres and treatment type. The annual reports put out by the California Department of Pesticide do not contain information as to where the pesticides are applied geographically. Herbicide application data for the categories of forestry, rangeland and right-of-way (ROW) are summarized in Appendix B in Table 24 for the years 2002 to 2006.[6] (Appendix B is part of the Watershed and Soils specialist report, found in Appendix T, Watershed and Soils, of this final EIS.)

The table summarizes the amount of chlorsulfuron, clopyralid, 2, 4-D, dicamba, glyphosate and triclopyr applied, for the years 2002-2006. These are the herbicides proposed for use under the Proposed Action. The table also determines what percentage these herbicides comprised in terms of the total amount applied in each county for 2002-2006, as well as pounds per acre. The use of herbicides on road rights-of-way is assumed to be primarily for noxious weed treatments. However, the acreage associated with right-of-way treatments is inconsistently reported. As a result, the average rates of application have been calculated only for forestry and rangelands.

The Forest has not been extensively involved in herbicide application in the last 5 years. However, in 2002 there was minor use of clopyralid, 2, 4-D, dicamba, glyphosate, and hexazinone, all of which were used for noxious weed control. From 2003 through 2007, no herbicides were applied on the Forest outside of existing permits. As a result, it is assumed that the majority of the herbicide applications summarized in Apendix B, Table 24 have been applied to lands other than national forest.

In 2006, no herbicides were applied in Modoc County for forestry. In the same year, no herbicides were applied for rangelands in both Lassen and Modoc counties. This is also the case for both Lassen and Modoc counties in 2004. However, in 2003 rangelands in Modoc County received herbicide application while Lassen County did not. In 2002, herbicide applications were not reported for rangelands in both counties. It is assumed that from 2003 to 2006 that the herbicide use in the forestry category was on lands owned or administered by other entities than the Forest Service.

Herbicide use for each of these categories appears to have widely varied from 2002 to 2006. The total amount of chlorsulfuron, clopyralid, 2, 4-D, dicamba, glyphosate and tricoplyr, for the forestry category, ranged from a low of 1,569.4 lbs. in 2002 to a high of 11,108.6 lbs. in 2006 for Siskiyou County. For rangelands, the maximum reported amount of herbicides applied from 2002 to 2006 occurred in 2003 in Siskiyou County, where 928.4 lbs. were applied. Right-of-way applications have ranged from a low of 139.9 lbs. in Lassen County in 2004 to a high of 6, 463.6 lbs in Siskiyou County during 2004.

At no time during the period of 2002-2006 did the total amount of chlorsulfuron, clopyralid, 2, 4-D, dicamba, glyphosate and triclopyr exceed 0.1 percent of the total amount of herbicides applied in Lassen, Modoc and Siskiyou counties.

Table 3 - 22. Previous Treatments of Noxious Weeds Using Herbicides, Modoc National Forest

Weed	Control agent	Scope of program
Scotch thistle	Herbicide & Physical	Over 500 Locations
Knapweeds	Herbicide	25 Locations
Leafy spurge	Herbicide	2 Locations
Yellow starthistle	Herbicide	25 Locations
Yellows pine thistle	Herbicide	3 Locations
Dalmatian toadflax	Herbicide	15 Locations

[6] http://www.cdpr.ca.gov/docs/pur/purmain.htm

Weed	Control agent	Scope of program
Musk thistle	Herbicide	2 Locations
Crupina	Herbicide	1 Location
Russian knapweed	Herbicide	4 Locations
Perennial pepperweed	Herbicide	12 Locations

Past activities also include the following:

- Mechanical treatment of less than 1 acre on the Goosenest District of the Klamath National Forest.
- Control of noxious weeds in areas adjacent to the Modoc by the Hat Creek District of the Lassen National Forest. Targeted species include dyer's woad, Scotch thistle, and squarrose knapweed. Ten acres of noxious weeds located on the Shasta Trinity National Forest have been treated by the Lassen N.F. as these acres are administered by the Lassen.
- Various noxious weeds (425 acres) have occurred on BLM land in Modoc and Lassen Counties that have been treated with physical methods, including prescribed fire, or with chemicals between 1997 and 2002. Of these acres, 410 were populated by Medusahead.
- Noxious weed eradication was performed by the Pit River Indian tribe, using a combination of herbicide and mechanical methods, on Tribal lands. Details on which herbicides have been used were not available. Eleven acres were treated on the Fort Bidwell Reservation for Mediterranean sage, Scotch thistle and dyer's woad using mechanical methods.
- Approximately 10,000 acres a year have been treated with herbicides on private, commercial farm ground and private forests within Modoc County. Approximately 1,000 acres per year of regulatory noxious weed control occurs. Additional detail on these activities was unavailable when this report was written.

Relevant Present Activities

Fuel treatments, fire, range management, dam construction and maintenance, recreation, timber harvest, and vegetation treatments, reforestation projects, road and right-of-way management (including state and county easements and railroads), and special uses are all ongoing activities on the Forest. Each of these management activities in some way tie in to the dispersal and propagation of weeds, typically through transporting seeds or providing seed bed opportunities. For a complete discussion of all these present activities, and how they relate to the spread and propagation of noxious weeds, Chapter 3 of the FEIS.

Present activities related specifically to the inventory and treatments of noxious weeds are listed below. These activities may belong to other agencies and the lands they administer, but occur within the boundaries of the 29 5th-field watersheds that are either wholly or partially located within the boundary of the Modoc National Forest.

- Klamath National Forest, Goosenest District: noxious weed inventory
- Ongoing noxious weed control on the Klamath and Lassen National Forest's mentioned above under relevant past activities
- Modoc National Wildlife Refuge that treats 200 acres annually to control Scotch thistle. Rodeo, Roundup, 2, 4-D, and other chemicals are applied by hand, ATV and truck. In addition, a limited amount of hand grubbing occurs.

- BLM-Alturas and Surprise Valley Offices: Approximately 50 acres in Modoc County are treated annually primarily for the control of Scotch thistle and Mediterranean sage. Both Telar and 2, 4-D are applied using trucks and helicopters. The treatment of 3,500 acres of exotic invasive plant species are treated annually by a combination of manual, mechanical, chemical (both aerial and ground applications, grazing, biological and prescribed fire methods.
- Ongoing weed eradication on Pit River tribal lands (see past activities for more detail)
- 10,000 acres a year on private, commercial farm ground and private forests are treated. 1,000 acres a year of regulator weed control occurs each year. Details regarding these treatments were not available at the time this report was written.

Relevant Foreseeable Activities

- Ongoing noxious weed control on the Klamath and Lassen National Forest's mentioned above under relevant past activities
- Modoc National Wildlife Refuge that treats 200 acres annually to control Scotch thistle. Rodeo, Roundup, 2, 4-D, and other chemicals are applied by hand, ATV and truck. In addition, a limited amount of hand grubbing occurs.
- Ongoing weed eradication on Pit River tribal lands (see past activities) for more detail
- 10,000 acres a year on private, commercial farm ground and private forests are treated. 1,000 acres a year of regulator weed control occurs each year. Details regarding these treatments were not available at the time this report was written.
- The Western Area Power Administration is proposing to vegetation and other types of maintenance along 1,400 miles of 69-500 kV transmission lines, of which approximately 456.2 of these miles are located within the Forest's boundary. The purpose of the right-of-way project is to maintain existing transmission lines and legal access road rights-of-way in order to ensure maintenance crews have safe and all-weather access to transmission line structures (Western Area Power Administration 2007). By implementing the project, the threat of vegetation to interfere with power lines and towers would be eliminated, vegetation would be controlled in a cost effective and environmentally sensitive manner, and year-round access would be facilitated.

Alternative 6 proposes using a combination of manual, mechanical, and herbicide methods to create favorable conditions for the establishment of low-growing plant communities. Seeding or planting may occur. Spot and broadcast herbicide applications would be used. Aerial applications would not occur. These methods would be applied to areas underneath and adjacent to the power lines and substations.

Under their Proposed Action, Western Area Power Administration may expand their use of herbicides for vegetation management. In Appendix G of their environmental assessment, Western proposes to use up to 25 herbicides, all of which have been approved and had human health and ecological risk assessments prepared (Western Area Power Administration 2007). At the time this report was written, information as to how much of each herbicide would be used, and when, and associated application method was not available. In addition, information as to how much herbicide would be applied on a watershed basis was also not available. The herbicides proposed for use by Western are listed below in Table 3-23.

Discussion of Cumulative Effects

Only the land and roads within the National Forest System would be treated in the action Alternatives proposed by this FEIS. The Forest, however, is intermingled with other federal, state, county, and private ownerships. Management activities and actions on neighboring lands may contribute to spread or containment of invasive plants on National Forest system lands, and vice versa.

Alternative 1 – Cumulative Effects

This Alternative is covered under other NEPA projects. Existing levels of pesticide treatments would continue, by Tribes, the County, and on other private and public lands. No new treatments would be associated with this project. Treatments on the Forest would occur on an extremely small percentage (<0.1%) of any watersheds in the project area. Direct and indirect effects from treatment are so insignificant and temporary that treatment under the no action Alternative does not contribute to significant cumulative effects. Lack of treatment would allow the continued spread of invasive plants and the associated changes in ecosystems.

Alternative 2 - Cumulative Effects

Only the land and roads within the National Forest System would be treated in the action Alternatives proposed by this FEIS. The Forest, however, is intermingled with other federal, state, county, and private ownerships. Management activities and actions on neighboring lands may contribute to spread or containment of invasive plants on National Forest System lands, and vice versa. The treatments described above by county would probably continue at similar levels in the future.

Very little vegetation would be removed in any watershed therefore none of the treatments are extensive enough under any Alternative to effect peak flows, low flows or water yield in any watershed. No tractor or dozer ground-disturbing activity is proposed for this project; therefore, methods used for treatment would have negligible effects on water infiltration into soil and associated surface runoff. No 5th-field watershed has more than 2.5 percent proposed for treatment, and most have less than 1 percent (Table 3-8). This amount is much too small an area to show effects to flows from treatment.

The three 5th-field watersheds with the largest treatment acres were looked at closely. These all have one large treatment site for each watershed.

Table 3 - 23. Herbicides Proposed for Use in the Western Area Power Administration Project

Herbicide	Use
Bromacil and Diuron	Substations and non sensitive areas only
Chlorsulfuron	Right of Way
Clopyralid	Noxious Weed Control
2, 4-D	Substations, Right of Way
Clopyralid and 2, 4-D	Substations, ROW and Noxious Weed Control
Dicamba	Right of Way (stump treatment) and Substations
Dithiopur	Landscaped Areas
Diuron	Substations
Flumioxazin	Bare-ground – Substations and Kochia (Mexican burning bush) control
Fosamine Ammonium	Right of Way

Herbicide	Use
Glyphosate	Substations and areas near water and wetlands
Imazapyr	Substations, Right of Way and Stump Treatment
Oxyfluorfen	Landscaped Sites and Bare-ground control
Sulfometuron Methyl	Storage yards and Substations
Sulfometuron Methyl and Chlorsulfuron	Bare-ground and substations
Tebuthiuron and Diuron	Substations
Mefluidide	Around Substations (on grass)
Imazapyr and Diuron	Substations and Right of Way
Tebuthiuron	Substations
Triclopyr	Right of Way and Stump Treatments
Pendamethalin	Substations
Oryzalin	Substations
Fluroxypyr	Right of Way, Substations especially for Kochia (Mexican burning bush)
Paclobutrazol	Right of Way (sensitive areas)
Trifluralin	Substations and yards

Coptic Bay has the largest number of acres of invasive plants identified; 5,676 with 2.3 percent of the watershed proposed for treatment. This is due to the single large treatment area for dyer's woad (5,658 acres) which has only 1.4 acres of treatment in a seasonal RCA. As there is little water present, treating this site is unlikely to effects water resources. All other sites within the watershed are less than 1 acre in size. There are 5 acres proposed for physical treatments. Only 12 percent of the treatments are proposed are within riparian areas.

Round Valley has one large site of common crupina that is on both national forest and private land. This infestation is about 159 acres on national forest land and 586 acres on adjacent private land. On Forest land this site would be treated with physical means under Alternative 2. There is a 16-acre treatment site for scotch thistle which would also be treated with physical means. All the other sites within the watershed are less than 1 acre in size.

Taylor Lake has an 851-acre treatment site for Dalmatian toadflax, which includes treatment within RCAs of ponds, springs and wetlands. This site was modeled in Table 3-9, and was below any threshold of concern.

Alternative 2 allows the use of aquatic glyphosate in RCAs at a distance of at least 10 feet from the High Water Mark for perennial and seasonally flowing streams. Other herbicides are allowed at a distance of at least 150 feet from seasonally flowing streams, and 300 feet from perennial streams (see Figure 2-2). This protects water resources from direct and indirect effects of herbicide use at each site. Chemical treatments are scattered in small patches across the watersheds, making it unlikely that herbicide concentrations would be additive with similar treatments at the watershed scale. The potential for cumulative effects is negligible due to the implementation of Design Standards that limit direct and indirect effects, the scattered nature of the treatments, and the dilution over time and space by mixing and addition of inflow downstream.

Alternative 2 is unlikely to have significant effects on water resources and therefore is unlikely to approach a threshold of concern or contribute to significant cumulative effects. No adverse cumulative effects are expected from implementation of this Alternative.

Alternative 3 - Cumulative Effects

Alternative 3 allows only physical treatments. Small acreages are being treated within each 6th-field watershed. As these treatments are primarily pulling weeds in sites scattered across the Forest, it is unlikely that these treatments would have significant direct and indirect effects, and are therefore unlikely to add significantly to cumulative effects. Design Standards 14, 16 and 25 protect the watersheds from cumulative effects.

Alternative 4 - Cumulative Effects

The cumulative effects are the same as those discussed under Alternative 2.

Alternative 5 - Cumulative Effects

This Alternative treats only 480 acres scattered across the Forest primarily with physical means. Given the minor effects at any site, and the scattered nature of the proposed treatments, cumulative effects from this Alternative are unlikely.

Alternative 6 - Cumulative Effects

This Alternative treats only 541 acres scattered across 541 sites. Design Standard 14 requires that no more than 15 percent of any 6th field watershed be treated in one year under this project. Design Standard 18b protects specific watersheds with high amounts of treatment in RCAs by limiting acres treated within RCAs. Given these and other Design Standards, it is unlikely that this Alternative would contribute significantly to cumulative effects.

Heritage Resources

This section dealing with heritage resources and effects of the Alternatives is limited to the physical presence of prehistoric and historic archeological resources. The traditional cultural properties/practices and locations of current use are discussed in the Tribal Section of this Chapter. No public comments were received concerning the effects of the Proposed Actions on the physical prehistoric or historic archeological resources.

The Forest has a vast array of prehistoric and historic archaeological resources, traditional cultural properties, and locations still used by local Native American populations. The prehistoric resources of the Forest span the last 10,000 years and the historic period sites date between roughly 1826 to the mid-20th Century. Contemporary Native American groups include the Pit River Tribe (Achomawi/Atsugewi), the Klamath Tribes (specifically, the Modoc), and the Northern Paiute of the Surprise Valley area. Many locations throughout the Forest continue to be utilized by these contemporary Native American peoples for plant gathering (such as epos and medicinal plants), hunting, and other traditional cultural uses (including religious activities).

Prehistoric archaeological resources include numerous "lithic scatters", places where peoples in the past made stone tools, butchered animals, or camped briefly, to more prominent encampments and village sites with visible rock rings, pit house depressions, and an array of stone tools. They also include rock stacks or cairns, rock alignments, and rock art (petroglyph and pictograph sites). Over 7,000 such prehistoric sites have been recorded on the Forest to date. The overall average site density for the Forest is one site per 54 acres.

Cultural, or heritage, resource sites are managed in several ways to comply with the provisions of the National Historic Preservation Act. The level or intensity of management, according to the Forest Plan, has the following range:

- Preservation - excluding incompatible land activities protects sites.

- Conservation - when preservation is not feasible, scientific information is recovered from sites so that other land-use activities can occur.
- Interpretation - sites are developed for public enjoyment and education through signs, trails, and public information kiosks.
- No Management - sites are not preserved in any way. (These sites are not of the quality suitable for nomination to the National Register of Historic Places. They contain little scientific information or Native American cultural heritage value.)

Cultural, or heritage, resource sites are managed in several ways to comply with the provisions of the National Historic Preservation Act.

Direct and Indirect Effects

Physical Manipulation (All Action Alternatives)

The use of physical treatment methods for the control of noxious weeds has the greatest potential for affecting heritage resources such as prehistoric and historic archaeological sites, in a direct manner. These methods may also affect potential traditional cultural properties and contemporary Native American uses. The affect may be relatively minor, that is, unlikely to affect those qualities that may make an heritage property eligible for the NRHP, then the action may be treated as an "Exempt Undertaking" under the Pacific Southwest Regions "Programmatic Agreement" (PA) with the California State Historic Preservation Office (SHPO).

Herbicides (Alternatives 2, 4, and 6)

The use of herbicides generally will have little potential effect on most archaeological properties (prehistoric or historic) and should be considered to have "no effect" on those qualities that may make a property eligible for the NRHP. Therefore, treatment of noxious weeds by the use of herbicides should be classed as an "Exempted Undertaking" in regards to compliance with the NHPA. The current PA allows for programmatic compliance for this class of undertaking.

However, this type of treatment may have an effect on existing or potential Native American Tribal cultural properties, especially if the potential area is used for gathering food or medicinal plants. Any proposed use of herbicide treatment should include advanced notification of the appropriate tribal organization and individuals who may use the area. Existing ethnographic information may help identify areas subject to potential conflicts.

Cultural (Alternatives 2 through 6)

Seeding to control noxious weeds should have no effect on most heritage resources, provided the seeds are broadcast, or less than a cubic meter of soil is disturbed per acre planted. This action could also be dealt with under the PA.

Goat Grazing (Alternatives 5 and 6)

The use of goat grazing to control noxious weeds should not represent a significant effect to most archaeological resources. Some very minor ground disturbance may be present as a result of the short-term trampling affect of a goatherd milling about in a single location. This action, however, should result in relatively little lateral displacement of surface artifactual materials (e.g., obsidian waste flakes, surface artifacts such as projectile points) and should have no impact on subsurface archaeological materials.

Implementation of Alternative 3 or 5 poses the greatest risk to heritage resources due to their reliance on physical + (digging) of noxious weeds.

Alternative 1 (No Action)

There would be no direct effect on heritage resources as a result of the Alternative. However, the proliferation of noxious weeds could displace native plants traditionally used by native people, and could also result in increased erosion of archeological sites as native vegetation is displaced. The displacement of native plants could also have an impact on visually aesthetic elements of historic sites.

Cumulative Effects

There are no direct or indirect effects from herbicide application control methods in any Alternative; therefore, there would be no cumulative effects on heritage resources from those activities. Physical and cultural methods may have direct and indirect effects, although environmental protection measures are in place to avoid these effects. Other activities already planned or ongoing on the Forest (with the exception of illegal activities) also have measures to protect cultural resources, as required by the Forest Plan and other regulations. Cumulative effects from any action Alternative are expected to be minimal, and cultural resources, known or discovered during activities, would be protected.

Consistency with Forest Plans and Other Laws and Policies

Any such actions would be implemented in accordance with applicable federal law and the Site Identification Strategy for the Modoc National Forest.

Human Health and Safety

This section describes the risk of negative impacts to human health and safety associated with noxious weed treatments including hand methods and herbicides. It is broken into two sections, a) those risks associated with hand methods and b) those risks associated with herbicide treatments.

This effects section responds to the DEIS public concerns that the FEIS should more clearly disclose the human health and safety issues of herbicides proposed for use, and more information on the effects of specified herbicides on humans. Volume 2 Appendix items (Appendix C, Spill and Safety Management; Appendix E, Herbicide Information; Appendix F, Human Health Risk Assessment; Appendix P, Social and Economic Specialist Report; and Volume 3, Response to Comments sections on Herbicides and Human Health) were utilized in this Human Health and Safety analysis.

Hand Methods

Hazards associated with using hand tools or workings on steep slopes under unfavorable site conditions are apparent. Conditions can be highly variable, ranging from gentle slopes with low vegetation densities and moderate ambient temperatures, to steep slopes with dense tall shrubs or trees and extremely hot or cold ambient temperatures. Workers could be cut by tools, hit by falling trees, or injured by falling onto sharp stumps or shrub stems. Risks of injuries increase with the amount of work, and are exacerbated when working in concentrated areas or when workers are fatigued. Injuries can vary from minor cuts, sprains, bruises, and abrasions to severe injuries causing major bleeding, compound bone fractures, serious brain concussions, or mortality.

Hand clearing of vegetation is relatively slow work, with rates of production of 2 to 4 workdays per acre. This exposes workers to the hazards of this work for longer periods in relation to other, more efficient methods of clearing vegetation. Risks of injury increase as the slope, vegetation

density, and vegetation height increases. Some invasive weed species can cause allergies and minor skin irritations in a few individuals. For example, leafy spurge contains a latex-bearing sap that irritates human skin and can (rarely) cause blindness in humans upon contact with the eye (Callihan et al. 1991). Some species of noxious weeds, such as thistles, cause minor scrapes and irritations.

Approximately 10 to 15 % of the U.S. population suffers from allergy symptoms from invasive weed species such as knapweed. Knapweed is a common and powerful allergen that peaks in August (Gillespie and Hedstrom 1979). Allergies to weeds such as knapweed may complicate or trigger asthma.

Other adverse health effects associated with outdoor work in rugged terrain are possible. Examples are extreme fatigue, heat exhaustion or heat stroke, and exacerbation of chronic health conditions, such as tendon or ligament damage or arthritis. In extreme situations, exertion from applying hand methods in rugged terrain could trigger a heart attack or stroke in predisposed workers.

Workman's compensation insurance data can suggest the magnitude of human health risks associated with hand methods, relative to some other methods. The Oregon State Accident Insurance Fund listed 2002 rates for reforestation activities (including brush cutting, slash piling and burning, construction of fire lines) not associated with logging operations as $7.89 per $100 of payroll (Heaser 2002, personal communication with D.Bakke). These rates are slightly higher than the rate for spraying herbicides ($7.10 per $100 of payroll) and for recreational forest trail construction ($6.32 per $100 payroll), but all of these rates indicate roughly comparable risk levels. The Workers Compensation Insurance Rating Bureau of California listed 2002 rates for forest workers (non-loggers) who handled chainsaws and handtools as $11.31 per $100 of payroll. This rate is comparable to workers who use herbicides (Egly 2002, personal communication with D. Bakke), indicating a similar level of work-related injuries (data for workers involved with mechanical treatments were unavailable).

Proper supervision and effective training for safe use of hand equipment can reduce risks of worker injury. Wearing boots with non-skid soles and snag-resistant long-sleeve shirts and trousers also reduces risks. Forest Service procedures and normal forestry worker practices would encompass the use of these common safety items.

Members of the public should not be at risk from hand methods, because they are not likely to be sufficiently close to specific areas when tools are used.

Effects

Alternative 1, the No Action Alternative, would have no direct effects on human health associated with noxious weed treatments. The No Action Alternative would pose a continued direct effect on individuals visiting the National Forest when encounters with thistles or noxious weeds cause rashes or other health problems.

There is no definitive way to distinguish between the action Alternatives, Alternatives 2 through 6, in terms of effects on human health and safety associated with hand methods. There is some level of potential risk, and significant adverse effects on human health could occur under any action Alternative, as explained in the above sections on the general consequences of using hand methods. Significant adverse risks are not expected if the treatments are conducted according to treatment prescriptions, but the potential for accidents, unexpected weather, and other factors that could cause unexpectedly high risks, is acknowledged.

Human Health and Safety of Herbicide Use

As Alternatives 1, 3, and 5 do not propose to use herbicides, there would be no direct, indirect, or cumulative risks of herbicide-related health effects from noxious weed treatments.

The risks of adverse health effects in Alternatives 2, 4, and 6 from the use of any of the six herbicides addressed in this FEIS depend on the level of exposure at any given time, the duration of that exposure, and the inherent toxicity of the herbicide. Possible short-term adverse health effects include nausea, headache, dizziness, eye irritation, and coughing. The effects of Alternative 6 relative to Issue 1 (human health and safety) are similar to those described under Alternatives 2 and 4. However, risks to worker health and safety for Alternative 6, and the potential for public exposure to herbicides, would be reduced due to treatment of fewer acres. Long-term effects such as cancer, reproductive effects, and heritable mutations, were also considered.

Applications of chlorsulfuron, Clopyralid, Glyphosate, and Triclopyr herbicides and the nonylphenol polyethoxylate surfactants are expected to pose a low risk to human health and safety. The use of 2, 4-D and Dicamba represent a higher risk to human health and safety. These conclusions are based on a comprehensive analysis of human health risks which was conducted to analyze the potential for adverse health effects to workers and members of the public from the use of these herbicides and surfactants. The analysis examines a range of potential exposures to herbicides, from routine operations involving workers, to accidents involving workers and the public. Assumptions range from typical rates of use to very high rates, representing what could be considered worst-case exposures. Appendix F of this FEIS presents the complete human health risk assessment. The following discussion on herbicide effects is taken from that risk assessment.

The risk assessment examines the potential health effects on all groups of people who might be exposed to any of the six herbicides that might potentially be used in treating noxious weeds. Those potentially at risk fall into two groups: workers and members of the public. Workers include applicators, supervisors, and other personnel directly involved in the application of herbicides. The public includes non-project forest workers, forest visitors or nearby residents who could be exposed through the drift of herbicide spray droplets, through contact with sprayed vegetation, or by eating, or placing in the mouth, food items or other plant materials, such as berries or shoots growing in or near forests, by eating game or fish containing herbicide residues, or by drinking water that contains such residues.

The analysis of the potential human health effects associated with the use of chemical herbicides uses the methodology of risk assessment generally accepted by the scientific community (National Research Council 1983; EPA 1986, both as referenced in Appendix F). In essence, this herbicide risk assessment consists of comparing doses that people may get from applying the herbicide (worker doses) or from being on or near an application site (public doses) with the U.S. Environmental Protection Agency's (EPA) established Reference Doses (RfD), a level of exposure considered protective of lifetime or chronic exposures. RfD's are based upon doses shown to cause no observed ill effects to test animals in either short-term (acute) or long-term (sub chronic or chronic) studies. Much of the information used in this risk assessment was gathered from herbicide-specific risk assessments completed by Syracuse Environmental Research Associates, Inc. (SERA), under contract to the Forest Service (principal author of these SERA risk assessments is Dr. Patrick Durkin). Details regarding the specific methods used to prepare the SERA human health risk assessments referenced in the Risk Assessment (Appendix F of this document) are provided in SERA (2000b, as referenced in Appendix F).

Different types of possible effects were considered, including acute and chronic systemic effects, cancer and mutations, and reproductive effects. These were evaluated using appropriate animal test data. The risk assessment evaluated the chances of herbicide exposure causing general

systemic effects that could range from nausea and headaches at low doses to organ damage, effects on reproduction, the possibility of birth defects, or even mortality at extreme doses. The risk assessment also examined the possibility of acute toxic effects from exposure in accidental scenarios. A Hazard Quotient (HQ) was computed, for each type of dose estimated for workers and members of the public, by dividing the dose by the RfD. In general, if the HQ was less than or equal to 1, the risk of effects was considered negligible. HQ values, because they are based on the RfD, a long-term measure of protection, can be considered over-protective when applied to acute exposures. This aspect is discussed in evaluating possible effects.

Because the risk assessment is based on a number of assumptions, readers and decision-makers should not make the conclusion that the risk values are absolute. If the assumptions are changed, the risk values change. However, the relative risk among herbicides or methods should remain the same unless new toxicity data becomes available.

One of the primary uses of a risk assessment is for risk management. Decision-makers can use the risk assessment to identify those herbicides, application methods, or exposure rates that pose the greatest risks to workers and the public. Specific Design Standards or other prevention measures can then be employed where the decision-maker feels the risks are unacceptably high. Reducing exposure can reduce risk. The use of Design Standards, personal protective equipment for applicators, and posting of treated areas are all examples of ways to reduce exposure to applicators and the public and are part of the action Alternatives (refer to the Design Standards in Chapter 2). Acceptable risk levels have been established and are used in the risk assessment and in this effects discussion. U.S. EPA has established a significant cancer risk level as being 1 chance in 1 million; the state of California, through Proposition 65, uses a standard of 1 chance in 1 hundred thousand. The RfD is also an EPA-established measure of acceptable risk for non-carcinogen exposures. This FEIS uses the standard of 1 chance in 1 million as a cancer risk level and the RfD as the standard for non-carcinogen exposures.

In all herbicide Alternatives, herbicide exposure levels for both the public and for workers executing treatment activities would not exceed acceptable levels of risk to human health for all herbicides proposed for use (Bakke 2005). The use of proper personal safety equipment, training, and supervision for all weed-treatment crews would be required to reduce the potential for injuries to workers.

The Risk Assessment in Appendix F has five major sections: 1) an introduction; 2) an identification of the hazards associated with each herbicide and its commercial formulations; 3) an assessment of potential exposure to the product; 4) an assessment of the dose-response relationships; and 5) a characterization of the risks associated with plausible levels of exposure. The following is a summary of Sections 2 – 5 including discussions about synergistic effects, sensitive individuals, and cumulative effects.

Hazard Analysis

The hazards associated with using each of the herbicides were determined by a thorough review of available toxicological studies. For the most part, these reviews are contained in other documents and are referenced in the Risk Assessment (refer to Appendix F, pages 2 to 30). A considerable body of information has been compiled in a group of risk assessments completed by SERA, as well as in a risk assessment contained in the programmatic Region 5 FEIS Vegetation Management for Reforestation (USDA 1989 as referenced in Appendix F) and in the programmatic Herger Feinstein Quincy Library Group Forest Recovery Act Final SEIS (USDA 2003). Another source of information on toxicity is the background statements contained in Forest Service Agricultural Handbook No. 633 (USDA 1984, as referenced in Appendix F).

Current peer-reviewed articles from the open scientific literature, as well as recent U.S. EPA documents are also used to update information contained in these reference documents.

The toxicological database for each herbicide was reviewed for acute, sub-chronic, and chronic effects to test animals. Because of the obvious limitations on the testing of chemicals on humans, judgments about the potential hazards of pesticides to humans are necessarily based in large part on the results of toxicity tests on laboratory animals. Information on actual human poisoning incidents and effects on human populations supplemented these toxicity test results, where such information is available. For a background discussion of the various toxicological tests and endpoints, refer to USDA, 1989 (pages F-7 to F-18). For the herbicide Triclopyr, there are two formulations that are commonly used in treating noxious weeds: the triethylamine (TEA) salt and the butoxyethyl ester (BEE). These have somewhat different toxic properties so are considered separately in the risk assessment. They are referred to as Triclopyr TEA and Triclopyr BEE respectively.

Impurities and Metabolites

Virtually no chemical synthesis yields a totally pure product. Technical grade herbicides, as with other technical grade products, may contain some impurities. The U.S. EPA defines the term impurity as "…any substance…in a pesticide product other than an active ingredient or an inert ingredient, including un-reacted starting materials, side reaction products, contaminants, and degradation products" (40 CFR 158.153(d)). To some extent, concern for impurities in technical grade herbicides is reduced by the fact that the existing toxicity studies on these herbicides were conducted with the technical grade product. Thus, if toxic impurities are present in the technical grade product, they are likely to be encompassed by the available toxicity studies on the technical grade product. An exception to this general rule involves carcinogens, most of which are presumed to act by non-threshold mechanisms. Because of the non-threshold assumption, any amount of a carcinogen in an otherwise non-carcinogenic mixture is assumed to pose some carcinogenic risk. This is the case with the following impurities:

- Hexachlorobenzene in Clopyralid.
- Ethylene oxide in some formulations of Glyphosate and in nonylphenol polyethoxylate (NPE)-based surfactants.
- 1,4-dioxane in some formulations of Glyphosate

For these three impurities, separate analyses of their carcinogenic risk were completed. The Risk Assessment contains the analyses for hexachlorobenzene. An analysis of the cancer risks from exposure to ethylene oxide and 1, 4-dioxane is included in separate references (USDA 2003, and Borrecco and Neisess 1991 both as referenced in the Risk Assessment). In addition to the carcinogenic risks, acute and chronic risks from exposure to hexachlorobenzene are specifically included in the Risk Assessment.

From USDA (2003), the risks of cancer from the exposure to ethylene oxide were considered negligible for occupationally exposed individuals, based on a standard of acceptable risk of 1 in 1 million. As the risks from ethylene oxide are considered in USDA (2003) and risks are considered acceptable, given the conservative assumptions of exposure, it will not be further analyzed or discussed in the Risk Assessment.

From Borrecco and Neisess (1991), the risks of cancer from the exposure to 1, 4-dioxane was considered negligible for occupationally exposed individuals, based on a standard of acceptable risk of 1 in 1 million. Since the Borrecco and Neisess paper was written, the amount of 1,4-dioxane that was assumed present in the Glyphosate formulation by the authors, has been determined to be much lower (correspondence between Borrecco and M. Lemon, Monsanto

Company 1995). Hence, the margins of safety in Borrecco and Neisess can be considered conservative. In addition, an evaluation of non-cancer toxicity indicated that exposures to 1, 4-dioxane would result in acceptable levels of risk (Borrecco and Neisess 1991).

Another impurity that has been considered separately is 2-butoxyethanol (also known as ethylene glycol monobutyl ether or EGBE). 2-butoxyethanol is an impurity in the Triclopyr BEE formulation. It is on the EPA Inerts List 2 (see discussion of inerts below), because of its toxicity. This impurity was also assessed in Borrecco and Neisess, 1991. The analysis of 2-butoxyethanol indicated that exposures would result in acceptable levels of risk to both workers and the public.

Similar to impurities, the potential effect of metabolites in a risk assessment is often encompassed by the available in vivo toxicity studies under the assumption that the toxicological consequences of metabolism in the species on which toxicity studies are available would be similar to those in the species of concern; human in this case. Uncertainties in this assumption are encompassed by using an uncertainty factor in deriving the RfD and may sometimes influence the selection of the study used to derive the RfD. There is an exception when environmental metabolites may be available for exposure, as is the case with 2, 4-D, Glyphosate, and Triclopyr. The environmental metabolites of 2, 4-D and Glyphosate are discussed below, while the environmental metabolite of Triclopyr is discussed under cumulative effects.

Although 2, 4-D does not appear to be metabolized extensively in mammals; the compound degrades in the environment to form the metabolite, 2, 4-dichlorophenol. Although 2, 4-dichlorophenol was not detected in vegetation or water samples after the application of 2, 4-D, it has been detected in aqueous sediments at approximately the same concentrations as 2, 4-D. 2; 4-Dichlorophenol is a toxic metabolite. The RfD for 2, 4-dichlorophenol is 0.003 mg/kg/day based on impaired immunological function. The RfD for 2, 4-dichlorophenol is approximately the same as the chronic RfD for 2, 4-D that is used in the risk assessment. Because there is no indication that workers or the general public will be exposed to substantial amounts of 2, 4-Dichlorophenol, the formation of this compound in sediment as part of the environmental degradation process does not contribute substantially to the risks associated with the use of 2, 4-D.

Glyphosate is partially metabolized in the environment to aminomethylphosphonate (AMPA). The U.S. EPA has assessed the potential consequences of exposures to AMPA as an environmental metabolite. Based on this review, the U.S. EPA concluded that only the Glyphosate parent is to be regulated and that AMPA is not of toxicological concern regardless of its levels in food. The position taken by the U.S. EPA is supported by more extensive reviews. The position taken by U.S. EPA appears to be reasonable and is well supported. Consequently, in the risk assessment, AMPA is not quantitatively considered in the dose-response and exposure assessments.

Inert Ingredients

The issue concerning inert ingredients and the toxicity of formulations is discussed in USDA (1989) (pages 4-116 to 4-119). The approach used in USDA (1989), the SERA Risk Assessments (as referenced in Appendix F), and this analysis to assess the human health effects of inert ingredients and full formulations has been to:

- Compare acute toxicity data between the formulated products (including inert ingredients) and their active ingredients alone;
- Disclose whether or not the formulated products have undergone chronic toxicity testing; and
- Identify, with the help of EPA and the chemical companies, ingredients of known toxicological concern in the formulated products and assess the risks of those ingredients.

Researchers have studied the relationships between acute and chronic toxicity and while the biological end-points are different, relationships do exist and acute toxicity data can be used to give an indication of overall toxicity (Zeise et al. 1984, as referenced in Appendix F). The court in NCAP v. Lyng, 844 F.2d 598 (9th Cir 1988) decided that this method of analysis provided sufficient information for a decision maker to make a reasoned decision. In SRCC v. Robertson, Civ.No. S-91-217 (E.D. Cal., June 12, 1992) and again in CATs v. Dombeck, Civ. S-00-2016 (E.D. Cal., Aug 31, 2001) the district court upheld the adequacy of the methodology used in USDA, 1989 for disclosure of inert ingredients and additives.

The U.S. EPA has categorized approximately 1,200 inert ingredients into four lists. Lists 1 and 2 contain inert ingredients of toxicological concern. List 3 includes substances for which EPA has insufficient information to classify as either hazardous (List 1 or 2) or non-toxic (List 4). List 4 contains non-toxic substances such as corn oil, honey and water. Use of formulations containing inert ingredients on List 3 and 4 is preferred on vegetation management projects under current Forest Service policy.

Since most information about inert ingredients is classified as “Confidential Business Information” (CBI) the Forest Service asked U.S. EPA to review herbicide formulations and advise if they contain inert ingredients of toxicological concern. In addition, the CBI files were reviewed in the development of the various SERA risk assessments. Information has also been received from the companies who produce the herbicides and spray additives. Appendix F contains information on inert ingredients in Section 2, Hazard Analysis.

Comparison of acute toxicity (LD50 values) data between the formulated products (including inert ingredients) and their active ingredients alone shows that the formulated products are generally less toxic than their active ingredients (USDA, 1989; USDA, 1984, SERA risk assessments).

The analysis in Appendix F reviewed the acute toxicity comparisons, the U.S. EPA review, and the examination of toxicity information on inert ingredients in each product. While these formulated products have not undergone chronic toxicity testing like their active ingredients, this review leads to the conclusion that the inert ingredients in these formulations do not significantly increase the risk to human health and safety over the risks identified for the active ingredients.

Additives

Additives, or adjuvants, to the formulations that might be used when herbicides are applied are not considered in detail in the risk assessment, with the exception of surfactants containing nonylphenol polyethoxylate (NPE) as an active ingredient. This active ingredient is specifically included because of the potential presence of nonylphenol in this compound (a U.S. EPA inerts list 2 material) and the potential for toxic effects, including endocrine disruption.

Additives might involve surfactants, drift reduction agents, and dyes or colorants. Many of the formulated herbicides require the use of added surfactants; such information is on the herbicide label. Surfactants increase the ability of the herbicide to be absorbed into plant tissues. Dyes and colorants are used to indicate that a plant or area has been treated, for several reasons, including avoiding waste of materials by retreating, to allow people to avoid treated areas in short term, and to be more effective by treating all target vegetation.

There is a colorant often used in foliar applications of these herbicides (Colorfast™ Purple) that contains a dye, Basic Violet 3 or Gentian Violet, considered a potential carcinogen. A risk assessment for the carcinogenic properties of this dye was completed (SERA, 1997b, as referenced in the Risk Assessment, Appendix F). In SERA (1997b) the cancer risk to workers and the public is at acceptable levels of risk. For public exposures, it is expected that the dye would

reduce exposures both to itself and to the other chemicals it might be mixed with (herbicide and other adjuvants) as the public would be alerted to the presence of treated vegetation.

As for other additives that potentially could be used, as previously stated and in USDA (2002, 2007 as referenced in Appendix F), there is a considerable range of such products that could be considered. USDA (2002, 2007) provides an overview of the various types of additives (or adjuvants) likely to be used in forest herbicide applications and provides acute toxicity data for many of the formulations used by the Forest Service. An analysis of the ingredients in these adjuvants did not identify any specific toxic concern with the exception of the ingredients discussed in the risk assessment (ibid). None were on EPA Inerts Lists 1 or 2.

The primary summary statement that can be made is that the more common risk factors for the use of these adjuvants are through skin or eye exposure. These adjuvants all have various levels of irritancy associated with skin or eye exposure. This reinforces the need for good industrial hygiene practices while utilizing these products, especially when handling the concentrate, such as during mixing. The use of chemical resistant gloves and goggles, especially while mixing, should be observed. Since state law requires the use of goggles and gloves when mixing or applying any of the herbicides, including any of the adjuvants, eye and skin protection should be adequate.

Herbicide Use - Direct and Indirect Effects

Worker Exposure Analysis

Pesticide applicators are the individuals most likely to be exposed to a pesticide during the application process. Two types of worker exposure assessments are considered: general and accidental/incidental. The term general exposure assessment is used to designate those exposures that involve estimates of absorbed dose based on the handling of a specified amount of a chemical during specific types of applications. The accidental/incidental exposure scenarios involve specific types of events that could occur during any type of application.

Initially, risk assessments for the Forest Service adjusted the exposure rate by the estimated dermal absorption rate, typically using 2, 4-D as a surrogate chemical when compound-specific data were not available (USDA 1989). SERA conducted a detailed review and re-evaluation of the available worker exposure studies that can be used to relate absorbed dose to the amount of chemical handled per day (SERA 1998b, 2006, as referenced in Appendix F). This review noted that there was no empirical support for a dermal absorption rate correction. Two factors appear to be involved in this unexpected lack of association: 1) algorithms for estimating dermal absorption rates have large margins of error; and, 2) actual levels of worker exposure are likely to be far more dependent on individual work practices or other unidentified factors than on differences in dermal absorption rates.

Thus, in the absence of data to suggest an Alternative approach, no corrections for differences in dermal absorption rate coefficients or other indices of dermal absorption seem to be appropriate for adjusting occupational exposure rates.

In general, occupational exposures may involve multiple routes of exposure (oral, dermal, and inhalation); nonetheless, dermal exposure is generally the predominant route for herbicide applicators. Typical multi-route exposures are encompassed by the methods used for general exposures. Accidental exposures, on the other hand, are most likely to involve splashing a solution of herbicides into the eyes or to involve various dermal exposure scenarios.

There are various methods for estimating absorbed doses associated with accidental dermal exposure. Two general types of exposure are modeled: those involving direct contact with a

solution of the herbicide and those associated with accidental spills of the herbicide onto the surface of the skin. Any number of specific exposure scenarios could be developed for direct contact or accidental spills by varying the amount or concentration of the chemical on or in contact with the surface of the skin and by varying the surface area of the skin that is contaminated. For this risk assessment, two exposure scenarios are developed for each of the two types of dermal exposure, and the estimated absorbed dose for each scenario is expressed in units of mg chemical/kg body weight.

Table 3 - 25. Herbicide and Nonylphenol Polyethoxylate Application Rates to be Used to Treat Noxious Weeds, Including the Incidental Rate of Application of the Impurity Hexachlorobenzene

Herbicide	App Rate-Typical Lb/ac	App Rate-Lowest Lb/ac	App Rate-Highest Lb/ac
Chlorsulfuron	0.047 ai	0.035 ai	0.062 ai
Clopyralid	0.25 ae	0.13 ae	0.25 ae
2, 4-D	1.5 ae	0.5 ae	2.0 ae
Dicamba	1.0 ae	0.25 ae	2.0 ae
Glyphosate	2.5 ae	0.75 ae	3.75 ae
Triclopyr TEA	1.0 ae	0.5 ae	1.5 ae
Triclopyr BEE	1.0 ae	0.5 ae	1.5 ae
Nonylphenol Polyethoxylate	1.7 ai	1.3 ai	2.3 ai
Hexachlorobenzene	0.000000625 ai	0.000000325 ai	0.000000625 ai

Note: These application rates include the incidental rates of application of the impurity hexachlorobenzene. ai = active ingredient; ae = acid equivalent. If the active ingredient is commercially formulated as a salt, ester, or amine, it is converted to its acid equivalent for purposes of comparison.

Exposure scenarios involving direct contact with solutions of the chemical are characterized by immersion of the hands for 1 minute or wearing contaminated gloves for 1 hour. Generally, it is not reasonable to assume or postulate that the hands or any other part of a worker would be immersed in a solution of an herbicide for any period. On the other hand, contamination of gloves or other clothing is quite plausible. For these exposure scenarios, the key element is the assumption that wearing gloves grossly contaminated with a chemical solution is equivalent to immersing the hands in a solution. In either case, the concentration of the chemical in solution that is in contact with the surface of the skin and the resulting dermal absorption rate are essentially constant. Exposure scenarios involving chemical spills onto the skin are characterized by a spill onto the lower legs as well as a spill on to the hands. In these scenarios, it is assumed that a solution of the chemical is spilled onto a given surface area of skin and that a certain amount of the chemical adheres to the skin.

Quantitative summaries of the exposures to workers from these exposure scenarios for both general and accidental exposures, by herbicide (including nonylphenol polyethoxylate and hexachlorobenzene), are shown in Appendix F. The implications of these exposure scenarios are discussed in the Risk Characterization section below.

Public Exposure Analysis

Under normal conditions, members of the general public should not be exposed to substantial levels of any of these herbicides. Members of the public would generally not be in the areas of maintenance work during herbicide application. In addition, posting of treatment areas should provide adequate warning to the public that an area has been treated. Despite the likelihood that the public would not be exposed to these herbicides, exposure scenarios were developed and evaluated for members of the public. These scenarios are described below.

Quantitative summaries of the exposures to the public from these exposure scenarios, by herbicide (including nonylphenol polyethoxylate and hexachlorobenzene), are shown in

Appendix F. The implications of these exposure scenarios are discussed in the Risk Characterization section below.

Direct Spray

The majority of the acres to be treated would not be expected to act as a specific draw to large numbers of non-project personnel. Nonetheless, any number of exposure scenarios can be constructed for the general public, depending on various assumptions regarding application rates, dispersion, canopy interception, and human activity. Several highly conservative scenarios are developed for this risk assessment. The two types of exposure scenarios developed for the general public includes acute exposure and longer-term or chronic exposure. All of the acute exposure scenarios are primarily accidental. They assume that an individual is exposed to the compound either during or shortly after its application. Specific scenarios are developed for direct spray, dermal contact with contaminated vegetation, as well as the consumption of contaminated fruit, water, and fish. Most of these scenarios should be regarded as extreme, some to the point of limited plausibility. The longer-term or chronic exposure scenarios parallel the acute exposure scenarios for the consumption of contaminated fruit, water, and fish but are based on estimated levels of exposure for longer periods after application.

For direct spray scenarios, it is assumed that during a ground application, a naked child is sprayed directly with the herbicide. The scenario also assumes that the child is completely covered (that is, 100 % of the surface area of the body is exposed), which makes this an extremely conservative exposure scenario that is likely to represent the upper limits of plausible exposure. An additional set of scenarios are included involving a young woman who is accidentally sprayed over the feet and legs. For each of these scenarios, some standard assumptions are made regarding the surface area of the skin and body weight.

In the dermal exposure from contaminated vegetation exposure scenario, it is assumed that the herbicide is sprayed at a given application rate and that an individual comes in contact with sprayed vegetation or other contaminated surfaces at some period after the spray operation. For these exposure scenarios, some estimates of dislodgeable residue and the rate of transfer from the contaminated vegetation to the surface of the skin must be available. No such data are directly available for these herbicides, and so estimation methods are used.

Water Contamination

Water can be contaminated from runoff, as a result of leaching from contaminated soil, from a direct spill, or from unintentional contamination from aerial applications. For this risk assessment, the three types of estimates made for the concentration of these herbicides in ambient water are acute/accidental exposure from an accidental spill and short and longer-term/chronic exposure to the herbicides in ambient water that could be associated with the typical application of this compound to a 100-acre treatment area.

There are two acute exposure scenarios. The first assumes that a young child (2- to 3-years old) consumes contaminated water shortly after an accidental spill of a field solution into a small pond. The second assumes that a small child consumes contaminated water shortly after an overland flow or drift event to a stream. Because these scenarios are based on the assumption that exposure occurs shortly after the water is contaminated, no dissipation or degradation of the herbicide is considered. The scenario for chronic exposure to these herbicides from contaminated water assumes that an adult consumes contaminated ambient water for a lifetime. Estimates of levels in ambient water were made based on the GLEAMS (Groundwater Loading Effects of Agricultural Management Systems) model. GLEAMS is a root zone model that can be used to examine the fate of chemicals in various types of soils under different meteorological and

hydrogeological conditions. Tables below describe the acute and chronic water contamination rates utilized in the risk assessment and are based on GLEAMS modeling.

Table 3 - 26. Short-Term Water Contamination Rates (WCR) of Herbicides, Nonylphenol Polyethoxylate, and the Hexachlorobenzene Impurity (In Mg/L Per Lb Applied)

Herbicide	Typical WCR	Low WCR	High WCR
Chlorsulfuron	0.1	0.01	0.2
Clopyralid	0.02	0.005	0.07
2, 4-D	0.15	0.13	0.42
Dicamba	0.003	0.00006	0.01
Glyphosate	0.02	0.001	0.4
Triclopyr	0.09	0.001	0.4
Nonylphenol polyethoxylate	0.012	0.0031	0.031
Hexachlorobenzene	0.09	0.001	0.3

Table 3 - 27. Longer-Term Water Contamination Rates (WCR) of Herbicides, Nonylphenol Polyethoxylate, and the Hexachlorobenzene Impurity (In Mg/L Per Lb Applied)

Herbicide	Typical WCR	Low WCR	High WCR
Chlorsulfuron	0.0006	0.0001	0.0009
Clopyralid	0.007	0.001	0.013
2, 4-D	0.002	0.001	0.004
Dicamba	0.00001	0.000005	0.00003
Glyphosate	0.001	0.0001	0.008
Triclopyr	0.03	0.008	0.05
Nonylphenol polyethoxylate	0.007	0.00001	0.014
Hexachlorobenzene	0.0005	0.00003	0.001

Many chemicals may be concentrated or partitioned from water into the tissues of animals or plants in the water. This process is referred to as bioconcentration. As with most absorption processes, bioconcentration depends initially on the duration of exposure but eventually reaches steady state. Generally, bioconcentration is measured as the ratio of the concentration in the organism to the concentration in the water, referred to as a bioconcentration factor (BCF). There are three with BCF value greater than 1: chlorsulfuron (1 to 12), 2, 4-D (40), and hexachlorobenzene (10,000). For both the acute and longer-term exposure scenarios involving the consumption of contaminated fish, the water concentrations of the herbicides used are identical to the concentrations used in the contaminated water scenarios. The acute exposure scenario is based on the assumption that an adult angler consumes fish taken from contaminated water shortly after an accidental spill into a pond. No dissipation or degradation is considered. Because of the available and well-documented information and substantial differences in the amount of caught fish consumed by the general public and Native American subsistence populations, separate exposure estimates are made for these two groups. The chronic exposure scenario is constructed in a similar way.

Vegetation Contamination

Under normal circumstances and in most types of applications, it is extremely unlikely that humans would consume, or otherwise place in their mouths, vegetation contaminated with these herbicides. Nonetheless, any number of scenarios could be developed involving either accidental spraying of crops, the spraying of edible wild vegetation, like berries, or the spraying of plants collected by Native Americans for basket weaving or medicinal use. Again, in most instances and particularly for longer-term scenarios, treated vegetation would probably show signs of damage from herbicide exposure, thereby reducing the likelihood of consumption that would lead to

significant levels of human exposure. Notwithstanding that assertion, it is conceivable that individuals could consume contaminated vegetation.

One of the more plausible scenarios involves the consumption of contaminated berries after treatment along a road or some other area in which wild berries grow. The two accidental exposure scenarios developed for this exposure assessment include one scenario for acute exposure and one scenario for longer-term exposure (90 days). In both scenarios, the concentration of herbicide on contaminated vegetation is estimated using a derived empirical relationship between application rate and concentration on vegetation.

For hexachlorobenzene the assumption used is that there is no dissipation of the impurity in plants over the course of the chronic contaminated vegetation scenario. This is due to its long half time in the soil (SERA, 1999c). An additional consideration with hexachlorobenzene is that the BCF in vegetation is established as 19.

Dose-Response Assessment

In evaluating the doses received under each scenario, the doses are evaluated against RfD's as previously stated. If all the exposures are below the RfD (an HQ less than or equal to 1) the assumption is that the proposed use of the herbicide presents little risk to either the public or workers. If any exposure exceeds the RfD, a closer look at the various studies and exposure scenarios must be made to determine whether a toxic response is expected from the exposure. This section of the risk assessment describes the RfD, its basis, and for those herbicides that show doses exceeding the RfD, it provides an analysis of the various studies and further refines the risk thresholds. Table below displays the acute and chronic RfDs used in the risk assessment.

Table 3 - 28. Reference Doses (Rfd) in Mg/Kg/Day Of Herbicides, Nonylphenol Polyethoxylate, and the Hexachlorobenzene Impurity

Herbicide	Acute RfD	Chronic RfD
Chlorsulfuron	0.25	0.02
Clopyralid	0.75	0.15
2, 4-D	0.067 (general population) 0.025 (women)	0.005
Dicamba	0.1	0.045
Glyphosate	2.0	2.0
Triclopyr	1.0 (general population) 0.05 (women)	0.05
Nonylphenol Polyethoxylate 1	0.1	0.1
Hexachlorobenzene 2	0.008	0.0008

[1] This is not a U.S. EPA-derived RfD; it is developed in the USDA, 2003 risk assessment on nonylphenol polyethoxylate and is described as a 'provisional reference dose'.

[2] The acute value for hexachlorobenzene is an ASTDR acute MRL (minimal risk level). It is similar to an U.S. EPA RfD.

Risk Characterization

A quantitative summary of the risk characterization for workers and the public associated with exposure to these herbicides is presented in this section, along with a narrative description. The quantitative risk characterization is expressed as the hazard quotient, which is the ratio of the estimated exposure doses to the RfD.

A reservation attached to this assessment is that associated with any risk assessment: Absolute safety cannot be proven, and the absence of risk can never be demonstrated. No chemical has been studied for all possible effects, and the use of data from laboratory animals to estimate hazard or the lack of hazard to humans is a process that has uncertainty. Prudence dictates that

normal and reasonable care would be taken in the handling of these herbicides. The introduction in Appendix F of this document discusses the concept of uncertainty in risk assessments, as do the lead-in paragraphs in Appendix F, Section 5 (Risk Characterization).

To summarize worker exposures, with the exception of 2, 4-D, typical application rates and non-accidental work scenarios indicates that risks to workers are considered acceptable. At typical application rates, the use of 2, 4-D represents a slight risk to workers, but it is unlikely that toxic effects would be seen. At the upper application rates, chronic exposures of workers to both Dicamba and 2, 4-D represent a risk of health effects, although the extent of those effects is not clear. For the accidental exposure scenarios that are analyzed, only one scenario, the wearing of contaminated gloves for one hour after being exposed to the highest rates of Triclopyr BEE represents a risk of health effects. All other accidental scenarios for all other herbicides have hazard quotients below 1. All of these herbicides can cause irritation and damage to the skin and eyes. Eye or skin irritation is likely to be the only overt effect due to mishandling of these herbicides.

As stated above, it is important to remember that under normal conditions, members of the general public should not be exposed to substantial levels of any of these herbicides. To summarize public exposures, exposure to chlorsulfuron, Clopyralid, Glyphosate, and the impurity hexachlorobenzene under the accidental scenarios analyzed here would represent acceptable levels of risk at all application rates and both acute and chronic exposures. Public exposures to 2, 4-D, Dicamba, Triclopyr and nonylphenol polyethoxylate result in hazard quotients exceeding one in several scenarios; some that greatly exceed one. The implications of hazard quotients that exceed one vary by herbicide; it is an incorrect assumption that the same HQ means the same degree of effects with different herbicides.

Worker Risks Related to Occupational Exposures

For typical concentrations, backpack sprayers can apply five of the six herbicides without exposures exceeding a hazard quotient (HQ) of 1 (refer to Tables 3-29 and 3-30). The exception is 2, 4-D, which slightly exceeds a HQ of 1. This implies that long-term employment applying these five herbicides, absent accidental scenarios, can be accomplished without any expected toxic effects. All worker occupational exposures at typical, lower, and upper application rate scenarios result in a hazard quotient less than or equal to 1 for chlorsulfuron, Clopyralid, Glyphosate, nonylphenol polyethoxylate, and the impurity hexachlorobenzene. In addition, the cancer risks from all the worker occupational exposures to hexachlorobenzene in Clopyralid are at least 2 orders of magnitude below the risk standard of 1 chance in 1 million.

Table 3 - 29. Hazard Quotients (Non-Cancer) for Backpack Applicators – General (Non-Accidental) Exposures of Herbicides, Nonylphenol Polyethoxylate, and the Hexachlorobenzene Impurity

Herbicide	Typical Rate of Application	Lower Rate of Application	Upper Rate of Application
Chlorsulfuron	0.01	0.0006	0.1
Clopyralid	0.01	0.0003	0.07
2, 4-D	2	0.04	16
Dicamba	0.1	0.002	2
Glyphosate	0.008	0.0001	0.08
Triclopyr TEA	0.1	0.004	1.2
Triclopyr BEE	0.1	0.004	1.2
Nonylphenol Polyethoxylate	0.1	0.005	0.9
Hexachlorobenzene	0.000005	0.0000001	0.00003

Table 3 - 30. Hazard Quotients (Non-Cancer) for Boom Spray Applicators – General (Non-Accidental) Exposures of Herbicides, Nonylphenol Polyethoxylate, and the Hexachlorobenzene Impurity

Herbicide	Typical Rate of Application	Lower Rate of Application	Upper Rate of Application
Chlorsulfuron	0.01	0.0002	0.1
Clopyralid	0.009	0.0001	0.07
2, 4-D	2	0.01	17
Dicamba	0.1	0.0007	2
Glyphosate	0.007	0.00005	0.08
Triclopyr TEA	0.1	0.001	1.3
Triclopyr BEE	0.1	0.001	1.3
Nonylphenol Polyethoxylate	0.09	0.002	1.0
Hexachlorobenzene	0.000004	0.00000005	0.00003

Note: Data for boom-sprayer application is for comparison purposes only. The Forest does not propose using boom sprayers.

For 2, 4-D, at the typical application rates, the hazard quotient slightly exceeds one with a value of 2 for both backpack and boom spray applications. At the upper rates of application, worker exposures greatly exceed a value of one, with hazard quotients of 16 and 17. One reason for these high hazard quotients is the additional 10X safety factor due to toxicity database gaps that is used to derive the RfD. As discussed in Appendix F (Section 4), and assuming that the missing studies don't change the conclusions, chronic human doses in the range of 0.08 to 0.09 mg/kg/day (upper range for workers) can result in some sub-clinical effects (effects to kidney, liver, testes, thyroid, body weight). At the typical exposures, effects to workers are unlikely, even with hazard quotients slightly exceeding unity.

For Dicamba, at the typical and lower application rates, the hazard quotients are below unity for backpack and boom spray applications. At the upper application rate, the hazard quotient slightly exceeds one with a value of 2. The simple verbal interpretation of this quantitative characterization of risk is that under a protective set of exposure assumptions, backpack and boom spray workers would not be exposed to levels of Dicamba that are regarded as unacceptable at the typical application rate. At the maximum application rate, some workers could be exposed to levels of Dicamba that would not be regarded as acceptable. It is unclear from the toxicity tests that form the basis for the RfD, if overt effects would be likely from this slight exceeding of the RfD. This dose is below the 45 mg/kg/day rat NOAEL by a factor of ~560.

For Triclopyr, both TEA and BEE formulations, typical and lower estimates of exposure for workers approach, but don't exceed, a level of concern. At the upper application range, exposure levels slightly exceed the level of concern, with hazard quotients of 1.2 and 1.3. The health consequences of these exposure levels are uncertain but would be expected to be minimal.

Worker Risks from Accidents and Incidents

Tables below display the hazard quotients for worker risks from accidents and incidents. As stated, the hazard quotient is based on the RfD, which for many of the herbicides is itself a measure of acceptable chronic exposure. Since the accident scenarios are infrequent events, the use of the hazard quotient is inherently conservative. With that said, all worker accidental exposures at typical, lower, and upper application rate scenarios result in a hazard quotient less than or equal to 1 for chlorsulfuron, Clopyralid, Glyphosate, Triclopyr TEA, nonylphenol polyethoxylate, and the impurity hexachlorobenzene.

Table 3-31 shows hazard quotients (non-cancer) for workers from accidental/incidental exposures at the typical application rate, and Table 3-32 shows hazard quotients (non-cancer) for workers from accidental/incidental exposures at the upper application rate.

Table 3 - 31. Hazard Quotients (Non-Cancer) for Backpack Applicators – Accidental/Incidental Exposures with Typical Application Rate of Herbicides, Nonylphenol Polyethoxylate, and the Hexachlorobenzene Impurity

Herbicide	Immersion of hands, 1 min.	Contaminated gloves, 1 hour	Spill on hands, 1 hour	Spill on lower legs, 1 hour
Chlorsulfuron	0.0000004	0.00003	0.00002	0.00004
Clopyralid	0.0000005	0.00003	0.0001	0.0002
2, 4-D	0.0005	0.03	0.01	0.03
Dicamba	0.0003	0.02	0.006	0.01
Glyphosate	0.000002	0.0001	0.0002	0.0006
Triclopyr TEA	0.00002	0.001	0.006	0.02
Triclopyr BEE	0.008	0.5	0.02	0.05
Nonylphenol Polyethoxylate	0.002	0.1	0.0005	0.001
Hexachlorobenzene	0.00006	0.004	0.0000008	0.000002

Table 3 - 32. Hazard Quotients (Non-Cancer) for Backpack Applicators – Accidental/Incidental Exposures with Upper Application Rate of Herbicides, Nonylphenol Polyethoxylate, and the Hexachlorobenzene Impurity

Herbicide	Immersion of hands, 1 min.	Contaminated gloves, 1 hour	Spill on hands, 1 hour	Spill on lower legs, 1 hour
Chlorsulfuron	0.000002	0.0001	0.0001	0.0003
Clopyralid	0.000003	0.0002	0.0006	0.001
2, 4-D	0.002	0.1	0.06	0.2
Dicamba	0.002	0.1	0.04	0.1
Glyphosate	0.00001	0.0008	0.001	0.003
Triclopyr TEA	0.0001	0.006	0.03	0.09
Triclopyr BEE	0.03	1.6	0.06	0.1
Nonylphenol Polyethoxylate	0.004	0.3	0.007	0.02
Hexachlorobenzene	0.0004	0.01	0.000004	0.00006

The accidental exposure scenario of wearing gloves contaminated with Triclopyr BEE for 1 hour exceeds the RfD for upper exposure levels (HQ = 1.6). Although it is unlikely that a one-time exposure to Triclopyr BEE at this level would result in toxic effects, this scenario indicates that adequate worker hygiene practices are important. As stated above, workers applying Triclopyr only occasionally would be at much lower risk of such an accident. If a worker applies Triclopyr often, and is sloppy with industrial hygiene, some effects to the kidney are plausible. The simple verbal interpretation of this quantitative characterization of risk is that under the most conservative set of accidental exposure assumptions, workers could be exposed to levels of Triclopyr BEE that are regarded as unacceptable. If Triclopyr is not applied at the highest application and concentration rate or if appropriate steps are taken to ensure that workers are not exposed to the maximum plausible rates (i.e., worker hygiene practices) the risk to workers would be substantially reduced.

All of these herbicides can cause irritation and damage to the skin and eyes. Eye or skin irritation is likely to be the only overt effect due to mishandling of these herbicides. These effects can be minimized or avoided by prudent industrial hygiene practices during handling. The amine formulations of 2, 4-D and Triclopyr can have impacts that are more serious to the eyes; eye

protection is critical when using these two active ingredients. Since state law requires the use of goggles when mixing or applying any of these herbicides, eye protection should be adequate.

Public Exposures from Direct Spray

Table 3-33 displays the hazard quotient values for the public, direct-spray scenarios. The two direct spray scenarios (child sprayed and woman sprayed on feet and legs) at all application rate scenarios results in a hazard quotient less than or equal to 1 for chlorsulfuron, Clopyralid, nonylphenol ethoxylate, and the impurity hexachlorobenzene.

Table 3 - 33. Hazard Quotient (Non-Cancer) for the Public – Direct-Spray Scenarios of Using Herbicides, Nonylphenol Polyethoxylate, and the Hexachlorobenzene Impurity

Herbicide	Child, typical rate	Child, upper rate	Woman, typical rate	Woman, upper rate
Chlorsulfuron	0.0006	0.005	0.00006	0.005
Clopyralid	0.004	0.02	0.0004	0.002
2, 4-D	0.5	2	0.1	1
Dicamba	0.2	1.7	0.02	0.2
Glyphosate	0.009	0.04	0.0009	0.004
Triclopyr TEA	0.2	1.3	0. 5	3
Triclopyr BEE	0.7	2	1.4	4
Nonylphenol Polyethoxylate	0.02	0.3	0.002	0.03
Hexachlorobenzene	0.00003	0.0002	0.000003	0.00002

The direct spray of the naked child with 2, 4-D at the upper exposure level slightly exceeds the level of concern, with a hazard quotient of 2. As with the worker exposures, one reason for these high hazard quotients is the additional 10X safety factor due to toxicity database gaps that is used to derive the RfD. Where the acute human exposures are less than about 1 mg/kg/day, no effects would be anticipated.

At the upper exposure level, the spraying of a child slightly exceeds the level of concern (HQ = 1.7). This level of exposure is unlikely to result in sub-clinical effects to a child. As stated in Appendix F, the acute RfD is based on a single-dose neurotoxicity study in rabbits with an implied NOAEL of 30 mg/kg/day. Based on this study, there is little chance of neurological effects to a child exposed at the upper application rates.

At the upper application rate of 1.5 lbs/acre, both Triclopyr BEE and Triclopyr TEA formulations would exceed the level of concern for all dermal exposure scenarios. At the typical rate, the Triclopyr BEE scenario for a woman sprayed also exceeds the level of concern. Based on the dose-severity relationship for Triclopyr, at these levels of acute exposure, it is unlikely that there would be any adverse health effects associated with a one-time exposure.

Public Exposures from Exposure to Treated Vegetation

Table 3-34 displays the hazard quotient values for members of the public who might contact sprayed vegetation. The scenario involving a woman contacting treated vegetation at all application rate scenarios results in a hazard quotient less than or equal to 1 for all herbicides but Triclopyr TEA and BEE. For Triclopyr BEE, at the typical rate of application, the HQ slightly exceeds 1, while at the upper application rates, the HQ for both TEA and BEE exceed the RfD (HQ = 2 – 3). Based on the dose-severity relationship for Triclopyr, at these levels of acute exposure, it is unlikely that there would be any adverse health effects associated with a one-time exposure. This scenario again highlights the need for prevention of public exposures during and immediately after spraying.

Table 3 - 34. Hazard Quotient (Non-Cancer) for the Public – Direct Spray Scenarios of Using Herbicides, Nonylphenol Polyethoxylate, and the Hexachlorobenzene Impurity

Herbicide	Typical rate	Upper rate
Chlorsulfuron	0.00006	0.0004
Clopyralid	0.0005	0.002
2, 4-D	0.2	1
Dicamba	0.03	0.2
Glyphosate	0.001	0.005
Triclopyr TEA	0.6	2
Triclopyr BEE	1.3	3
Nonylphenol Polyethoxylate	0.003	0.06
Hexachlorobenzene	0.0000009	0.000002

Public Exposure from Eating Sprayed Fruit (Acute and Chronic)

Table 3-35 displays the hazard quotient for members of the public shortly after ingesting contaminated fruit. The scenario involves eating berries daily for 90 days after they were sprayed with herbicides. Both the acute and chronic scenarios show similar results. For all six herbicides, nonylphenol polyethoxylate, and the impurity hexachlorobenzene, HQs are less than or equal to 1 for both the acute and chronic scenario for the typical rates of application. For all the herbicides but 2, 4-D, and Dicamba, and nonylphenol polyethoxylate, the HQs are less than 1 for the upper application rates. In addition, the cancer risk in the chronic scenario from hexachlorobenzene in Clopyralid is at least 3 orders of magnitude below the risk standard of 1 chance in 1 million for all exposure levels.

Table 3 - 35. Hazard Quotient (Non-Cancer) for the Public – Contaminated Fruit While Using Herbicides, Nonylphenol Polyethoxylate, and the Hexachlorobenzene Impurity

	Acute		Chronic	
Herbicide	Typical rate	Upper rate	Typical rate	Upper rate
Chlorsulfuron	0.002	0.05	0.01	0.2
Clopyralid	0.004	0.06	0.008	0.2
2, 4-D	0.7	15	1	17
Dicamba	0.1	4	0.04	1.2
Glyphosate	0.01	0.3	0.008	0.2
Triclopyr TEA	0.06	1	0.03	0.7
Triclopyr BEE	0.06	1	0.03	0.7
Nonylphenol polyethoxylate	0.2	4	0.003	0.07
Hexachlorobenzene	0.000002	0.00001	0.0000006	0.000006

For 2, 4-D, at the upper exposure level, the acute exposure exceeds the level of concern, with a hazard quotient of 15. As with the worker exposures, one reason for this high hazard quotient is the additional 10X safety factor due to toxicity database gaps that is used to derive the RfD. As stated, where the acute human exposures exceed about 1 mg/kg/day, potential sub-clinical effects could be seen. Based on the exposure value in Appendix F (Table F3-5c), the upper range acute exposure does not exceed this level. The chronic consumption of unwashed berries after application of the highest dose yields a hazard quotient that is substantially greater than unity. At the highest application rate of 2.0 lbs/acre, the estimated dose would be about 0.08 mg/kg/day. This value is in the range of which no chronic effects should be seen. This scenario may be considered conservative in that it does not consider the effects of washing contaminated vegetation, but again, it points out that oral exposures are of greater concern than dermal exposures. It also points out the importance of notifying the public of areas to be treated so that the collection of food products or basketry materials can be avoided

For Dicamba, at the upper exposure levels, both the acute and chronic exposures slightly exceed the level of concern, with hazard quotients ranging from 1.2 to 4. Again, it is uncertain from the toxicology studies whether such acute exposures would result in any overt effects to adults. For the chronic exposure, the estimated dose would be about 0.05 mg/kg/day. Similar to the worker exposures, it is unclear from the toxicity tests that form the basis of the RfD, if overt effects would be likely. This dose is 833 times lower than the 45 mg/kg/day rat NOAEL on which the current RfD is based.

For nonylphenol polyethoxylate, the consumption of contaminated vegetation represents a risk of clinical effects at the high application rates only (HQ = 4). This exposure could present risks of nausea and vomiting from the ingestion of sprayed fruit.

Public Exposure from Drinking Contaminated Water (Acute and Chronic)

Table 3-36 displays the hazard quotient values from the contaminated water scenarios involving public consumption. These scenarios involving a child drinking from a pond immediately after a spill or from a stream after a drift event, and an adult drinking water from the same contaminated pond over a lifetime are arbitrary scenarios. Scenarios that are more or less severe, all of which may be equally probable or improbable, easily could be constructed. However, these scenarios indicate that a spill of herbicide into a water body is something to be strongly avoided. Prevention strategies are displayed in Appendix A. Another aspect to the pond water contamination scenario is that it represents standing water, with no dilution or decomposition of the herbicide. This is unlikely in a forested situation where flowing streams are more likely to be contaminated in a spill, rather than a standing pond of water. For the acute stream contamination scenario where a child drinks from a contaminated stream, 2, 4-D just reaches a hazard quotient of 1 for the upper application rate; none of the other herbicides or nonylphenol polyethoxylates or the impurity hexachlorobenzene exceeds a value of one. For the scenario in which the adult drinks contaminated water over a lifetime, none of the hazard quotient values, for any of the herbicides, nonylphenol polyethoxylates, or the impurity hexachloro-benzene, at any application rate, exceeds a value of one. In addition, the cancer risk in the chronic scenario from hexachlorobenzene in Clopyralid is at least 5 orders of magnitude below the risk standard of 1 chance in 1 million for all exposure scenarios.

Table 3 - 36. Hazard Quotient (Non-Cancer) for the Public – Drinking Contaminated Water from Herbicides, Nonylphenol Polyethoxylate, and the Hexachlorobenzene Impurity

	Acute-spill		Acute-stream		Chronic-spill	
Herbicide	Typical rate	Upper rate	Typical rate	Upper rate	Typical rate	Upper rate
Chlorsulfuron	0.05	0.1	0.001	0.006	0.00004	0.0001
Clopyralid	0.09	0.2	0.0005	0.003	0.0003	0.0007
2, 4-D	6	15	0.3	1	0.02	0.05
Dicamba	3	10	0.002	0.02	0.000006	0.00005
Glyphosate	0.3	0.9	0.002	0.08	0.00004	0.0005
Triclopyr TEA	0.3	0.8	0.007	0.07	0.02	0.05
Triclopyr BEE	0.3	0.8	0.007	0.07	0.02	0.05
Nonylphenol Polyethoxylate	5	7	0.009	0.04	0.002	0.005
Hexachlorobenzene	0.00002	0.00004	5 E-7	0.000003	1 E-8	3 E-8

The acute exposure scenario with the child drinking water from a pond shows that chlorsulfuron, Clopyralid, Glyphosate, Triclopyr, and the impurity hexachlorobenzene have hazard quotient

values at or below 1 for all application rates. 2, 4-D, Dicamba, and nonylphenol ethoxylate show hazard quotient values greater than 1 for typical and high application levels.

For 2, 4-D, where the hazard quotient ranges from 6 to 15, the doses associated with these typical application rates ranges from 0.41 to 1.0 mg/kg per incident. Assuming that new studies don't change the current hazard discussions, levels of acute exposures from 0.1 to 1 mg/kg/day should not result in any adverse health effects.

With Dicamba, the hazard quotient slightly exceeds the level of concern (HQ = 3) at the typical exposure rate. As stated above for workers, it is uncertain from the toxicology studies whether such an acute exposure would result in any overt effects. At the upper exposure level, the consumption of contaminated water by a child exceeds the level of concern by an order of magnitude (HQ = 10). This level of exposure (approximately 1 mg/kg/day) may result in sub-clinical effects to a child, although the toxicity data do not clearly point to this conclusion. The acute RfD is based on a single-dose neurotoxicity study in rabbits with an implied NOAEL of 30 mg/kg/day. Based on this study, there is a chance for some neurological effects to a child exposed at the upper application rates from drinking water after a spill.

For NPE, the spill scenario represents the greatest risk, with a hazard quotient of 5 for the typical application rate, and a hazard quotient exceeding unity even with the lowest application rates. An HQ of 5 represents a risk of sub-clinical effects to the liver and kidney. The upper hazard quotient of 7 represents an increasing risk of clinical effects to the kidney, liver, and other organ systems.

Public Exposures from Consumption of Fish (Acute and Chronic)

Like the drinking water scenarios, the scenarios involving consumption of fish taken from contaminated waters are arbitrary scenarios. Scenarios that are more or less severe, all of which may be equally probable or improbable, easily could be constructed. Tables 3-37 and 3-38 display the hazard quotient values for these scenarios. For the chronic exposure scenarios, where recreational or subsistence adults consume fish for a lifetime, none of the hazard quotient values exceeds 1. In addition, the cancer risk in these chronic scenarios from hexachlorobenzene in Clopyralid is at least 2 orders of magnitude below the risk standard of 1 chance in 1 million for all exposure scenarios.

Table 3 - 37. Hazard Quotient (Non-Cancer) for the Public – Consumption of Contaminated Fish, Acute Exposure, as a Result of Using Herbicides, Nonylphenol Polyethoxylate, and Products Containing the Hexachlorobenzene Impurity

	Recreational		Subsistence	
Herbicide	Typical rate	Upper rate	Typical rate	Upper rate
Chlorsulfuron	0.002	0.003	0.008	0.01
Clopyralid	0.003	0.003	0.01	0.02
2, 4-D	7	12	36	60
Dicamba	0.05	0.1	0.3	0.7
Glyphosate	0.004	0.007	0.02	0.04
Triclopyr TEA	0.0005	0.0009	0.002	0.004
Triclopyr BEE	0.0005	0.0009	0.002	0.004
Nonylphenol Polyethoxylate	0.1	0.1	0.7	0.7
Hexachlorobenzene	0.001	0.002	0.006	0.008

The acute scenarios show that all but 2, 4-D have hazard quotient values below 1 for all application rates and for recreational and subsistence populations. For 2, 4-D, where the hazard quotient ranges from 7 to 60, the acute doses associated with these application rates ranges from

0.49 to 4.0 mg/kg per incident. Assuming that new studies don't change the current hazard discussions, levels of acute exposures from 1 to 10 mg/kg/day could result in prenatal effects, possible neurological effects, and body weight loss. These scenarios point out that spill prevention and the prevention of water contamination is a critical aspect of 2, 4-D use (refer to Best Management Practices descriptions in Appendix D).

Table 3 - 38. Hazard Quotient (Non-Cancer) for the Public – Consumption of Contaminated Fish, Chronic Exposure, as a Result of Using Herbicides, Nonylphenol Polyethoxylate, and Products Containing the Hexachlorobenzene Impurity

	Recreational		Subsistence	
Herbicide	Typical rate	Upper rate	Typical rate	Upper rate
Chlorsulfuron	3 E-7	6 E-7	0.000002	0.000005
Clopyralid	0.000002	0.000003	0.00001	0.00003
2, 4-D	0.003	0.009	0.03	0.07
Dicamba	2 E-8	1 E-7	2 E-7	0.000001
Glyphosate	7 E-8	8 E-7	5 E-7	0.000007
Triclopyr TEA	0.000005	0.00001	0.00004	0.0001
Triclopyr BEE	0.000005	0.00001	0.00004	0.0001
Nonylphenol Polyethoxylate	0.00001	0.00002	0.00008	0.0002
Hexachlorobenzene	0.000001	0.000002	0.000009	0.00002

Synergistic Effects

Synergistic effects are those effects resulting from exposure to a combination of two or more chemicals that are greater than the sum of the effects of each chemical alone (additive). Refer to USDA, 1989 (pages 4-111 to 4-114) for a detailed discussion on synergistic effects. Instances of chemical combinations that cause synergistic effects are relatively rare at environmental exposure levels. Review of the scientific literature on toxicological effects and toxicological interactions of agricultural chemicals indicate that exposure to a mixture of pesticides is more likely to lead to additive rather than synergistic effects (Kociba and Mullison 1985; Crouch et al. 1983; U.S. EPA 1986, all as referenced in Appendix F). In U.S. EPA (1986), the assumption of dose or response addition of the individual components is recommended in the absence of toxicity data on the mixture of the components, if the toxic response of the components is the same.

Synergism has rarely been observed in toxicological tests involving combinations of these herbicides with other commercial pesticides. The herbicide mixtures that could possibly occur on this project have not shown synergistic effects in humans who have used them extensively in forestry and other agricultural applications. However, synergistic toxic effects of herbicide combinations, combinations of the herbicides with other pesticides such as insecticides or fertilizers, or combinations with naturally occurring chemicals in the environment are not normally studied. Based on the limited data available on pesticide combinations involving these herbicides, it is possible, but unlikely, that synergistic effects could occur as a result of exposure to the herbicides considered in this analysis.

However, even if synergistic or additive effects were to occur as a result of a proposed treatment, these effects are dose dependent (Dost 1991, as referenced in Appendix F). This means that exposures to the herbicide plus any other chemical must be significant for these types of effects to be of a biological consequence. Based on the very low exposure rates estimated for the Alternatives analyzed in this FEIS, any synergistic or additive effects, if any, are expected to be insignificant.

The combination of surfactant and herbicide might indicate an increased rate of absorption through the skin; however, a review of recent studies indicates this is not often true (USDA,

2002, as referenced in Appendix F). For a surfactant to increase the absorption of another compound, the surfactant must affect the upper layer of the skin. Without some physical effect to the skin, there would be no change in absorption as compared to the other compound alone. The studies (USDA 2002, as referenced in Appendix F) indicate that in general non-ionic surfactants have less of an effect on the skin, and hence absorption, then anionic or cationic surfactants. Compound specific studies indicate that the alkylphenol ethoxylates generally have little or no effect on absorption of other compounds. In several studies, the addition of a surfactant actually decreased the absorption through the skin. It would appear that there is little support for the contention that the addition of surfactants to herbicide mixtures would increase the absorption through the skin of these herbicides.

Several of the six herbicides considered in this risk assessment can be combined with other herbicides to increase the range of effective control. Although combining any of these six herbicides with any other herbicide is not anticipated nor proposed under Alternatives 2 or 4, it is important to consider whether any of the six have shown synergistic effects when combined with other compounds. Studies of these six herbicides in combination with other compounds are not common, as toxicology studies generally involve the active ingredient. So to the extent that any studies exist, they are important to consider for their insight into potential impacts of combinations. In addition, in Alternative 6, there are two mixtures proposed to be used (Dicamba plus 2, 4-D and chlorsulfuron plus 2, 4-D.

Using current guidance on analyzing mixtures (refer to Appendix F), it is apparent that mixtures containing 2, 4-D will represent some degree of risk represented by 2, 4-D itself (several scenarios with HQ values > 1). None of the acute scenarios involving workers should represent a risk of additive effects when these two mixtures (2, 4-D plus chlorsulfuron and 2, 4-D plus Dicamba) are considered. Central estimates for chlorsulfuron result in HQ values less than 0.1, even at the highest application rate of 0.0625 pounds/acre, which would indicate that a mixture of 2, 4-D and chlorsulfuron should represent health risks that should focus on 2, 4-D itself, and not on the mixture. However, since several of the Dicamba HQ values also exceed 0.1 at the upper mixture rate of 1 lb ae/acre, there could be additive effects associated with this mixture (although, as stated below, there is some evidence that such interactions may not occur, as the mode of toxic action may be dissimilar between Dicamba and 2, 4-D). These additive effects of Dicamba and 2, 4-D would be more likely in public acute exposures and chronic worker exposures and would be unlikely in chronic public exposures or acute worker exposures.

The manufacturers recommend that chlorsulfuron formulations be mixed with a non-ionic surfactant. There is no published literature or information in the US EPA files that would permit an assessment of toxicological effects or risk assessment of chlorsulfuron mixed with a surfactant. According to the product label, the Telar formulation of chlorsulfuron may be applied in combination with other herbicides, such as 2, 4-D, Dicamba, or Glyphosate. However, there are no animal data to assess whether chlorsulfuron will interact, either synergistically or antagonistically with 2, 4-D or any other herbicide.

Clopyralid may be applied in combination with other herbicides. There are no data in the literature suggesting that Clopyralid will interact, either synergistically or antagonistically with this or other compounds.

A commercial formulation of picloram and 2, 4-D, Tordon 202C, has been shown to inhibit immune response in mice (SERA 1999c, as referenced in Appendix F). While the design of this study does not permit the determination of which agent caused the immune response, this observation is relevant to some Forest Service activities because, picloram is often applied with 2, 4-D (although the use of picloram is not proposed under this FEIS, as it is not registered in California).

There is no substantial evidence that Dicamba will interact with other compounds. A study by Moody et al. (1991, as referenced in Appendix F) indicates that Dicamba does not induce cytochrome P-450 activity and does not substantially affect a variety of other xenobiotic metabolizing enzymes. Although this finding does not rule out the possibility that Dicamba may be involved in toxicologically significant interactions, the induction of cytochrome P-450 is a major mechanism by which such interactions are known to occur.

There is very little information available on the interaction of Glyphosate with other compounds. The available data do not suggest a synergistic interaction between Glyphosate and the ethoxylated tallow amine (POEA) surfactant used in several formulations of Glyphosate from plausible routes of exposure (SERA 1996a, as referenced in Appendix G).

There is very little information available on the interaction of Triclopyr with other compounds. The available data do not suggest a synergistic interaction between the Triclopyr active ingredient and the other components in the commercial Triclopyr formulations of Garlon 3A or Garlon 4 (SERA 1996b, as referenced in Appendix F).

Sensitive Individuals

The uncertainty factors used in the development of the RfD takes into account much of the variation in human response. The uncertainty factor of 10 for sensitive subgroups is sufficient to ensure that most people would experience no toxic effects. “Sensitive” individuals are those that might respond to a lower dose than average, which includes women and children. As stated in National Academy of Sciences (NAS), 1993 (as referenced in Appendix F), the quantitative differences in toxicity between children and adults are usually less than a factor of approximately 10-fold. An uncertainty factor of 10 for sensitive subgroups may not cover all individuals that may be sensitive to herbicides because human susceptibility to toxic substances can vary by two to three orders of magnitude. Factors affecting individual susceptibility include diet, age, heredity, pre-existing diseases, and life style. Individual susceptibility to the herbicides proposed in this project cannot be specifically predicted. Unusually sensitive individuals may experience effects even when the HQ is equal to or less than 1.

There is no information to suggest that specific groups or individuals may be especially sensitive to the systemic effects of chlorsulfuron. Due to the lack of data in humans, the likely critical effect of chlorsulfuron in humans cannot be identified clearly. In animals the most sensitive effect of chlorsulfuron appears to be weight loss. There is also some evidence that chlorsulfuron may affect the circulatory system. However, it is unclear if individuals with pre-existing diseases of the circulatory system or metabolic disorders would be particularly sensitive to chlorsulfuron exposure. Individuals with any severe disease condition could be considered more sensitive to many toxic agents. The 1996 Food Quality Protection Act requires that U.S. EPA evaluate an additional 10X safety factor, based on data uncertainty or risks to certain age/sex groupings. U.S. EPA has evaluated chlorsulfuron against this standard and has recommended a 3X additional safety factor be used for the protection of infants and children. This additional 3X safety factor is factored into the acute and chronic RfD’s of this risk assessment as it applies to chlorsulfuron.

There is no information to suggest that specific groups or individuals may be especially sensitive to the systemic effects of Clopyralid (SERA, 1999a, as referenced in Appendix F). The likely critical effect of Clopyralid in humans cannot be identified clearly. Clopyralid can cause changes in organ and body weight, deceased red blood cell counts, as well as changes to the intestinal walls. These effects, however, are not consistent among species or even between different studies in the same species. Thus, it is unclear if individuals with pre-existing diseases of the kidney, liver, or blood would be particularly sensitive to Clopyralid exposures, although individuals with any severe disease condition could be considered more sensitive to many toxic agents.

There is anecdotal information (case histories) suggesting that some individuals may be sensitive to 2, 4-D. These individuals may develop impaired nerve function after exposure to 2, 4-D at levels that are not expected to cause adverse health effects in the general population. The effects reported in the case studies are debilitating, and recovery may be prolonged and incomplete. On the other hand, the case studies do not rule out the possibility that the neuropathy was caused by other unidentified agents. The medicine probenecid enhances the acute toxicity of 2, 4-D and 2,4,5-T to rats. Thus, individuals taking probenecid may be more sensitive than others to the acute toxicity of 2, 4-D. Laboratory studies demonstrate that there is substantial variation among individual animals within a species in their response to 2, 4-D. Also, there is evidence of human variability regarding dermal absorption rates. Individuals who absorb 2, 4-D more rapidly or eliminate the compound more slowly are likely to be more sensitive than others to 2, 4-D exposure.

The only identified sensitive subgroup for Dicamba appears to be children. Since the RfD for Dicamba explicitly considers the increased sensitivity of children with an additional safety factor and since exposure assessments for children are conducted in the risk assessment, this sensitive subgroup is addressed in the current risk assessment.

No reports were encountered in the Glyphosate literature leading to the identification of sensitive subgroups. There is no indication that Glyphosate causes sensitization or allergic responses, which does not eliminate the possibility that some individuals might be sensitive to Glyphosate as well as many other chemicals (SERA 2003a, as referenced in Appendix G).

Because Triclopyr may impair blood filtration, individuals with pre-existing kidney diseases are likely to be at increased risk (SERA, 1996b, as referenced in Appendix F). Because the chronic RfD for Triclopyr is based on reproductive effects, women of child-bearing age are an obvious group at increased risk (SERA 2003b as referenced in Appendix F). This group is given explicit consideration and is central to the risk characterization.

NP9E can cause increases in kidney and liver weight, and effects to kidney function and structure. Thus, individuals with pre-existing conditions that involve impairments of the kidney or liver may be more sensitive to this compound. There is some indication that sensitive individuals may develop contact allergies. People with a history of skin allergic reactions to soaps and detergents may be especially sensitive to dermal exposures of NP9E-based surfactants.

The potential of NP9E to induce reproductive effects should be considered low. Based on the available dose/duration/severity data, it appears that exposure levels below those associated with the most sensitive effect (i.e., kidney effects) are not likely to be associated with reproductive toxicity. However, as shown in the exposure scenarios, there is the potential for acute exposures to be in the range (considering a 100X safety factor) where effects to the developing fetus may occur, therefore women of child-bearing age could be considered a sensitive population.

Cumulative Effects of Human Health and Safety and the Risks Associated with Herbicide Use for Noxious Weed Treatments

The proposed use of herbicides could result in cumulative doses of herbicides to workers or the general public. Cumulative doses to the same herbicide result from (1) additive doses via various routes of exposure resulting from the management scenarios presented in Alternatives 2, 4, and 6, and (2) additive doses if an individual is exposed to other herbicide treatments.

Additional sources of exposure include: use of herbicides on adjacent private timberlands or home use by a worker or member of the general public. Using Forest Service and State of California pesticide-use records (from 2002 and 2003); Table F5-11 in Appendix F displays the use of herbicides on public and private timberlands, rangelands, and road rights-of-ways (the

latter assumed to be primarily for noxious weed work) within the four-counties that make up the Modoc National Forest area (Lassen, Modoc, Shasta, and Siskiyou Counties). This four county area would likely encompass the area where workers would be living while participating in this project.

It is conceivable that workers or members of the public could be exposed to herbicides as a result of treatments on surrounding public or private forestlands or from fire restoration efforts on National Forest System lands. Where individuals could be exposed by more than one route, the risk of such cases can be quantitatively characterized by simply adding the hazard quotients for each exposure scenario. For example, using Glyphosate as an example, the typical levels of exposure for a woman being directly sprayed on the lower legs, staying in contact with contaminated vegetation, eating contaminated fruit, and consuming contaminated fish leads to a combined hazard quotient of 0.03. Similarly, for all of the chronic Glyphosate exposure scenarios, the addition of all possible pathways lead to hazard quotients that are substantially less than one. Similar scenarios can be developed with the other herbicides. This risk assessment specifically considers the effect of repeated exposure in that the chronic RfD is used as an index of acceptable exposure. Consequently, repeated exposure to levels below the toxic threshold should not be associated with cumulative toxic effects.

Since these herbicides persist in the environment for a relatively short time (generally less than 1 year), do not bio-accumulate, and are rapidly eliminated from the body, additive doses from re-treatments in subsequent years are not anticipated. According to recent work completed by the California Department of Pesticide Regulation, some plant material contained Triclopyr residues up to 1.5 years after treatment (Glyphosate, up to 66 weeks), however, these levels were less than 1 part per million (Segawa et al. 2001 as referenced in Appendix F). Based on the re-treatment schedule in Alternatives 2, 4, and 6, it is possible that residues from the initial herbicide application could still be detectable during subsequent re-treatments, but these plants would represent a low risk to humans as they would show obvious signs of herbicide effects as so would be undesirable for collection.

Table F5-11 in Appendix F indicates that several of these herbicides are used primarily outside of forestlands in the four county area. In order to consider the cumulative effects of these other uses, U.S. EPA has developed the theoretical maximum residue contribution (TMRC). The TMRC is an estimate of maximum daily exposure to chemical residues that a member of the general public could be exposed to from all published and pending uses of a pesticide on a food crop (Table F5-13 in Appendix F). Adding the TMRC to this project's chronic dose estimates can be used as an estimate of the cumulative effects of this project with theoretical background exposure levels of these herbicides. The result of doing this doesn't change the risk conclusions based on the project-related HQ values.

Cumulative effects can be caused by different chemicals with a common metabolite or a common toxic action. With the exception of Triclopyr and chlorpyrifos discussed below, none of the other herbicides have been demonstrated to share a common metabolite with other pesticides. As shown in the analysis below, the use of Triclopyr in this project does not represent an unacceptable risk to human health due to its environmental metabolite.

The primary metabolite of Triclopyr is 3,5,6-trichloro-2-pyridinol, referred to as TCP. TCP is also the primary metabolite of an insecticide called chlorpyrifos. U.S. EPA (1998, 2002a both as referenced in Appendix F) considered exposures to TCP from both Triclopyr and chlorpyrifos in their general dietary and drinking water exposure assessments. The toxicity of TCP is similar to Triclopyr. In the RfD on Triclopyr, the provisional chronic RfD for TCP is 0.03 mg/kg/day, about the same as the 0.05 mg/kg/day for Triclopyr. For acute exposures in this risk assessment, the corresponding values are 1 mg/kg/day for Triclopyr and 0.25 mg/kg/day for TCP. The U.S. EPA

estimated dietary exposures at the upper 99.5% level for a young woman – i.e., the most sensitive population in terms of potential reproductive effects, the endpoint of greatest concern for Triclopyr. The upper range of acute exposure to Triclopyr was estimated at 0.012 mg/kg/day and the upper range of exposure to chlorpyrifos was estimated at 0.016 mg/kg/day. Thus, making the assumption that both Triclopyr and chlorpyrifos are totally converted to TCP, the total exposure is about 0.028 mg/kg/day, a factor of 8.9 below the level of concern. For chronic exposures, the U.S. EPA based the risk assessment on infants – i.e., individuals at the start of a lifetime exposure. The dietary analysis indicated that the total exposure expressed as a fraction of the RfD was 0.044 for TCP from Triclopyr and 0.091 for TCP from chlorpyrifos for a total of 0.135 or a factor of about 7.4 below the level of concern [1÷0.135 = 7.4]. Based on this assessment, the U.S. EPA (1998) concluded that

> ...the existing uses of Triclopyr and chlorpyrifos are unlikely to result in acute or chronic dietary risks from TCP. Based on limited available data and modeling estimates, with less certainty, the Agency concludes that existing uses of Triclopyr and chlorpyrifos are unlikely to result in acute or chronic drinking water risks from TCP. Acute and chronic aggregate risks of concern are also unlikely to result from existing uses of Triclopyr and chlorpyrifos.

This conclusion, however, is based primarily on the agricultural uses of Triclopyr – i.e., estimated dietary residues – and does not specifically address potential exposures from forestry applications. In forestry applications, the primary concern would be the formation of TCP as a soil metabolite. TCP is more persistent than Triclopyr in soil and TCP is relatively mobile in soil (U.S. EPA 1998) and could contaminate bodies of water near the site of application. In order to assess the potential risks of TCP formed from the use of Triclopyr, the TCP metabolite was modeled in the SERA risk assessment (SERA 2003b) along with Triclopyr. The results for TCP are summarized in SERA (2003b).

While Triclopyr and chlorpyrifos would not be commonly applied together in forestry applications, at least one formulation of chlorpyrifos, Nufos 4E, is labeled for forestry applications and may be applied at a rate of 1 lb/acre for the control of insect pests in tree nurseries and plantations. In order to assess potential exposures to TCP from the application of both Triclopyr and chlorpyrifos at the same site, GLEAMS was used to model the application of chlorpyrifos at 1 lb per acre under the same conditions used for Triclopyr (SERA 2003b). As modeled, concentrations of TCP in a small stream could reach up to 11 ppb from the use of Triclopyr at a rate of 1 lb/acre and up to 68 ppb in a small stream from the use of Triclopyr at a rate of 1 lb/acre and chlorpyrifos at a rate of 1 lb/acre.

The current RfD for TCP used by U.S. EPA (2002a) is 0.012 mg/kg/day for chronic exposure and 0.025 mg/kg/day for acute exposure. The child is the most exposed individual, consuming 1L of water per day at a body weight of 10 kg. Thus, based on the chronic RfD of 0.012 mg/kg/day, the associated concentration in water would be equivalent to 120 ppb. Since the peak exposure to TCP in water (68 ppb) is below the concentration associated with the chronic RfD, there is no basis for asserting that the use of Triclopyr with or without the use of chlorpyrifos will result in hazardous exposures of humans to TCP.

Recent studies have shown drift of chlorpyrifos, and other insecticides, from agricultural lands in the Sacramento/San Joaquin Valley to the Sierra Nevada range (McConnell et al. 1998). In the four-county Modoc National Forest area, chlorpyrifos use in 2002 totaled 5,800 pounds, primarily used in alfalfa, onion, mint, and walnut orchards in the agricultural valleys. Levels of chlorpyrifos have been measured in watercourses in the Sierra Nevada as high as 13 ng/L (equivalent to 0.013 ppb). These upper levels have been measured in the southern Sierra. As a comparison, the use of chlorpyrifos in Fresno County was over 40 times higher in 2002 then the four Modoc National

Forest counties combined. This would indicate that it is unlikely that such high aquatic levels of chlorpyrifos would be found in the Modoc National Forest area as a result of atmospheric movement. Assuming that 100% of measured chlorpyrifos would degrade to TCP (an over-exaggeration of the rate of degradation), this would add 0.013 ppb of TCP. If this amount is added to the modeled peak exposure of 68 ppb, it would not result in any appreciable increase in risk.

Estrogenic effects (a common toxic action and a form of endocrine disruption) can be caused by additive amounts of nonylphenol (NP), nonylphenol polyethoxylate (NPE), and their breakdown products. In other words, an effect could arise from the additive dose of a number of different xenoestrogens (estrogens from outside the body), none of which individually have high enough concentrations to cause effects. This can also extend out to other xenoestrogens that biologically react the same. Additive effects, rather than synergistic effects, are expected from combinations of these various estrogenic substances.

When assessing cumulative effects of exposure to NP and NPE, there must be some consideration of the contribution from other sources, such as personal care products (skin moisturizers, makeup, deodorants, perfumes, spermicides), detergents and soaps, foods, and from the environment away from the forest herbicide application site. In addition to xenoestrogens, humans are exposed to various phytoestrogens, which are hormone-mimicking substances naturally present in plants. In all, more than 300 species of plants in more than 16 families are known to contain estrogenic substances, including beets, soybeans, rye grass, wheat, alfalfa, clover, apples, and cherries. Adding together the contributions from the worst-case background environment and consumer products, as described in the Risk Assessment, there would be a background dose to a female worker of 27.034 mg/kg/day (assuming 100% dermal absorption) or 0.304 mg/kg/day (assuming 1% dermal absorption. Using the derived NP human NOEL of 0.10 mg/kg/day, these exposure estimates result in hazard quotients of 270 and 3. In terms of the risk assessment, the non-acute contribution of NPE (backpack workers exposure ranged from 0.000075 to 1.01 mg/kg/day) would contribute up to 10 to any hazard quotient; at typical application rates, the worker exposure would add 0.1 to the HQ. For the public chronic exposures at the upper range of application, the doses of NPE would add 0.00002 to 0.2 to any HQ. These may be negligible depending upon the background exposures, lifestyles, absorption rates, and other potential chemical exposures that are used to determine overall risk to environmental xenoestrogens.

Opposing Viewpoints Concerning the Use of Herbicides

Some people have expressed concern regarding the use of herbicides in an integrated pest management program even though available studies and evidence suggests minimal or no potential negative impacts on wildlife, the environment or on humans. Chief concerns include: synergistic reactions, bio-accumulation, persistence in environment, low dose impact, migration through the environment, and lack of data and transferability of knowledge. These concerns generally arise out of the uncertainty and lack of trust in the studies and state and federal certification processes. The Human Health Risks section of this chapter presents information and discussion on these subjects as they relate to human health. However, that discussion applies generally to wildlife, particularly since toxicity testing is carried out on laboratory animals and not on human subjects.

The problem of utilizing herbicides in an integrated weed management system was described by a research student as the “impossibility of determining a concise answer between those who see herbicides as a necessary tool and those who see it as a poison with no middle ground or room for compromise.”

Noxious Weeds

Thirty-two different noxious weeds are believed to be present in Modoc County, and are possibly occurring on the Modoc National Forest. Below are 14 noxious weed species listed with "proposed to be treated" in the right column. These species could be eradicated and/or controlled within the boundaries of the Modoc National Forest. The other species not identified for treatment are not known to occur on the Forest, or occur at rates that are currently beyond control within the Modoc National Forest.

Table 3 - 39. Weeds of Modoc County[7]

"A" Rated		
Common Crupina	*Crupina vulgaris*	Proposed to be treated
Dalmatian toadflax	*Linaria dalmatica*	Proposed to be treated
Diffuse knapweed	*Centaurea diffusa*	Proposed to be treated
Halogeton	*Halogeton glomeratus*	Not known to occur on the Modoc NF
Leafy spurge	*Euphorbia esula*	Not known to occur on the Modoc NF
Longleaf ground cherry	*Physalis longifolia*	Not known to occur on the Modoc NF
Musk thistle	*Carduus nutans*	Proposed to be treated
Perennial sowthistle	*Sonchus arvensis*	Not known to occur on the Modoc NF
Plumeless thistle	*Carduus acanthoides*	Proposed to be treated
Scotch thistle	*Onopordum acanthium*	Proposed to be treated
Skeletonweed	*Chondrilla juncea*	Not known to occur on the Modoc NF
Spotted knapweed	*Centaurea stoebe ssp. micranthos*	Proposed to be treated
Squarrose knapweed	*Centaurea squarrosa*	Proposed to be treated
Yellowspine thistle	*Cirsium ochrocentrum*	Not known to occur on the Modoc NF
"B" Rated		
Austrian fieldcress	*Rorippa austriaca*	Not known to occur on the Modoc NF
Canada thistle	*Cirsium arvense*	Proposed to be treated
Dyer's woad	*Isatis tinctoria*	Proposed to be treated
Globepodded hoarycress	*Cardaria pubescens*	Recently detected on the Modoc NF
Heart-podded hoarycress	*Cardaria draba*	Not known to occur on the Modoc NF
Japanese knotweed	*Polygonum cuspidatum*	Not known to occur on the Modoc NF
Mediterranean sage	*Salvia aethiopis*	Proposed to be treated
Purple loosestrife	*Lythrum salicaria*	Not known to occur on the Modoc NF
Quackgrass	*Agropyron repens*	Not known to occur on the Modoc NF
Russian knapweed	*Acroptilon repens*	Recently detected on the Modoc NF
Tall whitetop	*Lepidium latifolium*	Proposed to be treated
"C"Rated		
Common Russian thistle	*Salsola tragus*	Occur at rates beyond control
Field bindweed	*Convolvulus arvensis*	Occur at rates beyond control
Klamathweed	*Hypericum perforatum*	Proposed to be treated
Medusahead	*Taeniatherum caput-medusae*	Occur at rates beyond control
Povertyweed	*Iva axillaris*	Occur at rates beyond control
Puncturevine	*Tribulus terrestris*	Not known to occur on the Modoc NF
Yellow starthistle	*Centaurea solstitialis*	Proposed to be treated

See Page for definition of State of California Weed Rating System

Past Noxious Weed Treatments

Hand-pulling and grubbing efforts on the Forest and County over the past several years have proven ineffective in reducing populations or providing lasting control of target weed

infestations. Efforts have resulted in some success preventing individual Spotted knapweed from producing seeds during the treatment year (Modoc County 2000-2002).

Table 3 - 40. Previous Treatment of Invasive Species Through Use of Physical + Methods

Pest	Mechanism	Scope of program
gypsy moth	75 traps placed throughout county	None Detected
Scotch thistle	Herbicide & Physical +	Over 500 Locations

Use of herbicides to control weeds during the last 11 years on the Forest and adjacent lands has shown to be the most effective method at suppressing infestations and eradicating new populations. Although eradication of all weeds is not feasible Plateau-wide, isolated infestations have been treated with consistently moderate to high success.

Table 3 - 41. Previous Treatment of Noxious Weeds on the Modoc NF Through Use of Herbicides

Pest	Control agent	Scope of program
Scotch thistle	Herbicide & Physical +	Over 500 Locations
Knapweeds	Herbicide	25 Locations
Leafy spurge	Herbicide	2 Locations
Yellow starthistle	Herbicide	25 Locations
Yellowspine thistle	Herbicide	3 Locations
Dalmatian toadflax	Herbicide	15 Locations
Musk thistle	Herbicide	2 Locations
Crupina	Herbicide	1 Location
Russian knapweed	Herbicide	4 Locations
Perennial pepperweed	Herbicide	12 Locations

In addition to treatment of noxious weeds, pesticides are used on private lands, including privately owned commercial timberlands, ranch and farmlands, home sites, utility corridors, county and state roadways, and businesses. Much of the use of herbicides such as Glyphosate (Roundup) is sold over the counter for home and private use, and cumulative totals for the area are not available. According to reports filed by the Modoc County Agricultural Commissioner, an average of approximately 200,000 pounds of herbicides (approximately 140 different herbicides) have been utilized in Modoc County, primarily on agriculture crops on private land adjacent to Federal Lands) on an annual basis for over ten years (Department of Pesticide Regulation, 1991-2002 Annual Pesticide Use Reports, Indexed by Herbicide – Modoc County).

Public comments on the DEIS requested additional analysis of noxious weed treatment methods and less or no reliance on herbicides to control noxious weeds, clarify priority for treatment, and/or extensive analysis of each specific noxious weed and treatment methods. Some wanted less aggressive approaches to noxious weed treatment and others wanted more aggressive treatments. Some wanted more site specific information about each noxious weed-infested site.

Throughout the effects analysis, when specific sites where treatment may have an effect on a resource are discussed by site number, Volume 4, Map Book displays the location and approximate size of each inventoried noxious weed site and specific treatments of those sites is found in Appendix B.

Chapter 2 of this FEIS displays the decision tree and criteria that are to be utilized in determining site specific treatment methods, as well as resource protection measures.

The effects discussion below is summarized from the Noxious Weed Risk Assessment and NWRA Addendum for the Modoc National Forest Noxious Weed Treatment Project, and from the Design standard, Description of Alternatives, Appendix G: Weed Species Information and

Specialist Reports located in the project record. The Response to Comments Volume contains detailed responses to the above concerns. The Appendix Volume and Response to Comments Volume are incorporated into this section of the analysis.

Direct and Indirect Effects

Alternative 1 (no action): Under the No Action Alternative, it is expected that all noxious weeds would continue to regenerate and spread within the Modoc National Forest. New noxious weeds could invade the Forest. As weeds increase, there would be a corresponding increase in weed propagules, such as seeds and rhizomes, that could continue to spread the infestations.

Alternative 2 would allow for an aggressive noxious weed control program. Reductions in occurrences of the treated weeds and in size of the occurrences would be expected. Since new weeds and new or expanding occurrences would not be treated, the overall area occupied by noxious weeds on the Forest may actually be able to increase. Production of weed propagules would be reduced on the sites treated, although there still would be viable noxious weed seed in the seed bank on termination of this 5-year program, as many weed seeds remain viable for many years – up to 30 years for Scotch thistle. Removal of noxious weeds at treated sites could enhance the native communities, making them more resistant to weed invasion, which in turn would reduce the potential available habitat for weed invasion.

Alternative 3 would result in the reduction of some noxious weeds. However, only non-rhizomatous weeds would be treated, and, therefore, the rhizomatous species would continue to grow - possibly expanding in occurrence size - and produce propagules that could spread those weeds. Non-rhizomatous weeds would not be adding new propagules to the soil. However, the seed bank would not be treated, and the potential for this seed bank to regenerate weeds would be high, as ground generally would be disturbed during physical treatments, providing habitat for invasive plants. No Early Detection - Rapid Response would be included in this Alternative, and therefore new sites, expanded sites, or new noxious weeds would not be treated, allowing for untreated expanding noxious weed infestation.

Alternative 4 provides for aggressive treatment of noxious weeds, utilizing a wide range of treatment methods. All known noxious weed infestations, including rhizomatous species, would be treated by herbicide or physical methods. This Alternative would be in effect for 10 years, instead of the 5 years of Alternatives 2 and 3, and, therefore, the chances for complete removal of occurrences of noxious weeds would be greater, especially for smaller infestations. Early Detection - Rapid Response would allow treatment of the same weeds with the same treatments on new sites or sites that have expanded, which would provide more effective treatment and could result in the complete removal of many sites of the 14 known noxious weeds. However, Early Detection - Rapid Response would not address new noxious weeds, and therefore, these new species would be able to expand in size or occurrence number without treatment.

Alternative 5 would result in the reduction of some noxious weeds. However, two large infestations – one of dyer's woad and one of common crupina – would not be treated. Even with treatment on the periphery to keep it from expanding, the main infested acres of these two large sites would most likely increase in weed density, continuing to weaken native communities within the infestation, which would most likely allow further degradation by weeds due to the reduced competition. Only small infestations of non-rhizomatous weeds would be treated, and, therefore, the larger occurrences of rhizomatous species would continue to grow - possibly expanding in occurrence size - and produce propagules that could spread those weeds. Rhizomatous noxious weeds that have not been eliminated completely would be expected to re-infest areas, and possibly come back in denser stands. Physical+ treatments have been found to stimulate the roots of rhizomatous species, and even the small occurrences treated in this

Alternative, unless treated persistently over a long time, may not effectively control or eliminate these species. Clipping of seed heads would remove current year's seed, but not remove plants, nor address the seedbed already created. Persistent use of weed-eaters may reduce populations of noxious weeds. However, some plants, such as yellow starthistle, adapt to the removal of tops, and begin to flower and fruit extremely close to the ground. Mulching and tarping may reduce or eliminate a few small occurrences of weeds, but this method would be very limited, and use on rhizomatous species may not be effective, as extensive rhizomes with their stored carbohydrates may grow toward the light and the untarped/unmulched edge.

New sites and expanded sites and new noxious weeds can be treated in this Alternative through Early Detection - Rapid Response. This would eliminate any increase in infested acres from new information. Because new infestations are usually small, Physical+ treatment should be effective.

The success of treatment of noxious weeds by goat grazing would be limited due to the size of areas to be treated (>4 acres and <25 acres). This method would need to be followed up with continued treatment to address plants that come up from the seed bank.

Alternative 6: Due to the number of weed control techniques available under Alternative 6, it is expected to provide for the most variable and aggressive treatment and control of noxious weeds on those acres treated. However, the treated acres would be much less than in Alternatives 2 and 4. The ~ 6000-acre dyer's woad site and the large common crupina site would only be treated on the parameter to reduce expansion of the site. The noxious weeds at these sites would continue to compete with natives, reducing native plant vitality. This, in turn, could allow the noxious weeds to aggressively increase the density of noxious weeds. These acreages would remain a large source for noxious weed seed.

On the sites where treatment would take place, however, it is expected that noxious weed populations would be greatly reduced; some species could be contained, controlled, or eradicated over the life of the project.

Physical + treatment of weeds would remove noxious weeds where treatment can occur, but has the potential to increase noxious weed infestation by disturbing the soil and providing ideal conditions for the germination of the weed seed in the soil.

New sites, expanded sites and new noxious weeds can be treated in this Alternative, and therefore these new occurrences most likely would be controlled or eliminated. However, new satellite sites around the occurrences not to be treated could become a constant battle, and some new sites could escape detection and spread weed seed over a wide area before inventory reveals them. Unless good annual inventories are performed, satellite occurrences could get out of hand. Please see the discussion under Alternative 5 for effects from physical + treatments.

As under Alternative 2, herbicide exposure levels for both the public and for workers executing treatment activities would not exceed acceptable levels of risk to human health for all herbicides proposed for use (Bakke 2005). The use of proper personal safety equipment, training, and supervision for all weed-treatment crews would be required to reduce the potential for injuries to workers.

Cumulative Effects

Past, present, and reasonably foreseeable future actions that disturbed, are disturbing, or would disturb ground or weaken native plant communities provide potential habitat for noxious weeds. Previously approved physical + weed treatment programs, grazing activities on Forest allotments, timber management and fuel reduction, pile burning, railroad construction, road construction and maintenance, recreation such as OHV (off-highway vehicles) and foot or horse traffic, firewood gathering, dam construction and repair, goose nesting island construction, excavation of burrow

material, and stock pond construction all create disturbed ground, providing additional disturbed areas where noxious weeds can gain a foothold. In the long-term, this would lead to increased area and increased infestations occupied by known and new noxious weeds on the Forest, and possibly on other lands in Modoc County. Gains of past weed treatments may be lost in a few years of unchecked weed seed production.

Alternative 1 – No Action: This Alternative would result in no control, containment, or eradication of known noxious weeds. Prevention and education should help prevent new weeds from invading, but would not treat them if they are found.

Alternative 2 – Proposed Action: Herbicide treatment of noxious weeds would kill weeds without disturbing the soil. Weeds treated effectively in this manner for 5 years would remove that infestation from the Forest as long as viable propagules do not remain. Physical treatment of noxious weeds could create more disturbed ground, which is prime habitat for aggressive noxious weeds. Unless this treatment is continued to outlast the seed bank and desirable species seed in naturally or from cultural treatments, these areas could become dense weed patches upon termination of the project. Weed seed banks would not be treated, and these may be a continuing source of noxious weeds. Based on longevity of project, number of sites to be treated, treatments proposed, seed or rhizome longevity, size and number of occurrences, and Design Standard, known weeds and sites that might be eradicated include diffuse knapweed, plumeless thistle, and squarrose knapweed. Weeds that might be controlled or contained are yellow starthistle and tall whitetop. New weeds or sites would not be controlled.

Alternative 3: Physical treatment of noxious weeds could create more disturbed ground that is prime habitat for aggressive noxious weeds. Unless this treatment is continued to outlast the seed bank and desirable species seed in naturally or from cultural treatments, these areas could become dense weed patches upon termination of the project.

Rhizomatous noxious weeds would continue to grow and occurrences may increase in size. New sites and expanded sites may continue to grow unimpeded, and new noxious weeds that invade would be allowed to grow and infest the Forest. Weed seed banks would not be treated, and these may be a continuing source of noxious weeds. Based on longevity and of project, number of sites to be treated, and treatments proposed, seed or rhizome longevity, size and number of occurrences, and Design Standard, known weeds and sites that might be eradicated include diffuse knapweed, plumeless thistle, and squarrose knapweed. Weeds that might be controlled or contained are yellow starthistle and possibly tall whitetop. New weeds or sites would not be controlled.

Alternative 4: Rhizomatous noxious weed infestations would diminish across the Forest unless the infestation is near a sensitive area where herbicides (or herbicides that are effective for the particular noxious weed) cannot be used (see Design Standards). Glyphosate is not the most effective and efficient chemical for some rhizomatous weeds. Only the largest occurrences of rhizomatous species may still have plants at the end of 10 years. Due to the aggressive noxious weed treatment, overall noxious weed infestations would diminish across the Forest.

Physical treatment of noxious weeds could create more disturbed ground -- prime habitat for aggressive noxious weeds. Unless this treatment is continued to outlast the seed bank and desirable species seed in naturally or from cultural treatments, these areas could become dense weed patches upon termination of the project in 10 years.

Weed seed banks would not be treated, and these may be a continuing source of noxious weeds. Also, please see Cumulative Effects under Alternative 1. Based on longevity of project, number of sites to be treated, and treatments proposed, seed or rhizome longevity, size and number of occurrences, and Design Standard, weeds that might be eradicated include diffuse knapweed,

plumeless thistle, spotted knapweed, and squarrose knapweed. Weeds that might be controlled or contained are yellow starthistle, Canada thistle, common crupina, Dalmatian toadflax, Klamathweed, and tall whitetop. New weeds would not be controlled.

Alternative 5: The large untreated sites could become a source of many new satellite sites if careful, annual inventory is not performed. Physical + treatment of noxious weeds could create more disturbed ground that is prime habitat for aggressive noxious weeds. Unless this treatment is continued to outlast the seed bank and desirable species seed in naturally or from cultural treatments, these areas could become dense weed patches upon termination of the project.

Untreated rhizomatous noxious weeds would continue to grow and occurrences may increase in size. New sites and expanded sites and new noxious weeds can be treated in this Alternative, and therefore these new occurrences most likely would be controlled or eliminated since they most likely would be small. Weed seed banks would not be treated, and these may be a continuing source of noxious weeds. Also, please see Cumulative Effects under Alternative 1. Based on longevity of project and number of sites treated, and treatments proposed, seed or rhizome longevity, size and number of occurrences, and Design Standard, weeds that might be eradicated include diffuse knapweed, plumeless thistle, squarrose knapweed, spotted knapweed, tall whitetop and yellow starthistle. Weeds that might be controlled or contained are Klamathweed, musk thistle, Canada thistle, Dalmatian toadflax, Mediterranean sage, and common crupina. New species and new sites could be controlled.

Alternative 6: The large untreated sites could become a source of many, new satellite sites if careful, annual inventory is not performed. Weed seed banks would not be treated, and these may be a continuing source of noxious weeds, especially where Physical + treatments create disturbance. Scotch thistle seeds can live in the soil for up to 30 years. Also, please see Cumulative Effects under Alternative 1. Based on longevity of project and number of sites treated, and treatments proposed, seed or rhizome longevity, size and number of occurrences, Design Standard, and priority of treatment by Modoc County, weeds that might be eradicated include diffuse knapweed, plumeless thistle, squarrose knapweed, spotted knapweed, tall whitetop, yellow starthistle, Canada thistle, and Dalmatian toadflax. Weeds that might be controlled or contained are Klamathweed, musk thistle, Mediterranean sage, and common crupina. New species and new sites would be controlled.

Consistency with Forest Plans and Other Laws and Policies

The Proposed Action and Alternatives (except for Alternative 1, the no-action Alternative) are consistent with these directions and goals. Similarly, the Proposed Action and Alternatives are consistent with Executive Order 13112, section 2, (a), (2), (ii), which states, "Each Federal agency whose actions may affect the status of invasive species shall, to the extent practicable and permitted by law, detect and respond rapidly to and control populations of [invasive] species in a cost-effective and environmentally sound manner." The Federal Noxious Weed Act of 1974 directs us to "complete and implement cooperative agreements with State agencies regarding the management of undesirable plant species on Federal lands under the agency's jurisdiction; and establish integrated management systems to control or contain undesirable plant species targeted under cooperative agreements (7 U.S.C. 2814 (a (3, 4))," with which law the Proposed Action and Alternatives are also consistent.

Noxious weeds also imperil Threatened and Sensitive species plants and habitats with encroachment, competition, changes in fire regimes, and other threats; therefore, the Proposed Action and Alternatives are also consistent with Forest direction in conservation of Threatened and Sensitive plant species (q.v. Modoc NF Forest Plan, 4-21).

Because noxious weeds threaten native plant and plant community diversity, the Proposed Action and Alternatives are consistent with the Forest goals to provide plant diversity for scenic quality, wildlife use, and other resource objectives (Modoc NF Forest Plan, 4-2). Executive Order 13112, section 2, (a), (2), (iv), directs us also to "provide for restoration of native species and habitat conditions in ecosystems that have been invaded."

Rangelands

The rangeland management program on the Modoc National Forest provides up to 122,500 animal unit months of forage annually for livestock grazing. The Forest is divided into 84 grazing allotments. About 110 term permittees depend on using the allotments to graze their livestock, primarily from late spring to early fall (May-Sept.). To achieve vegetation management objectives through livestock grazing the Forest Service develops and implements allotment management plans (AMPs).

The Modoc National Forest also supplies forage for wild horses on the Devils Garden Wild Horse Territory of the Devils Garden Ranger District. The planned management level is 285 to 325 animals. Current populations are estimated at approximately 550 head.

Approximately 910,000 acres (56 %) of the Forest is managed under rangeland prescriptions (Rangeland Management Prescription – 10 and Rangeland Management with Forage Improvement (Range-Forage) Management Prescription -11 of the Modoc NF Forest Plan), of which 90 % is suitable for grazing. The 10 % deemed unsuitable for grazing is due to steep slopes, inaccessible dense timber, and/or lack of forage. An additional 200,000 acres of timberland provide long-term forage production due to open canopies.

Noxious weed populations have been identified on 51 of the 84 grazing allotments on the Modoc National Forest.

Program Objectives and Program Standards and Guidelines for rangeland management can be found in the Forest Plan.

Public comments on the DEIS requested the end of grazing, as many believe this is the primary vector for noxious weed spread, or they say the Proposed Action is a means to increasing grazing rather than improving natural plant health and diversity. Others wanted to see increased grazing to control noxious weeds.

The effects of noxious weed treatment on the grazing program are summarized below. The elimination of grazing, because some see it as a major vector of noxious weed spread, is outside the scope of this analysis. This analysis does display that the major vector for noxious weed spread is roads, not domestic grazing. The Alternatives display the effects of limited grazing to control noxious weeds. The Purpose and Need for the FEIS is to implement a program to control, contain, and/or eradicate species weed sites. (Chapter 1 of the FEIS). The treatment of noxious weeds would meet the need and requirement of the Forest to promote ecosystem health of forested and rangeland habitats by maintaining or improving native forbs and grass species, ultimately preventing the loss of wildlife habitat. Other resources, such as recreation and range, may also benefit from controlling weeds, insofar as all of the weeds the Forest is planning to treat are generally unpalatable to livestock. The effects section below indicates that grazing may be reduced in the short term to enhance the effects of noxious weed treatments proposed. Commodity use of rangelands could not be increased above current permitted levels without additional environmental analysis and public participation.

Direct and Indirect Effects

Under the No Action Alternative, it is anticipated weeds would continue to spread within NFS lands. As noxious weeds increase, they impact the livestock industry by lowering yield and quality of forage, interfering with grazing, and increasing costs of managing and producing livestock (DiTomaso, 1999). In the long-term, a reduction in forage quality and quantity could lead to downward adjustments in the allowable use made by livestock and to wild horses inhabiting the Devils Garden Herd Territory.

Alternative 2 would allow for a large scale program of noxious weed control (99 % of infested acreage), utilizing a combination of physical and herbicide treatments. Under this Alternative, nine acres of rhizomatous species, within ten feet of water would not be treated. This Alternative would result in positive impacts to the upland native plant communities, including desirable forage species available to livestock and wild horses. Carrying capacities would be maintained in these upland habitats. Noxious weeds would continue spreading in riparian habitats, and in the long term available forage in these habitats would decrease. The positive benefits of Alternative 2 would be experienced somewhat slower than for Alternative 4, due to the reduced acres receiving treatment each year.

All herbicide treatments would consist of directed spray to noxious weeds which are generally unpalatable to livestock, thereby limiting their consumption of treated forage. Also, because a maximum of four tenths of one % of the NFS lands in the project area would receive herbicide treatments during the five year implementation period, the chances of livestock consuming the quantity of treated forage necessary to cause adverse animal health effects would be very remote. Depending on the type of herbicide used, there may be some deferment of grazing required, as specified by label directions. This is normally a short period (days) and generally livestock operations can be easily adjusted to accommodate such restrictions.

Alternative 3 would have beneficial impacts to the rangeland resource, as there would also be large- scale noxious weed control implemented (87 % of the infested acreage), through physical methods. However, there are 47 sites (916 acres) of rhizomatous weed species that would not receive treatment, due to the ineffectiveness of physical methods for control of these species. These species would continue expanding, and, in the long term, the quantity of forage for livestock and wild horses would likely be reduced.

Alternative 4 allows for the large-scale treatment of noxious weed infestations (99 % of the infested acres), utilizing physical , cultural and herbicide treatments. There would be no treatment of 5 sites (9 acres) that consist of rhizomatous species, within 10 feet of water. This Alternative also includes an Early Detection- Rapid Response strategy to allow treatment of up to 200 acres of new infestations during the ten year implementation period.

Due to the large-scale treatment of noxious weeds, and the variety of treatment methods that could be implemented, Alternative 4 would provide the most beneficial impact to the upland rangeland resource, including improved forage quality and quantity for livestock and wild horses. Rhizomatous species would continue to expand in riparian habitats resulting in the decreased condition and forage quantity in these habitats.

As with Alternative 2, the probability of livestock consuming vegetation treated with an herbicide in amounts that would have animal health effects is extremely low, because noxious weeds are generally unpalatable and a maximum of less than five tenths of one % of the NFS lands in the project area would be treated with herbicides over the 10-year implementation period.

Again, there may be short-term deferment in livestock use, depending on which herbicide is used. This would be based on label instructions for the specific herbicide and is normally a short time

(days). This would be handled on a case-by-case basis, either through modification in pasture rotation, or deferment in treated pastures or allotments.

Alternative 5 allows for active treatment of only 7 % of the known acres of noxious weed infestations, including up to 200 acres (100 acres annually) treated under the Early Detection – Rapid Response strategy over the 10-year implementation period. Additionally, nine sites would receive limited treatments along the borders to contain infestations. This Alternative would implement non-herbicide treatments, including cultural, goat grazing, physical and physical + methods. As with Alternative 3, implementation of this Alternative would have beneficial impacts to the rangeland resource, as there would be some noxious weed control implemented. However, rhizomatous species would continue to expand, which would have negative impacts on upland and riparian habitats. In the long term, livestock carrying capacities would likely decline, leading to possible reductions in allowable use by livestock and wild horses.

The treatment of noxious weeds by goat grazing would have negligible impacts to livestock operations due to the limited size of areas to be treated (5 sites/41 acres), and the short period of time such treatments would occur. All goat grazing treatments would be carefully monitored to ensure that weed treatment objectives are met without damaging the range resource through overgrazing.

Alternative 6 would provide for the active treatment of 541 acres, 7 % of the known infestation acres, using the widest range of treatment techniques, consisting of physical, physical +, goat grazing, cultural methods, and herbicides including two tank mixes. Under this Alternative, the Early Detection/Rapid Response strategy would allow the treatment of 200 acres (100 acres annually) over the 10-year implementation period. Due to the number of weed control techniques available under Alternative 6, this Alternative would be expected to provide the most control of invasive species on those acres treated. In the long term, outside those areas having a containment objective, it is expected that noxious weed populations would be greatly reduced, and in many cases, eradicated. It is expected that forage species would have less competition for available water and nutrients, leading to a stabilized grazing capacity for livestock and wild horses. The positive effects of this Alternative would be less than Alternative 2 and 4, based on the limited treatment acreage.

If herbicides are used, there would be a very remote chance that livestock would consume enough treated forage to cause effects to animal health, as noxious weeds are generally unpalatable and only a maximum of less than one tenth of one % of NFS lands in the project area would be treated with herbicides during the 10-year implementation period. Again, there may be short- term deferment in livestock use, depending on which herbicide is used. This would be based on label instructions for the specific herbicide and is normally a short time (days). This would be handled on a case-by-case basis, either through modification in pasture rotation, or deferment in treated pastures or allotments.

As with the other Alternatives calling for cultural treatments (seeding), areas that are re-seeded would require rest for two to four years to allow new plants to become established. This might require a change in pasture rotation, complete rest of the allotment(s) or structural improvements such as fencing to facilitate the necessary rest. If livestock must be removed completely from an allotment, there would be negative economic impacts to the grazing permittee(s) if they must purchase Alternative forage sources for their livestock.

The treatment of noxious weeds by goat grazing would have the same negligible impacts to livestock operations as described in Alternative 5.

Cumulative Effects

Due to the small proportion of the NFS lands that are treated under any of the Alternatives, and through implementation of the Design Standards, there would be no cumulative impacts to the rangeland resource.

There may have to be adjustments in the livestock season of use, use areas and, perhaps in some cases, temporary closure of pastures or allotments to facilitate the effectiveness of weed treatments and/or cultural treatments. This would be coordinated with the affected grazing permittees on a site specific basis and incorporated into Annual Operating Instructions as necessary.

Consistency with Forest Plans and Other Laws and Policies

The Forest Plan calls for the rangelands and riparian areas to be managed in satisfactory ecological condition and maintain range resource productivity. Allotments are to be managed to protect soil, water, and streamside-dependent resources.

The Modoc NF Forest Plan contains the following Standards and Guidelines:

- "Mange allotments to protect soil, water, and streamside-dependent resources" (p. 4-19)
- "Manage livestock and wild horses to maintain range resource productivity" (p. 4-19)
- "Manage grazing to maintain desired vegetation expressions and satisfactory ecological condition" (pp. 4-94, 4-100)
- " Manage riparian areas to achieve satisfactory ecological condition and desired vegetation expressions....." (pp. 4-95, 4-101)

The No Action Alternative would be the least consistent with Forest Plan Standards. With little or no treatment of noxious weeds, infestations would continue to expand, displacing native vegetation and contributing to unsatisfactory ecological conditions, and decreased productivity of the range resource.

Based on the treatment of noxious weeds in Alternatives 2, 4, and 6, it is expected that ecological conditions would be maintained or improved, with a corresponding maintenance or improvement in range resource productivity. These Alternatives would be consistent with Forest Plan Standards. Alternatives 3 and 5 would also allow for improvement of rangeland conditions, except for those areas with noxious weeds that do not respond to non-herbicide treatments. Therefore, these Alternatives would also be consistent with Forest Plan Standards, but to a lesser degree.

Other Actions

The 1995 Rescission Act (PL 104, Section 504a) requires that the Forest Service schedule and complete environmental analyses for the renewal of term grazing permits. As part of the analyses, the Forest Service is completing Noxious Weed Assessments. The Noxious Weed Assessments describe the risks associated with implementing the various Alternatives, and provides recommendations on how those risks can be minimized. These recommendations may include adjusting the season of use, excluding grazing from certain areas, prohibitions of off road use by vehicles, or the washing of vehicles used in the management of livestock. Measures to minimize the spread of noxious weeds and to maximize control measures would be considered during the development of site-specific environmental analysis for the renewal of grazing permits.

Recreation

The Modoc National Forest is best known for its remote location and secluded recreation opportunities. Most visitors enjoy sightseeing, picnicking, camping, fishing, hiking, horseback

riding, and hunting. Some of these activities may occur on sites where noxious weed control activities are planned.

Under all Alternatives, previous biocontrol releases outside the Forest may eventually make their way into the recreation, wilderness, or inventoried roadless areas of the forest as long as their habitat (noxious weeds) exists.

Recreation occurs on nearly all areas of the Forest. The patterns of recreation use are relatively stable, with summer as the busiest season. Recreational uses support a tourist-based economic segment.

Typical summer activities include biking, camping, fishing in the mountain lakes and streams, horse packing and horseback riding, rock climbing, berry picking, sightseeing, and scouting for fall hunting trips. During the fall, fishing and hunting activities increase substantially. In the spring, use increases with antler hunting, camping, photography, hiking in the lower elevations, and mushroom picking.

Winter use is lower, with a small number visiting for backcountry skiing, snowshoeing, and snowmobiling. At this time of year, opportunities for solitude and outdoor recreational challenges are the greatest. Winter recreation activities would not be affected by noxious weed treatments nor would noxious weed treatments affect winter use of the Forest.

Recreational users, private landowners, and others use the Forest road and trail system for access to backcountry areas and the South Warner Wilderness. Forest personnel use roads and trails for fire control, special-use administration, facility access, resource monitoring, and general patrolling of the area. Most trail users travel by foot or pack and saddle stock.

Total recreation use on the Modoc National Forest as measured and reported in the National Recreation Visitors Survey was rated nearly the lowest of all Forest Service units, with a yearly recreation of 500,000 (plus or minus 25 %) visitor days. Use is generally confined to developed recreation sites, lakes, in areas where roads are adjacent to or near streams or lakes, and the South Warner Wilderness. Hunting is the major dispersed recreation use.

There are no noxious weeds within a developed recreation facility. The five weed occurrences below occur within 1/8th of a mile of the identified campground.

Table 3 - 42. Noxious Weed Infestations within 1/8 Mile of a Campground

Campground	Weed	ID Number	Population Size	Ranger District	Acres
Ash Creek	Scotch Thistle	BV219ONAC	3	Big Valley	0.1
Reservoir F	Canada Thistle	DG004CIAR4	20	Devil's Garden	0.1
Pepperdine	Canada Thistle	WM001CIAR4	>1000	Warner Mountain	0.1
Stough	Scotch Thistle	WM002ONAC	unknown	Warner Mountain	0.1
Stough	Canada Thistle	WM006CIAR4	10	Warner Mountain	0.1

Public comments received on the DEIS showed concern for herbicide treatments within heavily utilized recreation activities, and requested that Best Management Practices (BMPs) for recreation areas should be included in the FEIS.

The effects analysis below, in conjunction with the effects analysis section on human health, explains the potential effects of the Alternatives on recreation users. Best management Practices are specifically designed for forest management activities to meet the intent of the Clean Water Act. The established regional BMPs related to recreation are specifically designed to mitigate the effects recreational sites and activities have on water quality.

Direct and Indirect Effects

Noxious weeds can affect the recreation experience. Invading weeds such as spotted knapweed, Scotch thistle, and yellow starthistle can detract from the desirability of using recreation sites and enjoyment of the wilderness. These species can diminish the usefulness of sites because the stiff plant stalks, thorns, or sharp bristles can discourage or prevent walking, sitting, or setting up a camp. Noxious weeds can also detract from the recreation experiences by reducing the variety and amount of native flora to observe or study, and reducing forage available for wildlife and recreational livestock. Noxious weed infestations do not directly impact recreation sites on the Modoc National Forest, and the degree of indirect impacts is minimal since only five weed infestations are located within one-eighth of a mile of a developed recreation facility.

Direct and indirect effects of all action Alternatives include the cost of removal and disposal of dug, pulled, or clipped plants to insure they do not re-sprout or detract from the visual or recreational activities. The use of wheeled vehicles to transport hand-treatment crews and equipment, remove dug or clipped plants, or to apply herbicide would result in short-term visual impacts in the form of tracks created by laying down grasses. In dry years, these tracks could remain visible throughout the season, while in wetter years they could be erased by rains and re-growth before fall.

Long-term improvements as a result of all action Alternatives include an overall reduction of stiff plant stalks and sharp bristles, and increase in the variety and amount of native flora. Treating noxious weeds would be an improvement in the overall recreational environment, including the desirability and enjoyment of recreational sites, although in Alternatives 5 and 6 not all areas would benefit.

Alternative 1 (No Action) – Under the No Action Alternative, spread of noxious weeds could result in the unavoidable deterioration of the natural condition of adjoining land, diminishing the recreational experience for some people. The negative effects noxious weeds would have on use of dispersed recreation sites would be greatest under the no action Alternative.

Alternatives 3 and 5 – Direct and indirect effects on recreation resulting from implementation would include short-term (one to several days) encounters with treatment crews and visual impacts from pulled plants or digging. Additional effects resulting from Alternatives involving digging or pulling include disturbed soil that could increase sediment for brief periods, discoloring surface water and detracting from the recreation experience. Disturbed soil could also increase the noxious weed cover by providing better growing conditions for the prodigious seed-producing weed species, further reducing recreation opportunities listed above.

Alternatives 2, 4 and 6 – Direct and indirect effects on recreation resulting from implementation would include short-term (one to several days) encounters with herbicide treatment crews and visual impacts from wilting plants. The visual impacts of spraying would be temporary, and on most sites only last a few hours or less. Dying and wilting plants following herbicide treatment could be apparent. However, this appearance would be short-lived as surrounding vegetation would screen dead plants or blend with native vegetation, as it grew dormant. Additional effects resulting from Alternatives would be the protection of adjacent non-infested areas and preservation of intact plant communities, which would enhance the recreation experience. Concern over the herbicides may cause some Forest users to choose to recreate in areas that have not been recently treated with herbicides. All weed-treatment activities would be conducted in compliance with Modoc National Forest Travel Plan, which allows for administrative use.

Visual impacts of spraying would be temporary, and on most sites only last a few days or less. Odors emitted by herbicides may cause anxiety in persons unaware of their presence. Herbicides

proposed for use on this Project would not affect grasses or sedges at recommended application rates.

Early Detection - Rapid Response treatments under Alternatives 4, 5 and 6 would have the same direct and indirect effects as mentioned above.

Cumulative Effects

When any of the Proposed Actions is added to all the other forest management activities (grazing, vegetation management, timber operations, fuels reduction, prescribed fire, wildlife habitat improvement) recreation visitors would not experience a noticeable or measurable change in their experience, because the areas to be treated are so small and dispersed most visitors would be oblivious to the Proposed Actions and treatments.

Without treatment, thistle sites could become large and extensive near recreation trails or campgrounds, or wildfire may introduce large infestations of thistles near popular areas, impairing visitor enjoyment as they and their pets and livestock experience painful encounters with the thistles.

All management activities adjacent to recreation areas and recreation-area improvement projects include noxious weed inventory and treatment of sites found during implementation of the project, which would require noxious weed treatment and prevention measures that would not be noticeable to visitors since they would be part of each individual action.

Consistency with Forest Plans and Other Laws and Policies

Alternative 1 is not consistent with Modoc NF Forest Plan direction, as the spread of noxious weeds has the potential to limit recreational opportunities on the Forest as visitors to the Forest may choose to avoid areas infested with noxious weeds. All action Alternatives are consistent with the Modoc NF Forest Plan, and would not result in a decrease in recreational opportunities on the Forest.

Special Designated Areas

Special designated areas on the Modoc National Forest include Inventoried Roadless Areas (IRAs), Research Natural Areas (RNA's), Special Interest Areas (SIAs), the South Warner Wilderness Area (SWW), and a Wild and Scenic River Study Area (WSR). Under the Forest Plan, these areas are to be managed for the natural and scenic values.

One commenter on the DEIS suggested there was no Wild and Scenic River Assessment. The Modoc NF does not contain a designated Wild and Scenic River, nor have noxious weeds been identified in potential Wild and Scenic Rivers. The analysis below shows possible effects on proposed Wild and Scenic Rivers would be the same as the effects disclosed for Wilderness Areas.

One commenter on the DEIS suggested the need for additional Wilderness Areas. This is outside the scope of this analysis.

No comments were received concerning Research Natural Areas.

Inventoried Roadless Areas

In 2001, The Forest Service established a rule to protect the social and ecological values and characteristics of inventoried roadless areas from road construction and reconstruction, and certain timber harvesting activities to protect the following values or features at a national level:

- High quality or undisturbed soil, water, and air.
- Sources of public drinking water.
- Diversity of plant and animal communities.
- Habitat for threatened, endangered, proposed, candidate, and sensitive species; and for those species dependent on large, undisturbed areas of land.
- Primitive, semi-primitive non-motorized, and semi-primitive motorized classes of dispersed recreation.
- Reference landscapes.
- Natural appearing landscapes with high scenic quality.
- Traditional cultural properties and sacred sites.
- Other locally identified unique characteristics.

The Modoc National Forest has 19 inventoried roadless areas, covering approximately 201,600 acres. Seven of these are infested with noxious weeds which occur on 20 individual sites totaling 3,564.2 acres. The largest is the 5,657.8-acre dyer's woad site, with 3,554.1 acres within the Damon Butte Inventoried Roadless Area, which has over 50 miles of identified roads. The remaining sites all occur along roads that either surround or traverse the inventoried roadless areas.

Table 3 - 43. Inventoried Roadless Areas Containing Noxious Weed Infestation Sites

Name	Site ID No.	ALT 2	ALT 3	ALT 4	ALT 5	ALT 6	Acres	Roadless Area
Scotch Thistle	DG044ONAC	P	P	P	P+	P+	0.1	Big Canyon
Scotch Thistle	DG045ONAC	P	P	P	P+	P+	0.1	Big Canyon
Scotch Thistle	DG062ONAC	P	P	P	P+	P+	0.1	Big Canyon
Scotch Thistle	DG061ONAC	P	P	P	P+	P+	0.1	Big Canyon
Scotch Thistle	WM016ONAC	P	P	P	P+	P+	0.1	Crane Mtn.
Scotch Thistle	WM045ONAC	P	P	P	P+	P+	0.1	Crane Mtn.
Dalmatian Toadflax	DH005LIDA	H	NT	H	LT	H	0.1	Damon Butte
Dyer's Woad	DH016ISTI	P	P	P	P+	P+	0.1	Damon Butte
Dyer's Woad	DH013ISTI	P/H	P	P/H	LT	LT	3,554.1	Damon Butte
Scotch Thistle	DH039ONAC	P	P	P	P+	P+	0.1	Damon Butte
Scotch Thistle	BV156ONAC	P	P	P	P+	P+	0.1	Knox Mtn.
Dyer's Woad	WM011ISTI	P/H	P	P/H	P+	H	0.7	Mt. Vida
Dyer's Woad	WM009ISTI	P/H	P	P/H	P+	H	1.2	Mt. Vida
Dyer's Woad	WM018ISTI	P/H	P	P/H	P+	H	1.1	Mt. Vida
Dyer's Woad	WM015ISTI	P/H	P	P/H	P+	H	1.0	Mt. Vida
Dalmatian Toadflax	WM010LIDA	P/H	NT	P/H	NT	H	3.0	Mt. Vida
Dalmatian Toadflax	WM008LIDA	P/H	NT	P/H	NT	H	3.4	Mt. Vida
Scotch Thistle	BV285ONAC	P	P	P	P+	P+	0.1	Sears Flat
Scotch Thistle	BV157ONAC	P	P	P	P+	P+	0.1	Sears Flat
Scotch Thistle	WM022ONAC	P	P	P	P+	P+	0.1	Soldier

Treatment codes: P = Physical, P+ = Physical+, H = Herbicide, P/H = Physical and/or Herbicide, LT = Limited Treatment, and NT = No Treatment. The treatment methods are as proposed in chapter 2 for each type of treatment.

No comments were received concerning treatment of noxious weeds within inventoried roadless areas.

Direct and Indirect Effects

The direct and indirect effects on the characteristics of solitude, primitive recreation, and natural integrity that lead to designation as an IRA are described in the recreation section, and are not repeated here.

Treatment of noxious weeds within inventoried roadless areas would decrease the feeling of solitude during periods of treatment as crews treat the infestations. The sights and sounds of vehicles and the noise of crews would be short lived.

Alternative 1 (No Action) – Not treating noxious weeds would increase the loss of the following values and characteristics outlined in the Roadless Rule of 2001: diversity of plant and animal communities; habitat for threatened, endangered, proposed, candidate, and sensitive species and for those species dependent on large, reference landscapes; and natural-appearing landscapes.

Alternatives 2 and 4 – In addition to the effects outlined above in the recreation section, Alternatives 2 and 4 are the only Alternatives that would treat all existing sites within Inventoried Roadless Areas, thus restoring the values and characteristics for which the areas were established, by eradicating or controlling all infestations within inventoried roadless areas. However, since Alternative 2 does not have an Early Detection - Rapid Response component progress in eradication and control of noxious weeds would not be permanent. Alternatives 2 and 4 treat the total 3,564.2 acres of noxious weeds within inventoried roadless areas.

Alternative 3 – Has similar effects as Alternative 2 except that infestations of dalmatian toadflax, a rhizomatous species, would not be treated, resulting in further decline in the Mt. Vida and Damon Butte Inventoried Roadless Areas. Alternative 3 treats less than 3.7 acres of inventoried roadless areas.

Alternative 5 – Would not treat the Dalmatian toadflax sites in the Damon Butte and Mt. Vida areas, and would only treat the perimeter of the dyer's woad site, thus allowing the infestations to continue to degrade the roadless area characteristics and values. Alternative 3 treats less than 3.7 acres of inventoried roadless areas.

Alternative 6 – Alternative 6 would eradicate all the small infestations currently within inventoried roadless areas, thus protecting the values and characteristics of the sites. The Early Detection - Rapid Response component would provide for additional protection of the areas, but would be limited to by the cap on acres that could be treated. The dyer's woad infestation in the Damon Butte area would be part of a containment option, which would continue the degradation of the values and characteristics noted under Alternative 1. Alternative 6 would treat approximately 10 acres of inventoried roadless area.

Cumulative Effects

The sights and sounds of dead or dying noxious weeds would not significantly have cumulative effects when added to those of the ongoing permitted management activities of grazing, infrequent road use, and dispersed recreation.

Irreversible and Irretrievable Commitment of Resources

Under the No Action Alternative, an irreversible loss of natural integrity and apparent naturalness would occur once weeds become well established in an IRA, since eradication would probably never occur.

Consistency with Forest Plans and Other Laws and Policies

All action Alternatives are consist with Forest Plan direction and current policy and direction provided by Interim Directive #1920-2006-1 concerning management of inventoried roadless areas.

Wilderness

The South Warner Wilderness encompasses approximately 70,385 acres of undeveloped land found within the Warner Mountain Ranger District. It contains rugged topography, expansive vistas, rolling hills, mountain meadows, clear streams, and the highest peaks in northeastern California.

Historic noxious weed locations inside the South Warner Wilderness include Emerson Lake and Kaiser Canyon, and adjacent to the Wilderness at Pepperdine and Granger Canyon. Few surveys for noxious weeds have occurred in the Wilderness; actual sites are probably higher than what this document reflects.

Public comments on the DEIS concerning Wilderness included a request to expand wilderness designations on the Forest. These comments are outside the scope of this analysis because this document analyzes noxious weeds, not wilderness suitability.

Treatment of noxious weeds sites found within the designated South Warner Wilderness will be accomplished using only hand treatment. Herbicides and mechanical means will not be utilized under decisions made as a result of this analysis. If herbicides or mechanical treatments are required in the future, new analysis and decision will be necessary. This meets key criteria for defining Wilderness.

Direct and Indirect Effects

Under all Alternatives, the South Warner Wilderness (SWW) will continue to remain an area of undeveloped land, sufficient in size to preserve it in an unimpaired condition. Wilderness management will continue to emphasize natural conditions, and the landscape will remain primarily affected by the forces of nature. There are no hand treatment actions within any of the Alternatives that would affect the overall scenic attributes of the SWW. However, allowing infestations to grow unchecked could alter the natural landscape and degrade wilderness values. Some visitors may find the flowers of noxious weeds attractive.

Education, scientific and conservation purposes for Wilderness will not be affected by any of the Alternatives. Opportunities to study and learn about wilderness systems that are ecosystem in size will continue to be a unique opportunity within the SWW.

Recreation experiences on the SWW will be the same as those described above under the recreation discussion.

Alternatives 1, 2 and 3 would not treat new infestations of noxious weeds under an Early Detection - Rapid Response method, thus providing for the loss of wilderness characteristics as noxious weeds replace native species. Wilderness users would avoid areas of thistle infestations and may lead to creation of unwanted trails or campsites that cause erosion.

Only Alternatives 4, 5, and 6 provide for an early detection rapid response that would allow for eradication of new infestations and protection of wilderness characteristics.

Cumulative Effects

The impact of crews treating noxious weeds by hand would be similar to those of hikers or trail maintenance crews. The added noise and sight of treatment crews, when added to the permitted recreation and grazing use, would be of short duration and would not permanently alter wilderness characteristics. Those individuals seeking solitude would be impacted only during the treatment period.

Irreversible and Irretrievable Commitment of Resources

Only the No Action Alternative has an irreversible loss of natural integrity, and loss of apparent naturalness would occur once weeds become well established in the wilderness area since eradication would probably never occur.

Consistency with Forest Plans and Other Laws and Policies

All action Alternatives are consistent with management direction found in the Forest Plan and the Wilderness Act.

All action Alternatives are consistent with Forest Service Manual (FSM) 2323.26b, which allows plant control for “noxious farm weeds by grubbing or with herbicides when they threaten lands outside wilderness or when they are spreading within the wilderness, provided that it is possible to effect control without causing serious adverse impacts on wilderness values.”

All action Alternatives are consistent with the 1964 Wilderness Act, which requires managers of wilderness with the responsibility of maintaining the enduring resource of wilderness. The Act specifically requires that a Wilderness Area be managed to "preserve its natural conditions" and "to assure that an increasing population, accompanied by expanded settlement and growing modernization does not occupy and modify all areas within the United States."

Research Natural Areas (RNA) and Special-Interest Areas (SIA)

These areas were established for the purpose of maintaining biological diversity, conducting non-manipulative research and monitoring, and fostering education. Research Natural Areas are typical and distinctive natural ecosystems and habitats that are generally retained in an unmodified condition. Noxious weeds need to be eliminated if they were to become established in these areas, since they are not natural to the ecosystem.

The Modoc National Forest has two Research Natural Areas. The 800-acre Research Natural Area known as Devil's Garden RNA, located on the Devil's Garden Ranger District, was chosen as a representation of western juniper stand in the Modoc Plateau Physiographic Province. The 6,287-acre Raider Creek RNA in the South Warner Wilderness was designated as a representation of the white fir type. At this time, there are no known noxious weed locations within the Research Natural Areas, but an intensive search has not been conducted because of limited accessibility.

Special Interest Areas were developed because of their unusual scenic, historic, cultural, and geological values. The three Special Interest Areas (Burnt Lava Flow, Glass Mountain Lava Flow, and Medicine Lake Lava Flow Geologic Areas) are unlikely to be adversely affected by noxious weeds due to their geologic makeup and lack of soil.

Direct and Indirect Effects

In the event a new infestation of the existing species or a new species infestation occurred in one of these areas, it could be treated using the Early Detection - Rapid Response Strategy found in

Alternatives 4, 5, and 6. Infestations are expected to occur along transportation corridors. The SIAs are lava flows that contain very little soil area, except along Forest Roads. New infestations would probably be treated through the use of herbicides due to the lack of soil and water, since removal of root systems in the coarse lava flows would be difficult, if not impossible. There are no water courses, and no TES plant or animal habitats in the designated SIAs. The rugged terrain prevents human and animal access except along roads. Due to these factors, treatment of noxious weeds in existing or new sites is not anticipated to have direct, indirect or cumulative impacts within the designated Special Interest Areas.

The impacts to the RNA's would be similar to those described for inventoried roadless areas. (see above).

Early Detection - Rapid Response activities proposed include the identification and treatment of weeds that may enter the RNAs and SIAs through natural sources (e.g., wind, wildlife, fire). Effects from treatment of new locations would be the same as what is disclosed in this FEIS.

Under the no action Alternative, the lack of treatment of potential new infestations along with the likelihood that weeds would eventually spread from outside these areas into them, poses a risk that the RNA's would lose their research value.

Cumulative Effects

Under all Alternatives, there were no identified activities within the RNAs or SIAs, nor are there any Proposed Actions within them, that would increase the risk of noxious weed spread, with the exception of wildfire. Therefore, there are no cumulative impacts to be analyzed in conjunction with noxious weed treatments within RNA's or SIAs.

Consistency with Laws and Policies

All of the action Alternatives are consistent with the Forest Plan, and are consistent with direction in the Establishment Records by proposing specific control against target organisms and taking measures to control or eradicate these populations.

All the action Alternatives would be consistent with Forest Service Manual 4603 by removing exotic plant or animal life. The no action alterative would be consistent until a new weed infestation is discovered in the RNA, at which time a separate NEPA process would have to be completed to comply with this Manual direction.

Wild and Scenic Rivers

The Modoc National Forest does not have any designated Wild and Scenic Rivers.

Social and Economic Effects Analysis

The Modoc National Forest encompasses lands in Modoc, Lassen, and Siskiyou Counties of California. The area considered for the analysis of direct, indirect, and cumulative social and economic effects is all of Modoc County, as well as the surrounding unincorporated areas of Lassen and Siskiyou Counties.

The Modoc National Forest encompasses approximately 2 million acres. Of that total, National Forest System lands make up 1.6 million acres, while private landowners and other government agencies own the remaining land.

Modoc County comprises approximately 2,689,246 acres. Approximately 64 % of lands within the county are administered by an agency of the Federal Government. Most of that (1,374,238

acres) is administered by the Modoc National Forest. Less than 1 % is tribal trust land. The remainder is in private ownership.

Because of the high percentage of federal land ownership in the county, people living within the analysis area experience the effects of Forest Service policy and programs directly.

Population

Modoc County had an estimated population of 9,640 residents in 2004, reflecting growth of about 2 % since 2000 according to the California Department of Finance. By way of contrast, California's population grew by approximately 7 % during the same period. Although Modoc County experienced modest population growth, the population of the city of Alturas declined by 1.7 %. The overall analysis area population grew by 2.8 % with the majority of growth occurring in rural areas. The population density within Modoc County in 2000 was estimated at only 2.4 persons per square mile.

The racial diversity of the counties in the analysis area is displayed in the following table:

Table 3 - 44. Racial and Ethnic Diversity (2000 Census)

Racial/Ethnic Origin	percentage of Population		
	Modoc County	Lassen County*	Siskiyou County
White	85.9	80.8	87.1
Black or African American	0.7	8.8	1.3
American Indian & Alaska Native	4.2	3.3	3.9
Asian`	0.6	0.7	1.2
Native Hawaiian & Other Pacific Islander	0.1	0.4	0.1
Persons Reporting Some Other Race	5.7	3.2	2.8
Persons Reporting Two or More Races	2.8	2.7	3.6
White, Not of Hispanic/Latino Origin	81.1	70.6	83.3
Hispanic or Latino Origin	11.5	13.8	7.6

(U.S. Census Bureau 2000a)

Note: Totals do not sum to 100 % due to overlap of some categories (e.g., Someone of Hispanic origin may be of any race: therefore, they would be counted in two categories).

National Visitor Use Monitoring Survey Results

The National Visitor Use Monitoring Survey (NVUM) was implemented as a response to the need to better understand the use of and satisfaction with national forest system recreation opportunities. NVUM is a recreation sampling system designed to provide statistical recreation use information at the forest, regional, and national levels. In any given year, 25 % of the national forests conduct on-site interviews and sampling of recreation visitors. The Modoc National Forest participated in the NVUM project from January 1 through December 31, 2000. Weather during the sample year was unusual in that there was not much snow. The second winter of sampling was an average year. Another factor that may have affected results is that most visitors to the Modoc National Forest are locals, who tended not to stop for the interviews.

Estimates of recreation use for calendar year 2000 at the 80 % confidence level were 146,155 forest visits +/- 32.1 %. Of visitors interviewed, 98 % categorized themselves as White; 0.4 % as American Indian/Alaska Native; 0.3 % as Spanish, Hispanic, or Latino; 1.1 % as Native Hawaiian or Other Pacific Islander; and 0.2 % as Asian. Approximately 2 % of those surveyed indicated that they participate in gathering mushrooms, berries, firewood, or other natural products (USDA Forest Service 2001).

Income and Employment

The 1999 median household income in Modoc County was $27,522, compared to $47,493 for the State and $41,994 for the United States as a whole. Median household incomes in Lassen and Siskiyou Counties were somewhat higher at $36,310 and $29,530 respectively (U.S. Census Bureau 2000a). The table below displays the percentage of the analysis area populations that are below the poverty level. Data is provided for each county as a whole and by racial/ethnic group. Twenty-one % of Modoc County residents are below the poverty level, significantly higher than the State. Higher poverty rates were found in all racial/ethnic groups.

Table 3 - 45. Poverty Status (2000 Census)

Poverty Status	State of California	Modoc County	Lassen County	Siskiyou County
All individuals for whom poverty is determined	33,100,044	9,142	24,853	43,699
Individuals below poverty level	4,706,130	1,962	3,484	8,109
% Below Poverty Level	14.2 %	21.5 %	14.0 %	18.6 %
% Below Poverty Level by Racial/Ethnic Group				
White	10.5 %	18.6 %	12.9 %	16.6 %
Black or African American	22.4 %	41.7 %	10.9 %	25.7 %
Am. Indian and Alaska Native	21.9 %	41.8 %	36.2 %	31.7 %
Asian	12.8 %	21.2 %	10.3 %	58.1 %
Native Hawaiian and Other Pacific Islander	15.7 %	---	15.4 %	32.3 %
Some Other Race	24.0 %	48.8 %	18.6 %	25.1 %
Two or More Races	16.8 %	17.8 %	13.1 %	28.3 %
Hispanic or Latino	22.1 %	46.1 %	22.1 %	27.8 %
White Alone, Not Hispanic or Latino	7.8 %	17.3 %	12.1 %	16.3 %

(U.S. Census Bureau 2000c)

Note: Totals do not sum to 100 % due to overlap of some categories (e.g., Someone of Hispanic origin may be of any race; therefore, they would be counted in two categories).

The number of employed persons in the counties of the analysis area in 2004 is displayed in table 3-46. Unemployment in Modoc County in 2004 was estimated at 8.6 %, compared to 6.2 % for the state. Unemployment rates were at 9.3 % in Siskiyou County and 7.7 % in Lassen County.

Table 3 - 46. Employment (2004)

	Modoc County	Lassen County	Siskiyou County
Civilian Labor Force	4,150	12,220	19,210
Civilian Employment	3,790	11,280	17,420
Civilian Unemployment	360	940	1,790
Civilian Unemployment Rate	8.6 %	7.7 %	9.3 %

(California Employment Development Department 2005)

Stakeholder Groups

Various groups, expressing a diversity of social values, participated in this planning process. These groups often may have both local voices and affiliation with other like-minded organizations at the county, river basin, state, university, tribal, or national level. Ongoing and continuous public scoping activities over the last ten years, primarily at the local level, identified

interested and affected publics ("stakeholders") in noxious weeds control. These groups are extremely interested in the noxious weed treatment program chosen for the Modoc National Forest. These scoping activities revealed stakeholders' concerns about potential social effects resulting from the adoption of a decision on how noxious weeds are treated.

The major stakeholders were grouped into the following categories for analysis. There is considerable overlap among the delineated social organization groups. However, these distinctions are useful in setting the social context for the decision and describing the effects of these Alternatives to interested and potentially affected groups.

- Local Residents: City and Rural (non-Farm Landowners or Renters)
- Forest Recreation users
- Ranching and all Agricultural Forest Practices Industries
- The Hispanic Minority Community and Farm Laborers
- The Native American Tribes
- Environmental Organizations
- Other Federal & State Land Management Agencies
- State of California, County, City Government, River Basins

Most, if not all, groups are interested in promoting greater ecosystem health and insuring the long-term productivity of the land. While all groups recognize the threat posed by noxious weed infestations, some individuals and groups have strong feelings about the desirability of particular treatment methods.

The actions of the Modoc National Forest to manage noxious weeds affect these stakeholders. By the same token, the actions of these stakeholders affect the Modoc National Forest and each other. For example, the activities of all adjacent landowners affect populations of noxious weeds. This includes ranchers, other farm operations, other rural property owners, other Federal, State, County, and City government, and private homeowners within cities. It will take considerable collaboration and informed consent to stop the spread of noxious weeds in Modoc County due to the nature of the problem.

Stakeholder Attitudes, Beliefs, and Values

Public comments on the DEIS concerning Social Values and Economics are addressed in the analysis, and also in the Human Health and Safety Section and the Tribal Sections of this Chapter. The reader is also directed to the Response to Comment Sections on Economics and Values, Trust and Credibility, Tribal and Public Involvement, and Tribal/Native Americans, which are summarized in this and other sections of this Chapter.

Comments on the DEIS also reflected a lack of trust in the analysis, and that the analysis was prepared in a biased manner. The FEIS acknowledges that no amount of analysis will change the attitudes and beliefs of those who do not trust the analysis sections or statements contained in this FEIS.

Local Residents: City and Rural

Local residents work in the private sector, are government employees, or are retirees. Important formal and informal associations bring people of diverse backgrounds, occupations and cultures together. Local residents sell goods and services, provide lodging, amusement and professional

services, and work in finance, insurance, and real estate. Alturas, the only incorporated city in the analysis area, is governed by a mayor and four city council members. In addition, the city has an active Chamber of Commerce. Strong community spirit and shared values often found in rural areas are evident.

Although the employment opportunities are not primarily dependent on forest products, residents are concerned with the economic stability and growth of the area. While recognizing that commodity outputs (range and timber) contribute to the economic stability, non-commodity outputs provide residents with recreational opportunities as well as economic benefits from tourists attracted to the area for hunting, fishing, and other recreational pursuits.

Rural landowners, such as retirees, a small but growing number, have come to the area to escape large population centers or to purchase second homes or parcels of land for vacations or investment. These rural, non-farming residents, may live here year long or only seasonally. Environmental amenities provided by the rural character of the area attract new residents and their use of the Forest is generally recreational. Income sources may be primarily from retirement funds or from employment outside the area. Among the primary concerns of retirees on fixed income are taxes and the ability of the local communities to provide adequate health and social services.

A growing concern that cuts across many social groups is the loss of open space and the natural setting. The arrival of increasing numbers of retirees has generally resulted in subdivisions of open spaces and new development. However, the phenomenon of ever growing numbers of rural small property owners circling National Forests is not as pronounced in Modoc, Lassen, and Siskiyou counties as in other counties of California west of the Sierra Nevada Mountains or in other regions of the United States.

The Modoc National Forest uses a local Resource Advisory Committee (RAC) under the “The Secure Rural Schools and Community Self-Determination Act of 2000” (Public. Law No. 106-393) to propose projects and funding to the Secretary of Agriculture under section 203 of the Act. The membership requirements of the law require a balanced view of natural resource management among the participants. As required by law, the current members of the Forest’s RAC consist of individuals from a broad spectrum of social, economic, and environmental views.

Forest Recreation Users

People use the Modoc National Forest’s resources for a wide variety of recreational pursuits. This group primarily includes local residents and individuals from California to the south and west of the analysis area, and from southern Oregon. They use the Forest seasonally for recreation activities such as mule deer and pronghorn hunting, fishing, camping and rock hounding. The primary users of the Modoc National Forest are local residents from the surrounding communities. Visitors from outside the area also enjoy destinations of interest on the Forest. The local economy benefits from dollars spent by tourists attracted to the Forest. With more interest in amenity values than in resource developments, recreationists benefit from Alternatives which enhance the natural environment and recreation opportunities. They benefit from healthy wildlife habitat and populations, maintenance of access roads and trails, preservation of traditional hunting camps, and maintenance of developed recreation sites. Their major concern with invasive plants control is both forest degradation and their safety in pursuit of recreational interests. Like most American citizens, they look to the scientific community and government for the best methods to control invasive plants.

Ranching and all Agricultural Forest Practices Industries

Agriculture, including ranching, is the largest economic sector in the analysis area in terms of total industrial output. This group is comprised of individuals involved in livestock production and the growing of grain crops, hay and pasture, and vegetable crops. Many members of this group are long-time residents who own ranches and farms that have been passed to successive generations. Agricultural organizations, like the Modoc County Farm Bureau, Cattlemen's Association, 4-H clubs, rodeos, etc., are still part of the cultural life of the area.

The Modoc County Farm Bureau reports that the value of agricultural production produced in Modoc County in 2004 was $77.1 million. The Bureau reports that the top five crops, by value in 2004 were: Alfalfa Hay, $17.2 million; Cattle and Calves, $17.1 million; Potatoes, $11.7 million; Timber,$6.0 million; and Vegetables, $4.7 million.

Grazing on public lands is an integral part of many local ranch operations. While livestock graze on public lands during the summer months, those private lands not used for summer grazing are devoted to alfalfa and grass hay production for winter feeding. The table below shows the number of farms with Grazing Permits in Modoc County for 1987, 1992, and 1997 from the USDA National Agricultural Statistical Service. This series of information was discontinued in 2002. In 2005, the Modoc National Forest had 75 permittees.

Table 3 - 47. Farms with Grazing Permits, Modoc County

Description	1987	1992	1997
Farms with grazing permits, land in farms (farms)	128	128	121
Farms with grazing permits, land in farms (acres)	501,962	436,704	478,932
Farms with grazing permits, farms by land in farms (less than 100 acres)	3	10	11
Farms with grazing permits, farms by land in farms (100 to 259 acres)	11	3	7
Farms with grazing permits, farms by land in farms (260 to 499 acres)	9	17	7
Farms with grazing permits, farms by land in farms (500 to 999 acres)	19	21	13
Farms with grazing permits, farms by land in farms (1,000 to 1,999 acres)	29	27	27
Farms with grazing permits, farms by land in farms (2,000 acres or more)	57	50	56
Farms with grazing permits, source of permits (Forest service)	78	75	59
Farms with grazing permits, source of permits (Taylor grazing)	81	89	86
Farms with grazing permits, source of permits (Indian land)	5	4	5
Farms with grazing permits, source of permits (Other)	9	16	17

Source: USDA National Agricultural Statistical Service (http://usda.mannlib.cornell.edu/).

The Ranch Farming group benefits from Forest commodities, especially forage and water for domestic livestock. They have a strong interest in public land management. In fact, the Modoc National Forest was established in 1906 largely because of the work and recommendations of local ranchers.

The ranching and agricultural community would be the principal stakeholder group financially affected by the spread of noxious weeds. Noxious weed proliferation results in a loss of productive agricultural land. This group has long used chemical methods to control noxious weeds on their private property.

Hispanic Minority Community and Farm Laborers

This group is made up of ethnic minorities, primarily Hispanic, many of whom work for ranchers and farmers and other forest and agricultural industries. The minority population of the analysis area is growing both in number and as a proportion of the total population. The largest and fastest-growing segment of the minority population in the analysis area is Hispanics. The

Hispanic population of Modoc County was approximately 12 % in 2000 compared to only 4 % in 1980.

As noted above, poverty rates in Modoc County are well above the average for the state as a whole at 21.5 %. Poverty rates among many minorities are more than double that of white residents, and range from 41.7 to 48.8 % for Hispanics, American Indians, Blacks or African Americans, and those who indicated "some other race." Asian residents had a poverty rate of 21.2 %, which was also higher than whites, with a poverty rate of 18.6 %.

Minorities, particularly Hispanics, hold the majority of farm labor jobs in the analysis area. As such, Hispanics or other minorities could be employeed to treat noxious weeds. Concern has been expressed regarding potential impacts to these populations as a result of exposure to herbicide chemicals through their employment.

The Native American Tribal Communities

The Modoc National Forest consults with five federally recognized tribes: the Pit River Tribe, the Klamath Tribes, Ft. Bidwell Paiutes, Alturas Rancheria, and the Cedarville Rancheria. Additionally, consultation occurs with the unrecognized Shasta Tribe, Inc. and the Shasta Nation, Inc. Members of many tribes gather Forest products for consumption, medicinal, and spiritual use.

The population of Native American Indians has remained relatively constant over time at about 4 % of the population of Modoc County, and the analysis area as a whole. Through government to government consultation and discussions with traditional practitioners, Native Americans have expressed concern relative to the effects of noxious weeds and of herbicide use on culturally significant plants and impacts to human health as a result of exposure to, use of, and/or consumption of exposed plant materials.

Tribal communities in Modoc County experience high unemployment, and those who are employed often work seasonally in ranching and construction both on and off reservations and rancherias. Native Americans have traditional and non-traditional economic ties to the land. That is, religious/heritage sites are located on the Forest, and many individuals work on the land (logging, thinning, planting, etc.).

Through government-to-government consultation and individual discussions, Native Americans in Modoc County generally believe in retaining a natural landscape and using resources necessary to sustain their lifestyle. Thus, part of their concerns about how the Forest is managed stems from the desire to protect and preserve hunting, gathering, and spiritual places. Many believe that sites such as seasonal base camps, burial grounds, rock art, and prayer seats should be preserved out of respect for ancestors and to preserve examples of past lifestyles. Consequently, Native Americans prefer land management practices which maintain the Forest in a natural setting. Traditionalists may also include younger individuals interested in reviving and maintaining aspects of past lifestyles, beliefs, and traditions.

Most Native Americans in Modoc County are concerned with the economic necessity of employment. Generally, increased opportunities for local employment, especially available work on the land, is a benefit to these communities. The attitude of Native Americans towards noxious weed treatment methods varies from accepting only physical + treatment methods to some use of a variant of treatment methods, including chemicals.

Three traditional cultural properties and four plant-gathering areas have been identified on the Forest. Table 3-29 displays these areas and the known weed sites located within each. Only two gathering areas have weed sites identified within them. These weed sites represent approximately 0.01 % of the tribal areas identified.

Table 3 - 48. Traditional Cultural Properties and Gathering Areas and Associated Weed Sites

Area	Area Size (Acres)	Identified Weed Sites	Acreage of Identified Weed Sites
Medicine Lakes Highlands Traditional Cultural Property	42,350	0	0.0
Timber Mountain Traditional Cultural Property	4,074	0	0.0
Sugar Hill Traditional Cultural Property	2,429	0	0.0
Alturas Rancheria Gathering Area 1	184	2	44.4
Alturas Rancheria Gathering Area 2	103	0	0.0
Alturas Rancheria Gathering Area 3	80	0	0.0
Pit River Tribe Gathering Area	292,769	27	2.6
Total	341,989	29	47.0

(USDA Forest Service 2006)

The Forest Service and the Pit River Tribe are currently in negotiations to establish a participating agreement. This agreement would further facilitate the Forest Service and the Tribe working together cooperatively in the treatment of noxious weeds located in ancestral territories within the boundaries of the Modoc National Forest and on adjacent tribal lands.

Environmental Organizations

The group entitled "Environmental Organizations" covers a wide variety of individuals and organizations concerned about the environment and natural resource issues. This group has members in the analysis area and links to other stakeholder groups such as the scientific community and Native American Tribes. The views of this group are diverse, some support collaborative approaches and accept limited use of herbicides with strong oversight to eliminate or control noxious weeds, while others take the approach of no herbicides regardless of the cost or treatment effectiveness.

Organizations that seek to keep federal lands free of pesticide use in the treatment of noxious weeds refer to similar concerns including: human health and ecosystem reasons. They fear that over-reliance on pesticides may create "super-weeds" resistant to chemical control, thus exacerbating an already difficult infestation problem' many in this group view the introduction of herbicides to eradicate or control noxious weeds as both unsound science and ill-considered public policy, they have contributed public comments criticizing the scientific rationale for use of chemicals and the potential deleterious effects of chemicals to Forest flora, fauna, soils, and water.

Other Federal Land-Management Agencies

This group is composed of other Federal agencies, most of whom have land adjacent to the Modoc National Forest. These agencies are charged with promoting both economic opportunity and environmental protection. The USDI Bureau of Land Management and USDI National Park Service have lands adjacent to the Modoc National Forest. Other USDA Forest Service units that lie adjacent to or near the Modoc National Forest include the Shasta-Trinity, Lassen, Fremont-Winema, and Klamath National Forests. Other agencies with interests in the area include the USDA Natural Resources Conservation Service, Farm Service Agency, North Cal-Neva RC & D Office, and Rural Development Agency.

State and Local Governments

The State manages lands adjacent to and in the vicinity of the Modoc National Forest through the State of California Land Commission, the State of California Department of Fish and Game, and

the California Department of Parks and Recreation. Other state and local agencies with interests in the Proposed Action include the California Department of Pesticide Regulation, Regional State Water Quality Control Boards, the California State Transportation Agency, the Modoc, Lassen, and Siskiyou Boards of Agriculture and County Supervisors, and the City of Alturas.

This group also includes quasi-government institutions such as the Modoc Noxious Weed Working Group. The Modoc County Noxious Weed Working Group is a standing committee comprised of representatives of many public entities. Working closely with the county agricultural commissioner and the State Department of Food & Agriculture, the work group strives to coordinate weed management efforts and educate everyone on the need for weed awareness (http://www.pitriveralliance.net/resource/noxweeds.html).

All these groups use herbicides as one of the primary methods for controlling or eliminating noxious weeds once they have been established.

Environmental Consequences

Alternative 1 - No Action

Under the No Action Alternative, current management plans would continue to guide management of the project area. No aggressive treatment activities would be implemented to accomplish the Purpose and Need. This Alternative is required by regulation (CEQ Regulations for Implementing NEPA 1502.14(d)) and would call for no weed management treatments applied to any National Forest System lands, except for those Forest Service parcels under authority of the Federal Highway Administration, the State of California, or areas covered by site specific NEPA analysis. There would be no program for the management of seed banks, for the treatment of new infestations of existing species, or the occurrence of new species of weeds. This Alternative provides a baseline for comparison and analysis of effects.

Direct and Indirect Effects

Under this Alternative, no aggressive weed management activities would be conducted on the Modoc National Forest by the Forest Service. The spread of noxious weeds would continue, unchecked, except for localized activities totaling 20 to 30 acres of treatment annually, as authorized by site specific NEPA analysis or as treated under the authority of the Federal Highway Administration or the State of California.

Existing noxious weed infestations, even if treated, can leave behind seed banks, which can remain viable for many years after treatment activities have been completed. Alternative 1 does not provide for ongoing re-treatment or management of these seed banks. Without re-treatment, these sites continue sprouting from the seed bank, ensuring a reoccurrence of the infestation. Additionally, new infestations or the occurrence of new weed species would remain untreated.

All stakeholders would be adversely impacted under the implementation of Alternative 1, as the biological diversity of vegetative communities within the Forest would continue to be reduced. Native species and desirable non-native species would be threatened, as the occurrence of noxious weed infestations continues to increase.

Forage production on Forest rangelands would be reduced, adversely impacting habitat capability to support wildlife populations. Permitted grazing activities would be adversely impacted as less forage would be available for grazing by domestic livestock. Recreational users would be adversely impacted in that the enjoyment of the forest for some users may be reduced by the loss of biological diversity. In severe cases, some users may relocate their recreational activities to other areas of the forest or to other public lands as a result of noxious weed infestations.

Neighboring private and public lands would be adversely impacted as noxious weed populations spread from the Modoc National Forest. Land values may be reduced and costs to control noxious weed infestations for neighboring land owners or administrative agencies (federal, state, and local governments) would be increased.

Some stakeholders expressed concern regarding the potential impacts of herbicides to the environment and to human health. Although no herbicide treatments would be implemented under the No Action Alternative, many of those opposing the use of herbicide treatments would remain unsatisfied because the Forest is not treating more aggressively with physical + treatment methods. The no action alternative also would not use methods promoted by these stakeholders, continued and increasing negative effects to the health and diversity of the biological resources of the forest would occur as noxious weed infestations spread.

Concern was expressed that the application of herbicides for weed control may affect the ability of Native Americans and others to collect plants for traditional uses or medicinal reasons in specific areas. No herbicides would be applied under this Alternative; therefore, there would be no herbicide impacts to the collection of plants or other forest products.

However, the spread of noxious weeds from the Forest to Tribal trust lands would adversely impact American Indian Tribal interests. In the long term, noxious weed populations may threaten traditional gathering areas used by Tribal members.

Cost estimates associated with the implementation of Alternative 1 are displayed in Table 3-49. Assuming 30 acres of treatment annually, the estimated five-year discounted cost of this Alternative is $135,670. There is no time limit on implementation under this Alternative; therefore in order to facilitate comparison with the longest term considered under the other Alternatives, ten years was used as to estimate the discounted cost of "full implementation." The ten-year discounted cost is estimated to be $247,920. Although data about the historical rate of effectiveness was not available, it was assumed that physical + treatments would be applied to non-rhizomatous species, with an 80 % estimated rate of effectiveness. Using this assumption, the average cost per effectively treated acre is approximately.

Table 3 - 49. Alternative 1 Estimated Costs (2006 dollars)

Economic Measure	Dollars
Five-Year Discounted Cost	$135,670
Ten-Year Discounted Cost	$247,920
Cost per Effectively Treated Acre	> $413

Because the majority of inventoried infestations would remain untreated under this Alternative, they would continue to spread. New infestations of existing species and new species would remain untreated. Therefore, the future cost to control noxious weeds would continue to escalate.

The table below displays the potential employment and income that may be supported within the local economy as a result of implementing Alternative 1. The employment figures presented represent potential full-time, part-time, and/or seasonal positions.

Table 3 - 50. Alternative 1 Estimated Job and Income Impacts

Impact	Amount
Jobs	2
Labor Income ($1,000)	$39

(USDA Forest Service 2005)

Cumulative Effects

Although private land owners and federal, state, and local governments administering lands adjacent to the Forest would continue noxious weed treatment activities, it is likely that they would be unable to treat all occurrences. To the extent that some noxious weed infestations on lands adjoining the Forest may remain untreated, implementation of Alternative 1 would contribute to or accelerate the long-term decline in the health and sustainability of native plant communities within the Forest and adjoining land ownerships. The resulting decrease in biological diversity and reduction in the economic and social returns natural plant communities provide, would adversely impact all stakeholders. Costs incurred by adjoining land ownerships to treat noxious weed infestations would likely continue to escalate as a result of the increasing likelihood and scale of the spread of weeds from untreated National Forest System lands.

Deferring the treatment of current noxious weed populations on the Modoc National Forest would result in continued growth and expansion of these sites. Because no action would be taken to address seed bank management, these viable reserves of weed seed would continue to germinate ensuring that even if treated, existing infestations would recur, spread, and create ever larger seed bank reserves. Future management of these expanding sites would require increasingly larger expenditures to implement effective treatments.

Alternative 2 - Proposed Action

The Modoc National Forest proposes to treat 14 species of noxious weeds on 536 sites comprising approximately 6,899 acres to eradicate, control, or contain the occurrences. Between 300 to 1,500 acres would be treated annually for the next five years. Herbicides would be applied by directed spray and wicking treatments. Herbicides would include Clopyralid, Dicamba, Glyphosate, Triclopyr, and 2-4-D. Treatments would include use of surfactants and dyes. Surfactants increase the absorption of herbicide by the weeds, and dyes assist the applicator in efficiently treating target weeds. However, this Alternative would not incorporate a program to treat new infestations of existing species or new species of weeds occurring on the Forest.

Herbicide treatments would occur only once each year. Some noxious weed sites may require re-treatment during the same year to fully control or eradicate the site. Re-treatment of noxious weed sites after annual herbicide treatment activities within the same season will normally be done by hand or physical + treatments.

Noxious weed seed banks can remain viable for many years after treatment activities have been completed on currently inventoried sites. Re-treatment of these sites is needed to control sprouting from the seed bank and prevent a reoccurrence of the infestation. This re-treatment activity is identified as seed bank management. Seed bank management includes visiting previously treated sites on an annual basis to treat newly germinated weeds.

The annual combination of methods used would vary depending on noxious weed species, distance from water or other sensitive areas, effectiveness of treatments, and most economical and efficient treatment methods available. There would be no aerial spraying or herbicide use within ten feet of water.

The table below summaries the size of areas by treatment method relative to the size of all areas proposed for treatment, and of the Forest as a whole.

Table 3 - 51. Alternative 2 Treatment Methods

Treatment Method	Acres	percentage of Treatment Acres	percentage National Forest System Acres
Physical – hand pulling, hoeing, grubbing	31	0.4 %	0.002 %
Physical and/or Herbicide Treatments	5,961	86.4 %	0.358 %
Herbicide	907	13.2 %	0.055 %
Total	6,899	100 %	0.415 %

Direct and Indirect Effects

Herbicide treatments employed under this Alternative are expected to more effectively control weed populations than Alternatives that do not utilize herbicides. However, since all sites would not be treated each year, seed production would continue at untreated sites. New infestations of existing species or infestations of new species would not be treated under this Alternative. Implementation of Alternative 2 would slow the spread of noxious weed species (Noxious Weed Risk Assessment 2006). Biological diversity would be maintained by controlling, reducing, and in some limited cases, eliminating occurrences of 14 species of noxious weeds within the Modoc National Forest. After five years, an environmental analysis would be required to authorize continued noxious weed treatment activities.

To the extent that all stakeholders have an interest in promoting greater ecosystem health and ensuring the long-term productivity of the land, all stakeholders would benefit from implementation of this Alternative. Sensitive plant populations would be benefited as competition for light, water, and nutrients would be reduced (Beyer 2006).

Forage production on Forest rangelands would be maintained or enhanced, supporting habitat capability to sustain wildlife populations. Forage for domestic livestock grazing would be maintained or improved, supporting permitted grazing activities. Recreational opportunities and environments would be enhanced by the reduction of noxious weed infestations, contributing to biologically diverse populations of native and desirable non-native plant populations.

Potential for the spread of noxious weeds from the Modoc National Forest to adjoining land ownerships would be reduced through implementation of Alternative 2. Control efforts on the Forest would therefore contribute to containment of the costs incurred by private land owners and other agencies for the control of noxious weeds.

Although public concern was expressed relative to the health risk of herbicide use, physical control methods also represent human health risks for crews implementing control activities. Crews would be exposed to the potential for injuries as a result of tripping, falls, motor vehicle accidents, tool use, etc. Physical control methods are more time consuming to implement and therefore require increased time in the field, increasing exposure to the risk of physical injury. Contra Costa County experienced increased worker compensation claims as a result of implementing physical control methods. There was a significant rise in the incidence of back injuries above that experienced when herbicide treatments were implemented. A contributing factor may have been that all members of the crew were over the age of 40. The experience of Contra Costa County was that physical control methods were less effective and required more repeat treatments and thus increased worker exposure. Additionally, crews found physical treatment methods to be physically demanding and tiring (Jefferies 2006). However, 2002 Worker Compensation Insurance data cited in the Human Health and Safety specialist's report (Bakke 2005) indicated that compensation rates for physical treatment methods were only slightly higher than for herbicide treatment methods.

Combinations of physical, physical +, and herbicidal treatments are proposed under this Alternative. Physical control methods will be used exclusively to treat 31 acres and, as an option, for treating an additional 5,961 acres. The design of Alternative 2 requires the use of proper personal safety equipment, training, and supervision for all weed treatment crews to reduce the potential for injuries to workers. However, crew members tasked with implementation of physical treatment methods would be exposed to greater risk of injury under this Alternative than under Alternatives 5 and 6 due to the potential number of acres to be treated. Crews made up of temporary employees may be less likely to experience repetitive motion injuries due to the potential for a shorter length of exposure. Crews made up of permanent personnel may be at greater risk, as the length of exposure has the potential to be more long term.

Some stakeholders are concerned about the potential impacts of herbicides to the environment and to human health. Exposure of the general public to herbicides may occur through members of the public visiting recently treated areas; permittees conducting activities within treatment areas; or through the consumption of plant materials, water, or fish contaminated by herbicide chemicals. Areas to be treated at one time would generally be small and scattered. Total annual treatment acres (300-1,500 acres) represent between 0.02 to 0.09 % of the lands administered by the Modoc National Forest; in total, less than 0.41 % (6,868 acres) of the Forest could be subject to herbicide treatment. Additionally, herbicides would be applied through the use of directed spray or by application to individual plants by wick, minimizing the potential for drift beyond the targeted plants. Public exposure would therefore be minimal.

Design Standards for all Alternatives utilizing herbicides require that treatment areas be posted with notification signs at access points prior to initiating treatment activities. These signs will list the herbicides to be used, the effective dates for treatment, and the name and number of a Forest Service contact. Dyes would be used to facilitate the identification of recently treated plants. Human health and safety impacts to workers and the public under a variety of exposure scenarios including exposure from direct spray, treated vegetation, consumption of sprayed fruit, drinking contaminated water, or consuming fish by recreational and subsistence users were analyzed in the Human Health and Safety specialist's report (Bakke 2005). Both acute (one-time) and chronic (long-term) circumstances were considered. Details of the analysis are located in the project record worksheet analysis for each herbicide, which is located in the Forest Supervisor's Office in Alturas, CA. The worksheets contain over 500 pages and will not be repeated in detail here. However, using compliance with recommended safety practices and procedures, results indicate that exposure levels would not be expected to exceed acceptable levels of risk, particularly given the relatively small area to be treated.

Some expressed concern relative to herbicide impacts in areas utilized for mushroom-gathering activities. The Modoc, Klamath, and Shasta-Trinity National Forests jointly administer commercial mushroom gathering permits in the Medicine Lakes Highlands Traditional Cultural Property. Mushrooms are also an important cultural resource to Native American tribes in the area. No weed sites are currently identified in the Medicine Lakes Highlands area, and no weed treatment activities impacting this important resource are anticipated.

A small percentage of the population may have a hypersensitivity to a wide variety of pesticides, perfumes, household cleaners, construction products or industrial herbicides, including the herbicides proposed for use by the Forest. Risk of exposure for these individuals would be minimal (see Human Health and Safety Report, Bakke, 2005).

For some forest users, any exposure to herbicides, direct or indirect, reduces the quality of their experience in the forest. Some individuals may regard the presence of herbicide residues and odors as a threat to good health and an adverse impact to their quality of life. These individuals

may chose to relocate to other areas of the forest or other public lands to avoid recently treated areas.

Those with the greatest risk of exposure would be the workers applying the herbicides. In accordance with the letter of direction dated November 18, 2005 from the Chief of the Forest Service in response to public concern about migrant and guest worker health and safety (Bosworth 2005) all Alternatives would require strict adherence to health and safety requirements for all workers. Exposure levels would not be expected to exceed acceptable levels of risk to human health for all herbicides proposed for use by the Forest (Bakke 2005). Herbicides would only be applied by personnel who have been certified as applicators in accordance with label instructions and federal and state pesticide regulations. All crews assigned to conduct weed treatment activities would be required to have received training, conducted in the language of the crew, addressing health and safety precautions, Herbicide Fact Sheets, spill plans, and requirements for personal protective equipment. Additionally, supervision and inspections would be provided to ensure compliance with all safety requirements including the use of required personal protective equipment.

To address herbicide impacts to gathers and weavers, the California Environmental Protection Agency, Department of Pesticide Regulation completed a study entitled "Residues of Forestry Herbicides in Plants of Interest to Native Americans in California Forests." This report is discussed in the Tribal/Native American specialist report (Meza 2006). The conclusions are quoted below.

"In general, low residue levels were detected in the roots, shoots, foliage, and berries of plants treated with granular hexazinone and also in roots of bracken fern treated with Glyphosate, Triclopyr, or liquid hexazinone. Although levels were low, residues persisted in many of the sampled media, with Glyphosate remaining detectable in bracken fern roots at 67 weeks post-application, the last sampling period for the plant-herbicide combination.

Also gatherers sampling shoots, foliage, and berries in Glyphosate or Triclopyr treatment areas may be exposed to herbicide. The highest residue levels were generally observed on application day or 4 weeks following application (second sampling interval) with residues remaining detectable in plant materials for several weeks thereafter. Consequently, herbicide residue data should be used for exposure assessment to determine if gatherers and basket weavers are exposed to hazardous levels of the four forestry herbicides.

As herbicide residues were found to move off-site to non-treatment areas, plant gatherers and basketweavers may want to select plants beyond 100 ft. down slope from treated areas for up to 12 weeks following treatment. (Ando 2002) "

Effects to human health relative to Native American traditional uses including the consumption of plant materials, water, or fish are addressed in detail in the specialist's reports for Human Health and Safety (Bakke 2005), and for Tribal/Native American Uses (Meza 2006). Exposure levels would not be expected to exceed acceptable levels of risk to human health for all herbicides proposed for use (Bakke 2005).

Positive impacts to Native American tribal interests would be a reduced risk of weed infestations encroaching on gathering areas, and adversely impacting populations of traditional plant resources. Additionally, the risk of invasive species encroachment on Tribal lands would be reduced. Negative impacts are an increased chance that traditional plant resources in close proximity to treatment areas may be damaged or lost.

Approximately 341,989 acres of traditional cultural properties and tribal gathering areas have been identified on the Forest. Approximately 47 acres of weed infestations have been identified within these areas. Under Alternative 2, approximately 45.2 acres would not be treated, 0.5 acres

would be treated through the use of physical treatment methods only, 0.5 acres would be treated through the use of herbicides only, and 0.8 acres would be treated with a combination of physical and herbicide treatments. The acres of gathering areas proposed for herbicide treatment represents 0.0004 % of the total identified tribal areas. Additionally, herbicides would be applied through the use of directed spray or by application to individual plants by wick, minimizing the potential for drift beyond the targeted plants.

Design Standards for this Alternative require that Forest personnel work closely with Native American tribal leadership regarding annual operating plans to prevent the spread of weed populations onto tribal lands and also to protect heritage resources such as traditional plant gathering areas. If tribal crews are utilized to implement treatment activities through the proposed participating agreement with the Pit River Tribe, cultural familiarity with traditional plant materials by crew members may afford additional protection to these resources.

The timing of treatment activities may correspond with the timing of traditional gathering activities. Advance coordination with tribal leadership would allow for adjustments to annual treatment plans based on new information and make it possible for tribal leaders to provide notification to tribal membership regarding planned treatment activities. Such advance notice would allow those conducting traditional gathering activities to avoid exposure to recently treated areas. Notification signs would be posted at access points to treatment areas prior to initiating treatment activities. These signs will list the herbicides to be used, the effective dates for treatment, and the name and number of a Forest Service contact. Additionally, dyes used in herbicide treatments would facilitate the identification of recently treated plants.

National Visitor Use Monitoring (NVUM) survey results indicate that Native Americans represented only 0.4 % of Forest recreation visitors surveyed. Of all visitors surveyed, those who participate in gathering natural products represented only 2 %. Although survey results are the only source of information regarding National Forest use levels, many local residents did not stop and participate in the survey. Those who did not participate in the survey likely included American Indian users who may not have considered their activities as “recreational.” Therefore, survey results are likely to have underestimated the number of these users. Nonetheless, even if undercounting is assumed, the very small area to be treated indicates a minimal risk of exposure to Native American forest visitors. Adverse impacts to gathering activities for subsistence or income producing purposes are not expected.

Despite the low risk of exposure, some users would likely consider any herbicide treatments as an intrusion, endangering traditional cultural practices important to tribal lifestyles and quality of life. Therefore, herbicide use at any level may contribute to a perceived reduction in quality of life for some American Indian users.

Native American workers implementing weed treatment activities under the proposed participating agreement with the Pit River Tribe would be at increased risk of exposure to herbicides or to injuries as a result of weed treatment activities. Exposure levels would not be expected to exceed acceptable levels of risk to human health for all herbicides proposed for use by the Forest (Bakke 2005). In accordance with the letter of direction dated November 18, 2005 from the Chief of the Forest Service in response to public concern about migrant and guest worker health and safety (Bosworth 2005), all Alternatives would require strict adherence to health and safety requirements for all workers. Herbicides would only be applied by personnel who have been certified as applicators in accordance with label instructions and federal and state pesticide regulations. All crews assigned to conduct weed treatment activities would be required to have received training, conducted in the language of the crew, addressing health and safety precautions, Herbicide Fact Sheets, spill plans, and requirements for personal protective

equipment. Additionally, supervision and inspections would be provided to ensure compliance with all safety requirements including the use of required personal protective equipment.

Estimated costs include the cost of treatment activities, seed bank management, monitoring and inventory activities, water quality monitoring, and soil unit validation. Water quality monitoring and map unit validation will be completed under this Alternative due to the potential for herbicide use. The highest level of annual treatments (1,500 acres) was assumed. The estimated five-year discounted cost for the implementation of Alternative 2 in 2006 dollars is $1,393,760. The total discounted cost for the life of the Alternative is the same, as Alternative 2 is proposed with a five-year life span. These figures are an approximation, and are intended to allow for comparison of the Alternatives. No adjustment was made to allow for the effects of inflation on the cost of implementation as it occurs in future years. The estimated cost per effectively treated acre is $243.

Table 3 - 52. Alternative 2 Estimated Treatment Costs (2006 dollars)

Economic Measure	Dollars
Five-Year Discounted Cost	$1,393,760
Total Discounted Cost (Life of Alternative = Five Years)	$1,393,760
Cost per Effectively Treated Acre	$243

The estimate of total cost for five years of implementation calculated above assumed that the maximum level of annual treatment (1,500 acres) would be implemented each year. Needless to say, costs would be reduced at lower annual treatment levels.

An analysis was conducted to determine how long it would take to treat all areas proposed for treatment under this Alternative. It was assumed that treatments would be implemented at the maximum annual level proposed, 1,500 acres. Treatments were assumed to be 80 % effective, and that the remaining 20 % of acres would likely require some form of re-treatment in succeeding years, thereby reducing the number of “new” acres that could be treated in each year following the first year of implementation (e.g., 20 % of acres treated (300 acres) in year one would be treated again in year two, therefore only 1,200 “new” acres would be treated in years two through five). Under these assumptions, approximately nine % of acres proposed for treatment would not be treated within the five-year life of this Alternative. At the lowest level of annual treatment proposed (300 acres), as much as 82 % of proposed areas would remain untreated. If priority is placed on applying an initial treatment to as many acres as possible before re-treatment activities are initiated, rates of spread could be slowed considerably. However, depending on the actual annual weed treatment program level, some areas requiring re-treatment may not receive that follow-up treatment during the proposed implementation period.

Table 3-53 below displays the potential employment and income that may be supported within the local economy as a result of implementing Alternative 2. The employment figures presented represent potential full-time, part-time, and/or seasonal positions.

Table 3 - 53. Alternative 2 Estimated Job and Income Impacts

Impact	Amount
Jobs	72
Labor Income ($1,000)	$922

(UDSA Forest Service 2005)

Many other anticipated economic benefits are not easily converted to dollar amounts. In addition to job and income benefits, there would be additional intangible and difficult to quantify economic benefits. Some of those benefits, such as improved biodiversity, improved forage for

wildlife and domestic cattle grazing, and protection of adjacent lands, are discussed above. Other benefits include those listed below:

- Reduced potential for increased erosion and soil loss associated with weed-dominated plant communities
- Protection of aquatic species resulting from reduced runoff and sedimentation
- Improved esthetic value of the landscape
- Potential increases in the amount of recreation use that would occur in relatively weed-free areas

Refer to the other specialists' reports for further discussion of the effects of the Alternatives on the above resources.

Cumulative Effects

In combination with noxious weed treatment activities implemented on adjoining land ownerships, implementation of Alternative 2 would contribute to the long term improvement and maintenance of area biodiversity and ecosystem health, positively impacting all stakeholders. Costs to adjoining land ownerships to control and contain noxious weed infestations would be reduced in the long term, as seed sources on National Forest system lands are reduced or eliminated.

Herbicide treatments on National Forest System lands, when combined with herbicide treatment activities on adjoining land ownerships, represent a potential for increased risk of exposure to some members of the public. These risks are discussed in the Human Health Specialist's report. Bioaccumulations within the environment of the chemicals proposed for use are not anticipated. The anticipated risk to human health is considered low.

Alternative 3

Alternative 3 was developed in response to scoping comments to provide an Alternative that did not include herbicides. Alternative 3 treats a total of 5,993 acres through physical methods.

Between 300 to 1,500 acres would be treated annually for the next five years. However, this Alternative would provide no program for the treatment of new infestations of existing weeds or occurrences of new weed species.

Noxious weed seed banks can remain viable for many years after treatment activities have been completed on existing plants. Re-treatment of these sites is needed to control sprouting from the seed bank and prevent a reoccurrence of the infestation. This re-treatment activity is identified as Seed Bank Management. Seed Bank Management includes visiting previously treated sites on an annual basis to treat newly germinated weeds.

The size of the area to be treated relative to the Forest as a whole is displayed in the table below.

Table 3 - 54. Alternative 3 Treatment Methods

Treatment Method	Acres	percentage of Treatment Acres	percentage of National Forest System Acres
Physical – hand pulling, hoeing, grubbing	5,993	100 %	0.362 %

Direct and Indirect Effects

The direct and indirect effects resulting from the implementation of Alternative 3 would be similar to those described under Alternative 2 with the following exceptions.

No herbicides would be used, therefore impacts related to the application of herbicides would not occur under this Alternative; however, overall effectiveness of treatment activities is expected to be lower. Only a portion of existing sites would be treated each year, so seed production at untreated sites would continue. The occurrence of treated species of noxious weeds would decline during the five years of implementation. New infestations of existing species or occurrences of new species would not be treated. After five years, additional analysis would be required to continue treatment activities. Control and eradication of larger sites would not occur. Soil disturbance resulting from physical + and physical treatment methods also provides conditions conducive to new seed invasion (Beyer 2006). Implementation of Alternative 3 would maintain biodiversity to a lesser extent than would occur under Alternative 2. As a result of soil disturbance resulting from the use of physical + methods, this Alternative could potentially increase or exacerbate some noxious weed infestations and result in loss of diversity (Beyer 2006).

Although the potential for the spread of noxious weed infestations to other land ownerships would be reduced as compared to Alternative 1, there may be greater potential for spread than would occur under Alternatives 2, 4, and 6,.

No risks to workers as a result of herbicide use would occur under this Alternative. Because all acres would be treated using physical treatment methods, the potential for physical injuries to workers is greater under this Alternative, due to increased exposure to the risks involved. As described under Alternative 2, Alternative 3 would require strict adherence to health and safety requirements for all workers implementing treatment activities.

No herbicides would be utilized under this Alternative. Therefore, adverse impacts to human health and the environment as a result of herbicide use would not occur.

No adverse impacts to traditional Native American gathering areas would occur as a result of herbicides. Of the 47 acres of weed infestation identified within identified gathering areas, 45.7 acres would not be treated. Approximately 1.3 acres would be treated with physical treatment methods. The spread of noxious weed populations may be slowed, but ground disturbance as a result of physical treatment methods could provide habitat for the spread of some weed species. Risk of spread to tribal lands is less than under Alternative 1, but greater than under Alternatives 2, 4, and 6.

Native American workers implementing weed-treatment activities under the proposed participating agreement with the Pit River Tribe would be at greater risk of physical injuries as a result of weed treatment activities under this Alternative relative to Alternative 2, due to the increased number of acres to be treated using physical methods. In accordance with the letter of direction dated November 18, 2005 from the Chief of the Forest Service in response to public concern about migrant and guest worker health and safety (Bosworth 2005) all Alternatives would require strict adherence to health and safety requirements for all workers. All crews assigned to conduct weed treatment activities would be required to have received training, conducted in the language of the crew, addressing health and safety precautions and requirements for personal protective equipment. Supervision and inspections would be required to ensure compliance with all safety requirements including the use of required personal protective equipment.

Design Standards for this Alternative require that Forest personnel work closely with Native American tribal leadership regarding annual operating plans to prevent the spread of weed

populations on to tribal lands and also to protect heritage resources such as traditional plant gathering areas. This coordination would allow for adjustments to annual treatment plans to improve potential effectiveness and address tribal concerns.

Estimated costs include the cost of treatment activities, monitoring and inventory activities, and seed bank management. Water quality monitoring and soil profile examinations would not be required, since no herbicide treatments would be utilized. The estimated five-year discounted cost for the implementation of Alternative 3 in 2006 dollars is $2,225,190, and is displayed in Table 3-55. Because Alternative 3 specified a life of five years, this is also the total discounted cost. No adjustment was made to allow for the effects of inflation on the cost of implementation as it occurs in future years. Projected costs are highest under this Alternative due to the labor intensity of physical treatments. The estimated cost per effectively treated acre is $418 per acre.

Table 3 - 55. Alternative 3 Estimated Treatment Costs

Economic Measure	Dollars
Five-Year Discounted Cost	$2,225,190
Total Discounted Cost (Life of Alternative = Five Years)	$2,225,190
Cost per Effectively Treated Acre	$418

An analysis was conducted to determine how long it would take to treat all areas proposed for treatment under this Alternative. It was assumed that treatments would be implemented at the maximum annual level proposed, 1,500 acres. Treatments were assumed to be 80 % effective, and that the remaining 20 % of acres would likely require some form of re-treatment in succeeding years, thereby reducing the number of “new” acres that could be treated in each year following the first year of implementation (e.g., 20 % of acres treated (300 acres) in year one would be treated again in year two, therefore only 1,200 “new” acres would be treated in years two through five). Under these assumptions, all acres proposed for treatment would be treated within the five year life of this Alternative. At the lowest level of annual treatment proposed (300 acres), as much as 79 % of proposed areas would remain untreated. If priority is placed on applying an initial treatment to as many acres as possible before re-treatment activities are initiated, rates of spread could be slowed considerably. However, depending on the actual annual weed treatment program level, some areas requiring re-treatment may not receive that follow-up treatment during the proposed implementation period.

The estimated number of jobs and income potentially supported over five years as a result of implementing Alternative 3 are detailed in the following table.

Table 3 - 56. Alternative 3 Estimated Job and Income Impacts

Impact	Amount
Jobs	17
Labor Income ($1,000)	$437,654

(USDA Forest Service 2005)

As described in under Alternative 2, there would be other benefits that are difficult to convert to dollar values. Refer to the specialists’ reports for other resource areas for a discussion of the effects of the Alternatives on these resources.

Cumulative Effects

Cumulative effects under Alternative 3 would be similar to those described under Alternative 2; however, the cumulative use of herbicides within the area would be lower than under Alternatives 2, 4, and 6. Thus, potential for impacts to human health from these chemicals would also be lower. Herbicide use will continue on private and other federal lands.

Alternative 4

Alternative 4 expands on Alternative 2 to reflect scoping comments on the need to provide flexibility in treatment methods to eradicate, control, or contain the current occurrences and expanding or new infestations of the selected noxious weeds over a ten-year time period by adding an Early Detection – Rapid Response component.

The annual weed treatment program would treat an estimated of 500-1,500 acres per year for ten years. Herbicides would be applied by directed spray and wicking treatments. The herbicides utilized would include Clopyralid, Dicamba, Glyphosate, Triclopyr, and 2-4-D. Treatments in Alternative 4 would also include use of surfactants and dyes. Surfactants increase the absorption of herbicide by the target weeds, and dyes assist the applicator in efficiently treating target weeds.

An Early Detection – Rapid Response Strategy would be implemented in this Alternative. Early Detection – Rapid Response would provide the opportunity to treat new sites of the identified species that have developed, new sites of new noxious weed species, and existing sites that have expanded using the same treatments as outlined provided the effects are within the design Standards, and effects analyses are reflected in this FEIS. Proposed treatment under Early Detection – Rapid Response would be capped at 200 acres over the life of the Alternative with no more than 100 acres treated in any single year. The rationale for this cap is to provide limited flexibility to treat new and/or expanding weed sites while remaining within the range of effects as displayed in this analysis.

Herbicide treatments will occur only once each year. Some noxious weed sites may require re-treatment during the same year to fully control or eradicate the site. Re-treatment of noxious weed sites after annual herbicide treatment activities within the same season will normally be done by physical + treatments.

Noxious weed seed banks can remain viable for many years after treatment activities have been completed on existing plants. Re-treatment of these sites is needed to control sprouting from the seed bank and prevent a reoccurrence of the infestation. This re-treatment activity is identified as Seed Bank Management. Seed Bank Management includes visiting previously treated sites on an annual basis to treat newly germinated weeds.

Table 3-57 summarizes the size of the areas proposed for each treatment method relative to all areas proposed for treatment, and to the National Forest System lands administered by the Modoc National Forest.

Table 3 - 57. Alternative 4 Treatment Methods

Treatment Method	Acres	percentage of Treatment Acres*	percentage of National Forest System Lands
Physical – hand pulling, hoeing, grubbing	31	0.45 %	0.002 %
Physical and / or Herbicide Treatments	5,961	86.40%	0.358 %
Herbicide	907	13.15%	0.055 %
Total Treatment Acres – Existing Infestations	6,899	100 %	0.415 %
Early Detection – Rapid Response Strategy – same species at new or expanded sites and new species and new sites (Max. of 100 acres in any one year)	200	---	0.012 %

* percentages are based on the estimated total of existing infestations and do not include estimated acres to be treated through Early Detection – Rapid Response.

Direct and Indirect Effects

Up to 6,868 acres could potentially be treated with herbicides under this Alternative. Up to 200 additional acres could also be treated with herbicides under the Early Detection – Rapid Response strategy.

The effects of Alternative 4 would be similar to those described under Alternative 2, but would occur over a longer period of time (ten years verses five). This Alternative is expected to be more effective at controlling the spread of weeds due to the ability to treat new or expanded occurrences of the 14 identified noxious weed species, as well as newly occurring species. The result would be more effective maintenance of native plant communities and plant diversity. The ability to treat new infestations increases the potential for the maintenance or improvement of native plant communities above that provided by Alternative 2. Overall, the potential for spread to other land ownerships would be less than is anticipated under Alternative 2.

Physical treatment methods could be implemented on up to 31 acres under this Alternative. This includes acres that could be treated with physical and/or herbicide treatments. It also includes the maximum number of acres potentially treated through Early Detection – Rapid Response. The risk of physical injuries to workers implementing this Alternative and the resultant costs are similar to Alternative 2. Risk of injury and associated costs would be higher than under Alternatives 5 and 6. Approximately 5,961 acres could be treated with herbicides and/or physical treatments. If all of these acres are treated physically, risk of worker injury and associated costs could potentially be similar to Alternative 3. However these impacts would likely be lower since a significant number of acres may be treated with herbicides rather than with physical treatments. As described under the Alternatives above, Alternative 4 would require strict adherence to health and safety requirements for all workers implementing treatment activities.

Impacts relative to Issue 1 would be the same as described under Alternative 2, but would occur over a longer period of time. Herbicide treatments would be applied to as much as 200 additional acres over that treated under Alternative 2 due to Early Detection – Rapid Response for a total of approximately 7,068 acres. However, effects are not expected to differ measurably from those anticipated under Alternative 2.

Impacts related to Issue 2 would be the same as described under Alternative 2, but would occur over a longer period of time. The risk of the spread of noxious weed species to tribal lands would be lower under this Alternative due to the use of Early Detection – Rapid Response.

Herbicides would be used to treat 0.5 acres and physical or herbicide treatments would be applied to 0.8 acres within identified gathering areas. The acres proposed for herbicide treatment represents 0.0004 % of the total identified tribal gathering areas. A small amount of additional acreage could be treated to address new infestations of the 14 identified noxious weed species, occurrences of new species, or expansions of existing sites. Herbicides would be applied through the use of directed spray or by application to individual plants by wick, minimizing the potential for drift beyond the targeted plants.

As with the other action Alternatives, Design Standards for this Alternative require that Forest personnel work closely with Native American Tribal leadership regarding annual operating plans to prevent the spread of weed populations onto Tribal lands and also to protect heritage resources such as traditional plant gathering areas. This coordination would allow for adjustments to annual treatment plans to increase likely effectiveness and address Tribal concerns. Notification signs would be posted at access points to treatment areas prior to initiating treatment activities. These signs will list the herbicides to be used, the effective dates for treatment, and the name and number of a Forest Service contact. Additionally, dyes used in herbicide treatments would facilitate the identification of recently treated plants.

Estimated costs include the cost of treatment activities, seed bank management, monitoring and inventory activities, water quality monitoring, and soil profile examination. Water quality monitoring and soil profile examination are required under this Alternative as a result of the use of herbicide treatments. The costs of Early Detection – Rapid Response are not included. The estimated five-year discounted cost of Alternative 4 in 2006 dollars is $1,383,010. This figure is an approximation and is intended to allow comparison of the Alternatives. No adjustment was made to allow for the effects of inflation on the cost of implementation as it occurs in future years. No estimate for rate of spread was incorporated in cost estimates. The total discounted cost of implementing Alternative 4 is $1,987,840. Unlike Alternatives 2 and 3, these costs would be incurred over a period of ten years rather than five. The cost per effectively treated acre is estimated at $241 per acre.

Table 3 - 58. Alternative 4 Estimated Treatment Costs (2006 dollars)

Economic Measure	Dollars
Five-Year Discounted Cost	$1,383,010
Total Discounted Cost (Life of Alternative = Ten Years)	$1,987,840
Cost per Effectively Treated Acre (inventoried acres)	$241
Cost per Effectively Treated Acre (ED-RR)	$226

It is unknown what treatment methods would be required for infestations to be treated through Early Detection – Rapid Response. To estimate the average costs, the estimated acres of Early Detection – Rapid Response were distributed among the treatment methods based on the proportions estimated for existing infestations as displayed in the preceding table. Because the cost of monitoring is covered in the cost of treated existing inventoried acres, the expected cost per effectively treated acre under Early Detection – Rapid Response is estimated to be approximately $226 per acre.

An analysis was conducted to determine how long it would take to treat all areas proposed for treatment under this Alternative. It was assumed that treatments would be implemented at the maximum annual level proposed, 1,500 acres. Treatments were assumed to be 80 % effective, and that the remaining 20 % of acres would likely require some form of re-treatment in succeeding years, thereby reducing the number of “new” acres that could be treated in each year following the first year of implementation (e.g., 20 % of acres treated (300 acres) in year one would be treated again in year two, therefore only 1,200 “new” acres would be treated in years two through ten). Under these assumptions, all acres proposed for treatment would be treated within the ten-year life of this Alternative. At the lowest level of annual treatment proposed (500 acres), as much as 46 % of proposed areas would remain untreated. If priority is placed on applying an initial treatment to as many acres as possible before re-treatment activities are initiated, rates of spread could be slowed considerably. However, depending on the actual annual weed treatment program level, some areas requiring re-treatment may not receive that follow-up treatment during the proposed implementation period.

The estimated number of jobs and income potentially supported as a result of the implementation of Alternative 4 are detailed in the table below.

Table 3 - 59. Alternative 4 Estimated Job and Income Impacts

Impact	Amount
Jobs	97
Labor Income ($1,000)	$1,262

(USDA Forest Service 2005)

Cumulative Effects

The cumulative effects of Alternative 4 would be the same as described under Alternative 2 above.

Alternative 5

Alternative 5 was developed in response to comments on the DEIS to provide a non-herbicide Alternative that contained additional non-herbicide treatments. This Alternative would be implemented over a ten-year treatment period. An Early Detection – Rapid Response Strategy would be implemented in this Alternative. Early Detection – Rapid Response would provide the opportunity to treat new sites of the identified species that have developed, new sites of new noxious weed species, and existing sites that have expanded using the same treatments as outlined, provided the effects are within the Design standards, and effects analyses are reflected in this FEIS. Proposed treatment under Early Detection – Rapid Response would be capped at 200 acres over the life of the Alternative, with no more than 100 acres treated in any single year. The rationale for this cap is to provide limited flexibility to treat new and/or expanding weed sites, while remaining within the range of effects as displayed in this analysis.

Noxious weed seed banks can remain viable for many years after treatment activities have been completed on existing plants. Re-treatment of these sites is needed to control sprouting from the seed bank and prevent a reoccurrence of the infestation. This re-treatment activity is identified as Seed Bank Management. Seed Bank Management includes visiting previously treated sites on an annual basis to treat newly germinated weeds.

The table below summaries the size of areas by treatment method relative to the total area proposed for treatment and to the Forest as a whole.

Table 3 - 60. Alternative 5 Treatment Methods

Treatment Method	Acres	percentage of Treatment Acres[1]	percentage of National Forest System Lands
Physical + – hand pulling hoeing, grubbing, clipping, seed head or plant, hand-held string trimmer, mulching/tarping	139	50 %	0.008 %
Goat Grazing or Physical+	41	15 %	0.003 %
Limited Treatment (treatments along border of current infestation to prevent spread using physical+ methods or goat grazing)	100	35 %	0.006 %
Total Treatment Acres – Existing Infestations	280	100 %	0.017 %
Early Detection – Rapid Response Strategy – hand and Physical+ treatment of same species at new or expanded sites and new species and new sites (Avg. of 20 acres per year for ten years, Max. of 100 acres in any one year)	200	---	0.012 %

[1] percentages are based on the estimated total of existing infestations to be treated, and do not include estimated acres to be treated through Early Detection – Rapid Response.

Direct and Indirect Effects

The effects of Alternative 5 would be similar to those described under Alternative 3, but would occur on a smaller number of acres over a longer period of time. Total acres treated under this Alternative would be 0.029 % of National Forest System acres. Two large sites, a 5,657.76 acre site of dyer's woad and one 158.27 acre site of common crupina, would only be treated to reduce, but not eliminate, the potential for spread. Because the smaller number of acres to be treated may allow for increased re-treatment of some sites, there may be an increased chance of control and elimination of smaller infestations, but large sites and rhizomatous species would be more

difficult to control using the treatment methods specified. Soil disturbance as a result of treatment activities may increase the susceptibility of a site to re-invasion by noxious weed species. This Alternative may present an increased risk of spread to adjoining land ownerships as compared to Alternatives 2, 4, and 6. However, Early Detection – Rapid Response would allow the treatment of new infestations of the 14 identified weed species and infestations by new species. Overall effectiveness would be less than that expected under Alternatives 2, 4, and 6. This Alternative proposes a ten-year period of implementation.

The potential for Physical+ injuries to workers implementing treatment activities would be less than described under Alternative 3 because this Alternative would utilize Physical+ treatment methods on up to 139 acres. As described under the Alternatives above, Alternative 5 would require strict adherence to health and safety requirements for all workers implementing treatment activities.

No herbicides would be utilized under this Alternative. The effects relative to Issue 1 would be the same as described under Alternative 3; however, fewer acres would be treated.

The effects relative to Issue 2 would be the same as described under Alternative 3, except that all 47 acres of noxious weed infestations within identified gathering areas would be treated through Physical+ treatment methods. There may be an increased chance of control and elimination of smaller infestations within gathering areas, but large sites may be more difficult to control. Soil disturbance as a result of treatment activities may increase the susceptibility of a site to re-invasion by noxious weed species and renewed risks to desirable native plants within these gathering areas.

Should Native American crews be utilized to implement treatment activities across the forest under the proposed participating agreement, they would be at risk of Physical+ injuries as described under Alternative 3. However the potential risk would be reduced due to the smaller number of acres to be treated. Alternative 5 would require strict adherence to health and safety requirements for all workers implementing treatment activities.

Estimated costs include the cost of treatment activities, seed bank management, and monitoring and inventory activities. Water quality monitoring and soil profile examinations would not be required since no herbicide treatments would be utilized. The estimated five-year discounted cost for the implementation of Alternative 5 in 2006 dollars is $533,420. The total discounted cost of implementing this Alternative is $900,230. No adjustment was made to allow for the effects of inflation on the cost of implementation as it occurs in future years. These costs would occur over a period of ten years. The average cost per effectively treated acre is $1,159. This cost is higher than the average for Alternative 3, due to the higher estimated unit cost of Physical+ treatments plus mulching/tarping. Additionally the annual costs of seed bank management and inventory and monitoring activities would be spread across fewer acres. This Alternative would leave the largest percentage (96 %) of inventoried infestations untreated.

Table 3 - 61. Alternative 5 Estimated Treatment Costs (2006 dollars)

Economic Measure	Dollars
Five-Year Discounted Cost	$533,420
Total Discounted Cost (Life of Alternative = Ten Years)	$900,230
Cost per Effectively Treated Acre (inventoried acres)	$1,159
Cost per Effectively Treated Acre (ED-RR)	$507

Treatments under Alternative 5 would be focused more on the eradication of small infestations and containment and control of large infestations, rather than on their elimination. Early Detection – Rapid Response would be implemented, using Physical+ plus tarping/mulching treatment methods. Because the costs of inventory and monitoring activities and seed

management are included in the cost of treating existing inventoried acres, the expected cost per effectively treated acre to treat new infestations as they occur under Early Detection – Rapid Response is estimated to be approximately $507.

The estimated number of jobs and income potentially supported as a result of the implementation of Alternative 5 are detailed in the table below.

Table 3 - 62. Alternative 5 Estimated Job and Income Impacts

Impact	Amount
Jobs	8
Labor Income ($1,000)	$192

(USDA Forest Service 2005)

Cumulative Effects

Cumulative effects under Alternative 5 would be similar to those described under Alternative 3 above.

Alternative 6

Alternative 6 was developed to respond to comments that requested a more flexible approach utilizing herbicide treatment methods, a larger range of Early Detection – Rapid Response techniques, and additional herbicides. This Alternative will be implemented over a ten-year treatment period.

Herbicide treatments would include Chlorsulfuron, Clopyralid, Dicamba, Glyphosate, Triclopyr, 2-4-D, and two herbicide mixtures (Mix 1: Chlorsulfuron + 2, 4-D, and Mix 2: Dicamba + 2, 4-D). Herbicide treatments would also include use of surfactants and dyes. Surfactants increase the absorption of herbicide by the target weeds, and dyes assist the applicator in efficiently treating target weeds. Herbicide treatments would be the primary treatment for rhizomatous species.

An Early Detection – Rapid Response Strategy would be implemented in this Alternative. Early Detection – Rapid Response would provide the opportunity to treat new sites of the identified species that have developed, new sites of new noxious weed species, and existing sites that have expanded using the same treatments as outlined, provided the effects are within the Design Standards, and effects analyses are reflected in this FEIS. Proposed treatment under Early Detection – Rapid Response would be capped at 200 acres over the life of the Alternative with no more than 100 acres treated in any single year. The rationale for this cap is to provide limited flexibility to treat new and/or expanding weed sites while remaining within the range of effects as displayed in this analysis.

Herbicide treatments would occur once each year. Some sites may require re-treatment during the same year to fully control or eradicate the site. Re-treatment of noxious weed sites after annual herbicide treatment activities within the same season will normally be done by physical + methods.

Noxious weed seed banks can remain viable for many years after treatment activities have been completed on existing plants. Re-treatment of these sites is needed to control sprouting from the seed bank and prevent a reoccurrence of the infestation. This re-treatment activity is identified as Seed Bank Management. Seed Bank Management includes visiting previously treated sites on an annual basis to treat newly germinated weeds.

A summary for Alternative 6 of the size of areas by treatment methods compared to all areas proposed for treatment and to the Forest as a whole are displayed in the following table.

Table 3 - 63. Alternative 6 Treatment Methods

Treatment Method	Acres	percentage of Treatment Acres[1]	percentage of National Forest System Lands
Physical+ - Hand pulling, hoeing, grubbing, clipping seed head or plant, hand-held string trimmer, mulching / tarping	19	6 %	0.001 %
Physical+ and / or Herbicide Treatments	116	34 %	0.007 %
Herbicide Treatment	65	19 %	0.004 %
Cultural – Limited Goat Grazing or Herbicide Treatment (>4 acres and < 25 acres for thistle flowers).	41	12 %	0.003 %
Limited Treatment (treatments along border of current infestation to prevent spread using physical+ methods, herbicide, or goat grazing)	100	29 %	0.006 %
Total Treatment Acres – Existing Infestation	341	100 %	0.021 %
Early Detection – Rapid Response Strategy – same species at new or expanded sites and new species and new sites (Avg. of 20 acres per year for ten years, Max. of 100 in any one year)	200	---	0.012 %

[1] percentages are based on the estimated total of existing infestations to be treated and do not include estimated acres to be treated through Early Detection – Rapid Response.

Direct and Indirect Effects

The effects of Alternative 6 would be similar to those described under Alternatives 2 and 4, but would occur on fewer acres over a longer period of time. A large site of dyer's woad, a large site of Dalmatian toadflax, and a large site of common crupina would not be treated, except around the borders to prevent spread or the establishment of satellite infestations. Treatments applied to these sites would utilize herbicides.

Efforts under this Alternative would be focused more on eradication of small infestations and containment and control of large infestation rather than their elimination. This Alternative allows for the use of Early Detection – Rapid Response procedures to treat not only new occurrences of the 14 identified weed species, but also occurrences of new weed species when they are first discovered, and are small and manageable. The use of Early Detection – Rapid Response would reduce the potential for spread on the forest and to other land ownerships.

A total of approximately 522 acres could potentially be treated annually with herbicides under Alternative 6. This represents 0.03 % of all National Forest System lands. Approximately 200 acres of these could be treated through Early Detection – Rapid Response. This represents a risk of exposure to members of the public that would be less than under Alternatives 2 and 4.

As under Alternative 2, herbicide exposure levels for both the public and for workers executing treatment activities would not exceed acceptable levels of risk to human health for all herbicides proposed for use (Bakke 2005). The use of proper personal safety equipment, training, and supervision for all weed treatment crews would be required to reduce the potential for injuries to workers. Physical+ treatment methods could be implemented on up to 19 acres (including potential treatments under Early Detection – Rapid Response), much lower than under Alternatives 2, 3, 4, or 5.

The effects relative to Issue 1 are similar to those described under Alternatives 2 and 4. However, risks to worker health and safety and the potential for public exposure to herbicides would be reduced due to treatment of fewer acres.

Impacts related to Issue 2 would be the same as described under Alternative 4, but would occur over a longer period of time. However, a total of approximately 45.5 acres of noxious weeds would be treated with herbicides, and another acre would be managed with either Physical+ or herbicide treatments within identified gathering areas. While this represents a greater use of herbicides within traditional tribal gathering areas than under Alternatives 2 and 4, it represents only 0.01 % of the total gathering area acreage. Use of herbicides increases the likelihood that the existing infestations can be eliminated. The risk of the spread of noxious weed species to tribal lands would be lower under this Alternative, due to the use of Early Detection – Rapid Response to treat new and spreading infestations of not only the 14 identified species, but also new species.

As with the other action Alternatives, Design Standards for this Alternative require that Forest personnel work closely with Native American tribal leadership regarding annual operating plans, to prevent the spread of weed populations on to tribal lands and also to protect heritage resources such as traditional plant gathering areas. This coordination would allow for adjustments to annual treatment plans to improve potential effectiveness and address Tribal concerns. Notification signs would be posted at access points to all treatment areas prior to initiating treatment activities. These signs would list the herbicides to be used, the effective dates for treatment, and the name and number of a Forest Service contact. Additionally, dyes used in herbicide treatments would facilitate the identification of recently treated plants.

As under Alternative 2, herbicide exposure levels for tribal members and for workers executing treatment activities would not exceed acceptable levels of risk to human health for all herbicides proposed for use (Bakke 2005). The use of proper personal safety equipment, training, and supervision for all weed treatment crews would be required to reduce the potential for injuries to workers.

Estimated costs include the cost of treatment activities, seed bank management, monitoring and inventory activities, water quality monitoring, and soil profile examination. Water quality monitoring and soil profile examination are required under this Alternative as a result of the use herbicide treatments. The costs of fully implementing this Alternative are detailed in the table below. Estimated five-year discounted cost for the implementation of Alternative 6 in 2006 dollars is $455,200. No adjustment was made to allow for the effects of inflation on the cost of implementation, as it occurs in future years. The total discounted cost of implementing this Alternative is $734,630. The average cost per effectively treated acre is estimated to be $660. This cost is higher than estimated under Alternatives 2 and 4, due to the higher estimated cost of soil and water monitoring, and because the costs of seed bank management, inventory and monitoring are spread over a fewer number of treated acres. The total cost of implementation over the life of the Alternative is much lower than under Alternatives 2 and 4; however, approximately only 4 % of the total inventoried noxious weed sites would be treated under Alternative 6.

Table 3 - 64. Alternative 6 Estimated Treatment Costs (2006 dollars)

Economic Measure	Dollars
Five-Year Discounted Cost	$455,200
Total Discounted Cost (Life of Alternative = Ten Years)	$734,630
Cost per Effectively Treated Acre - Inventoried Acres)	$660
Cost per Effectively Treated Acre for ED-RR	$261

It is unknown what treatment methods would be required for infestations to be treated through Early Detection – Rapid Response. To estimate costs, the estimated acres of Early Detection – Rapid Response were distributed among the treatment methods based on the proportions estimated for existing infestations as displayed in the preceding table. Because the costs of monitoring and seed bank management are covered in the average cost of treating existing inventoried acres, the expected average cost per effectively treated acre for the treatment of new

infestations under Early Detection – Rapid Response is estimated to be approximately $261 per acre.

The estimated number of jobs and income potentially supported as a result of the implementation of Alternative 6 are detailed in the table below.

Table 3 - 65. Alternative 6 Estimated Job and Income Impacts

Impact	Amount
Jobs	22
Labor Income ($1,000)	$364

(USDA Forest Service 2005)

Cumulative Effects

The cumulative effects of Alternative 6 would be the same as described under Alternative 4.

Summary of Effects

Alternatives 4 and 2 would have the greatest potential for public and worker exposure over the life of the Alternative, due to the total number of acres that could potentially be treated with herbicides. Annual treatments under both Alternatives would be applied to a maximum of 1,500 acres, which represents approximately 0.09 % of the forest. Of the Alternatives that propose the use of herbicides, Alternative 6 would propose herbicide applications to the fewest number of acres, with a total of 522. This represents 0.03 % of the national forest system lands administered by the Modoc National Forest.

Alternative 6 would treat the highest number of acres within identified traditional gathering areas, and may pose the greatest risk of exposure to Native Americans gathering traditional plant materials. However, consultation at the gathering area with representatives from the Alturas Rancheria showed this risk was acceptable to the Tribe, because treating the area effectively with herbicides would prevent the loss of the area to Dalmatian toadflax. The Alturas Rancheria responded in writing that it wants the Forest to treat the Dalmatian toadflax in the gathering area. They understand it would require herbicides to treat the infestation. In their letter, the Tribe wrote that they have Alternative places for gathering the resource provided by the gathering area. Approximately 45.5 acres could potentially be treated with herbicides under Alternative 6 which represents about 0.01 % of all identified gathering area and 0.003 % of the national forest system lands administered by the Modoc National Forest.

Alternative 1 would cost the least to implement, would treat the fewest acres, and would not contain or control most of the inventoried noxious weed sites on the forest. Alternatives 2, 3 and 4 would treat the most acres of the six Alternatives considered. Alternatives 4, 5, and 6 would provide for treatment activities for a period of ten years versus five years under Alternatives 1, 2, and 3. The most costly Alternative overall is 3, followed by 2, and 4. Not surprisingly, these Alternatives also propose to treat the largest number of acres.

Average cost per effectively treated acre is lowest under Alternative 4. This low cost can be attributed to treatment methods with a lower per-acre cost, and the lowest level of required water quality and soil monitoring of all the Alternatives proposing herbicide treatments. Additionally, recurring annual costs such as seed bank management and inventory and monitoring activities are distributed across a larger number of acres effectively treated each year. The highest average cost per effectively treated acre occurs in Alternatives 1 and 5, which treat the fewest acres using the most expensive treatment method. Because Alternatives 1 and 5 treat the fewest acres, annual costs such as inventory and monitoring and seed bank management are distributed across fewer acres, increasing the per-acre cost to a greater extent.

Early Detection – Rapid Response treatment activities are proposed under Alternatives 4, 5, and 6. The lowest average cost per effectively treated acre for these treatments is Alternative 4, followed by 6, and the highest cost occurs under Alternative 5. Alternatives 1, 2, and 3 do not provide for Early Detection – Rapid Response.

Table 3 - 66. Summary of Effects by Alternative

Measure	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6
Acres of Potential Herbicide Treatment (Public and worker exposure)[1]	0	6,868	0	7,068	0	522
Acres of Potential Herbicide Treatment within Identified Gathering Areas (exposure of Native American Gatherers)	0	1.3	0	1.3	0	45.5
Five-Year Discounted Cost Estimate ($1000)	$136	$1,394	$2,225	$1,383	$533	$455
Estimated Total Discounted Cost ($1000)	$248	$1,394	$2,225	$1,988	$900	$735
Avg. Cost per Effectively Treated Acre – Inventoried Sites	$1,183	$243	$418	$241	$1,159	$660
Avg. Cost per Effectively Treated Acre – ED-RR	NA	NA	NA	$226	$507	$261
Jobs	2	72	17	97	8	22
Labor Income ($1000)	$39	$922	$438	$1,262	$192	$364

Alternative 4 would potentially support the largest number of jobs and income in the community, due to the large number of acres potentially treated with herbicides. It was assumed that all herbicide treatments would be achieved through contracting. IMPLAN modeling indicates that weed treatment services would stimulate a larger number of jobs and income per million dollars of output than would occur through the use of Forest Service crews. Therefore, Alternatives which propose higher levels of herbicide weed treatment services, tend to have an increased potential to stimulate jobs and income.

Environmental Justice

Executive Order 12898 requires the evaluation of Alternatives to determine whether they would disproportionately impact minority or low-income populations. Hispanic, American Indian, Black or African American, and Asian populations have a larger proportion of individuals with incomes below the poverty level. Crews hired to conduct weed treatment activities in the area are frequently made up of minority workers.

Alternative 1, No Action: Under the No-Action Alternative, no jobs or income would be supported; however, existing jobs and income would not be lost. Existing weed treatment activities as authorized by the Federal Highway Administration or the State of California would continue. Additionally, some weed-treatment activities authorized under site-specific NEPA analysis would continue.

Based on the above analysis, there would be no disproportionate impact to minority or low income groups as a result of implementation of Alternative 1.

Alternative 2: Native American stakeholders have expressed concern that residues from herbicides may contaminate food sources and cause harm over time. Because traditional basket weavers often use their teeth to hold fiber plants in preparing them for weaving, fiber plants with herbicide residues are also of concern.

To address herbicide impacts to gatherers and weavers, the California Environmental Protection Agency, Department of Pesticide Regulation completed a study entitled "Residues of Forestry Herbicides in Plants of Interest to Native Americans in California Forests". This report is discussed in the Tribal/Native American specialist report. Tribal/Native American gatherers collecting shoots, foliage, and berries in treatment areas may be exposed to herbicides. The highest residue levels were generally observed on application day and for four weeks following application with residues remaining detectable in plant material of treatment activities.

Design Standards of this Alternative require that Forest personnel work closely with Native American Tribal leadership regarding annual operating plans to protect heritage resources such as traditional plant gathering areas, rock art, and historic structures. The potential for impacts to traditional plant gathering areas from weed infestation would be reduced. At the same time, coordination with Tribal leadership would help to minimize adverse impacts resulting from the application of herbicides. Additionally, coordination with Tribal leadership would allow notification to those conducting traditional gathering activities so that exposure to recently treated areas could be avoided. As stated above, areas subject to treatment annually represent only 0.09 % of the Forest and National Visitor Use Monitoring results indicate Native American visitors represent a very small portion of Forest use. Risk to Native Americans seeking to collect traditional plant materials would be minimal.

Crews employed for weed treatment activities may be composed of minority workers. As stated above, appropriate training, supervision, and inspection would be implemented to ensure that worker exposure does not exceed recommended safety levels.

Impacts to recreation users are expected to be minor, and would not differ with regard to ethnicity or income status.

Based on the above analysis, this Alternative would not have disproportionate adverse impacts on minority or low-income populations.

Alternative 3: The effects of Alternative 3 would be similar to Alternative 2, except that no herbicides would be utilized. However, because some large sites of rhizomatous species would not be treated, there may be an increased risk of spread to adjoining land ownerships than under the other action Alternatives.

Through consultation, the Alturas Rancheria identified three plant-gathering areas that are important to them on FS lands. One gathering area is 184 acres, another is 103 acres, and the last is 80 acres. The combined total of acres is 367. The 184-acre gathering area has two Dalmatian toadflax infestations on the site. One infestation is 44.33 acres and the second is 0.09 acres. Table 2-5, Alternative 2 Site-Specific Treatment Information in the FEIS, indicates that physical methods are not effective in treating this rhizomatous weed. Therefore, this gathering area could be lost due to encroaching Dalmatian toadflax under Alternative 3.

Consultation regarding the infestation was done in the field, at the gathering area with the Tribe. The Tribe responded in writing after the field trip. The Tribe wants the Forest to treat the Dalmatian toadflax in the gathering area. They understand it would require herbicides to treat the infestation as indicated in Table 2-3, Weed Treatment Methods by Noxious Weed Species, of this FEIS. Under this Alternative, this site would not be treated. In their letter, the Tribe wrote that they have alternate places for gathering the resource provided by the gathering area. They requested a timeline for treatment and subsequent monitoring.

Based on the above analysis, this Alternative could have a disproportionate adverse impacts to the Alturas Rancheria by the loss of their traditional gathering area due to spread of Dalmatian toadflax (that would not be treated under this Alternative). Other than this potential effect, this

Alternative would not have any disproportionate adverse impacts on any other minority or low-income populations.

Alternative 4: The environmental justice concerns under Alternative 4 are similar to those described under Alternative 2. Because a relatively small portion of the Forest would undergo treatment each year, this Alternative would not have disproportionate adverse impacts on any minority or low-income populations.

Alternative 5: Effects relative to environmental justice are the same as described under Alternative 3. However, because some large sites would only be treated around the perimeter of the infestation, and the treatment methods employed under this Alternative are not as effective in controlling large sites or rhizomatous species, there may be an increased risk of spread to adjoining land ownerships, than under the other action Alternatives.

Alternative 6: The effects relative to environmental justice under Alternative 6 would be the same as described under Alternatives 2 and 4. However, herbicide treatments would be applied to a smaller portion of the Forest. Based on the above analysis and the relatively small portion of the Forest that would undergo treatment each year, this Alternative would not have disproportionately adverse impacts on minority or low-income populations.

Tribal and American Indian Uses

Introduction

The Modoc National Forest, located in northeastern California, is one of 155 national forests administered by the Forest Service, U.S. Department of Agriculture. Native American land, which lies within, adjacent and outside the Modoc National Forest, and Forest Service land, are affected by legislation such as the National Environmental Policy Act (NEPA) of 1970. California, according to the U.S. Census Bureau, maintains the highest American Indian population of any state in the United States. The California and Oregon Native American Tribes residing on or near the Modoc National Forest are divided between the six federally recognized tribes, and the two federally unrecognized. The six federally recognized tribes are listed below (Federal Register Vol.73, No. 66, Friday, April 4, 2008):

Alturas Indian Rancheria, California

Cedarville Rancheria, California

Fort Bidwell Indian Community of the Fort Bidwell Reservation of California

Susanville Indian Rancheria, California

Pit River Tribe, California (includes XL Ranch, Big Bend, Likely, Lookout, Montgomery Creek and Roaring Creek Rancherias)

Klamath Tribes, Oregon

The two unrecognized tribes are listed below:

The Shasta Tribe, Inc.

The Confederated Bands of the Shasta and Upper Klamath River Indians

The Modoc National Forest proposes to treat noxious weeds on Forest Service lands to meet the requirements of the National Environmental Policy Act. We have prepared this Forest Service Environmental Impact Statement (FEIS). The American Indian component includes a statement on the existing conditions, direct and indirect effects, and cumulative effects.

Existing Conditions

American Indian tribes gather forest products for consumption, medicinal and spiritual uses, where consultation has indicated a wide range of plants important to tribes. Plant species include sagebrush (*Artemisia tridentate*), epos (*Perideridia spp*.), elderberries (*Sambucus ssp*.) wild onions (*Alliums spp*.), mules ears (*Wyethia mollis*), wild plums (*Prunus spp*.), Oregon grape (*Berberis aquifolium*), and others. Also, several American Indian cultural properties or sacred sites, which total 48,853 acres in the Modoc National Forest, are eligible for nomination to the National Register of Historic Places.

Government-to-Government Consultation with Tribes

In an effort to control noxious weeds on the 1.6 million acres of the Modoc National Forest, Native American Tribes were engaged in a consultation process with the Forest Service as required by executive orders, agency memorandums and statutes, including the National Environmental Policy Act. The tribes, tribal organizations, and interested individuals expressed concerns in four areas.

Tribal Concerns on Noxious Weed Control

1. The use of herbicides for invasive weed control may cause health problems to the public and Native American people.
2. The use of herbicides for invasive weed control may affect the traditional or medicinal uses of plants by Native Americans.
3. The use of herbicides for invasive weed control may provide only a short-term solution, when alternate, long-term remedies are available.
4. The use of herbicides for invasive weed control has the potential to adversely affect all natural resources in the forest.

Alturas Indian Rancheria Gathering Site

The Alturas Indian Rancheria identified three plant gathering areas on the Modoc Nation-al Forest, totaling 367 acres. One of the two sites is infested with Dalmatian toadflax (*Linaria dalmatica L.*), which is a non-native plant under consideration for treatment.

Fort Bidwell Indian Community of the Fort Bidwell Reservation Forest Certification

The Fort Bidwell Indian Community was certified by the Scientific Certification System under the Forest Conservation Program, and in accordance with the Forest Stewardship Council's Principles and Criteria as a well-managed forest in February 2004. The tribal willingness to address noxious weeds was a contributing factor toward their certification, which was in partnership with the Modoc National Forest, Bureau of Land Management, and the Bureau of Indian Affairs.

Pit River Tribal Noxious Weed Eradication Program

In cooperation with the U.S. Bureau of Indian Affairs (BIA), Pit River employs a noxious weed eradication program of physical, mechanical, biological and herbicidal treatments.

Klamathweed (Hypericum perforatum L.)

St. Johnswort or Klamathweed is a non-native plant species of medicinal value and is one of 14 weeds identified for noxious weed treatment; however, treatment is by physical + methods and not by herbicides.

Enthnobotany

The Forest Service Washington Office provided an intensive three-week training course in ethnobotany to the botanist of the Modoc National Forest. Ethnobotany is the study of how people in a particular cultural or region use indigenous plants. The purpose of the training is to increase the cultural sensitivity of the Modoc National Forest during any government-to-government consultation with tribes.

Public Law 108-278

The Tribal Forest Protection Act of 2004 (P.L. 108-278) authorizes the Secretary of Agriculture and the Secretary of the Interior to contract with Indian tribes in order to protect Indian forest land or rangeland. The Pit River Tribe and the Fort Bidwell Indian Community have trust land adjacent to the Modoc National Forest. Despite an apparent opportunity to implementing Public Law 108-278 in treating noxious weeds, American Indian tribes have made no requests under the Act.

Direct and Indirect Effects

Under the No-Action Alternative

Noxious weeds would spread unabated toward tribal trust lands under this alternative. The costs incurred by tribes to treat noxious weeds would increase as non-native plants spread across trust lands.

Pit River Tribe, California, Trust Lands

Non-native plant populations of Scotch thistle (*Onopordum acanthium L.*) may threaten trust land of the Pit River Tribe on the XL Ranch and near McGinty Point.

Fort Bidwell Indian Community, California, Trust Lands

Non-native plant populations such as dyer's woad (*Isatis tinctoria L.*) may pose a future threat to lands on the Fort Bidwell Indian Community by encroaching on tribal trust land.

American Indian Cultural Properties as Gathering Areas, Non-Trust Lands

Non-native plant populations or noxious weeds threaten a 285,351-acre plant-gathering area important to the Pit River Tribe. Twenty-seven weed sites have been identified of less than 0.10 acres each, except for one site of 0.16 acres.

Alternatives 2, 4, and 6 (Herbicide Use)

The large-scale program of noxious weed control would use a combination of physical and herbicidal treatments. Treatment methods may direct foliar spray or by wicking individual plants. Non-native plant populations or noxious weeds within 10 feet of water would be treated with hand treatments or aquatic glyphosate. Cost to the tribes would be reduced in the long-term, since seed sources would be reduced or eliminated.

Pit River Tribe, California, Trust Lands

Non-native plant populations of Scotch thistle (*Onopordum acanthium L.*) may be treated by physical, mechanical and herbicidal methods, depending on consultation outcomes.

Fort Bidwell Indian Community, California, Trust Lands

Non-native plant populations such as dyer's woad (*Isatis tinctoria L.*) may be treated by physical, mechanical and herbicidal methods, depending on consultation outcomes. Presently, the tribe is neither utilizing herbicides nor supporting the use of herbicides as a treatment method. The tribe is especially concerned about the sub-watershed, which is a community based water system

providing drinking water to the reservation. The sub-watershed is not identified as a municipal watershed within the State of California.

American Indian Cultural Properties as Gathering Areas, Non-Trust Lands

Non-native plant populations or noxious weeds threaten a 285,351-acre plant-gathering area important to the Pit River Tribe, which may be treated by physical, mechanical and herbicidal methods, depending on consultation outcomes. Also, herbicides are considered to have "no effect" on archaeological properties.

Non-Cultural Properties as Gathering Areas, Non-Trust Lands

Over 90 percent of noxious weed occurrences are along public roads. Health risks to Native American elderly gatherers and weavers increase, according to a December 2002 California Environmental Project Agency study entitled, "Residues of Forestry Herbicides in Plants of Interest to Native Americans in California Forests."

Alternative 3 (Non-Herbicide Use)

The large scale program of noxious weed control would implement physical treatments to rangeland resources (87 percent of infested acreage). The Forest Service may be unable to halt noxious weeds, particularly dyer's woad on the Fort Bidwell Indian Community where physical treatment methods are less effective. Also, the tribal sub-watershed would remain unaffected with herbicides under this alternative.

Alternative 5 (Non-Herbicide Use)

Active treatments of only four percent of noxious weed infestations would occur. The Forest Service may be unable to halt noxious weeds under this alternative.

Cumulative Effects

Fuels and Prescribed Fire

Herbicides are not employed in the Forest Service Fuels Programs; consequently, no increased human health risks due to chemical exposure would occur. A temporary seasonal loss of plants occurs under the prescribed fires, which enhance culturally important plant and wildlife habitat over the long term.

Range Management

Herbicides are not used by the Forest Service Range Program; consequently, no increased human health risks due to chemical exposure would occur. Access to cultural important areas is not limited under the range management program. A Geographical Information System (GIS) analysis of noxious weed occurrences shows that grazing areas are not infested with non-native plant populations.

Recreation

Herbicides are not utilized by the Forest Service Recreation Program; consequently, no increased human health risks due to chemical exposure would occur. Access to culturally important areas is not limited under the recreation program. The recreational users of Forest Service roads do contribute to the spread noxious weeds. The cumulative effect to tribal communities is the loss of easily accessible gathering areas. Presently, tribes are consulted on campground development

and improvement projects as a mitigation effort against the loss of more plant gathering areas and to improve other areas.

Reforestation

Activities associated with replanting trees may have included the use of herbicides prior to 1984. Presently, no herbicides are used since 1984 in reforestation activities; however, 800 acres of Forest Service land are planned for gopher control, using strychnine-laced oats. The human health risk to tribal gatherers and weavers due to chemical exposure is negligible, since the strychnine-laced oats are placed underground in burrows.

Roads Administration

GIS analyses of noxious weed occurrences indicate that Forest Service road systems contribute to the spread of non-native plant populations. Herbicides are neither used by the roads program nor are limits imposed on access points to culturally sensitive areas. Sixty miles of California State Highways cross the Modoc National Forest. Also, Modoc County maintains 1,040 miles of roads through the national forest. Specific terms of easement for vehicle transportation include provisions for herbicide use.

Timber Administration and Vegetation Treatments

The Forest Service road system was designed to support timber harvests after World War II. Access was limited to certain areas for short durations. The implementation of contract "C" provisions has helped reduce the spread of noxious weeds prior to logging.

Special Uses

The Forest Service processes a mean caseload of 160 special use permits annually. The provisions of these permits require users to aid the Forest Service in controlling noxious weeds. Utilities require prior authorization for the power transmission and distribution of electricity and natural gas on over 3,000 acres of power and pipeline corridors. Also, the Forest Service leases over 1,460 acres to public and private agencies for communication purposes, including 900 acres leased to the Department of Defense. In the last five years, herbicides have not been used to maintain these corridors. Two railroads cross portions of the national forest where herbicides are known to be used to control vegetation. The rights-of-way are owned by the railroad.

Previous Noxious Weed and Adjacent Treatments

The Modoc County Department of Agriculture treated noxious weeds on national forest land with a memorandum of understanding prior to 2002. Records indicate a period of 30 years where herbicides were used primarily on private lands. The herbicides persist in the environment for less than one year and are not bio-accumulative. Herbicidal treatments on Forest Service land, combined with adjacent lands, may increase potential exposure to tribal communities. The risk to human health is expected to be low.

Sagebrush Steppe Ecosystem Restoration Project (SSERP)

The SSERP project is the restoration of sagebrush communities that are invaded by juniper over the past 100 to 150 years. The project area consists of 6.5 million acres, where restoration treatments would employ mechanical and hand and fire methods. American Indian tribes indicated vegetative changes created by sagebrush restoration may adversely affect the integrity of tribal cultural resources. Also, tribes state that large-scale fire usage may adversely impact air

quality. The use of herbicides for the SSERP project is not expected; therefore, the risk to human health is anticipated to be minimal.

Vegetated Communities

The effects of weed-treatment options on vegetation resources are important. Vegetation resources considered under the Proposed Action and each Alternative are plant communities and Management Indicator Species (MIS). MIS include Federally Listed Species (Threatened, Endangered, and Sensitive Species-TES) and Watch List Species.

The concerns for vegetation resources are intense because the results of doing nothing to stem the invasion of weeds are likely to be worse in the long term than the most aggressive treatment strategy. Biodiversity and plant species richness for native vegetation and plant communities, wildlife habitat values, and sensitive species populations are likely to be severely compromised by the unchecked invasion of weeds. Similarly, these same vegetation resources could be compromised by unconstrained weed treatment efforts as well.

Commenters on the DEIS were concerned about re-vegetating treated areas to native plant species, which is part of the Proposed Action.

Comments on the DEIS focused on herbicide effects to non-target plants, plant communities, federally listed species, and the effects of specific herbicides on vascular plants. The following discussion focuses on how these effects may differ among Alternatives. The Botany Specialist Reports in the Appendix K of Volume 2, and the Native Plants discussion in the Response to Comments section in Volume 3, are expanded information of the summarized analysis below.

Plant Communities

The Forest encompasses numerous plant communities, many of which contain or have the potential to contain the noxious weeds listed in this document.

There are 17 major vegetation types found on the Forest, based on the classification of California Vegetation, CALVEG (Parker and Mayas 1981), and on the Wildlife Habitat Relationship Program. The Forest is dominated by juniper and eastside pine. Western juniper covers approximately 28% of the Forest. Juniper has increased substantially as a result of fire-suppression efforts and past grazing practices. Low sagebrush is the third-most dominant vegetation type. It is indicative of vast acreages of shallow soil, generally low-productivity land. With the addition of big and silver sagebrush to the low sagebrush habitat types, together these communities cover 20 % of the land.

Conifer vegetation types found on the Forest are eastside pine, mixed conifer, white fir, red fir, and lodgepole forest. In total, commercial conifer vegetation types are found in nearly 640,000 acres, or 40 % of the Forest. Aspen groves are found on the more mesic high-elevation sites, primarily in the Warner Mountains. Rocky ridgelines support curlleaf mountain mahogany and cheatgrass.

Noxious weed species have been observed on the Forest in many plant communities. Dry communities are inherently vulnerable to invasion by many species of weeds, including knapweeds and yellow starthistle (Callihan et al. 1989 and Lacey et al. 1997). Species such as knapweeds, Scotch thistle, dyer's woad, and Mediterranean sage can primarily be found in habitat types such as sagebrush, juniper and eastside pine communities. Disturbance factors such as road and utility corridors, timber sales, and OHV use increase vulnerability to noxious weed invasion.

Riparian areas are associated with many communities on the Forest. Riparian areas in satisfactory ecological condition are vital for maintaining certain vegetation communities, water quality, fish

and wildlife habitats. Wetlands and riparian areas occur along ponds, marshes, rivers, and streams. They are often inundated by water and normally have saturated or seasonally saturated soil conditions within 10 feet of surface water. The width of the areas may vary from a few feet along small streams, ponds and within spring meadows, to several hundred feet along major rivers, lakeshores, and within large meadow basins. Because of the presence of moisture and abundant nutrients, wetlands and riparian areas are often the most productive areas of vegetative growth. They are valuable in providing forage for both wildlife and livestock.

Occasionally, noxious weed infestations occur in these areas. Some weeds, such as Canada thistle, spotted knapweed, and perennial pepperweed, have the potential to dominate riparian areas if not controlled. Wetland riparian areas, at this time, are relatively free of noxious weeds species with the exception of Canada thistle, which tends to be found in wetter areas on Forest lands.

Spotted knapweed can reduce frequency and composition of native species and is considered a threat to conservation of native plant communities (Lajeunesse et al. 1995; Tyser and Key 1988; Belcher and Wilson 1989; Lym and Messersmith 1985). Other noxious weeds such as yellow starthistle and dyer's woad have been found to reduce establishment and growth of more desirable species (Evans and Chase 1981; Rice et al. 1994; Callihan et al. 1989).

Ecosystem processes that involve water retention and noxious weeds can impact nutrient cycling. Cryptogamic ground crust, which is composed of small lichens and mosses and commonly covers undisturbed soil surfaces, is reduced by spotted knapweed (Tyser 1992). This ground crust is important for soil stabilization, moisture retention, and nitrogen fixation (Anderson et al. 1982). Spotted knapweed also increases erosion rates because of its tap-rooted growth characteristic. Runoff was 56 % higher and sediment yield was 192 % higher on spotted knapweed plots compared to bunchgrass plots during a simulated rainfall period (Lacey et al. 1989). Knapweed infestations would have long-term detrimental effects on soil and water resources.

Introduction and spread of noxious weeds threaten biological diversity of native plant communities, and can alter ecosystem processes such as intensity and frequency of fire, hydrologic cycles, and soil erosion rates. Weeds impact wildlife by reducing forage, modifying habitat, or changing how species interact within the environment.

The effects on plant communities are summarized from the Botany Report Addendum for the Modoc National Forest Noxious Weed Treatment Project, and from the Design Standard, Description of Alternatives, and Specialist Reports in the Project Record.

Direct and Indirect Effects

Alternative 1 – No Action: Under the No Action Alternative, it is anticipated that weeds would continue to spread within the Modoc National Forest. As weeds increase, there would be a corresponding decrease in native plant cover and, subsequently, a decrease in intact native plant communities, and in plant diversity, especially where weeds spread to the point of becoming monocultures. Plant communities are aggregations of individual plants, and are somewhat stable, but do evolve over time. What affects the species, and species diversity, would also affect the communities in which they are included, and subsequently, diversity of plant communities. Soil erosion may increase because the root systems of weeds are generally less binding of soil particles, and those eroding and disturbed landscapes would be more susceptible to continued invasion by weeds.

Alternative 2 would allow for an aggressive treatment program for noxious weed control, resulting in positive impacts to native plant communities and native plant diversity. Inadvertent trampling and injury of native plants and thus plant communities by the treatment crews could

result, but the benefits from reduced competition for sunlight, water, space, and nutrients should outweigh these inadvertent side-effects of treatment.

Depending on the herbicide used, there may be some loss of vitality or even death of some native plants if drift, runoff or subsurface movement moves herbicides to non-target areas and native plants take it up. Some herbicides are specific to certain groups (dicots vs. monocots) or families (grass or mustard family for example), and widespread spraying could selectively remove some of these. However, widespread spraying is not proposed. Herbicide treatments in this project would be by directed spray or wick. Therefore, although some individual plants may be affected, widespread removal of certain groups or families from plant communities would not result, nor would changes in direction of communities, from, say, mixed forb/grass to an all-grass community.

Although physical treatment of weeds would remove individual plants, this treatment has the potential to increase noxious weed infestation by disturbing the soil and providing ideal conditions for the germination of the weed seed or overlooked rhizomes in the soil. New noxious weeds and new sites would not be treated, and in these places, native plant communities may become degraded during the project and plant diversity reduced.

Alternative 3 could have beneficial impacts to native communities and native plant diversity as there would be some weed control implemented, and therefore native plant and weed competition would be reduced, and communities would remain intact. However, because some weed species may be spread as a result of ground disturbance or incomplete removal, there are caveats with this physical treatment only Alternative, especially since the life of the project is only five years, much less than the length of time that many noxious weeds seeds and propagules can still remain viable and re-infest the site. Physical treatment of weeds has the potential to increase weed infestation by disturbing the soil and thereby providing ideal conditions for the germination of the weed seed in the soil. New noxious weeds and new sites would not be treated, and in these places, native plant communities may become degraded even during the project, and native plant diversity reduced. As an example, cheatgrass and medusahead have invaded sagebrush communities within the Forest. These communities have been changed by the replacement of native grasses and many forbs with these non-native, invasive grasses, even though sagebrush is still there. The communities have changed in many places from sagebrush/native grass and forb to sagebrush/cheatgrass or sagebrush/medusahead. Some negative effects, such as inadvertent trampling by the treatment crews, could also result.

Noxious weeds with rhizomes would not be treated in this Alternative. Consequently, native communities and diversity in those areas could continue to be negatively impacted from competition with these aggressive weeds.

Areas with bare soil resulting from weed treatments that are greater than ¼ acre in size would be evaluated to assess a need for rehabilitation. Re-vegetation seed mixes have the potential to unbalance native communities nearby if not carefully chosen. However, these mixes would be designed on a site-specific basis to consider objectives and conditions at each site. Negative effects are not expected.

Alternative 4 allows for the aggressive treatment of noxious weeds, utilizing a wide range of treatment methods. Due to the aggressive noxious weed treatment, Alternative 4 would, overall, be beneficial to native plant communities and diversity. Although some negative effects, such as inadvertent trampling by the treatment crews, could result, the benefits from reduced competition for sunlight, water, space, and nutrients should outweigh these inadvertent side effects of treatment.

Depending on the herbicide used, there may be some loss of vitality or even death of some native plants if drift, runoff or subsurface movement moves herbicide to non-target areas. Physical treatment of weeds has the potential to increase noxious weed infestation by disturbing the soil and providing ideal conditions for the germination of the weed seed in the soil. Some herbicides are specific to certain groups (dicots vs. monocots) or families (grass or mustard family for example), and widespread spraying could selectively remove some of these. However, widespread spraying is not proposed. Herbicide treatments in this project would be by directed spray or wick. Therefore, although some individual plants may be affected, widespread removal of certain groups or families from plant communities would not result, nor would changes in direction of communities, from, say, mixed forb/grass to an all-grass community.

All inventoried sites and new sites of the known 14 weeds would be treated over a period of 10 years, which is long enough to exhaust the seed bank of many of the 14 noxious weeds. This Alternative would be beneficial to native plant communities and plant diversity across the Forest. However, new weeds would not be treated, and native communities and plant diversity may therefore become degraded over time if new noxious weeds invade. Also see Direct and Indirect Effects under Alternative 2.

Alternative 5, as with Alternative 3, a manual-treatment-only Alternative would have benefits to native plant communities and diversity. Occurrences of non-rhizomatous species other than the infestations over 500 acres would be treated and over time, some of these treated occurrences would be contained, controlled, or eradicated. The 913 acres (consisting of 7 sites) of rhizomatous weeds would receive limited treatment, and competition could be intense between native communities and weeds, with invasives taking over in many cases. Although new weeds and new sites could be treated for non-rhizomatous species, those that reproduce vegetatively would continue to grow, spread, and compete.

Bare areas created by the treatment of noxious weeds would be evaluated for rehabilitation. Appropriate seed mixes and certified weed free mulch would be applied as needed so as not to compete or unbalance local native communities.

Effects from the treatment of noxious weeds by goat grazing may include some removal or injury to native plants, but should not injure communities or native plant diversity. All goat grazing treatments would be carefully monitored to ensure that weed treatment objectives are met without damaging nearby native plant communities through trampling or overgrazing. Removal of noxious weeds by goats would eventually have a beneficial effect as native plant communities are restored to the site. See also Direct and Indirect Effects under Alternative 3.

Alternative 6 would provide for the most variable and aggressive treatment of noxious weeds. Due to the number of weed control techniques available under Alternative 6, it would be expected to provide the most control of invasive species for treated sites. In the long term, outside of the 6,000-acre dyer's woad site and the large common crupina site, it is expected that noxious weed populations would be greatly reduced, and in many cases, eradicated. In the long term, it is expected that native plant communities would have less competition for available water and nutrients, resulting in stable, healthy native plant communities. However, in the two large untreated infestations, native plant communities could become severely degraded.

Cumulative Effects

Alternative 1 – No Action: Natural events (fire, flood, drought, disease, insects, landslides, climate change) have affected plant communities in the past, and continue to do so. However, where native ruderal plants would reinvade after a natural disturbance, and, gradually, later-stage seral natives would move in, now noxious weeds, highly adapted to infesting disturbed sites, are just as likely to invade and take over these places, and change the conditions on those sites so that

they remain in an early seral stage, inhabited primarily by the weeds themselves. (A ruderal plant is one that grows where natural vegetational cover has been disturbed by humans.)

The effects of many past actions continue to affect native plant communities and plant diversity. Roads, railroads and power line construction and maintenance have created vectors or pathways for continuing weed infestation, and have essentially isolated some native communities from one another by creating barriers (isolating sections of a vernal pool, for example, by the raised bed of the track) or by changing intervening habitat -- open, dry and hot vs. shaded, moist, cool (such as a wide open swath for a power line) -- across which plants not adapted to those conditions cannot easily pass. Some past road maintenance has spread noxious weeds that were in the cinders and gravel of the borrow material, creating, in some cases, monocultures of weeds in place of native communities.

Fire suppression has changed some plant communities by not selecting against non-fire adapted species, such as juniper. Canopy-cover removal during timber management and fuels reduction has changed understory soil moisture and light conditions – conditions necessary for some cool-forest communities. Plant communities that require low light and moist soil have subsequently been selected against in these places. Plantation-like conditions have replaced native communities in some cases.

Road construction has changed hydrologic function and connectivity of springs and seeps, drying habitat and causing enough change in special aquatic features (such as fens) so that many no longer support communities they once had, such as sphagnum or three-ranked hump moss.

Dam building, goose-nest island construction, and dug-outs for watering holes have changed the hydrology in the Devils Garden area, and subsequently, some vernal pool plant communities had been inundated, and others dried up, while vernal pool habitat may have been inadvertently created by other actions.

Projects on the Forest continue to affect native plant communities and plant diversity. Pile burning can sterilize the soil and kill the native seedbed, creating disturbed openings where invasives can invade intact native communities and begin to disperse their propagules. Fire suppression continues to allow non-fire-adapted species to thrive, squeezing out fire-adapted species. Juniper has invaded native grasslands and sagebrush steppe, and changed these areas to juniper woodlands with little understory.

Effects of reasonably foreseeable future actions include effects from projects that are on the schedule of Proposed Actions (SOPA). The proposed sagebrush steppe ecosystem restoration project could change the native plant communities over a large area of the Forest back to one that is less dominated by juniper. Recreation (OHV, horse riding, hiking, camping), firewood gathering, and many other activities have the potential to affect native communities and plant diversity. In the long-term, this gradual degradation of native communities could lead to a downward trend in extent and diversity of native plants and communities.

Alternative 2: The five-year life span of this project would most likely not be sufficient to outlast the viability of most of the seeds of noxious weeds. Most likely weeds would begin to germinate from the seed bank after termination of the project, and over time, they could again become a source of competition with native plants and subsequently, communities. Also see Cumulative Effects under Alternative 1.

Alternative 3: The 5-year life span of this project would most likely not be sufficient to outlast the viability of most of the seeds of noxious weeds. Most likely weeds would begin to germinate from the seed bank after termination of the project, and over time, again become a source of competition with native plants and subsequently, communities. Disturbance of the soil during implementation of this Alternative could provide a ready site for reinvasion of noxious weeds, or

stimulate the weed seed bank. It is possible that on some sites the density of noxious weeds, over time, could become greater than at the beginning of the project. Also see Cumulative Effects under Alternative 1.

Alternative 4: The 10-year life span of this project would most likely be sufficient to outlast the viability of many, but not all, of the seeds and propagules of noxious weeds. Most likely,

weeds would begin to germinate after termination of the project, and over time, again become a source of competition with native plants and, subsequently, communities, unless a continuation of weed treatments is approved. Early Detection - Rapid Response would allow treatment of the same weeds with the same treatments on new sites or sites that have expanded, which would provide more effective treatment, and could result in the complete removal of many sites of the 14 known noxious weeds. However, Early Detection - Rapid Response would not address new noxious weeds, and therefore, these new species would be able to expand in size or occurrence number without treatment. Also see Cumulative Effects under Alternative 1.

Alternative 5: The project would benefit native plant communities and plant diversity for the life of the project. However, seeds would remain viable on untreated sites, and the noxious weed seed bank would continue to accumulate there. Disturbance of the soil during implementation of this Alternative could provide a ready site for reinvasion of noxious weeds, or stimulate the weed seed bank if treatments are not done in a timely fashion. It is possible that on untreated sites the density of noxious weeds, over time, could become greater than at the beginning of the project, unless a continuation of weed treatments is approved. New sites and expanded sites and new noxious weeds can be treated in this Alternative through Early Detection - Rapid Response. This would eliminate any increase in competition to native plants and communities from new information. Also see Cumulative Effects under Alternative 1.

Alternative 6: The project would benefit native plant communities and plant diversity for the life of the project. However, seeds would remain viable on untreated sites, and the noxious weed seed bank would continue to accumulate there. Disturbance of the soil during implementation of Physical+ treatments in this Alternative could provide a ready site for reinvasion of noxious weeds by stimulating the weed seed bank or weed rhizomes still in the soil. It is possible that on untreated sites the density of noxious weeds, over time, could become greater than at the beginning of the project unless a continuation of weed treatments is approved. Also see Cumulative Effects under Alternative 1.

Irreversible and Irretrievable Commitment of Resources

Implementation of the action Alternatives with appropriate Design Standard would result in no irreversible or irretrievable loss of native plant communities and native plant diversity. Currently, these resources are at more risk from invasion and displacement by noxious weed populations.

Consistency with Forest Plans and Other Laws and Policies

The Proposed Action and Alternatives are consistent with the Modoc NF Land and Resource Management Plan's goals for native plant and plant community diversity as outlined on page 4-2: to "provide vegetative diversity to maintain viable populations and other resource objectives, including scenic quality, wildlife, and reduced wildfire loss." These goals themselves as well as the Proposed Action and Alternatives are consistent with Federal NFMA regulations. 36 CFR 219.27 states that "All management prescriptions shall... provide for and maintain diversity of plant and animal communities," for multiple use objectives, and "preserve and enhance the diversity of plant and animal communities." See also FSM 2620.1 and 2622.01.

Federally Listed and Watch List, and Plant Species

Federally Listed Plant Species

One threatened species occurs on the Modoc National Forest. Slender Orcutt grass, *Orcuttia tenuis,* is limited to relatively deep vernal pools or vernal pool-type habitat with clay soil. On the Modoc National Forest, most occurrences are in seasonally wet areas within sagebrush flats or ponderosa pine/juniper woodlands.

The main habitat requirement for slender Orcutt grass is standing water of sufficient quantity and duration to drown out most competition from other plants and meet the physiological requirements for prolonged inundation, followed by a period of gradual (becoming total) desiccation (Corbin and Schoolcraft 1990).

Slender Orcutt grass seeds germinate in the spring while under water, and plants send up long, floating leaves. As the pool dries, plants put out shorter terrestrial leaves, and then flowering stalks. Plants generally mature later than other vernal pool annuals, so often they are the only vegetation still green by mid-summer on the vernal pool bed. As an annual, it depends on seed set to replenish the seed bank for continued survival.

Direct and Indirect Effects

Alternative 1: No Action: Noxious-weed infestatations spreading and out of control due to lack of treatment may reduce habitat areas of slender Orcutt grass.

Alternatives 2, 4 and 6: No direct or indirect effects are expected to slender Orcutt grass from weed treatments in Alternatives 2, 4, or 6. Habitat requirements for slender Orcutt grass restrict other species un-adapted to the severe conditions of prolonged inundation, followed by a period of desiccation. Additionally, Design Standards would further protect rare plant species, including DS-33, no herbicide use within 100 feet of threatened or endangered plants. Herbicide use would not indirectly affect threatened and endangered plant species by impacts to invertebrate pollinator species such as bees and butterflies, as slender Orcutt grass is wind pollinated.

It is unlikely that plants would be injured during physical + weed removal by digging or injury to the roots or stem, since the weed occurrences are in different habitat, such as on the raised bed of railroad right-of-way, whereas slender Orcutt grass occurs on the flat, vernal-pool areas.

Alternatives 3 and 5: Direct and Indirect Effects: The habitat that slender Orcutt grass occupies is not susceptible to invasion, as discussed at length in the Biological Assessment (BA). Therefore, physical + treatments would not be so close to slender Orcutt grass that there would be direct or indirect effects. Noxious weeds anywhere near slender Orcutt grass are found on higher ground, such as railroad right-of-ways and dikes.

Cumulative Effects

The effects from many past actions continue to impact native plants. Roads, railroads and powerline construction and maintenance have created vectors or pathways along which weeds can move from one location to another distant one. Vectors also provide habitat for continued weed infestation. Not only do these areas provide habitat for noxious weeds in places that normally would not support them (raised beds of railroads going across vernally wet meadows), the corridors give noxious weeds a foothold from which they can spread. These areas (such as a right-of-way for a powerline) isolate some native communities from one another by creating barriers or a drastically different intervening habitat—open, dry, and hot vs. shaded, moist,

cool—across which un-adapted native plants cannot easily pass, nor cross-pollinate, leading to possible genetic problems in small populations.

Some past road maintenance has spread noxious weeds that were in the cinders and gravel of the borrow material, creating, in some cases, monocultures of weeds in place of native communities that may have included native plants. This is especially true of medusahead, a C-rated noxious weed in Modoc County, which would not be treated in the project.

Fire suppression continues to allow non-fire-adapted species to thrive, squeezing out fire-adapted species. Canopy-cover removal during timber management and fuels reduction has changed understory soil moisture and light conditions – conditions necessary for some cool-forest native plants. Plant communities that require low light and moist soil have subsequently been selected against in these places. Plantation-like conditions, where the diversity of understory plants is minimal, have replaced more diversified native communities, in some cases. Other forest activities, such as logging, thinning, prescribed fire, road building and road maintenance may result in habitat alteration and physical + injury to native plants, which may open up the habitat for invasive and noxious weed infestation. Dam building, goose nest island construction, and dug-outs for watering holes have changed the hydrology in the Devils Garden area. Subsequently, some vernal-pool plant communities have been inundated, and others dried up, while vernal-pool habitat may have been inadvertently created by other actions.

Projects on the Forest continue into the present to have both positive and negative effects to native plants and habitat. Pile burning can sterilize the soil and kill the native seedbed, creating disturbed openings where weeds can invade and begin to disperse their propagules. Pile burning can also eliminate the native plant seed bank. Fire suppression and past overgrazing have allowed juniper to invade native grasslands and sagebrush steppe, and changed these areas to juniper woodlands with little understory.

`Irreversible and irretrievable commitment of resources

Implementation of the action Alternatives with appropriate Design Standards will result in no irreversible or irretrievable loss of slender Orcutt grass.

Consistency with Forest Plan and Other Laws and Policies

During review, it was determined that no habitat for slender Orcutt grass occurs within the proposed treatment areas. Alternative 6, will have “No Effect” on individuals or populations of slender Orcutt grass. No endangered plant species are known to occur on lands administered by the Modoc National Forest.

The Modoc NF Land and Resource Management Plan was completed before the discovery of our only threatened plant, slender Orcutt grass (*Orcuttia tenuis*). However, management of noxious weeds as it relates to Threatened species is consistent with FSM 2670.2, which seeks to promote recovery efforts for Threatened species, and 2670.3, which places top priority on Threatened species recovery and directs us to "avoid all adverse impacts on threatened... species," and to "identify and prescribe measures to prevent adverse modification or destruction of critical habitat and other habitats essential for the conservation of... threatened... species." In this way, the Proposed Action and Alternatives are consistent with Forest Service objectives and policy, and with the Endangered Species Act.

Sensitive Plant Species

Forest Service Manual (FSM) 2670.5 defines sensitive species as “those plants and animal species identified by a Regional Forester for which population viability is a concern, as evidenced

by significant current or predicted downward trends in population numbers, density, or habitat capability that reduce a species existing distribution." In FSM 2670.22, management direction for sensitive species is, in part, to ensure that species do not become threatened or endangered because of Forest Service actions, and to maintain viable populations of all native species (U.S. Forest Service 1990a). In addition to Forest Service Region 5 sensitive species, the State of California keeps current listings for all state-sensitive species.

The thirty sensitive species listed for the Modoc National Forest may have the potential to occur in treatment areas. Table K1-1 in Appendix K summarizes these species and the habitats in which they would most likely occur.

Surveys for TES plants have been conducted in many areas across the Forest. Although surveys are not complete in all proposed treatment areas, sufficient analysis of the risks to TES plants can be accomplished with current information; prior to treatment, a survey may be conducted as part of development of the annual work plan.

There are no known instances where sensitive plants and noxious weeds occur in such close proximity that the proposed control measures will impact the sensitive plants to such a degree that it will contribute to a trend towards federal listing or loss of viability to the population or species.

The effects are summarized from the Biological Evaluation, Addendum, and Supplement for the Modoc National Forest Noxious Weed Treatment Project and from the Design Standard, Description of Alternatives, and Specialist Reports in the Project Record.

Direct and Indirect Effects

All Alternatives: "Effects to all Sensitive Species From all Alternatives" has been prepared as part of the Addendum to the Biological Evaluation; none of the Alternatives in this project would cause a listing of any of the sensitive species. This determination was made through an assessment of risk for each species, using the factors of endemism, number of occurrences and number of plants per occurrence on the Forest, portion of known occurrences that are on the Forest, habitat vulnerability, whether a noxious weed currently exists within 50 feet, other threats, habitat alteration expected from the project, herbicide treatment expected within 50 feet, increased weed vectors as a result of the project, and the Design Standard under which that plant falls.

Alternative 1 No Action: Identified noxious weeds can continue to grow and compete with sensitive plants for space and resources. New noxious weed species may become established and compete with sensitive plants. Noxious weeds that produce allelopathic substances (toxic chemicals produced that have a negative impact on other organisms) can prevent other plants, including sensitive plants, from growing in those locations. As weeds increase, there would be a corresponding increase in weed propagules, such as seeds and rhizomes, that could continue to spread the infestations, further reducing plants, populations, and/or habitat of sensitive species.

Alternative 2 would allow for an aggressive treatment program for noxious weed control. Reductions in occurrences of the treated weeds, and in size of the occurrences, would be expected. Since new weeds and new or expanding occurrences would not be treated, the overall area occupied by noxious weeds on the Forest may actually be able to increase. If this happens, noxious weeds would most likely compete aggressively for resources with some sensitive plant species.

Production of weed propagules would be reduced on the sites treated, although there still would be viable noxious weed seed in the seed bank on termination of this five-year program, as many weed seeds remain viable for years – up to 30 years for Scotch thistle. With the removal of

competitive noxious weeds at the treated sites, sensitive plants and habitat could be enhanced in those areas.

Since herbicides are designed to kill plants, and, therefore, some damage to sensitive plant species is possible despite cautious planning and implementation. Some native plants, including sensitive species, may be injured or killed. Sensitive plants could also be damaged or removed during physical or herbicide treatment, either directly or indirectly, such as by trampling or exposing roots.

Herbicide spray, drift, runoff, leaching, or groundwater movement may result in mortality to individuals, reduce their productivity, or lead to abnormal growth patterns. For ground applications of herbicides, the closer the sensitive species is to the application site, the greater is the likelihood of damage. Specific Design Standard for the different Alternatives address how close herbicide treatments can come to sensitive plants. Even if plants were injured or killed, in no case is this determined to lead to a listing of any sensitive plant species on the Forest.

During herbicide application, the level and extent of damage to sensitive plants depends, in part, on site-specific conditions, such as wind speed. Application instructions for each herbicide must be followed by the applicator, and can be found in the label directions. Herbicides can move off-site in water, soil and wind. Site-specific soil and water characteristics, as well as herbicide formulation characteristics, affect this movement. Effects from herbicide movement are reduced by Design Standards (please see FEIS for a listing by Alternative).

The potential to harm sensitive species is also dependent on herbicide characteristics. Herbicides vary as to their potency, selectivity, and persistence. These factors all play a role in how much harm can occur. Measures taken to limit exposure, such as application methods, may reduce herbicide movement off-site.

Some bare ground may be exposed during physical treatments as the weeds are removed, and noxious weeds, since they are aggressive invaders, may again take over these bare places. Herbicide treatment is less likely to be ground disturbing, and thereby, less likely to expose fresh soil for invasion.

New noxious weed species, and new and expanded sites, would not be treated in this Alternative. This potentially leaves these weeds and locations as sources of weed plants and propagules that may compete with sensitive plants.

As noxious weeds are removed, natives, including sensitive plants, have the chance of replacing them, or natives may be reseeded at sites that are too large to reseed naturally in a timely fashion, before weeds again take over. Seeded species could potentially compete with sensitive species.

Alternative 3 would result in the reduction of some noxious weeds, and consequently, reduction in competition with sensitive plants, for a period of five years. However, only non-rhizomatous weeds would be treated, and, therefore, the rhizomatous species would continue to grow—possibly expanding in occurrence size—and produce propagules that could spread those weeds. Several occurrences of sensitive plants are within 50 feet of rhizomatous noxious weeds. These occurrences could be extirpated if weeds are not controlled.

No Early Detection - Rapid Response would be included in this Alternative, and therefore new sites, expanded sites, or new noxious weeds would not be treated, allowing for untreated, expanding noxious weed infestation, and most likely, additional competition to sensitive plants.

Some bare ground may be exposed during physical treatments as the weeds are removed, and noxious weeds may again invade these bare, disturbed places. Or, as noxious weeds are removed, natives have the chance to replace them, or may be reseeded at some sites.

Some native plants, including sensitive species, may be injured or killed by the treatment methods either directly or indirectly, as by trampling or inadvertent mechanical injury.

Alternative 4 provides for aggressive treatment of noxious weeds, utilizing a wide range of treatment methods. All known noxious weed infestations, including rhizomatous species, would be treated by herbicide or physical methods. This Alternative would be in effect for 10 years, instead of the five years of Alternatives 2 and 3, and therefore, the chances for complete removal of occurrences of noxious weeds would be more likely, especially for smaller infestations. Early Detection - Rapid Response would allow treatment of the same weeds with the same treatments on new sites or sites that have expanded, which would provide more effective treatment, and could result in the complete removal of many sites of the 14 known noxious weeds. However, Early Detection - Rapid Response would not address new noxious weeds, and therefore, these new species would be able to expand in size or occurrence number without treatment.

As noxious weeds are removed, sensitive plants have the chance to replace them, if the habitat is appropriate. Sensitive plants and habitat would be enhanced by this Alternative, except in the case of new noxious weeds, which would be allowed to compete and degrade sensitive plants and habitat. Some sensitive plants may be injured or killed by the treatment methods, both physical and herbicide, either directly or indirectly. Please see Direct Effects under Alternative 2.

Alternative 5 would result in the reduction of some noxious weeds, with the accompanying reduction in competition to sensitive plants and degradation of their habitat. However, two large infestations – one of dyer's woad and one of common crupina – would not be treated. Sensitive plants that might be within those two infestations may experience reduced vigor, and their habitat may become degraded. Only small infestations of non-rhizomatous weeds would be treated, and, therefore, the larger occurrences of rhizomatous species would continue to grow—possibly expanding in occurrence size—and produce propagules that could spread those weeds. Expanding populations of these species could impact Columbia yellow cress and scalloped moonwort, two sensitive species within 50 feet of larger infestations of Canada thistle. Rhizomatous noxious weeds that have not been eliminated completely would be expected to re-infest areas, and possibly come back in denser stands, competing aggressively with any sensitive plants.

Physical+ treatments have been found to stimulate the roots of rhizomatous species, and even the small occurrences treated in this Alternative, unless treated persistently over a long time, may not effectively control or eliminate these species, providing no relief if sensitive plants are nearby.

New sites and expanded sites and new noxious weeds can be treated in this Alternative through Early Detection - Rapid Response. This would eliminate any increase in competition to sensitive plants from new information. It is unknown what new sites might be discovered under Early Detection - Rapid Response. No effect to sensitive plants is expected from treatment of noxious weeds by goat grazing. It would be limited and fences and herders would control the goats.

Also, refer to the direct and indirect effects for Alternative 3.

Alternative 6: Due to the number of weed-control techniques available under Alternative 6, it would be expected to provide for the most variable and aggressive treatment and control of noxious weeds, on those acres treated, and enhancement for those sensitive species that occur near those treated sites. However, the treated acres would be much less than in Alternatives 2 and 4. The 6,000-acre dyer's woad site and the large common crupina site would receive limited perimeter treatments, and, therefore, large acreages would be left untreated, and sensitive plant habitat that might occur in those areas could continue to become more degraded as noxious species increased in density.

On the sites where treatment would take place, it is expected that noxious weed populations would be greatly reduced, and sensitive plants and habitat would be enhanced.

Physical+ treatment of weeds would remove noxious weeds where treatment can occur, but has the potential to increase noxious weed infestation by disturbing the soil and providing ideal conditions for the germination of the weed seed in the soil. Although sensitive plants would benefit from weed removal, if weeds competitively germinate on the disturbed soil, the benefit may be lost.

New sites and expanded sites and new noxious weeds can be treated in this Alternative, and therefore these new occurrences most likely would be controlled or eliminated. Please see discussion under Direct Effects for Alternative 2, 4, and 5.

Cumulative Effects

Alternative 1 – *No Action:* Natural events (fire, flood, drought, disease, insects, landslides, climate change) have affected sensitive plants in the past, and continue to do so. Where, normally, native ruderal plants would reinvade after a natural disturbance, and, gradually, later-stage seral natives, including sensitive plants, would move in, now noxious weeds, highly adapted to infesting disturbed sites, are just as likely to invade and take over these places, and change the conditions on those sites so that they remain inhabited primarily by the weeds themselves, not giving natives and sensitive plants a chance to grow on the site. Discussing the potential cumulative effects of natural disturbance is beyond the scope of this analysis.

The effects from many past actions continue to impact sensitive plants. Roads, railroads and powerline construction and maintenance have created vectors or pathways for continuing weed infestation, in addition to removal or injury. Not only do these vectors encourage noxious weeds to compete with natives along these corridors, but also these swaths isolate some native communities from one another by creating barriers or changing intervening habitat—open, dry and hot vs. shaded, moist, cool (such as a wide open swath for a powerline)—across which un-adapted sensitive plants cannot easily pass, and cross-pollinate, leading to possible genetic problems in small populations.

Some past road maintenance has spread noxious weeds that were in the cinders and gravel of the borrow material, creating, in some cases, monocultures of weeds in place of native communities that may have included sensitive plants. This is especially true of medusahead, a C-rated noxious weed in Modoc County, which would not be treated in the project.

Fire suppression continues to allow non-fire-adapted species to thrive, squeezing out fire-adapted species, such as the sensitive plant Bakers globemallow. Canopy cover removal during timber management and fuels reduction has changed understory soil moisture and light conditions – conditions necessary for some cool-forest communities and sensitive plants such as mountain lady slipper. Plant communities that require low light and moist soil have subsequently been selected against in these places. Plantation-like conditions, where the diversity of understory plants is minimal, have replaced more diversified native communities, in some cases. Road construction and trampling by cows have changed hydrologic function and connectivity of springs and seeps, drying habitat and causing enough change in special aquatic features (such as peatlands) so that, where once these plants had habitat, habitat no longer exists for sensitive plants such as moonworts, two species of hump moss, and bug-on-a-stick moss. Cow trails continue to cut across sensitive plant habitat for Ash Creek ivesia, trampling individuals and degrading habitat. Dam building, goose nest island construction, and dug-outs for watering holes have changed the hydrology in the Devils Garden area, and subsequently, some vernal pool plant communities had been inundated, and others dried up, while vernal pool habitat may have been inadvertently created by other actions. Projects on the Forest continue into the present to affect sensitive plants and habitat. Pile burning can sterilize the soil and kill the native seedbed, creating disturbed openings where weeds can invade and begin to disperse their propagules. Pile burning

can also eliminate the sensitive-plant seed bank. Fire suppression and past overgrazing have allowed juniper to invade native grasslands and sagebrush steppe, and changed these areas to juniper woodlands with little understory. Ash Valley milkvetch and crown milkvetch, both sensitive species, have habitat in the sagebrush steppe.

Effects of reasonably foreseeable future actions from projects that are on the schedule of Proposed Actions (SOPA) include plant community changes from the proposed Sagebrush Steppe Ecosystem Restoration Project. This project covers a large area of the Forest, and plans are to revert back to a landscape less dominated by juniper. The effect to sensitive milkvetches is predicted to be enhancement of habitat. Recreation (OHV use, horse riding, hiking, camping), firewood gathering, and many other activities have the potential to affect sensitive plants and habitat by trampling, spreading weed seeds, and picking. Lady slipper orchids are especially prone to collection by rare plant enthusiasts and casual pickers. In the long term, this gradual degradation of native and sensitive plant communities and habitats could lead to loss of some of these species from the Forest. In the foreseeable future, however, it is unlikely that Alternative 1 would lead to a listing of any sensitive plant species on the Forest.

Alternative 2: There could be an additive cumulative effect to susceptible non-target species if herbicide use is repeated over time on the same site. This cumulative effect would be most likely where the treatment toolbox is most limited (as in Alternatives 2 and 4). However, this effect is generally only found where spray is broadcast, a method that would not be used in this project.

Over a five-year period, sensitive plants would have to compete less with noxious weeds, and noxious weeds would be less of a threat to sensitive plant habitat. After five years, if a new decision document to control noxious weeds is not approved; noxious weeds may again start to encroach on sensitive-plant habitat.

Also, see Cumulative Effects under Alternative 1.

Alternative 3: Physical treatment of noxious weeds could create more disturbed ground that is prime habitat for aggressive noxious weeds. Unless this project is continued to outlast the seed bank, and desirable species seed in naturally or from cultural treatments, these areas could become dense weed patches upon termination of the project, effectively keeping out sensitive species.

Rhizomatous noxious weeds would continue to grow and occurrences may increase in size. New sites and expanded sites may continue to grow unimpeded and new noxious weeds that invade would be allowed to grow and infest the Forest. Weed seed banks would not be treated, and these may be a continuing source of noxious weeds. Noxious weeds would most likely continue to compete with sensitive plants. Also, please see Cumulative Effects under Alternative 1.

Alternative 4: Due to the aggressive noxious weed treatment, overall noxious weed infestations would diminish across the Forest, which would improve the situation for sensitive plants that are competing with those species. Only the largest occurrences of rhizomatous species may still have plants at the end of 10 years, with possible effects to Columbia yellow cress and scalloped moonwort, two sensitive plants within 50 feet of infestations of Canada thistle.

Physical treatment of noxious weeds could potentially create more disturbed ground, prime habitat for aggressive noxious weeds. Unless this treatment is continued to outlast the seed bank, these areas could become dense weed patches upon termination of the project in 10 years, and provide a new flush of competition with sensitive plants several years later. An Early Detection Rapid Response Strategy (EDDR) would be implemented to treat new sites of the identified species; however, new weed species would not be treated. Therefore, new weed species may invade and compete with sensitive plants.

Weed seed banks would not be treated, and these may be a continuing source of noxious weeds. Also, please see Cumulative Effects under Alternative 2.

Alternative 5: The large, untreated sites could become a source for many, new satellite sites if careful, annual inventory is not performed. Physical+ treatment of noxious weeds could create more disturbed ground that is prime habitat for aggressive noxious weeds to reinfest and compete with sensitive plants. Unless this treatment is continued to outlast the seed bank, and desirable species seed in naturally or from cultural treatments, these areas could become dense weed patches upon termination of the project.

Untreated rhizomatous noxious weeds would continue to grow and occurrences may increase in size. Under EDRR, new sites and expanded sites and new noxious weeds can be treated in this Alternative, and therefore these new occurrences most likely would be controlled or eliminated since they most likely would be small. Weed seed banks would not be treated, and these may be a continuing source of noxious weeds. Due to the number of weed control techniques available under Alternative 6, it would be expected to provide for the most variable and aggressive treatment and control of noxious weeds on those acres treated, and enhancement for those sensitive species that occur near those treated sites. Also, please see Cumulative Effects under Alternative 3.

Alternative 6: Due to the number of weed-control techniques available under Alternative 6, it would be expected to provide for the most variable and aggressive treatment and control of noxious weeds on those acres treated, and enhancement for those sensitive species that occur near those treated sites. Noxious weeds on the large, untreated sites would probably increase in density, further degrading habitat for native species and sensitive plants. These sites could also become a source for many, new satellite sites if careful, annual inventory is not performed, and subsequently provide aggressive competition to sensitive plants.

Untreated rhizomatous noxious weeds would continue to grow and occurrences may increase in size. Sensitive plants nearby could be negatively affected by increased competition for resources. Under EDDR, new sites and expanded sites and new noxious weeds could be treated in this Alternative, and therefore these new occurrences most likely would be controlled or eliminated since they most likely would be small. Alternative 5 discusses the impact of Early Detection - Rapid Response on sensitive species.

Weed seed banks would not be treated, and these may be a continuing source of noxious weeds. Also, please see the Cumulative Effects discussion under Alternatives 2, 4, and 5.

Irreversible and irretrievable commitment of resources

Implementation of the action Alternatives with appropriate Design Standards will result in no irreversible or irretrievable loss of sensitive plants. Currently, sensitive plants are more at risk from invasion and displacement by noxious weed populations.

Consistency with Forest Plans and Other Laws and Policies

The Proposed Action and Alternatives are consistent with the following management objectives in the Modoc N.F. Forest Plan, as amended:

The Modoc N. F. Forest Plan directs us to "manage and conserve sensitive plant species and their habitats to insure that viable populations are maintained," in order to insure that "federal listing as threatened or endangered species is unnecessary (Modoc NF Forest Plan 1991, 4-21)." To these ends, the Modoc National Forest is directed to "develop and implement a consistent, systematic, biologically sound program for sensitive plant species (ibid, 4-21)." Combating noxious weeds is an important part of conserving sensitive plant species and their habitats; the Proposed Action and

its Alternatives are part of a consistent, systematic, and biologically sound program for the implementation of sensitive-plant conservation.

Watch List Plant Species

A number of plant species reviewed for Regional Sensitive Species list revision did not meet the criteria to be included on the Forest Service Region Five List, but are of more localized concern and need to be considered in the planning process. These include species that are locally rare (as opposed to declining throughout their range), are of public concern, occur as disjoint populations, are newly described taxa, lack sufficient information on population size, threats, trend, or distribution, etc.

These watch lists are dynamic and updated as the need arises to reflect changing conditions and new information. The creation of the sensitive species and watch lists are key steps in meeting our commitment as an agency to maintain biologically diverse and healthy ecosystems (CNPS Inventory, 2001).

The 69 watch list plant species listed for the Modoc National Forest may have the potential to occur in treatment areas. Table K1-2 in Appendix K summarizes these species and the habitats in which they would most likely occur.

Surveys for watch list plants have been conducted in many areas across the Forest. Although surveys are not complete in all proposed treatment areas, sufficient analysis of the risks to watch list plants can be accomplished with current information; before any treatment is accomplished a survey would be done.

There are no known instances where watch list plants and noxious weeds occur in such close proximity that the proposed control measures would impact the watch list plants to such a degree that it would contribute to a trend towards federal listing or loss of viability to the population or species.

This effects section below is summarized from the Botanical Report and Addendum for the Modoc National Forest Noxious Weed Treatment Project and from the Design Standard, Description of Alternatives, and Specialist Reports in the FEIS. Watch list plants make an important contribution to forest biodiversity, and analysis can be summarized from plant community, plant diversity, and sensitive plant species information.

Two watch list species are known to exist within 50 feet of proposed weed treatment sites. Bogg's Lake hedge-hyssop (Gratiola heterosepala) exists near two proposed treatment sites for Scotch thistle at Emigrant Springs, DG036ONAC and DG037ONAC. Habitat for this watch list species is marshes and swamps (lake margins), vernal pools/clay. The Forest has 18 occurrences of this species, ranging in size from two to more than 10,000 individuals. One occurrence of Baker's globemallow exists near a dyer's woad within the Long Damen burn. There are at least 47 known occurrences of Baker's globemallow, with many more most likely within the boundaries of the Blue Fire that burned in the Warner Mountains in 2000. This species is a fire-follower, and impacts to its existence would most likely come from fire suppression rather than noxious weed treatments.

Direct and Indirect Effects

The direct and indirect effects for watch list plant species would be the same as for sensitive plant species. Please see the discussion under sensitive plants (above).

Cumulative Effects

Cumulative effects for watch list plant species would be the same as for sensitive plant species, for Alternatives 1 through 5. Please see the discussion under sensitive plants (above).

Alternative 6: Noxious weeds on the large, untreated sites would probably increase in density, further degrading habitat for native species and watch list plants. These sites could also become a source for many, new satellite sites if careful, annual inventory is not performed. These weeds could subsequently provide aggressive competition to watch list plants.

Untreated rhizomatous noxious weeds would continue to grow and occurrences may increase in size. Watch list plants nearby could be negatively affected by increased competition for resources. New sites and expanded sites and new noxious weeds could be treated in this Alternative, and therefore these new occurrences most likely would be controlled or eliminated since they most likely would be small. Weed seed banks would not be treated, and these may be a continuing source of noxious weeds. Also, please see the Cumulative Effects discussion under Alternatives 2, 4, and 5.

Consistency with Forest Plans and Other Laws and Policies

The Proposed Action and Alternatives are consistent with the Modoc NF Land and Resource Management Plan's goals for native plant and plant community diversity as outlined on page 4-2: to "provide vegetative diversity to maintain viable populations and other resource objectives, including scenic quality, wildlife, and reduced wildfire loss." These goals themselves as well as the Proposed Action and Alternatives are consistent with Federal NFMA (National Forest Management Act) regulations. 36 CFR 219.27 states that "All management prescriptions shall... provide for and maintain diversity of plant and animal communities," for multiple use objectives, and "preserve and enhance the diversity of plant and animal communities." See also FSM 2620.1 and 2622.01.

Wildlife and Fish

The Modoc National Forest is home to more than 350 species of wildlife and fish that utilize a wide variety of different or combinations of various habitats. The Modoc National Forest established its wildlife and fish program objectives in its Land and Resource Management Plan (Forest Plan), as amended by the Sierra Nevada Forest Plan and the Northwest Forest Plan. To implement wildlife and fish objectives, the Forest uses a subset of species called “Management Indicator Species.” The Forest Plan sets forth standards and guidelines for these Management Indicator Species. “They [Management Indicator Species] are designed to maintain viable populations of *all* existing native and desired non-native vertebrate species within the planning area” (Forest Plan, p. 4-25).

These Management Indicator Species include federally listed threatened and endangered species [Endangered Species Act (ESA)], Forest Service Sensitive species (FSM 2670), and other Management Indicator Species (harvest species, ecological indicator species, and special-interest species). Management requirements for these species are listed in the Forest Plan Standards And Guidelines, as well as the various land allocations and prescriptions that provide habitat. However, management direction (both within and supplemental to the Forest Plan) for federally listed species provides enhancement of present population levels, as required by ESA.

Federally listed species are designated because low population levels and loss of habitat may eventually render them extinct. The Forest Service management centers on achievement of recovery plan goals. The Forest is required to consult with the U.S. Fish and Wildlife Service (USFWS) whenever the Forest initiates any activity which may affect a federally listed T&E

species. The Biological Assessments (BAs) prepared for wildlife and fish species documents the potential effects of the Proposed Action on federally listed species. The Biological Assessments are summarized below and may be found in their entirety in the Appendix Volume.

Forest Service sensitive species are those species needing special management emphasis to ensure their viability, and to preclude trends toward endangerment that would result in their federal listing. The sensitive species are taken from the most current Pacific Southwest Region (R-5) Regional Forester's Sensitive Species list dated 8 June 1998. The Biological Evaluations (BEs) for wildlife and fish prepared for this project documents the effects of the Proposed Action on sensitive species.

For the Modoc NF, 32 species of wildlife and fish (FLRPM, Page 3-37) are defined as Management Indicator Species. The categories are Threatened and endangered (T&E), Sensitive species, and Other MIS. Other MIS include harvest species, ecological indicator species, and special interest species. The MIS, along with their monitoring requirements, are listed in Table 3-69 below, as well as on page 3-97 of the Modoc National Forest, Final Environmental Impact Statement for the Land and Resource Management Plan (1991). A Management Indicator Species analysis for wildlife species was prepared to document the potential effects of implementation of the Proposed Action on these species. The analyses of Management Indicator Species are found in the BA, BE, and the MIS documents prepared for this project, which are summarized below and published in their entirety in the Appendix Volume.

On January 10, 2001, President Clinton signed an Executive Order (Executive Order 13186) that required Federal Agencies to promote the conservation of migratory birds. The EO requires federal agencies to incorporate migratory bird habitat and population management objectives and recommendations into all phases of agency planning processes as appropriate. In order to do so, the Forest Service identifies management practices that may impact populations of migratory birds and develops management objectives or recommendations that avoid or minimize these impacts through the land management planning process. The MIS and TES species identified in the Forest Plan include several species of migratory birds, some of which are identified by USFWS as migratory species. The potential effects for all of these species are discussed below and in the supporting documentation.

The fisheries section has been divided into four subsections: General Fisheries and Aquatic Resources Habitat Conditions and Threats, Threatened and Endangered Aquatic species, Forest Service Sensitive Aquatic species, and other Aquatic Management Indicator Species.

The terrestrial wildlife section has been divided into four subsections: General Discussion of Effects of Selected Herbicides on Terrestrial Wildlife, Federally Listed Terrestrial Wildlife Species, Sensitive Terrestrial Wildlife Species, and Other Wildlife Management Indicator Species.

The comments received on the DEIS focused on the effects of herbicide treatments on humans and wildlife species, including aquatic, terrestrial, and macro invertebrates. Commenters wanted to see specific analysis for each species and the effects of specific herbicides.

The specialist reports which include the BAs, BEs and MIS reports are contained in their entirety in the Appendix sections U, V, and W in Volume 2, and the wildlife and riparian sections of the Response to Comments Volume are all summarized in the following sections.

Fish and Aquatic Wildlife Species

Risk Assessment Information – Specific Sites

Aquatic systems and riparian habitats are not the targets of herbicide treatment in this project; therefore, the effects to these systems and habitats should rarely occur and with low intensity.

In this analysis, the Forest excluded all sites that were greater than 100 feet from water because the potential for contamination from the chemical was essentially zero because the chemical does not move that far off site under typical conditions. Typical conditions were described in the FEIS and were tied back to labeling requirements (wind speed, time until precipitation, droplet size, temperature limits for volatilization, etc.) For further information see the Project File, Volume 2, Part 2, Appendix U, Fish and Aquatic.

The following are specific noxious weed occurrences within 100 feet of TES species habitat.

WM012CIAR4 – This is a Canada thistle site of 0.08 acres. It is located near Fitzhugh Creek which is occupied by the Goose Lake redband trout. There are approximately 100 plants in the area.

WM003LIDA – This is a Dalmatian toadflax site of 8.25 acres near Lassen Creek which is occupied by the Goose Lake redband trout.

BV006CEDI3 – This is a Diffuse Knapweed site of 0.06 acres near Johnson Creek which is occupied by the Goose Lake redband trout and Modoc sucker. There are more than 100 plants in the area.

BV004CEDI3 - This is a Diffuse Knapweed site of 0.08 acres near Johnson Creek which is occupied by the Goose Lake redband trout and Modoc sucker. There are more than 1000 plants in the area.

BV006CEDI - This is a Diffuse Knapweed site of 0.87 acres near Johnson Creek which is occupied by the Goose Lake redband trout and Modoc sucker. There are approximately 100 plants in the area.

WM002ISTI – This is a dyer’s woad site of 2.58 acres near Buck Creek which is occupied by Goose Lake redband trout.

BV001SAAE – This is a Mediterranean sage site of 0.27 acres near Johnson Creek which is occupied by the Goose Lake redband trout and Modoc sucker. There are more than 100 plants in the area.

BV260ONAC – This is a Scotch thistle site of 0.10 acres near Johnson Creek which is occupied by the Goose Lake redband trout and Modoc sucker. There are more than 100 plants in the area.

BV002CEMA4 – This is a Spotted knapweed site of 0.31 acres near Johnson Creek which is occupied by the Goose Lake redband trout and Modoc sucker. There are approximately 300 plants in the area.

BV117ONAC – This is Scotch thistle site of 0.15 acres near Ash Creek which is occupied by Modoc sucker.

DG043ONAC – This is a Scotch thistle site of 0.09 acres near Cottonwood Campground. This is within Modoc sucker habitat.

DG005CIAR4 – This is a Canada thistle site of 0.10 acres along the Fairchild Swamp ditch which is shortnose sucker habitat. This ditch is often seasonally dry.

DG006CIAR4 - This is a Canada thistle site of 0.09 acres along the Fairchild Swamp ditch which is shortnose sucker habitat. This ditch is often seasonally dry.

DG016CIAR4 - This is a Canada thistle site of 0.09 acres along the Fairchild Swamp ditch which is shortnose sucker habitat. This ditch is often seasonally dry.

DH012CIAR4 – This is a Canada thistle site of 0.08 acres along Willow Creek near Clear Lake Reservoir, habitat for the Lost River and shortnose sucker.

Total habitat affected: Lost River sucker, shortnose sucker, and Modoc sucker (endangered) is 2.29 acres. Goose Lake redband trout (sensitive) is 12.6 acres. There is overlap in the distribution of the Modoc sucker and Goose Lake redband trout, so the total area affected is 13.2 acres.

General Fisheries and Aquatic Resources: Habitat Conditions and Threats to Federally Listed Fish and Aquatic Wildlife Species

The analysis area for this document includes the entire Modoc National Forest. This area encompasses about 1.6 million acres of Forest System lands as well as 337,000 acres of lands administered by other agencies or private landowners. The Forest has an incredibly diverse series of habitats ranging from sagebrush at the lowest elevations to white bark pine at the highest elevations. The table below documents the threatened, endangered, and proposed fish species that are present on the Forest. The USDI Fish and Wildlife Service letter dated July 11, 2005 (1-10-05-105-SP) was used to determine the species that should be included in this analysis.

Table 3 - 67. Federally Listed Fish Species That Occur on or Downstream of the Modoc National Forest

Common Name	Scientific Name	Status	Occur on Forest	Also Forest MIS
Shortnose sucker	*Chasmistes brevirostris*	Endangered	X	X
Lost River sucker	*Deltistes luxatus*	Endangered	X	X
Modoc sucker	*Catostomus microps*	Endangered	X	X
Warner sucker	*Catostomus warnerensis*	Threatened		
Shasta crayfish	*Pacifastacus fortis*	Endangered		

Management Direction and Existing Conditions

Management for the Forest is detailed in the Modoc National Forest Land and Resource Management Plan (Forest Plan)(1991), Lost River and Shortnose Sucker Recovery Plan (1993), Final Rule of Endangered Status and Critical Habitat for Modoc Sucker (1985).

The following section provides a very brief account of the distribution and types of habitat utilized for each species analyzed within this document. Detailed species accounts for the Lost River sucker, shortnose sucker, and Modoc sucker can be found in previous Biological Consultations #1-1-96-F-57 and 1-10-96-F-35, Modoc National Forest Long Term Grazing Program.

Shortnose and Lost River Sucker Existing Conditions

These species are found within the Lost River drainage on Devil's Garden and Doublehead Districts; these fish are known to be widespread in Willow, Boles, and Fletcher Creeks as well as in pools and wetlands. Primarily lake residents, the fish have been documented to successfully

spawn, and live year round on the Forest. Radio-telemetry studies on these fish are on-going by National Biological Survey (NBS) and Bureau of Reclamation (BOR) personnel.

Habitat for these species consists of open water in lakes and streams, except when they move upstream to spawn. Fish begin making short migrations up into streams when discharge increases at any time from early February through early April, although March is probably the most frequent month of movement. It appears that the spawning requirements for Lost River sucker are somewhat narrower than the shortnose sucker. In Willow Creek radio-tagged suckers were found to migrate only 3-6 km and remain on spawning grounds for 2-3 weeks (Perkins and Scoppetone 1996). The Lost River sucker requires well graveled riffles (>50%), although they will occasionally utilize well oxygenated spawning substrates upwelling springs. According to Perkins et al. (1995) they have evolved different feeding strategies. Apparently Lost River suckers are bottom feeders, while shortnose suckers feed on smaller food items within the water column.

Modoc Sucker Existing Conditions

The Modoc sucker historically occurred in small tributaries of the Upper Pit River in Lassen and Modoc Counties, California, but is now found only in portions of two small drainage systems in Modoc County. Preferred habitat of the species consists of small streams characterized by large shallow pools with cover, soft sediments, and clear water. Food of the Modoc sucker consists of benthic invertebrates, algae, and detritus. During spring spawning runs, the species ascends creeks or tributaries that may be dry during summer months.

A 1978 California Department of Fish and Game survey reported the species from eight creeks: Washington, Hulbert, Turner, Willow, Ash, Dutch Flat, Johnson, and Rush. Additional streams were inhabited by the species historically, but its small, often seasonally flowing stream habitat indicates that Modoc suckers may have never been common. Habitat degradation has removed natural barriers and allowed hybridization with the related Sacramento sucker (*Catostomus occidentalis*), threatening the genetic integrity of the Modoc sucker.

On June 11, 1985, the Fish and Wildlife Service determined the Modoc sucker to be an endangered species. Critical habitat was also designated for the Modoc sucker. A designation of critical habitat does not create a management plan for a listed species. Designation does not automatically prohibit certain actions, establish numerical population goals, or prescribe specific management actions (inside or outside of critical habitat). However, critical habitat may provide added protection for areas designated and thus assist in achieving recovery. Areas designated as critical habitat receive protection under Section 7 of the Endangered Species Act with regard to actions carried out, funded, or authorized by Federal Agencies.

Warner Sucker Existing Conditions

The Warner sucker is endemic to the streams and lakes of the Warner Basin in south-central Oregon. Early residents of the area recalled when the suckers and other fishes were very abundant and would ascend the creeks in the spring to spawn. The Warner sucker is currently known to occur in portions of Crump and Hart Lakes, the spillway canal north of Hart Lake, and portions of Snyder, Honey, Twenty mile, and Twelve mile Creeks. Suitable habitat includes large, shallow natural lakes, although fish would spread into sloughs and seasonal lakes during wet year; some resident fish are found in low gradient streams as well (Williams et al. 1989). Warner suckers use low to moderate gradient streams for spawning and rearing. In streams, larvae drift feed on zooplankton near the surface and as they get older then switch to foraging on algae and associated benthic food items (Kennedy).

No treatments are being proposed within 5 miles of this species or its habitat. Therefore, there would be no direct, indirect, or cumulative effects to this species or its habitat.

Shasta Crayfish Existing Conditions

The range of the Shasta crayfish is very limited occurring only within the mid section of the Pit River drainage system of Shasta County. It is grouped into eight geographically isolated populations. One of these populations, the Fall River/Fall River Mill population, is considered to be extirpated. The total population in 1978 was estimated to be fewer than 6,000 individuals (Daniels 1980). Subsequent loss of habitat points to a 1988 population that probably numbered fewer than 3,000 individuals. They have a low abundance and their distribution is highly fragmented. Migration and genetic exchange between populations is limited by hydroelectric development, natural barriers, and loss of habitat (USFWS 1998).

Shasta crayfish are found in cool, clear springs, lakes, and streams, frequently at or near a spring source, in areas with abundant volcanic rubble or boulders for escape cover from predators (Light and Clarke 1991). They prefer boulder/cobble substrate, but will also use silty substrate as long as rocks are not embedded. They have been observed using aquatic vegetation for cover, but use of vegetation is uncommon. The species prefers areas of water movement as in locations with distinct flow from a spring source. They are found in all habitat types, such as pools, riffles, and runs, but prefer runs.

Hydroelectric developments have resulted in habitat loss and fragmentation. The introduction of nonnative crayfish species, particularly the signal crayfish, introduction of nonnative game fish species, pathogens from introduced species, hatchery management, trout habitat restoration, and Cray fishing have also contributed to a population decline. Sedimentation of lava substrate preferred by Shasta crayfish has been brought about through canalization, dredging, logging, forest fires, culverts and bridges, agriculture, grazing, and muskrat activity.

This species was listed as a Federal endangered species in 1988. Critical habitat has not been designated.

There is no habitat for Shasta Crayfish on the Modoc National Forest. This species only occurs about 25 miles west of the Modoc National Forest primarily in the Fall River and Hat Creek sub-drainages of the Pit River in Shasta County. Therefore, there would be no direct, indirect, or cumulative effects to this species or its habitat.

Effects of Alternatives on the Lost River, Shortnose, and Modoc Suckers

No-Action Alternative (Alternative 1)

Direct and Indirect Effects: Potential adverse effects to the aquatic environment from not controlling the spread of noxious weeds include but are not limited to, an increase in sedimentation, reduction in stream bank stability, elevated water temperature with the lack of canopy cover, and a potential decrease in the amount of organic matter available to enter affected streams.

Without treatment, noxious weeds would likely become widely established across the Forest. This could lead to an increase in soil erosion (sediment deposition) and surface water runoff. Studies indicate a nearly three-fold increase in sediment yield from knapweed sites compared to an uninfested bunchgrass site.

Cumulative Effects: Weeds would continue to invade and spread on the Forest. As this process occurs, weed control options become narrower. Loss of native vegetation could lead to changes in channel morphology as channel stability decreases.

Effects of Physical + Treatment Components on the Lost River Sucker, Shortnose Sucker, and Modoc Sucker—Alternatives 2 through 5, And 6

Direct and Indirect Effects: Physical + treatment as proposed are not expected to have any direct or indirect effects on the Lost River sucker, shortnose sucker, and Modoc sucker or habitat of the species.

Cumulative Effects: The physical + treatment of weed sites could result in some localized soil disturbance and possibly increased sedimentation of nearby drainages. These effects would be expected to be minor and temporary in duration because of the comparatively few acres of soil disturbance followed by the reclamation and restoration (where appropriate) of treated areas. Treatment would result in better riparian condition, in turn providing more stable and useful aquatic habitat.

Effects of Herbicide Treatments on the Lost River Sucker, Shortnose Sucker, and Modoc Sucker Action Alternatives (Alternatives 2, 4, and 6)

Direct and Indirect Effects: Direct effects to the Lost River sucker, shortnose sucker, and Modoc sucker would be primarily associated with herbicide application near streams and associated riparian areas, lakes, or wetlands. A total of 0.36 acres (4 sites) of noxious weeds are found adjacent to Lost River sucker and shortnose sucker habitat. A total of 1.93 acres (8 sites) of noxious weeds are found adjacent to Modoc sucker habitat

Herbicides are applied in liquid formulations and are sprayed on foliage of the target vegetation. In some cases soil may be a major receptor and contamination can occur by chemicals leaching through the soil to the groundwater and ultimately reaching the aquatic environment. This method of introduction usually poses the least amount of risk to the aquatic environment because chemicals typically disappear from the ground surface by either plant uptake of the chemical, volatilization, and natural decomposition of the active ingredients or adsorption of the herbicide by soil particles. Design Standards or other prevention measures proposed to address this are included in all Alternatives utilizing chemical treatments.

Surfactants are used in herbicide formulations to increase the absorption of the herbicide by lowering the surface tension of the targeted plants. Since herbicides are used to kill plants, using a surfactant to make it more effective is a moot point. Inert ingredients are used to improve the performance of a pesticide, and are ‘confidential business information’ of the chemical companies, and analysis of these herbicides is therefore impossible. Dyes would be used in herbicide treatments to show where the herbicide has been administered. Its effect on non-target terrestrial and aquatic species is unknown; however, its use has not resulted in any known problems. Using dyes can be an aid to making sure that only the target species is treated, and it has been recommended that dyes be used in the administering of herbicides. A synergistic effect is any effect of two herbicides acting together which is greater than the simple sum of their effects when acting alone: such herbicides are said to show synergism. The synergistic effect of the two mixes has been covered in Dave Bakke’s Specialist Report in support of the FEIS.

Leaks, spills, and improper storage and handling of containers are the source of most pesticide related groundwater contamination. These impacts can easily be mitigated with proper training of personnel and proper storage and disposal of chemicals. Risk from an accidental spill of herbicide into a water body on the Forest is considered low.

Another mode of pesticide entry to the aquatic system includes overland flow from precipitation events. Risk varies depending on soil composition and timing and intensity of precipitation events

after application. Risk tends to be lower on well-vegetated forests and rangeland where soil infiltration is typically greater than precipitation. Overland flow occurs infrequently on most forest land because the infiltration capacity of the forest floor and soil is usually far greater than the rate of precipitation. Aquatic organisms are more at risk of negative impacts from herbicides in small perennial streams, or during late season when flow is reduced, due to their limited capability for dilution. Design Standards or other prevention measures proposed to address precipitation events are included in the Proposed Action.

Design Standards for riparian areas would reduce the risk of direct and indirect effects. A reduction of noxious weeds in riparian areas and other aquatic habitats would benefit native plant species and result in better stream bank and riparian condition, in turn providing more stable and useful aquatic environments.

Not all noxious weeds would be chemically treated. Even under the integrated weed management approach, not all weed populations would be eradicated, leaving an available seed source for continued propagation or the unlikely option of weeds being out-competed by native or desirable plant species.

Cumulative Effects: No adverse downstream cumulative effects would be expected from situations involving herbicide runoff or leaching because of the method of application, Best Management Practices (BMPs) and Design Standards or other prevention measures designed to prevent these types of impacts from occurring.

Effects of Early Detection – Rapid Response Strategy on the Lost River sucker, shortnose sucker, and Modoc sucker Action Alternatives (Alternatives 4, 5, and 6)

Alternatives 4, 5, and 6 include treatment of up to 200 acres (100 acres per year maximum) under this strategy. Only methods approved for use under this NEPA decision are approved for use, therefore the direct, indirect, and cumulative effects for the Early Detection – Rapid Response Strategy would be the same as listed above for the action Alternatives.

Cumulative Effects of Resource Activities on the Lost River sucker, shortnose sucker, and Modoc sucker.

Timber and Silvicultural Activities: On average 2,500 acres are logged for saw logs with an additional 3,000 treated for wood fiber annually on the Modoc National Forest. Harvest prescriptions vary from clearcutting to understory thinning; however clearcutting has been radically reduced in over the past ten years. The various timber sales may have had effects on the species discussed in this document that would have been disclosed within their individual National Environmental Policy Act dictated documentation; discussing the potential effects of those projects is beyond the scope of this document. .

The amplitude of effect future timber and silvicultural activities is expected to significantly decrease due to the institution of noxious weed prevention measures. Noxious weed locations would be presented as part of the ID team process so that activities in these areas can be avoided or mitigated (timing projects outside of high risk seasons). Logging systems design should maintain ground cover by minimizing ground disturbance and avoid opening up the overstory adjacent to noxious weed populations. Logging equipment would be washed to stem the transfer of noxious weeds (timber sale clause CT 6.343). Timber sale contract clauses C5.12 (Use of Road Purchaser), C5.4 (General and Special Maintenance Requirements), and C6.315 (Sale Operation Schedule) would be used to keep vehicles and equipment out of high-risk areas during weed seed production periods.

Timber harvest and silvicultural treatments would continue to be regulated so any potential adverse effects would be mitigated for during the project phase for all federally listed species. Therefore, between the measures to decrease noxious weeds and the mitigations of future timber harvest activities, there are no anticipated significant cumulative effects on T&E fish.

Grazing: Grazing allotments occur on every acre of the Modoc National Forest, however, roughly 10% of these allotments are vacant and about 2% are in non-use. Approximately, 122,500 animal unit months of grazing occurs annually. There is also one wild horse territory with approximately 425 head.

The greatest potential for livestock to spread noxious weeds is transportation in the animals' hair. A secondary, but smaller concern could be the concentrated use of areas causing bare patches. If weed occurrences were adjacent, they could provide a seed bed. Livestock may be used as a tool to control of noxious weeds in the future, depending on the species and the estimated effectiveness of domestic animals.

The integration of the new guidelines are hoped to minimize the potential spread of weed occurrences as well as new infestations. The following standards and guidelines would be utilized.

- Annual operating plans would provide information to the permittees regarding noxious weed identification, methods of spread and prevention measures.
- The exclusion of livestock (and wildlife where feasible) from high priority noxious weed sites should be considered where the animals are likely to cause spread of the weed off site

Potential cumulative effects of livestock grazing are fairly minimal.

Fire: Fire management activities that have the potential to spread noxious weeds can be separated into two categories: fuels management and suppression. Approximately 17,000 acres are proposed for fuels treatment per year across the Forest: 5,000 acres of prescribed burns and 12,000 acres of mechanical fuels manipulation.

Areas that have mechanical treatments such as brush mowing and coniferous tree understory thinning are less likely to have potential to spread noxious weeds. Activities associated with mowing are not likely to leave bare spaces upon completion of the project. Plus, areas would be mowed when there is less of a chance of equipment spreading seed. Understory thinning would have the guidelines stated in the timber and silviculture section.

Prescribed burns have a potential to increase the amount of noxious weed occurrences on the Forest. Areas that are left bare post fire would be considered for seeding with appropriate seed mixes. Other mitigations to minimize the potential for noxious weed spread would be implemented during prescribed burning activities.

Timing of fire in relation to specific weed species in proposed burn area would be considered; if possible, time burning to control weeds. If burning must be during a high-risk period when weed populations are likely to be favored, NEPA documents will discuss the monitoring and prompt treatment immediately upon observing a weed problem. Monitor burned areas intensively the first year after burning, preferably for 3 years.

Fire management treatments would continue to be regulated so any potential adverse effects would be mitigated during the project phase for all federally listed species. Therefore, between the measures to decrease noxious weeds and the mitigations of future fire management activities, the 3.42 acres that could be treated in Lost River sucker, shortnose sucker, and Modoc sucker, there are no expected cumulative effect on these three species.

Wildfire and associated suppression and rehabilitation measures on the other hand certainly may provide both an excellent seed source and seed bed. Although there is little control of the location of wildfire, the following standards and guidelines would be implemented during the course of wildfire suppression.

The use of high-priority sites for fire camps and staging areas would be avoided whenever any reasonable Alternative exists. Noxious weed prevention would be addressed in fire rehabilitation and restoration plans.

There is no way of quantifying the location and extent of future wildlife fires, therefore a determination of the cumulative effects of fire on T&E fish is not possible.

Recreation: Although there is a myriad of recreation associated activities that occur on the Modoc National Forest, the two past-times that have the greatest potential to cause the spread of noxious weeds are stock use and equestrian related events. Stock use on Modoc NF is estimated as 6,650 Recreation Visitor Days (RVD) annually with the vast majority within the South Warner Wilderness. Typically there is only one equestrian special use a year; however, there are a few other rides once every five years. Special event horse use averages roughly 50 horses for three days. In summary, there is a rather minor amount of stock and horse use on the Forest as a whole.

In order to decrease the potential for weed introduction via these means, the following Operating Guides have been instituted.

- Special emphasis would be placed on inventory and management of noxious weeds at trailheads.
- Special Use Permits for equestrian groups would recommend pelletized feed be used rather than hay or straw.
- Facilities and high-visibility travel ways would be maintained as weed free zones. Weeds at administration sites, visitor centers, and trailheads would be controlled. Information informing the public and forest service employees that these are "zero tolerance" areas would be posted. This would also be used as opportunities for education. Working cooperatively with the State of California, State of Nevada and the County Weed Boards we would strive to prevent the introduction and establishment of noxious weed infestations as a result of roads, recreation facilities, special use permits, timber harvest, and fuels treatment (see FSM 2081.2),

Given the rather small and mostly localized use of stock and equestrians, plus the implementation of the above guidelines it is not anticipated that recreational activities would significantly contribute to noxious weed spread on this Forest.

The implementation of the weed control program discussed in this document coupled with recreational activities that occur on the Forest would have no cumulative effect on the T&E fish species.

Herbicide Treatments: Of the roughly 2.5 million acres of federal lands encompassed by our Modoc National Forest Map only 6,913 acres would receive treatment on the Modoc National Forest for noxious weeds or about 0.0028%. Of the roughly 4 million acres of state, private and federal lands encompassed by the Forest map, about 14,000 acres or .0056% are treated annually for noxious weed eradication (including the acres proposed by the Modoc National Forest). As stated previously, a maximum of 3.42 acres would be treated in areas that have any potential to effect Lost River sucker, shortnose sucker and Modoc sucker. Due to the location of most of the weed infestations in areas outside of live water occupied by T&E fish, the short duration of management activities, , and other mitigations specific within the Design Standards, there are no

significant cumulative effects expected with implementation of mechanical, physical and chemical control activities associated with the Noxious Weed Treatment Project.

Consultation to Date

Forest and FWS personnel have been in continual contact during the course of the planning effort. A letter was received from the Fish and Wildlife Service on April 8, 2003, (ref 1-10-03-I-082), concurring with the Forest's determination that the action "may affect, but is not likely to adversely affect the Modoc, Lost River, and shortnose suckers" for this project, previously named, "Noxious Weed Strategy Implementation Project". The most current consultation with the Klamath Falls office occurred on January 31, 2007, when Rick Hardy was contacted regarding this document that would address specific changes that were included in the FEIS.

Determination for Federally Listed Species

Based on the analysis of effects of the project this project would have "No Effect" on the Lost River sucker, shortnose sucker, Modoc sucker, Warner sucker, and Shasta Crayfish or their habitat with the implementation of the Action Alternatives.

For the Warner Sucker and the Shasta Crayfish, this determination is based on the distance (over 5 miles) of the proposed treatment area from the Warner sucker and distance (25 miles) of the proposed treatment area from the Shasta crayfish.

For the Lost River sucker, shortnose sucker, and Modoc sucker, this determination is based on the fact that Design Standards for RCAs have been established to protect these species, and the limited number of sites to be treated (2.29 acres, 12 sites). The only chemical proposed for use within 10' of live water is a riparian approved formulation of Glyphosate. Vegetative or channel morphology change are not anticipated to be significant enough to affect the species.

Forest Service Sensitive Fish and Aquatic Wildlife Species

The affected environment and environmental consequences of the Sensitive Fish and Aquatic Wildlife Species are summarized from the Biological Evaluation Report located in Appendix U.

The table below indicates which species that occur or have habitat downstream from the Forest that may be affected by implementation of any of the Alternatives.

Table 3 - 68. USDA Forest Service Region 5 Sensitive Aquatic Species that occur or have habitat downstream from the Modoc National Forest.

Common Name	Scientific Name	Taxon	Habitat That Could Be Affected	Forest MIS
California floater	*Anodonta californiensis*	invertebrate		
Scalloped juga	*Juga acutifilosa*	invertebrate		
Cascade frog	*Rana cascade*	amphibian		
Northern leopard frog	*Rana pipiens*	amphibian	X	
Spotted frog	*Rana pretiosa*	amphibian	X	
Northwestern pond turtle	*Clemmys marmorata marmorata*	reptile	X	
Goose Lake sucker	*Catostomus occidentalis lacusanserinus*	fish	X	
Goose Lake tui chub	*Gila bicolor thallassina*	fish	X	
Goose Lake lamprey	*Lampetra tridentata ssp.*	fish	X	
Goose Lake redband trout	*Oncorhynchus mykiss pop 6*	fish	X	X
Warner Valley redband	*Oncorhynchus mykiss pop 4*	fish		

Common Name	Scientific Name	Taxon	Habitat That Could Be Affected	Forest MIS
trout				

As detailed in the Biological Evaluation Report for Sensitive Fish and Aquatic Species the California floater, Scalloped juga, Cascade frog, and Warner Valley redband trout do not have suitable habitat that is directly, indirectly, or cumulatively affected by the Proposed Action and will not be carried forward in this analysis.

The following section provides a very brief account of the distribution and types of habitat utilized for each species that could be affected by Alternatives analyzed within this document.

Goose Lake redband trout

The name redband trout is used to cover a confusing complex of distinctive trout that occur in isolated headwater streams of the McCloud, Pit, Klamath, and Columbia River systems of California, Nevada, and Oregon. The Goose Lake redband trout is endemic to Goose Lake and its major tributaries (Lassen and Willow creeks in California and the extensive Thomas Creek system and Crane Creek in Oregon) as well as to smaller streams such as Cottonwood Creek in California and several small streams in Oregon. Berg (1987) reported that Joseph, Parker, and East creeks (tributaries of the upper Pit River in California) contained trout genetically similar to Goose Lake redband. This species has both lake and stream dwelling populations, which both rely on headwater streams for spawning. Riffles with clean gravels and suitable water temperatures are required.

The long-term persistence of this fish depends largely on the health of populations in the headwater streams flowing into Goose Lake in Oregon and California, even though much of the conservation attention has focused on large fish in the lake itself. The extirpation of the lake population during a drought and its subsequent partial recovery indicate the probable importance of downstream colonization of the lake from headwater populations. Because of the high level of concern over extirpation of Goose Lake redband (and other native fishes) from Goose Lake when it dried up, conservation efforts have been under way in the watershed, by both agencies and private landowners, to restore streams (e.g., by changing grazing practices) and to remove or alter migration barriers (Moyle 2002). Populations are currently stable.

Goose Lake toy chub

In California toy chubs are native mostly to interior drainages, except the Central Valley, and absent from all coastal drainages, except where introduced. In the Sacramento-San Joaquin drainage toy chubs are native only to Pit River downstream at least as far as Hat Creek and Lake Britton and to Goose Lake, although they have been introduced into some reservoirs and ponds in various locations.

The Goose Lake tui chub is considered by Snyder (1908) to be the native tui chub of the upper Pit River from Big Valley upstream to and including Goose Lake. Hubbs et al. (1979) determined that the Pit River form and the Goose Lake form of tui chub were distinct and that the Goose Lake tui chub was a distinct subspecies with the thalassina name. Tui chubs in general are opportunistic omnivores and consume a wide variety of aquatic invertebrates (Moyle 1976). Tui chubs are abundant and widely distributed, and so are not in trouble as a species (Moyle 2002).

Goose Lake sucker

The Goose Lake sucker is a described subspecies of Sacramento sucker. The Goose Lake sucker was originally described in 1913 as a subspecies (Fowler 1913) and further studies indicated that the subspecies was distinct, but the differences minor. During their second year, Goose Lake

suckers migrate in April or May, depending on water temperature, to spawn in streams that are tributary to the lake (Martin 1967). Adults have been found in the lake, some of the streams, and some of the reservoirs throughout the year. During summer, young suckers are very abundant in shallow water among aquatic macrophytes. Goose Lake suckers feed primarily on algae and diatoms (Martin 1967).

Northwestern pond turtle

Northwestern pond turtles have been sighted in several locations on the Forest, including Willow Creek on Big Valley RD, Lost River on Doublehead RD, and along the Pit River near Alturas. Pond turtles utilize a variety of habitats in areas with permanent or relatively permanent water that have a slower current. They require basking sites (e.g., partially submerged logs, rocks, open mud banks) and are omnivorous.

Northern leopard frog

Historically, the northern leopard frog was widely distributed in North America, but uncommon and localized in California. Its known elevational range extends from 4,000 to 5,000 feet in California. In California, native populations of the northern leopard frog whose origin is largely unquestioned, are historically recorded from the Modoc and Lassen Counties. Recent surveys have indicate the species is nearly absent from these historical sites. No individuals of this taxon were encountered during field surveys by Jennings and Hayes (1994). The nearest recent siting was of a single adult at the Tule Lake National Wildlife Refuge in 1990. Depending on temperature and geography, northern leopard frogs enter hibernation during the fall and winter months and emerge from the bottom of aquatic habitats in the spring, as soon as ice melts. Northern leopard frogs require permanent aquatic habitat to breed, feed, and overwinter. Since this species is relatively susceptible to water loss, it is essential that a moist substrate occur in the vicinity of the aquatic habitat. As adults, they may take cover in grasslands, meadows, and pastures.

Most of the essential habitat is no longer present or so fragmented that the habitat can no longer support populations of this taxon. Moreover, bullfrogs have become well established along RCAs where northern leopard frogs where historically present. Although the interaction between these two taxa is poorly understood, bullfrogs may have a negative effect on leopard frogs (Jennings and Hayes 1994).

Spotted frog

The spotted frog is one of the most widely distributed taxon in the western United States; however, in California historical records indicate this species was present on the Modoc Plateau, Pit River drainage, and in the Warner Mountains. Its known elevational range extends from 3,200 to 4,800 feet. The spotted frog is a highly aquatic species typically found in permanent water such as streams, rivers, marshes, springs, pools, and small lakes. Spotted frogs do not seem to occur in stagnant water, which contain cattails. There is no specific data on feeding; however, the food eaten differs with age and size of the frog and includes many insects, arachnids, and mollusks.

No individuals of this taxon were found during a concerted field effort on the Modoc Plateau, Pit River drainage, and in the Warner Mountains at sites where this taxon was historically present (Jenning and Hayes 1994). A single sub-adult frog reported in Cedarville in 1989 has been classified as a misidentification of the species (Hayes pers. comm.).

Effects of the Alternatives on Sensitive Fish and Aquatic Species

Northern leopard frog, Spotted frog, Northwestern pond turtle, Goose Lake sucker, Goose Lake tui chub, Goose Lake lamprey, and Goose Lake redband trout

No-Action Alternative (Alternative 1)

Direct Effects and Indirect: Potential adverse effects to the aquatic environment from not controlling the spread of noxious weeds include but are not limited to, an increase in sedimentation, reduction in stream bank stability, elevated water temperature with the lack of canopy cover, and a potential decrease in the amount of organic matter available to enter affected streams.

Without treatment, noxious weeds would likely become widely established across the Forest. This could lead to an increase in soil erosion (sediment deposition) and surface water runoff. Studies indicate a nearly three-fold increase in sediment yield from knapweed sites compared to an uninfested bunchgrass site.

Cumulative Effects: Weeds would continue to invade and spread on the Forest. As this process occurs, weed control options become narrower. Loss of native vegetation could lead to changes in channel morphology as channel stability decreases.

The no action Alternative is not expected to have any direct, indirect, or cumulative adverse effects on the Goose Lake sucker, Goose Lake tui chub, Goose Lake lamprey, Goose Lake redband trout, Northwestern pond turtle, northern leopard frog, and spotted frog.

Effects of Physical + Treatment Components (Alternatives 2 through 6)

Direct and Indirect Effects: Physical + treatment as proposed is not expected to have any direct or indirect effects on the Goose Lake sucker, Goose Lake tui chub, Goose Lake lamprey, Goose Lake redband trout, Northwestern pond turtle, Cascade frog, northern leopard frog, and spotted frog

Cumulative Effects: The physical + treatment of weed sites could result in some localized soil disturbance and possibly increased sedimentation of nearby drainages. These effects would be expected to be minor and temporary in duration because of the comparatively few acres of soil disturbance followed by the reclamation and restoration (where appropriate) of treated areas. Treatment would result better riparian condition, in turn providing more stable and useful aquatic habitat.

Physical + treatment as proposed is not expected to have any direct, indirect, or cumulative adverse effects on the Goose Lake sucker, Goose Lake tui chub, Goose Lake lamprey, Goose Lake redband trout, Northwestern pond turtle, Cascade frog, northern leopard frog, and spotted frog

Effects of Herbicidal Treatments (Alternatives 2, 4, and 6)

Direct and Indirect Effects: Direct effects to the Goose Lake sucker, Goose Lake tui chub, Goose Lake lamprey, Goose Lake redband trout, Northwestern pond turtle, northern leopard frog, and spotted frog would be primarily associated with herbicide application near streams and associated riparian areas, lakes, or wetlands. A total of 12.6 acres of noxious weeds are found adjacent to the habitat of these species.

Herbicides are applied in liquid formulations and are sprayed on foliage of the target vegetation. In some cases soil may be a major receptor and contamination can occur by chemicals leaching through the soil to the groundwater and ultimately reaching the aquatic environment. This method of introduction usually poses the least amount of risk to the aquatic environment because chemicals typically disappear from the ground surface by either plant uptake of the chemical, volatilization, and natural decomposition of the active ingredients or adsorption of the herbicide by soil particles. Design Standards or other prevention measures proposed to address this are included in all Alternatives utilizing chemical treatments.

Leaks, spills, and improper storage and handling of containers are the source of most pesticide related groundwater contamination. These impacts can easily be mitigated with proper training of personnel and proper storage and disposal of chemicals. Risk from an accidental spill of herbicide into a water body on the Forest is considered low.

Another mode of pesticide entry to the aquatic system includes overland flow from precipitation events. Risk varies depending on soil composition and timing and intensity of precipitation events after application. Risk tends to be lower on well-vegetated forests and rangeland where soil infiltration is typically greater than precipitation. Overland flow occurs infrequently on most forest land because the infiltration capacity of the forest floor and soil is usually far greater than the rate of precipitation. Aquatic organisms are more at risk of negative impacts from herbicides in small perennial streams, or during late season when flow is reduced, due to their limited capability for dilution. Design Standards or other prevention measures proposed to address precipitation events are included in the Proposed Action. Detailed herbicide information was published in the DEIS, Appendix E, and is incorporated into this document by this reference. Appendix E consisted of a copy of information available on the Internet and was not republished in the FEIS to reduce costs. Summary information is found in Chapter 2 of the FEIS.

Design Standards are prescribed for RCAs to protect sensitive fish and aquatic species. A reduction of noxious weeds in riparian areas and other aquatic habitats would benefit native plant species and result in better stream bank and riparian condition, in turn providing more stable and useful aquatic environments.

Not all noxious weeds would be chemically treated. Even under the integrated weed management approach, not all weed populations would be eradicated, leaving an available seed source for continued propagation or the unlikely option of weeds being out-competed by native or desirable plant species.

Cumulative Effects: No adverse downstream cumulative effects would be expected from situations involving herbicide runoff or leaching because of the method of application, Best Management Practices (BMPs) and Design Standards or other prevention measures designed to prevent these types of impacts from occurring.

Cumulative Effects of Resource Activities on the Sensitive Fish and Aquatic Species

Timber and Silvicultural Activities

On average, 2,500 acres are logged for saw logs with an additional 3,000 treated for wood fiber annually on the Modoc National Forest. Harvest prescriptions vary from clear cut to understory thinning, however clearcutting has rarely been used in recent times. The various timber sales may have had effects on the species discussed in this document that would have been disclosed within their individual National Environmental Policy Act dictated documentation; discussing the potential effects of those projects is beyond the scope of this document. .

The amplitude of effect future timber and silvicultural activities is expected to significantly decrease due to the institution of noxious weed prevention measures. Timber sales and other cultural treatments would need to have changes in planning and implementation. Noxious weed locations would be presented as part of the ID team process so that activities in these areas can be avoided or mitigated (timing projects outside of high risk seasons). Logging systems design should maintain ground cover by minimizing ground disturbance and avoid opening up the overstory adjacent to noxious weed populations. Logging equipment would be washed to stem the transfer of noxious weeds (timber sale clause CT 6.343). Timber sale contract clauses C5.12 (Use of Road Purchaser), C5.4 (General and Special Maintenance Requirements), and C6.315 (Sale Operation Schedule) would be used to keep vehicles and equipment out of high-risk areas during weed seed production periods. The current regulations are anticipated to minimize this type weed spread.

Timber harvest and silvicultural treatments would continue to be regulated so any potential adverse effects would be mitigated for during the project phase for all sensitive species. Therefore, between the measures to decrease noxious weeds and the mitigations of future timber harvest activities, there are no anticipated significant cumulative effects on sensitive aquatic species.

Grazing

Grazing allotments occur on every acre of the Modoc National Forest, however, roughly 10% of these allotments are vacant and about 2% are in non-use. Approximately, 122,500 animal unit months of grazing occurs annually. There is also one wild horse territory with approximately 425 head.

The greatest potential for livestock to spread noxious weeds is transportation in the animals' hair. A secondary, but smaller concern could be the concentrated use of areas causing bare patches. If weed occurrences were adjacent, they could provide a seed bed. Livestock may be used as a tool to control of noxious weeds in the future, depending on the species and the estimated effectiveness of domestic animals.

The integration of the new guidelines are hoped to minimize the potential spread of weed occurrences as well as new infestations. The following standards and guidelines would be utilized.
Annual operating plans would provide information to the permittees regarding noxious weed identification, methods of spread and prevention measures.
The exclusion of livestock (and wildlife where feasible) from high priority noxious weed sites should be considered where the animals are likely to cause spread of the weed off site.

Potential cumulative effects of livestock grazing are fairly minimal.

Fire

Fire management activities that have the potential to spread noxious weeds can be separated into two categories: fuels management and suppression. Approximately 17,000 acres are proposed for fuels treatment per year across the Forest: 5,000 acres of prescribed burns and 12,000 acres of mechanical fuels manipulation.

Areas that have mechanical treatments such as brush mowing and coniferous tree understory thinning are less likely to have potential to spread noxious weeds. Activities associated with mowing are not likely to leave bare spaces upon completion of the project. Plus, areas would be mowed when there is less of a chance of equipment spreading seed. Understory thinning would have the guidelines stated in the *timber and silviculture* section.

Prescribed burns have a potential to increase the amount of noxious weed occurrences on the Forest. Areas that are left bare post fire would be considered for seeding with appropriate seed mixes. Other mitigations to minimize the potential for noxious weed spread would be implemented during prescribed burning activities.

Timing of fire in relation to specific weed species in proposed burn area would be considered; if possible, time burning to control weeds. If burning must be during a high-risk period when weed populations are likely to be favored, NEPA documents will discuss the monitoring and prompt treatment immediately upon observing a weed problem. Monitor burned areas intensively the first year after burning, preferably for 3 years.

Fire management treatments would continue to be regulated so any potential adverse effects would be mitigated during the project phase for all federally listed species. Therefore, between the measures to decrease noxious weeds and the mitigations of future fire management activities, the 12.6 acres that could be treated in Goose Lake sucker, Goose Lake tui chub, Goose Lake lamprey, Goose Lake redband trout, Northwestern pond turtle, northern leopard frog, and spotted frog habitat, there are no expected cumulative effect on these three species.

Wildfire and associated suppression and rehabilitation measures on the other hand certainly may provide both an excellent seed source and seed bed. Although there is little control of the location of wildfire, the following standards and guidelines would be implemented during the course of wildfire suppression.

The use of high-priority sites for fire camps and staging areas would be avoided whenever any reasonable Alternative exists. Noxious weed prevention would be addressed in fire rehabilitation and restoration plans.

There is no way of quantifying the location and extent of future wildlife fires, therefore a determination of the cumulative effects of fire on sensitive aquatic species is not possible.

Recreation

Although there is a myriad of recreation associated activities that occur on the Modoc National Forest, the two past-times that have the greatest potential to cause the spread of noxious weeds are stock use and equestrian related events. Stock use on Modoc NF is estimated as 6,650 Recreation Visitor Days (RVD) annually with the vast majority within the South Warner Wilderness. Typically there is only one equestrian special use a year; however, there are a few other rides once every five years. Special event horse use averages roughly 50 horses for three days. In summary, there is a rather minor amount of stock and horse use on the Forest as a whole.

In order to decrease the potential for weed introduction via these means, the following Operating Guides have been instituted.
Special emphasis would be placed on inventory and management of noxious weeds at trailheads.
Special Use Permits for equestrian groups would recommend pelletized feed be used rather than hay or straw.
Facilities and high-visibility travel ways would be maintained as weed free zones. Weeds at administration sites, visitor centers, and trailheads would be controlled. Information informing the public and forest service employees that these are "zero tolerance" areas would be posted. This would also be used as opportunities for education. Working cooperatively with the State of California, State of Nevada and the County Weed Boards we would strive to prevent the introduction and establishment of noxious weed infestations as a result of roads, recreation facilities, special use permits, timber harvest, and fuels treatment (see FSM 2081.2).

Given the rather small and mostly localized use of stock and equestrians, plus the implementation of the above guidelines it is not anticipated that recreational activities would significantly contribute to noxious weed spread on this Forest.

The implementation of the weed control program discussed in this document coupled with recreational activities that occur on the Forest would have no cumulative effect on the sensitive aquatic species.

Cumulative Effects of the Use of Herbicide Treatments within the Analysis Area on Sensitive Fish and Aquatic Species

Of the roughly 2.5 million acres of federal lands encompassed by our Modoc National Forest Map only 6,913 acres would receive treatment on the Modoc National Forest for noxious weeds or about 0.0028%. Of the roughly 4 million acres of state, private and federal lands encompassed by the Forest map, about 14,000 acres or .0056% are treated annually for noxious weed eradication (including the acres proposed by the Modoc National Forest). As stated previously, a maximum of 12.6 acres would be treated in areas that have any potential to effect Goose Lake sucker, Goose Lake tui chub, Goose Lake lamprey, Goose Lake redband trout, Northwestern pond turtle, northern leopard frog, and spotted frog. Due to the location of most of the weed infestations in areas outside of live water occupied by sensitive aquatic species, the short duration of management activities, and other mitigations specific within the Design Standards, there are no significant cumulative effects expected with implementation of mechanical, physical and chemical control activities associated with the Noxious Weed Treatment Project.

Determinations of Effects on Sensitive Fish and Aquatic Species

There will be a “No Impact” determination for all aquatic species for implementation of the No Action Alternative or the implementation of the prevention program.

There will be a “No Impact” determination for all aquatic species for implementation of physical + treatment. The effects of these treatments are expected to be minor and temporary in duration.

There will be a “No Impact” determination for the following species for implementation of chemical treatments: California floater, scalloped juga, Cascade frog, and Warner Valley redband trout. These species do not have suitable habitat that is directly, indirectly, or cumulatively affected.

There will be a May impact individuals, but not likely to cause a trend to federal listing or a loss of viability” for chemical activities for the following species: Goose Lake sucker, Goose Lake tui chub, Goose Lake lamprey, Goose Lake redband trout, Northwestern pond turtle, northern leopard frog, and spotted frog. This determination is based on the fact that Design Standards have been established to protect these species, and the limited number of sites to be treated (12.6 acres). The only chemical proposed for use within 10 feet of live water is a riparian approved formulation of Glyphosate.

Forest Service Aquatic Management Indicator Species

The purpose of this report is to evaluate and disclose the impacts of the Noxious Weed Treatment Project on the Fisheries and Aquatic Management Indicator Species (MIS) identified in the Forest (NF) Land and Resource Management Plan (Forest Plan) (USDA 1991). This report documents the effects of project Alternatives on the habitat of selected MIS. Detailed descriptions of the

Noxious Weed Treatment Project Alternatives are found in Chapter 2 of the Project Environmental Impact Statement (USDA 2007).

MIS are animal or plant species identified in the Modoc NF Forest Plan (USDA 1991, which was developed under the 1982 National Forest System Land and Resource Management Planning Rule (1982 Planning Rule) (36 CFR 219). Guidance regarding MIS set forth in the Modoc NF Forest Plan directs Forest Service resource managers to (1) at project scale, analyze the effects of proposed projects on the habitats of each MIS affected by such projects, and (2) at the national forest (forest) or bioregional scale, monitor populations and/or habitat trends of forest MIS, as identified by the Forest Plan.

Direction Regarding the Analysis of Project-Level Effects on MIS

Project-level effects on MIS are analyzed and disclosed as part of environmental analysis under the National Environmental Policy Act (NEPA). This involves examining the impacts of the proposed project Alternatives on MIS habitat by discussing how direct, indirect, and cumulative effects would change the quantity and/or quality of habitat in the analysis area.

Where the Modoc NF Forest Plan requires population monitoring or population surveys for an MIS, the project-level effects analysis for that MIS must be informed by population monitoring data, which are gathered at the forest or bioregional scale. Population monitoring and survey data are not generally gathered for site-specific projects. Therefore, adequately analyzing project effects to MIS, including Threatened, Endangered, and Sensitive (TES) species that are also MIS, involves the following steps:

- Identifying which MIS have habitat that would be either directly or indirectly affected by the project Alternatives; these MIS are potentially affected by the project.
- Identifying the Forest Plan forest-level or bioregional-level monitoring requirements for this subset of forest MIS.
- Analyzing project-level effects on MIS habitats or habitat components for this subset of forest MIS.
- Discussing forest or bioregional scale habitat and/or population trends for this subset of forest MIS.
- Relating project-level impacts on MIS habitat to habitat and/or population trends for the affected MIS at the forest or bioregional scale.

These steps are described in detail in the Pacific Southwest Region's draft document "MIS Analysis and Documentation in Project-Level NEPA, R5 Environmental Coordination" (USDA 2006). This Management Indicator Species (MIS) Report documents application of the above steps to select and analyze potentially affected MIS for the Noxious Weed Treatment Project.

Direction Regarding Monitoring of MIS Population and Habitat Trends at the Forest and Bioregional Scales

Forest or bioregional scale monitoring requirements for the Modoc NF's MIS are found in the Monitoring Plan of the FOREST PLAN (USDA 1991) and in Appendix E of the Sierra Nevada Forest Plan Amendment Final Environmental Impact Statement (FEIS) (USDA 2001), as adopted by the 2004 Sierra Nevada Forest Plan Amendment (SNFPA) Record of Decision (ROD) (USDA 2004).

Habitat Status and Trend

The Modoc NF Forest Plan (USDA 1991) requires Forest-scale monitoring of habitat status and trend for select MIS on the Modoc NF; for MIS with habitat potentially affected by the Noxious Weed Treatment Project. Habitat trend is the direction of change in the amount of habitat between the time the Forest Plan was approved and the present. The methodology for assessing habitat status and trend is described in detail in the Modoc National Forest MIS Report (USDA 2007).

Habitats are the vegetation types (for example, mixed conifer forest) and/or ecosystem components (for example, cliffs or lakes) and any special habitat elements (for example, snags) required by an MIS for breeding, cover, and/or feeding. Required habitat is identified using habitat relationships data or models. Habitat relationships for fish MIS are identified individually.

Population Status and Trend

Population monitoring requirements for the MIS of the Modoc NF are identified in either Appendix E of the Sierra Nevada Forest Plan Amendment (SNFPA) FEIS (USDA 2001), as adopted by the 2004 Sierra Nevada Forest Plan Amendment Record of Decision (ROD) (USDA 2004), or the Monitoring Plan of the Forest Plan (USDA 1991).

For Modoc NF MIS (USDA 1991) that are listed in Appendix E of the SNFPA FEIS (USDA 2001), population monitoring requirements are identified in Appendix E. For all other Modoc NF MIS, population monitoring requirements are identified in the Forest Plan Monitoring Plan (USDA 1991). There are many types of population data, and this document identifies the type of population monitoring data required for each MIS. The population monitoring requirements for the MIS with habitat potentially affected by the Noxious Weed Treatment Project are summarized in Table 3-51 of this report. All population monitoring data are collected and/or compiled at the forest or bioregional scale, consistent with the Forest Plan as amended by the SNFPA "site specific monitoring or surveying of a proposed project or activity area is not required" (36 CFR 219.14(f)).

Population status is the current condition of the MIS related to the type of population monitoring data (population measure) required in the Forest Plan for that MIS. Population trend is the direction of change in that population over time.

As discussed in Appendix E of the 2001 SNFPA (USDA 2001), there is a wide range of monitoring data that can be used to describe the status and trend (or change) of populations, ranging from describing changes in distribution based on presence-absence data to describing changes in population structure. Distribution population monitoring consists of collecting presence data for the MIS across a number of sample locations; over time, changes in the distribution of the MIS can be identified and tracked. Presence data is collected using a number of direct and indirect methods, such as surveys (population surveys), bird point counts, tracking number of hunter kills, counts of species sign (such as deer pellets), and so forth.

Presence population data for MIS are collected and consolidated by the Modoc NF in cooperation with State and Federal agency partners (including the California Department of Fish and Game, U.S. Geological Survey, and USDI Fish and Wildlife Service) or conservation partners (including Partners in Flight and various avian joint ventures). The Modoc NF's MIS monitoring program for species typically hunted, fished, or trapped was designed to be implemented in cooperation with California Department of Fish and Game (CDFG), consistent with direction in the 1982 Planning Rule to monitor Forest-level MIS population trends in cooperation with state fish and wildlife agencies to the extent practicable (36 CFR 219.19(a)(6)). To be biologically meaningful for wide-ranging MIS, presence data are collected and tracked not only at the Forest scale, but also at larger scales, such as range wide, state, province, or important species management unit

(for example, Deer Assessment Unit or waterfowl migratory routes). Population data at various scales are important to both assess and provide meaningful context for population status and trend at the Forest scale.

Selection of Level Fisheries and Aquatic MIS

Management Indicator Species (MIS) for the Modoc NF are identified in the Forest Plan (USDA 1991). The Fisheries/Aquatic MIS analyzed for the Project were selected from this list of MIS identified in the Forest Plan and are listed below.. In addition, Table 3-69 identifies the status of the MIS (2nd column), reason each MIS was identified in the Forest Plan (3rd column) and discloses whether or not the MIS is potentially affected by the Noxious Weed Treatment Project (4th column).

Table 3 - 69. Fisheries/Aquatic Management Indicator Species Selected for Project-Level Analysis for the Noxious Weed Treatment Project, Modoc NF

Management Indicator Species	Species Status	Forest Plan Habitat Indicator	Category for Project Analysis [1]
Shortnose sucker	Endangered	Cold water aquatic	3
Lost river sucker	Endangered	Cold water aquatic	3
Modoc sucker	Endangered	Cold water aquatic	3
Goose Lake redband trout	Sensitive	Cold water aquatic	3
Rainbow trout	Non-TES	Cold water aquatic	3
Brook trout	Non-TES	Cold water aquatic	2
Brown trout	Non-TES	Cold water aquatic	3
Largemouth bass	Non-TES	Warm water aquatic	3

1 Category 1: MIS whose habitat is not in or adjacent to the project area and would not be affected by the project.

Category 2: MIS whose habitat is in or adjacent to project area, but would not be either directly or indirectly affected by the project.

Category 3: MIS whose habitat would be either directly or indirectly affected by the project.

Brook trout, identified as Category 2 above, would not be further discussed because, although there is suitable habitat in the area, this species is found at higher elevations where no treatment is scheduled and therefore would have no impact on Forest-level brook trout habitat or population trends.

The Fisheries/Aquatic MIS whose habitat would be either directly or indirectly affected by the Noxious Weed Treatment Project, identified as Category 3 in Table 3-69, are carried forward in this analysis, which will evaluate the direct, indirect, and cumulative effects of the Proposed Action and Alternatives on the habitat of these MIS. The MIS selected for Project-Level MIS analysis for the Noxious Weed Treatment Project are: Shortnose sucker, Lost River sucker, Modoc sucker, Goose Lake redband trout, rainbow trout, brown trout, and largemouth bass.

Forest Plan Monitoring Requirements for Fish and Aquatic MIS

The Modoc NF Forest Plan (USDA 1991) and Appendix E of the Sierra Nevada Forest Plan Amendment Final Environmental Impact Statement (USDA 2001), as adopted by the 2004 Sierra Nevada Forest Plan Amendment ROD (USDA 2004), identify Forest and bioregional scale habitat and population monitoring requirements for the Modoc NF MIS. As discussed in the introduction to this report, Forest-scale habitat monitoring requirements are identified in the Monitoring Plan of the Modoc NF Forest Plan (USDA 1991). For those Modoc NF MIS that are listed in Appendix E of the SNFPA FEIS (USDA 2001), population monitoring requirements are described in Appendix E. For all other Modoc NF MIS, population monitoring requirements are

described in the Forest Plan Monitoring Plan (USDA 1991). Habitat and population monitoring results for Modoc NF's MIS are described in the Modoc National Forest Management Indicator Species Report (USDA 2007) and are summarized below for the MIS being analyzed for the Noxious Weed Treatment Project.

Table 3 - 70. Modoc NF Forest Plan MIS Requirements for the Selected Project-Level Fisheries/Aquatic MIS for the Noxious Weed Treatment Project (USDA 2007, as Amended by the SNFPA 2004)

SELECTED PROJECT-LEVEL MIS	MIS Monitoring Requirements	
	Habitat	Population
Shortnose sucker	Stream surveys, photo points	Recovery Plan
Lost River sucker	Stream surveys, photo points	Recovery Plan
Modoc sucker	Stream surveys, channel profiles, photo points	Population sampling
Goose Lake redband trout	Stream surveys, photo points	Distribution/relative abundance
Rainbow trout	Stream/lake habitat surveys	Distribution/population
Brook trout	Stream/lake habitat surveys	Distribution/population
Brown trout	Stream/lake habitat surveys	Distribution/population
Largemouth bass	Stream/lake habitat surveys	Distribution/population

Forest Plan, Monitoring Plan (USDA 1991).

FEIS, Appendix E (USDA 2001).

Methodologies for MIS Monitoring

Shortnose Sucker and Lost River Sucker

Quality of habitat is assessed using a variety of techniques that range from subjective observation to intensive measurements. Photographs can be used to document conditions over time. Assessment of Proper Functioning Condition (PFC) can be used by Interdisciplinary teams to document observations of channel morphology and riparian vegetation. PFC is a nationally adopted protocol most useful in low gradient stream systems where range management is often the management practice of concern. Two other regionally adopted inventory protocols are used to evaluate habitat condition. Fish Habitat Inventory collects information at the scale of the habitat unit and is useful in characterizing condition. The R5 Stream Condition Inventory is used to monitor changes at the reach scale, and to compare reaches. Both methodologies include attributes most likely to be changed by management; these include shade, substrate composition, pools, channel shape, and large wood. Data is used to determine trend in conditions, and evaluated using data from similar streams, rather than against a model or set of standard objectives. The Modoc National Forest MIS Report (USDA 2007) provides additional information about the distribution and population trend for this species.

Modoc Sucker

Important habitat components for the Modoc sucker include: the shading of streams by vegetation; coarse woody debris; the presence of pools in the summer; the presence of algae, detritus, and aquatic invertebrates; the presence of sand and gravels of various sizes not covered by sediment; and good water quality. This species is found in the riverine CWHR habitat type.

Quality of Modoc sucker habitat is assessed using a variety of techniques that range from subjective observation to intensive measurements. Photographs can be used to document conditions over time. Assessment of Proper Functioning Condition (PFC) can be used by

Interdisciplinary teams to document observations of channel morphology and riparian vegetation. PFC is a nationally adopted protocol most useful in low gradient stream systems where range management is often the management practice of concern. Two other regionally adopted inventory protocols are used to evaluate Modoc sucker habitat condition. Fish Habitat Inventory collects information at the scale of the habitat unit and is useful in characterizing condition. The R5 Stream Condition Inventory is used to monitor changes at the reach scale, and to compare reaches. Both methodologies include attributes most likely to be changed by management; these include shade, substrate composition, pools, channel shape, and large wood. Data is used to determine trend in conditions, and evaluated using data from similar streams, rather than against a model or set of standard objectives. Channel cross-sections and vegetative green line survey are also used to monitor riparian condition over time. The Modoc National Forest MIS Report (USDA 2007) provides additional information about the distribution and population trend for this species.

Goose Lake Redband Trout

Quality of redband trout habitat is assessed using a variety of techniques that range from subjective observation to intensive measurements. Photographs can be used to document conditions over time. Assessment of Proper Functioning Condition (PFC) can be used by Interdisciplinary teams to document observations of channel morphology and riparian vegetation. PFC is a nationally adopted protocol most useful in low gradient stream systems where range management is often the management practice of concern. Two other regionally adopted inventory protocols are used to evaluate redband trout habitat condition. Fish Habitat Inventory collects information at the scale of the habitat unit and is useful in characterizing condition. The R5 Stream Condition Inventory is used to monitor changes at the reach scale, and to compare reaches. Both methodologies include attributes most likely to be changed by management; these include shade, substrate composition, pools, channel shape, and large wood. Data is used to determine trend in conditions, and evaluated using data from similar streams, rather than against a model or set of standard objectives. The Modoc National Forest MIS Report (USDA 2007) provides additional information about the distribution and population trend for this species.

Rainbow Trout, Brown Trout, and Largemouth Bass

Quality of habitat for these species is assessed using a variety of techniques that range from subjective observation to intensive measurements. Photographs can be used to document conditions over time. Assessment of Proper Functioning Condition (PFC) can be used by Interdisciplinary teams to document observations of channel morphology and riparian vegetation. PFC is a nationally adopted protocol most useful in low gradient stream systems where range management is often the management practice of concern. Two other regionally adopted inventory protocols are used to evaluate trout habitat condition. Fish Habitat Inventory collects information at the scale of the habitat unit and is useful in characterizing condition. The R5 Stream Condition Inventory is used to monitor changes at the reach scale, and to compare reaches. Both methodologies include attributes most likely to be changed by management; these include shade, substrate composition, pools, channel shape, and large wood. Data is used to determine trend in conditions, and evaluated using data from similar streams, rather than against a model or set of standard objectives. The Modoc National Forest MIS Report (USDA 2007) provides additional information about the distribution and population trend for these species.

Effects of Proposed Action on Selected Fisheries and Aquatic MIS

Detailed information on MIS for the Forest is documented in the Modoc Forest MIS Report (USDA 2007).

Shortnose Sucker and Lost River Sucker

The shortnose sucker and Lost River sucker are federally listed endangered species; additional information on affected environment and environmental consequences of the Noxious Weed Treatment Project on these species is found in the project BA.

Habitat - Species Relationship

Detailed information on MIS for the Modoc NF is documented in the Modoc National Forest MIS Report (USDA 2007), which is hereby incorporated by reference.

The habitat requirements of the shortnose and Lost River suckers are not well known. It appears that the Lost River sucker is primarily a lake species and spends most of its time in fairly deep water (Moyle 2002). The shortnose sucker is thought to have a life history similar to the cui-ui (*Chasmistes cujus*) of Pyramid Lake, Nevada: it is thought to spend most of the year in the open waters of large lakes (Ibid).

Cool water, high amounts of dissolved oxygen, and cool freshwater refuges appear to be important habitat components for both species (Buettner and Scoppettone 1991). When conditions become stressful in lakes, such as in the summer when there can be heavy algal blooms and fluctuations in dissolved oxygen, pH, and suspended and dissolved materials, areas where streams or springs flow into lakes may be important refugia (USFWS 1993).

Project-level Effects Analysis based on Habitat

Key Habitat Factor(s) for the Analysis:

The Forest Forest Plan identified these species as associated with riparian habitats. These species are found in the lacustrine and riverine CWHR habitat types..

Analysis Area for Project-level Effects Analysis

These species migrate from Clear Lake Reservoir to spawn in Willow Creek and Boles Creek. Summer holding occurs in reservoirs as well as deeper pools within the channels.

Current Condition of the Key Habitat Factor(s) in the Analysis Area

There are currently 35.5 miles of stream habitat and 1,962 acres of reservoir habitat for the species on the Forest.

Alternative 1 (No Action)

Direct and Indirect Effects to Habitat: Potential adverse effects to the aquatic environment from not controlling spread of noxious weeds include but are not limited to, an increase in sedimentation, reduction in stream bank stability, elevated water temperature with the lack of canopy cover, and a potential decrease in the amount of organic matter available to enter affected streams. Without treatment, noxious weeds would likely become widely established across the Forest. This could lead to an increase in soil erosion (sediment deposition) and surface water runoff.

Cumulative Effects to Habitat As weed infestations become more severe, it becomes more difficult to restore natural or near natural conditions. Conditions arise where instead of using physical + treatments or relatively low applications of low toxicity herbicides, more intensive physical + treatment or intensive applications at higher concentrations of more toxic herbicides may be necessary to control later stages of weed infestations. When this occurs, the risk to the aquatic environment also increases and viability of aquatic species may also be at risk.

It is anticipated that under the No Action Alternative there would be an increase in noxious weeds within suitable habitat. The relative cumulative effect to shortnose and Lost River suckers of this increase would be relatively small compared to the existing amount of habitat in the analysis area.

Alternatives 2, 4, and 6

Direct and Indirect Effects to Habitat: Mechanical treatment of weed sites could result in some localized soil disturbance and possibly increased sedimentation of nearby drainages. These effects would be expected to be minor and temporary in duration because of the comparatively few acres of soil disturbance followed by the reclamation and restoration (where appropriate) of treated areas. Treatment would result in better riparian condition, in turn providing more stable and useable aquatic habitat.

Under these Alternatives, potential direct effects to aquatic resources would be primarily associated with herbicide application near streams and associated riparian areas, lakes, or wetlands. Most herbicides are applied in liquid formulations and are sprayed on foliage of the target vegetation. In some cases soil may be a major receptor and contamination can occur by chemicals leaching through the soil to the groundwater and ultimately reaching the aquatic environment. This method of introduction usually poses the least amount of risk to the aquatic environment because chemicals typically disappear from the ground surface by either plant uptake of the chemical, volatilization, and natural decomposition of the active ingredients or adsorption of the herbicide by soil particles. Norris et al. (1991), indicates leaching of chemicals through the soil profile is a process of major public concern, but is least likely to occur in Forest environments. Prevention measures proposed to address this are included as part of the Design Standards. Leaks, spills, and improper storage and handling of containers are the source of most pesticide related groundwater contamination. These impacts can easily be prevented with proper training of personnel and proper storage and disposal of chemicals. Risk from an accidental spill of herbicide into a water body on the Forest is considered low.

Another mode of pesticide entry to the aquatic system includes overland flow from precipitation events. Risk varies depending on soil composition and timing and intensity of precipitation events after application. Risk tends to be lower on well-vegetated forests and rangeland where soil infiltration is typically greater than precipitation. Norris et al. (1991) indicated that overland flow occurs infrequently on most forestland because the infiltration capacity of the Forest floor and soil is usually far greater than the rate of precipitation. Aquatic organisms are more at risk of negative impacts from herbicides in small perennial streams, or during late season when flow is reduced, due to their limited capability for dilution. Prevention measures proposed to address precipitation events are included in the Design Standards. A reduction of noxious weeds in riparian areas and other aquatic habitats would benefit native plant species and result in better stream bank and riparian condition, in turn providing more stable and useful aquatic environments. An indirect effect of these Design Standards is that not all noxious weeds would be chemically treated. Even under the integrated weed management approach, not all weed populations would be eradicated, leaving an available seed source for continued propagation or the unlikely option of weeds being out-competed by native or desirable plant species.

Cumulative Effects to Habitat

The mechanical treatment of weed sites could result in some localized soil disturbance and possibly increased sedimentation of nearby drainages. These effects would be expected to be minor and temporary in duration because of the comparatively few acres of soil disturbance followed by the reclamation and restoration (where appropriate) of treated areas. Treatment would result better riparian condition, in turn providing more stable and useful aquatic habitat. Mechanical treatment as proposed is not expected to have any direct, indirect, or cumulative adverse effects on these species.

No adverse downstream cumulative effects would be expected from situations involving herbicide runoff or leaching because of the method of application, Best Management Practices (BMPs), and Design Standards to prevent these types of impacts from occurring. See Appendix D for a list of the specific BMPs.

It is not anticipated that there would be any cumulative effects by chemical spraying of noxious weeds due to the use of chemicals at only their prescribed label rate, the relative non-toxicity of the chemicals to other than target (i.e. plant) organisms, the use of riparian Design Standards, and the limited area of chemical treatment. Riparian habitat would benefit by decreasing weeds and the acreages to be treated are very small so there is no direct contact with fish and other aquatic species.

It is anticipated that implementation of these Alternatives, in combination with these past, present, and reasonably foreseeable future actions, would result in the treatment of 0.36 acres (4 sites) of suitable habitat across the analysis area. Therefore, the cumulative effect to shortnose sucker and Lost River sucker under these Alternatives would be negligible compared to the amount of existing habitat in the analysis area.

Alternatives 3 and 5

Direct And Indirect Effects To Habitat

Mechanical treatment of weed sites could result in some localized soil disturbance and possibly increased sedimentation of nearby drainages. These effects would be expected to be minor and temporary in duration because of the comparatively few acres of soil disturbance followed by the reclamation and restoration (where appropriate) of treated areas. Treatment would result in better riparian condition, in turn providing more stable and useful aquatic habitat.

Cumulative Effects to Habitat

The mechanical treatment of weed sites could result in some localized soil disturbance and possibly increased sedimentation of nearby drainages. These effects would be expected to be minor and temporary in duration because of the comparatively few acres of soil disturbance followed by the reclamation and restoration (where appropriate) of treated areas. Treatment would result better riparian condition, in turn providing more stable and useful aquatic habitat.

Mechanical treatment as proposed is not expected to have any direct, indirect, or cumulative adverse effects on these species.

Summary of Habitat and Population Status and Trend at the Forest and Bioregional Scale

The Modoc NF Forest Plan (as amended by the SNFPA) requires Forest-scale habitat monitoring and bioregional-scale population monitoring for the shortnose sucker and Lost River sucker hence, the shortnose sucker and Lost River sucker effects analysis for the Noxious Weed Treatment Project must be informed by both habitat and population monitoring data. The sections below summarize the habitat and population status and trend data for the shortnose and Lost River sucker. This information is drawn from the detailed information on habitat and

population trends in the Modoc National Forest MIS Report (USDA 2007), which is hereby incorporated by reference.

Habitat Status and Trend

Barring future water developments on the Modoc National Forest, the amount of habitat appears stable. As fish passage problems are recognized, it is probable that quality of habitat would be increased.

Lost River sucker and shortnose sucker habitat on the Modoc is considered abundant and has remained relatively constant since the development of the Forest Plan (M.Yamagiwa pers. comm.).

Population Status and Trend

The shortnose and Lost River suckers were listed as endangered species on July 18, 1988 (USFWS 1988). No Critical Habitat has been designated. A recovery plan has been written for both species (USFWS 1993). Population decreases of these suckers seem to be primarily related to decreasing spawning habitat from damming, draining, and dredging of historical spawning areas (Ibid). Other predominant threats to these suckers are continued loss of habitat, water diversions, competition and predation by introduced species, hybridization with other sucker species, insularization of remaining habitats, and drought (USFWS 1988). Decreases in water quality resulting from timber harvest, dredging activities, removal of riparian vegetation, and livestock grazing may also cause problems for these species (USFWS 1988).

All of the streams containing these fish on the Modoc National Forest have become seasonally flowing during the drought of the late 1980s and early 1990s. The varied causes for the declines in these two species are not clearly understood (USFWS 1988). What is clear is that there has been a drastic reduction in the spawning success of these long-lived species; for example, populations of both species in Oregon and in Copco Reservoir have not spawned for about 18 years (Ibid).

Based upon recent surveys conducted by the National Biological Survey, there are 23,000 Lost River suckers and 73,000 shortnose suckers on the Modoc NF. According to past survey records there appears to be an increasing trend in the population numbers in the past ten year period (Ibid). Habitat availability trends for this same time period seem to be experiencing an increasing trend (Ibid). The Annual Monitoring Report for 2002 suggest that populations of these two species are relatively stable but the demographics of the populations appears to be changing. Data suggest that fish captured are beginning to appear in the older age class (U.S. Geological Survey 2003).

Both the Lost River and Shortnose Suckers were petitioned for de-listing. The USFWS found that the petition did not present substantial scientific or commercial information indicating that either species warranted de-listing (67 FR 34422).

Relationship of Project-Level Impacts to Forest-Scale Habitat and Population Trends for the Species

Mechanical treatment as proposed would not alter or contribute to existing Forest-wide trend in population or distribution.

Herbicide treatment would result in the treatment of 0.36 acres (4 sites) of suitable habitat across the analysis area. Therefore, the impact of the Noxious Weed Treatment Project would not alter or contribute to existing Forest-wide trend in population or distribution for the shortnose sucker and Lost River sucker.

Modoc Sucker

The Modoc sucker is a federally listed endangered species; additional information on affected environment and environmental consequences of the Noxious Weed Treatment Project on these species is found in the project BA.

Habitat - Species Relationship

Detailed information on MIS for the Modoc NF is documented in the Modoc National Forest MIS Report (USDA 2007), which is hereby incorporated by reference.

Suitable habitat consists of large, shallow, muddy-bottomed pools that are partially shaded by vegetation and contain cool (less than 77° F.), moderately clear water (Moyle 2002). The temperature of water in two Modoc sucker streams indicated that a maximum water temperature of less than 70° F., with daily temperature variations of less than 10° F., provides suitable conditions, and that maximum temperatures of 60 to 65° F. seem to be optimum (Studinski 1993).

Most of the creeks in which Modoc suckers occur become seasonally flowing by mid summer, severely limiting the available habitat. Pools, especially during drought years, may be the most critical factor limiting populations (Ibid). The Modoc sucker utilizes toe-logs and tips of juniper revetments and coarse woody debris in streams for cover (USFS unpublished data). They also will use rocky substrate and algae if no other cover is available in the pool.

Project-level Effects Analysis based on Habitat

Key Habitat Factors for the Analysis

The Forest Forest Plan identified these species as associated with riparian habitats. These species are found in the following CWHR habitat types: lacustrine and riverine.

Analysis Area for Project-level Effects Analysis

The Modoc sucker occurs in two sub-drainages of the Pit River system within the Modoc NF in northeastern California. The streams in which this species occurs are characterized by low summer flows and large, shallow pools with cover, soft sediments, and clear water (USFWS 1985). In many cases, large sections of the streams have only subsurface flows in the summer and the suckers are confined to relatively small permanent pools (Studinski 1993). These streams are within the Devil's Garden and Big Valley Ranger Districts of the Modoc NF.

Current Condition of the Key Habitat Factor(s) in the Analysis Area

The Modoc sucker has been extirpated from a significant portion of its naturally limited range due to hybridization with the Sacramento sucker (Catostomus occidentalis) (USFWS 1985) and habitat loss from overgrazing, siltation, channelization, and other agricultural activities (USFWS 1985). Habitat degradation has also eliminated some natural within-stream barriers that prevented Sacramento suckers from invading Modoc sucker habitat (USFWS 1985). Additional factors include predation by introduced brown trout (Salmo trutta) (Ibid) and the late 1980 and early 1990 drought, which has increased the number of creeks which were seasonally flowing during the summer.

Alternative 1 (No Action)

Direct and Indirect Effects to Habitat

Potential adverse effects to the aquatic environment from not controlling spread of noxious weeds include but are not limited to, an increase in sedimentation, reduction in stream bank stability, elevated water temperature with the lack of canopy cover, and a potential decrease in the amount of organic matter available to enter affected streams. Without treatment, noxious weeds would likely become widely established across the Forest. This could lead to an increase in soil erosion (sediment deposition) and surface water runoff.

Cumulative Effects to Habitat

As weed infestations become more severe, it becomes more difficult to restore natural or near natural conditions. Conditions arise where instead of using physical + treatments or relatively low applications of low toxicity herbicides, more intensive physical + treatment or intensive applications at higher concentrations of more toxic herbicides may be necessary to control later stages of weed infestations. When this occurs, the risk to the aquatic environment also increases and viability of aquatic species may also be at risk.

It is anticipated, that under the No Action Alternative, there would be an increase in noxious weeds within suitable habitat. The relative cumulative effect to Modoc suckers would be relatively small compared to the existing amount of habitat in the analysis area.

Alternatives 2, 4, and 6

Direct and Indirect Effects to Habitat

Mechanical treatment of weed sites could result in some localized soil disturbance and possibly increased sedimentation of nearby drainages. These effects would be expected to be minor and temporary in duration because of the comparatively few acres of soil disturbance followed by the reclamation and restoration (where appropriate) of treated areas. Treatment would result in better riparian condition, in turn providing more stable and useful aquatic habitat.

Under these Alternatives, potential direct effects to aquatic resources would be primarily associated with herbicide application near streams and associated riparian areas, lakes, or wetlands. Most herbicides are applied in liquid formulations and are sprayed on foliage of the target vegetation. In some cases soil may be a major receptor and contamination can occur by chemicals leaching through the soil to the groundwater and ultimately reaching the aquatic environment. This method of introduction usually poses the least amount of risk to the aquatic environment because chemicals typically disappear from the ground surface by either plant uptake of the chemical, volatilization, and natural decomposition of the active ingredients or adsorption of the herbicide by soil particles. Norris et al. (1991), indicates leaching of chemicals through the soil profile is a process of major public concern, but is least likely to occur in Forest environments. Prevention measures proposed to address this are included as part of the Design Standards. Leaks, spills, and improper storage and handling of containers are the source of most pesticide related groundwater contamination. These impacts can easily be prevented with proper training of personnel and proper storage and disposal of chemicals. Risk from an accidental spill of herbicide into a water body on the Forest is considered low.

Another mode of pesticide entry to the aquatic system includes overland flow from precipitation events. Risk varies depending on soil composition and timing and intensity of precipitation events after application. Risk tends to be lower on well-vegetated Forests and rangeland where soil infiltration is typically greater than precipitation. Norris et al. (1991) indicated that overland flow

occurs infrequently on most forestland because the infiltration capacity of the Forest floor and soil is usually far greater than the rate of precipitation. Aquatic organisms are more at risk of negative impacts from herbicides in small perennial streams, or during late season when flow is reduced, due to their limited capability for dilution. Prevention measures proposed to address precipitation events are included in the Design Standards. A reduction of noxious weeds in riparian areas and other aquatic habitats would benefit native plant species and result in better stream bank and riparian condition, in turn providing more stable and useful aquatic environments. An indirect effect of these Design Standards is that not all noxious weeds would be chemically treated. Even under the integrated weed management approach, not all weed populations would be eradicated, leaving an available seed source for continued propagation or the unlikely option of weeds being out-competed by native or desirable plant species.

Cumulative Effects to Habitat

The mechanical treatment of weed sites could result in some localized soil disturbance and possibly increased sedimentation of nearby drainages. These effects would be expected to be minor and temporary in duration because of the comparatively few acres of soil disturbance followed by the reclamation and restoration (where appropriate) of treated areas. Treatment would result better riparian condition, in turn providing more stable and useful aquatic habitat. Mechanical treatment as proposed is not expected to have any direct, indirect, or cumulative adverse effects on these species.

No adverse downstream cumulative effects would be expected from situations involving herbicide runoff or leaching because of the method of application, Best Management Practices (BMPs) and Design Standards to prevent these types of impacts from occurring. See Appendix D for a list of the specific BMPs.

It is not anticipated that there would be any cumulative effects by chemical spraying of noxious weeds due to the use of chemicals at only their prescribed label rate, the relative non-toxicity of the chemicals to other than target (i.e. plant) organisms, the use of riparian Design Standards, and the limited area of chemical treatment. Riparian habitat would benefit by decreasing weeds and the acreages to be treated are very small so there is no direct contact with fish and other aquatic species.

It is anticipated that implementation of these Alternatives, in combination with these past, present, and reasonably foreseeable future actions, would result in the treatment of 1.93 acres (8 sites) of suitable habitat across the analysis area. Therefore, the cumulative effect to Modoc sucker under these Alternatives would be negligible compared to the amount of existing habitat in the analysis area.

Alternatives 3 and 5

Direct and Indirect Effects to Habitat

Mechanical treatment of weed sites could result in some localized soil disturbance and possibly increased sedimentation of nearby drainages. These effects would be expected to be minor and temporary in duration because of the comparatively few acres of soil disturbance followed by the reclamation and restoration (where appropriate) of treated areas. Treatment would result in better riparian condition, in turn providing more stable and useful aquatic habitat.

Cumulative Effects to Habitat

The mechanical treatment of weed sites could result in some localized soil disturbance and possibly increased sedimentation of nearby drainages. These effects would be expected to be

minor and temporary in duration because of the comparatively few acres of soil disturbance followed by the reclamation and restoration (where appropriate) of treated areas. Treatment would result better riparian condition, in turn providing more stable and useful aquatic habitat.

Mechanical treatment as proposed is not expected to have any direct, indirect, or cumulative adverse effects on these species.

Summary of Habitat and Population Status and Trend at the Forest and Bioregional Scales

The Modoc NF Forest Plan (as amended by the SNFPA) requires Forest-scale habitat monitoring and bioregional-scale population monitoring for the Modoc sucker; hence, the Modoc sucker effects analysis for the Noxious Weed Treatment Project must be informed by both habitat and population monitoring data. The sections below summarize the habitat and population status and trend data for the Modoc sucker. This information is drawn from the detailed information on habitat and population trends in the Modoc National Forest MIS Report (USDA 2007), which is hereby incorporated by reference.

Habitat Status and Trend

Based on the observations of biologists, habitat availability, as a result of improved cattle allotment management, has increased over the past ten year period (M. Yamagiwa pers. comm.).

Population Status and Trend

Past reports estimated the population of the Modoc sucker to be less than 5,000 individual fish (Moyle 2002) and 2,605 (Ford 1977), with the reproductive (effective) population being 200 and 104, respectively, based on length-frequency analyses (Ford 1977, USFS unpublished data). Moyle and Ford, however, did not census the entire reaches where Modoc suckers are known to exist.

A more recent estimate of the effective population is 3,000 individual fish, which was determined from 1994 surveys conducted by the National Biological Survey (M. Yamagiwa pers. comm.). Population numbers for Modoc suckers is difficult to obtain and interpret. Visual counts have been conducted during night surveys with no definitive population numbers obtained, just distribution. It is known that there is a positive increase in numbers of Modoc suckers where exotic fish (largemouth bass) are removed (S. Reid pers. comm.). Based upon past survey records, it is estimated that the population trend for this species is increasing over the past ten year period (Ibid).

Relationship of Project-Level Impacts to Forest-Scale Habitat and Population Trends for the Species

Mechanical treatment as proposed would not alter or contribute to existing Forest-wide trend in population or distribution.

Herbicide treatment would result in the treatment of 1.93 acres (8 sites) of suitable habitat across the analysis area. Therefore, the impact of the Noxious Weed Treatment Project would not alter or contribute to existing Forest-wide trend in population or distribution for the Modoc sucker.

Goose Lake Redband Trout

Habitat - Species Relationship

Detailed information on MIS for the Modoc NF is documented in the Modoc National Forest MIS Report (USDA 2007), which is hereby incorporated by reference.

The Goose Lake redband trout is a Forest Service sensitive species. The name redband trout is used to cover a complex of distinctive trout that occur in isolated headwater streams of the McCloud, Pit, Klamath, and Columbia River systems of California, Nevada, and Oregon. The Goose Lake basin can be considered a disrupted part of the Sacramento River basin because Goose Lake has overflowed to the Pit River in historical times.

Project-level Effects Analysis based on Habitat

Key Habitat Factors for the Analysis

The Forest Forest Plan identified these species as associated with riparian habitats. These species are found in the lacustrine and riverine CWHR habitat types.

Analysis Area for Project-level Effects Analysis

The Goose Lake redband trout is endemic to Goose Lake and its major tributaries (Lassen and Willow creeks in California and the extensive Thomas Creek system and Crane Creek in Oregon) as well as to smaller streams such as Cottonwood Creek in California and several small streams in Oregon. Berg (1987) reported that Joseph, Parker, and East creeks, tributaries of the upper Pit River in California, contained trout genetically similar to Goose Lake redband trout. It is generally recognized that the native trout of the upper Pit River are Goose Lake redband trout.

Current Condition of the Key Habitat Factors in the Analysis Area

The long-term persistence of this fish depends largely on the health of populations in the headwater streams flowing into Goose Lake in Oregon and California, even though much of the conservation attention has focused on large fish in the lake itself. The extirpation of the lake population during a drought and its subsequent partial recovery indicate the probable importance of downstream colonization of the lake from headwater populations. Because of the high level of concern over extirpation of Goose Lake redband trout (and other native fishes) from Goose Lake when it dried up, conservation efforts have been under way in the watershed, by both agencies and private landowners, to restore streams (e.g., by changing grazing practices) and to remove or alter migration barriers (Moyle 2002).

Alternative 1

Direct and Indirect Effects to Habitat

Potential adverse effects to the aquatic environment from not controlling spread of noxious weeds include but are not limited to, an increase in sedimentation, reduction in stream bank stability, elevated water temperature with the lack of canopy cover, and a potential decrease in the amount of organic matter available to enter affected streams. Without treatment, noxious weeds would likely become widely established across the Forest. This could lead to an increase in soil erosion (sediment deposition) and surface water runoff.

Cumulative Effects to Habitat

As weed infestations become more severe, it becomes more difficult to restore natural or near natural conditions. Conditions arise where instead of using physical + treatments or relatively low applications of low toxicity herbicides, more intensive physical + treatment or intensive applications at higher concentrations of more toxic herbicides may be necessary to control later stages of weed infestations. When this occurs, the risk to the aquatic environment also increases and viability of aquatic species may also be at risk.

It is anticipated, that under the No Action Alternative, there would be an increase in noxious weeds within suitable habitat. The relative cumulative effect to Goose Lake redband trout would be relatively small compared to the existing amount of habitat in the analysis area.

Alternatives 2, 4, and 6

Direct and Indirect Effects to Habitat

Mechanical treatment of weed sites could result in some localized soil disturbance and possibly increased sedimentation of nearby drainages. These effects would be expected to be minor and temporary in duration because of the comparatively few acres of soil disturbance followed by the reclamation and restoration (where appropriate) of treated areas. Treatment would result in better riparian condition, in turn providing more stable and useful aquatic habitat.

Under these Alternatives, potential direct effects to aquatic resources would be primarily associated with herbicide application near streams and associated riparian areas, lakes, or wetlands. Most herbicides are applied in liquid formulations and are sprayed on foliage of the target vegetation. In some cases soil may be a major receptor and contamination can occur by chemicals leaching through the soil to the groundwater and ultimately reaching the aquatic environment. This method of introduction usually poses the least amount of risk to the aquatic environment because chemicals typically disappear from the ground surface by either plant uptake of the chemical, volatilization, and natural decomposition of the active ingredients or adsorption of the herbicide by soil particles. Norris et al. (1991), indicates leaching of chemicals through the soil profile is a process of major public concern, but is least likely to occur in Forest environments. Prevention measures proposed to address this are included as part of the Design Standards. Leaks, spills, and improper storage and handling of containers are the source of most pesticide related groundwater contamination. These impacts can easily be prevented with proper training of personnel and proper storage and disposal of chemicals. Risk from an accidental spill of herbicide into a water body on the Forest is considered low.

Another mode of pesticide entry to the aquatic system includes overland flow from precipitation events. Risk varies depending on soil composition and timing and intensity of precipitation events after application. Risk tends to be lower on well-vegetated forests and rangeland where soil infiltration is typically greater than precipitation. Norris et al. (1991) indicated that overland flow occurs infrequently on most forestland because the infiltration capacity of the Forest floor and soil is usually far greater than the rate of precipitation. Aquatic organisms are more at risk of negative impacts from herbicides in small perennial streams, or during late season when flow is reduced, due to their limited capability for dilution. Prevention measures proposed to address precipitation events are included in the Design Standards. A reduction of noxious weeds in riparian areas and other aquatic habitats would benefit native plant species and result in better stream bank and riparian condition, in turn providing more stable and useful aquatic environments. An indirect effect of these Design Standards is that not all noxious weeds would be chemically treated. Even under the integrated weed management approach, not all weed populations would be eradicated, leaving an available seed source for continued propagation or the unlikely option of weeds being out-competed by native or desirable plant species.

Cumulative Effects to Habitat

The mechanical treatment of weed sites could result in some localized soil disturbance and possibly increased sedimentation of nearby drainages. These effects would be expected to be minor and temporary in duration because of the comparatively few acres of soil disturbance followed by the reclamation and restoration (where appropriate) of treated areas. Treatment would result better riparian condition, in turn providing more stable and useful aquatic habitat.

Mechanical treatment as proposed is not expected to have any direct, indirect, or cumulative adverse effects on these species.

No adverse downstream cumulative effects would be expected from situations involving herbicide runoff or leaching because of the method of application, Best Management Practices (BMPs) and Design Standards to prevent these types of impacts from occurring. See Appendix D for a list of the specific BMPs.

It is not anticipated that there would be any cumulative effects by chemical spraying of noxious weeds due to the use of chemicals at only their prescribed label rate, the relative non-toxicity of the chemicals to other than target (i.e., plant) organisms, the use of riparian Design Standards, and the limited area of chemical treatment. Riparian habitat would benefit by decreasing weeds and the acreages to be treated are very small so there is no direct contact with fish and other aquatic species.

It is anticipated that implementation of these Alternatives, in combination with these past, present, and reasonably foreseeable future actions, would result in the treatment of 12.6 acres (9 sites) of suitable habitat across the analysis area.

Therefore, the cumulative effect to Goose Lake redband trout under these Alternatives would be negligible compared to the amount of existing habitat in the analysis area.

Rainbow Trout, Brown Trout, and Largemouth Bass

The rainbow trout, brown trout, and largemouth bass are MIS game species on the Modoc NF. They are all found in lacustrine and riverine habitats on the Forest. These species have historically been moved and stocked in many streams and lakes of the Modoc NF throughout the 20th century, although many lakes and streams have naturally reproducing populations. It is unknown to what extent naturally reproducing rainbow trout are of native genetic stock, unaffected by hatchery introductions, while all brown trout and largemouth bass are non-native to the area.

Habitat - Species Relationship

Detailed information on MIS for the Modoc NF is documented in the Modoc National Forest MIS Report (USDA 2007), which is hereby incorporated by reference.

Project-level Effects Analysis Based on Habitat

Key Habitat Factor(s) for the Analysis

The Forest Forest Plan identified these species as associated with riparian habitats. These species are found in the following CWHR habitat types: lacustrine and riverine.

Analysis Area for Project-level Effects Analysis

Rainbow trout are widely distributed throughout streams and lakes within the Sierra Nevada bio-region. Rainbow trout habitat on the Modoc is considered abundant and has remained relatively constant since the development of the Forest Plan (M. Yamagiwa pers. comm.).

Brown trout are widely distributed throughout streams and lakes within the Sierra Nevada Bio-region. Brown trout habitat on the Modoc is considered abundant and well distributed at higher elevations across the Forest, primarily on the Warner Mountain Ranger District (M. Yamagiwa pers. comm.).

Available largemouth bass habitat on the Modoc National Forest consists primarily of Big Sage Reservoir with bass occupying several other small reservoirs on the Devil's Garden and Doublehead Districts.

Current Condition of the Key Habitat Factor(s) in the Analysis Area

Several grazing strategies have been implemented on allotments (containing rainbow trout) to improve riparian conditions. Habitat trend for rainbow trout on the Modoc appears to be stable at this time (M. Yamagiwa pers. comm.).

This species has stable populations across the Sierra Nevada Bioregion. Some Forests, including the Modoc National Forest, are actively removing brown trout from streams to restore native fisheries and amphibian populations.

The amount of largemouth bass habitat has remained relatively stable since the development of the Forest Plan, as the existing lakes and reservoirs have not undergone any substantial change in habitat conditions.

Alternative 1

Direct and Indirect Effects to Habitat

Potential adverse effects to the aquatic environment from not controlling spread of noxious weeds include but are not limited to, an increase in sedimentation, reduction in stream bank stability, elevated water temperature with the lack of canopy cover, and a potential decrease in the amount of organic matter available to enter affected streams. Without treatment, noxious weeds would likely become widely established across the Forest. This could lead to an increase in soil erosion (sediment deposition) and surface water runoff.

Cumulative Effects to Habitat

As weed infestations become more severe, it becomes more difficult to restore natural or near natural conditions. Conditions arise where instead of using physical + treatments or relatively low applications of low toxicity herbicides, more intensive physical + treatment or intensive applications at higher concentrations of more toxic herbicides may be necessary to control later stages of weed infestations. When this occurs, the risk to the aquatic environment also increases and viability of aquatic species may also be at risk.

It is anticipated, that under the No Action Alternative, there would be an increase in noxious weeds within suitable habitat. The relative cumulative effect to these species would be relatively small compared to the existing amount of habitat in the analysis area.

Alternatives 2 and 4

Direct and Indirect Effects to Habitat

Mechanical treatment of weed sites could result in some localized soil disturbance and possibly increased sedimentation of nearby drainages. These effects would be expected to be minor and temporary in duration because of the comparatively few acres of soil disturbance followed by the reclamation and restoration (where appropriate) of treated areas. Treatment would result in better riparian condition, in turn providing more stable and useful aquatic habitat.

Under these Alternatives, potential direct effects to aquatic resources would be primarily associated with herbicide application near streams and associated riparian areas, lakes, or wetlands. Most herbicides are applied in liquid formulations and are sprayed on foliage of the target vegetation. In some cases soil may be a major receptor and contamination can occur by chemicals leaching through the soil to the groundwater and ultimately reaching the aquatic

environment. This method of introduction usually poses the least amount of risk to the aquatic environment because chemicals typically disappear from the ground surface by either plant uptake of the chemical, volatilization, and natural decomposition of the active ingredients or adsorption of the herbicide by soil particles. Norris et al. (1991), indicates leaching of chemicals through the soil profile is a process of major public concern, but is least likely to occur in Forest environments. Prevention measures proposed to address this are included as part of the Design Standards. Leaks, spills, and improper storage and handling of containers are the source of most pesticide related groundwater contamination. These impacts can easily be prevented with proper training of personnel and proper storage and disposal of chemicals. Risk from an accidental spill of herbicide into a water body on the Forest is considered low.

Another mode of pesticide entry to the aquatic system includes overland flow from precipitation events. Risk varies, depending on soil composition and timing and intensity of precipitation events after application. Risk tends to be lower on well-vegetated forests and rangelands where soil infiltration is typically greater than precipitation. Norris et al. (1991) indicated that overland flow occurs infrequently on most forestland because the infiltration capacity of the forest floor and soil is usually far greater than the rate of precipitation. Aquatic organisms are more at risk of negative impacts from herbicides in small perennial streams, or during late season when flow is reduced, due to their limited capability for dilution. Prevention measures proposed to address precipitation events are included in the Design Standards. The prescribed widths of the Riparian Conservation Areas (RCAs) are consistent with the Forest Plan as modified by the Sierra Nevada Framework ROD, 2001. The specified distances for perennial streams, lakes and special aquatic features is 300 feet, and 150 feet for seasonally flowing streams. Herbicide treatment for these For Alternatives 2 and 4 are as follows: From the High Water Mark outward to 10 feet to– no herbicide use. From a distance of 10 feet to 150 feet only aquatic Glyphosate may be applied by wicking on the plant. On seasonally flowing streams, Glyphosate, Clopyralid, Dicamba, and Triclopyr may be used farther than 150 feet. On perennial streams, Glyphosate, Clopyralid, Dicamba, and Triclopyr may be used farther than 300 feet. 2, 4-D would not be applied within 1,000 feet of surface or live water. A reduction of noxious weeds in riparian areas and other aquatic habitats would benefit native plant species and result in better stream bank and riparian condition, in turn providing more stable and useful aquatic environments. An indirect effect of these Design Standards is that not all noxious weeds would be chemically treated. Even under the integrated weed management approach, not all weed populations would be eradicated, leaving an available seed source for continued propagation or the unlikely option of weeds being out-competed by native or desirable plant species.

Cumulative Effects to Habitat

The mechanical treatment of weed sites could result in some localized soil disturbance and possibly increased sedimentation of nearby drainages. These effects would be expected to be minor and temporary in duration because of the comparatively few acres of soil disturbance followed by the reclamation and restoration (where appropriate) of treated areas. Treatment would result better riparian condition, in turn providing more stable and useful aquatic habitat. Mechanical treatment as proposed is not expected to have any direct, indirect, or cumulative adverse effects on these species.

No adverse downstream cumulative effects would be expected from situations involving herbicide runoff or leaching because of the method of application, Best Management Practices (BMPs) and Design Standards to prevent these types of impacts from occurring. See Appendix D for a list of the specific BMPs.

It is not anticipated that there would be any cumulative effects by chemical spraying of noxious weeds due to the use of chemicals at only their prescribed label rate, the relative non-toxicity of

the chemicals to other than target (i.e. plant) organisms, the use of riparian Design Standards, and the limited area of chemical treatment. Riparian habitat would benefit by decreasing weeds and the acreages to be treated are very small so there is no direct contact with fish and other aquatic species.

Under these Alternatives, the potential for direct and indirect effects to water quality would be prevented through the application of Design Standards. It is unlikely that these Alternatives would introduce pesticides into either the North/South Fork of the Pit River or Klamath River that are in excess of the applicable Basin Water Quality Plans and would meet state and federal water quality objectives (Adams 2007).

Therefore, the cumulative effect to rainbow trout, brown trout, and largemouth bass under these Alternatives would be negligible.

Alternatives 3 and 5

Direct and Indirect Effects to Habitat

Mechanical treatment of weed sites could result in some localized soil disturbance and possibly increased sedimentation of nearby drainages. These effects would be expected to be minor and temporary in duration because of the comparatively few acres of soil disturbance followed by the reclamation and restoration (where appropriate) of treated areas. Treatment would result in better riparian condition, in turn providing more stable and useful aquatic habitat.

Cumulative Effects to Habitat

The mechanical treatment of weed sites could result in some localized soil disturbance and possibly increased sedimentation of nearby drainages. These effects would be expected to be minor and temporary in duration because of the comparatively few acres of soil disturbance followed by the reclamation and restoration (where appropriate) of treated areas. Treatment would result better riparian condition, in turn providing more stable and useful aquatic habitat.

Mechanical treatment as proposed is not expected to have any direct, indirect, or cumulative adverse effects on these species.

Alternative 6

Direct and Indirect Effects to Habitat

See the discussion on Alternatives 2 and 4. The primary difference is that under this Alternative, the SMZs would be treated for noxious weeds by the use of herbicides other than Glyphosate. From the outer edge of the High Water Mark for a distance of 10 feet, aquatic formulations of Glyphosate may be used. From 10 feet from the edge of the High Water Mark outward, 2, 4-Damine, chlorsulfuron, and Glyphosate may be used. From 25 feet from the edge of the High Water Mark outward Clopyralid, Dicamba, Triclopyr, and Tank Mix #1 (chlorsulfuron + 2, 4-D amine) and Tank Mix #2 (Dicamba + 2, 4-D amine). Outside of 100 feet, ester forms of 2, 4-D may be used in the tank mix.

In the areas under the Lahontan Water Quality Control Board jurisdiction (see Figure 3-2), with Alternative 6 no herbicide treatment will occur from the high-water mark for a distance of 10 feet. From a distance of 10 to 100 feet from the high-water mark, only aquatic glyphosate will be used. At a distance greater than 100 feet from the high-water mark, the other herbicides shown in the Alternative may be applied.

Cumulative Effects to Habitat

In this Alternative, 6.1 acres are within 10 feet of a waterway and 37.5 acres are located within 100 feet of water. The concentrations of herbicides that are proposed to be applied near or adjacent to water (within 25 feet of High Water Mark for streams, lakes, and special aquatic features) are less than label directions and are determined to be a low risk to adversely effect downstream beneficial uses (Adams 2007).

Under these Alternatives, the potential for direct and indirect effects to water quality would be prevented through the application of Design Standards. It is unlikely that these Alternatives would introduce pesticides into either the North/South Fork of the Pit River or Klamath River that are in excess of the applicable Basin Water Quality Plans and would meet state and federal water quality objectives (Adams 2007).

Therefore, the cumulative effect to rainbow trout, brown trout, and largemouth bass under these Alternatives would be negligible.

Terrestrial Wildlife Species

The analysis area for terrestrial species includes the entire Modoc National Forest. This area encompasses about 1.6 million acres of Forest System lands, as well as 337,000 acres of lands administered by other agencies or private landowners. The Forest has a diverse series of habitats, ranging from sagebrush at the lowest elevations to white bark pine at the highest elevations. Special habitats or features that support these species include black oak, aspen, wetlands, cliffs, talus slopes, snags, coarse woody debris, and lava-related features such as tubes, caves, and flows. Some species are limited to specialized habitats such as lava caves and tubes, while others like mule deer are found in all of the habitat types.

Since the publication of the Draft Environmental Impact Statement for the noxious weed project, the Geographical Information System (GIS) data have been updated in 2005; therefore, there will be differences in the information provided between the DEIS and the FEIS and its supporting documentation with respect to noxious weed and wildlife occurrences. Exact acreages were used from the GIS runs, but they were for tracking purposes and not to connote any undue accuracy in the values.

Wildlife Management Direction

Management direction and protection measures for bald eagle and its habitat are provided in a general way within the Endangered Species Act (1973), the Bald Eagle Protection Act (1940), and the Migratory Bird Treaty Act (1918), as well as the Forest Service Manual. Specific direction is found in the Pacific Bald Eagle Recovery Plan and the Modoc National Forest Land and Resource Management Plan (Forest Plan) (USFS 1991a). Although the bald eagle has been de-listed and is now considered a sensitive species, the following direction provides general guidance for management.

With respect to the Endangered Species Act (ESA) (1973), “The purposes of this Act are to provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved, to provide a program for the conservation of such endangered species and threatened species, and to take such steps as may be appropriate to achieve the purposes of the treaties and conventions … [until] the measures provided pursuant to this Act are no longer necessary. Such methods and procedures include, but are not limited to, all activities associated with scientific resources management such as research, census, law enforcement, habitat acquisition and maintenance, propagation, live tarping, and transplantation, and in the

extraordinary case where population pressures within a given ecosystem cannot be otherwise relieved, may include regulated taking."

The Migratory Bird Treaty Act (1918 as amended by PL 99-645 1986) states that, "Except as allowed by implementing regulations, this act makes it unlawful to pursue, hunt, kill, capture, possess, buy, sell, purchase, or barter any migratory bird, including the feathers or other parts, nests, eggs, or migratory bird products. Public Law 95-616 also ratified a treaty with the Soviet Union specifying that both nations will take measures to protect identified ecosystems of special importance to migratory birds from pollution, detrimental alterations, and other environmental degradations."

The Bald Eagle Protection Act (1940) imposes criminal and civil penalties on anyone (including associations, partnerships and corporations) in the U.S. or within its jurisdiction who, unless excepted, takes, possesses, sells, purchases, barters, offers to sell or purchase or barter, transports, exports or imports at any time or in any manner a bald or golden eagle, alive or dead; or any part, nest or egg of these eagles; or violates any permit or regulations issued under the Act. A criminal conviction requires that the violator acted knowingly or with wanton disregard of the consequences.

Forest Service Manual direction states that Forests, "… conduct activities and programs to assist in the identification and recovery of threatened and endangered plant and animal species... Through the biological evaluation process, review actions and programs authorized, funded and carried out by the Forest Service to determine their effect on threatened and endangered species and species proposed for listing." The manual also states that, Forests should, "Identify and prescribe measures to prevent adverse modification or destruction of critical habitat and other habitats essential for the conservation of endangered, threatened, and proposed species. Protect individual organisms or populations from harm or harassment as appropriate." (USFS 1991a)

The Pacific Bald Eagle Recovery Plan (USDI USFWS 1986) provides explicit direction for habitat management and population goals. Although there is no specific direction concerning noxious weed management in the recovery plan, the following guidelines could pertain to the project.

- Maintain and enhance avian and mammalian food sources (1.312 found on page 46).
- Maintain and enhance wetland areas for waterfowl production (1.3121 found on page 47).
- Restrict human disturbance at eagle use areas (1.33 found on page 52).
- Establish buffer zones around nest sites (1.331 found on page 53).
- Exclude logging, construction, habitat improvement, and other activities during critical periods of eagle use (1.332 found on page 53).
- Prohibit vehicle traffic at sensitive key areas during periods of eagle use (1.334 found on page 54).
- Monitor levels of pollutants and the effects they may have on eagles (2.222 found page 61).

In addition, the Modoc Forest Plan (USFS 1991b) direction for the bald eagles from page 4-26 is paraphrased below:

- Implement the Bald Eagle Recovery Plan as applicable to the Modoc National Forest.
- Manage habitats according to the Raptor Management Prescription.
- Survey and manage occupied and potential sites.

Wildlife Risk Assessment Methods and Definitions

The analysis of potential effects to wildlife from the ingestion of herbicides was completed using various sources of information. Syracuse Environmental Research Associates, Inc. (SERA) risk assessments authored by Dr. Patrick Durkin, PhD under contract to the Forest Service, formed a basis for the narratives and tables. David Bakke, USDA Forest Service Region 5 Pesticide Use Specialist, developed the worksheets which contain these tables; they are found within the Project File for the Modoc NF Noxious Weeds Project. In addition, peer-reviewed journal articles provided insights to the potential effects of herbicides on wildlife conducted in field situations (as opposed to laboratory experiments), as well as the potential effects of noxious weeds on wildlife species and their habitats.

The pesticide risk assessment consists of an estimate of the potential doses that different types of wildlife may be exposed to from the application of herbicides under various scenarios (e.g., a large bird consuming herbicide-contaminated vegetation). These doses are then compared against the lowest sub-chronic or chronic "No Observable Effect Level" (NOEL) or the "No Observable Adverse Effect Level" (NOAEL) for a comparable species. The ratio of the dose ingested to the NOEL/NOAEL is called a Hazard Quotient (HQ). The lowest NOEL or NOAEL is based on data from experiments on surrogate species (e.g., rats, dogs, ducks) instead of the species of interest themselves (spotted owls, marten, etc). By using the lowest NOEL/NOAEL regardless of the species, some of the interspecies variability is taken into account.

This analysis includes a variance found within the application rate or the applied concentration of an herbicide, which may change based on local conditions. In addition, some variability occurs in the various scenarios, including the percentage of an animal's diet containing contaminated materials (insects, vegetation, fish, small mammals) or a spill of a chemical into water. In either case, exposure depends on the amount of chemical hypothetically ingested or absorbed by a type of animal (e.g., predatory bird eating contaminated fish, small bird eating contaminated insects, carnivorous mammal eating prey).

The risk is expressed as a central estimate bounded by lower and upper levels. Because of the need to encompass many different types of exposure as well as the need to express the uncertainties in the assessment, this risk assessment involves numerous calculations. These calculations are contained in worksheets in the project file for this FEIS, and are based on the SERA risk assessments for the various herbicides proposed for use in the FEIS. The acute scenarios discussed within the Biological Assessment, the Biological Evaluation, and the Management Indicator Species Report assume that 100% of the diet contains contaminated materials. For the chronic levels (on-site), the lower level consists of 10%, the central level consists of 30%, and the upper level consists of 100% of the diet in contaminated materials.

As described in worksheets, exposure rates are expressed in milligrams (mg) of absorbed dose per kilogram (kg) of body weight per day. For the acute exposure scenario, the estimated residue level is taken as the product of the application rate and the residue rate. For the longer-term exposure scenario, a duration of 90 days is used, and the dissipation on the vegetation is estimated based on the estimated or established foliar halftimes.

The quantitative risk characterization is expressed as the Hazard Quotient, which is the ratio of the estimated exposure doses to the lowest NOEL/NOAEL. The hazard quotient provides a way to relate the risk of the use of the various herbicides, so the decision maker can make an informed decision. Hazard Quotients greater than 1.0 are expressed in standard decimal notation and smaller numbers are expressed in scientific notations, e.g., 7 E-7 equivalent to 7×10^{-7} or 0.0000007.

There are Hazard Quotients for each of the herbicides proposed for use within the Noxious Weed Project FEIS. Additives to the formulations that might be used when herbicides are applied are not considered quantitatively in this risk assessment, with the exception of surfactants containing nonylphenol polyethoxylate as an active ingredient.

Acute exposure -- A single exposure or multiple exposures occurring within a short time (24 hours or less).

Chronic exposure -- Long-term exposure. Lab studies extend over the average lifetime of the species (for a rat, exposure is two years).

No Observable Effect Level (NOEL) – The dose of a chemical at which no statistically or biologically significant increases in frequency or severity of adverse effects were observed between the exposed population and its appropriate control. Effects may be produced at this dose, but they are not considered to be adverse to the organism.

No Observable Adverse Effect Level (NOAEL) **-** The dose of a chemical at which no treatment related effects were observed.

Federally Listed Terrestrial Wildlife Species

The Forest has a diverse series of habitats ranging from sagebrush at the lowest elevations, to white bark pine at the highest elevations. The following table lists the federally listed wildlife species that are present on the Forest. The USDI Fish and Wildlife Service (USFWS) letter, dated July 11, 2005 (1-10-05-105-SP), was used to determine the species that should be included in this analysis. The most current species list was downloaded on June 19, 2008. The analysis includes the species included on both lists.

Table 3 - 71. Federally Listed Species Occurring On or Downstream of the Modoc National Forest

Common Name	Scientific Name	Status
Bald Eagle	*Haliaeetus leucocephalus*	de-listed
Northern Spotted Owl	*Strix occidentalis caurina*	Threatened

The next phase of the analysis process involves deciding which species to carry forward to the effects section. This process is documented in the following table, which details the status of the species, and discloses whether or not they are potentially affected by the Noxious Weeds Treatment Project. As can be seen in the table below, the only terrestrial species potentially affected by the project, which will be carried forward for further analysis, is the bald eagle. The northern spotted owl will not be further discussed because the project does not directly or indirectly affect the habitat, or the Forest-level population trend.

Table 3 - 72. Selection of MIS for Project-Level Analysis for the Noxious Weed Treatment Project

Species	Management Indicator Species	Species whose habitat is not in or adjacent to the project area, and would not be affected by the project.	Species whose habitat is in or adjacent to project area, but would not be either directly or indirectly affected by the project.	Species whose habitat would be either directly or indirectly be affected by the project.
Bald Eagle	X			X
Northern Spotted Owl	X		Only physical + treatments would occur within habitat.	

Consultation to Date

Forest and USDI Fish and Wildlife Service, Klamath Falls [Oregon] Fish and Wildlife Office, personnel have conducted ongoing consultation during the course of the planning effort. Over the years, the lead biologist for USFWS in the consultation process has changed; our new lead for consultation is Rick Hardy. Tony Hawkes, Wildlife Biologist and Contaminants Specialist, has also been included in this consultation process.

US Fish and Wildlife Service correspondences completed for the informal consultation include 1-10-03-I-082, 1-10-98-TA-042, 1-10-99-TA-067, 1-10-01-SP-020, 1-10-03-SP-037, 1-10-03-I-082, 1-10-04-234, 1-10-05-I-021, 1-10-05-SP, and the letter of concurrence dated 8 March 2007. Three meetings between USFS and USFWS have occurred in Klamath Falls at the USFWS office. Mary Flores attended a meeting in Klamath Falls on January 7, 2003 with Leonard Le Captain, Tony Hawkes, and Stewart Reid to discuss the project as it stood at that point in time. On May 20, 2005, Mary Flores, Rick Hardy and Tony Hawkes discussed the weed project, especially in light of the change in the Design Standards for 2,4–D, tank mixes with 2, 4-D, and the addition of chlorsulfuron. A final, Request for Concurrence letter was sent to the Klamath Falls Office November 29, 2006; the concurrence letter for the Modoc NF Noxious Weeds Project is in Appendix A of the terrestrial BA.

In addition, Mary Flores (USFS), Leonard Le Captain (USFWS), Rick Hardy (USFWS), and Tony Hawkes (USFWS) and USFWS front desk staff conducted numerous phone consultations, including, but not limited to October 26, 2000, December 12, 2000, November 18, 2002, November 26, 2002, December 16, 2002, December 18, 2002, January 7, 2003, February 10, 2003, March 31, 2003, December 12, 2003, August 31, 2004, September 14, 2004, November 3, 2004, February 14, 2005, February 15, 2005, March 15, 2005, March 25, 2005, April 5, 2005, August 24, 2005, September 13, 2005, September 19, 2006, and November 13, 2006. Other USFWS offices were contacted on various occasions as well.

Federally Listed Threatened and Endangered Wildlife Species

The following species information is taken from the Biological Assessment located in Appendix V.

Bald Eagle (delisted)

The Modoc NF has bald eagle nest sites dispersed across the Forest, based on data from April 2005. The territories are usually near lakes or streams with abundant fish and waterfowl food supplies. The trend for bald eagle has increased to the point that the US Fish and Wildlife Service is in the process of delisting this species. In certain areas within northeastern California, bald eagle nesting territories have exceeded recovery plan goals (J. Purvine and S. Clay, pers. comm.). There are five bald eagle territories that have the potential for noxious weed treatment on the Forest.

Suitable habitat for bald eagles includes large trees for perching and nesting near lakes and large rivers. Polite et al (1990) state that 87% of bald eagle nest sites in California are within one mile of water, and that bald eagles require "large bodies of water, or free-flowing streams with abundant fish..." for feeding. Shimamoto (1981) suggests that bald eagles require their food supply to be within a mile of their nest. According to Shimamoto and Newman (1981), a suitable feeding site is usually within 12 miles of bald eagle roosts; and winter roosts have not been found greater than 20 miles from nest sites. Winter roosts are isolated stands of late-seral habitat on prominent topography near abundant winter food, which includes waterfowl and carrion. There

are about 21,200 acres of occupied nesting habitat Forest-wide, based on the Forest EVEG data layer; there are 1,100 additional acres of potential habitat utilizing the same vegetation data.

Foraging habitat on the Modoc National Forest often includes lakes, reservoirs, and streams as part of the nest stand. Often agricultural lands adjacent to or within the Forest are part of foraging areas. Bald eagles are frequently seen utilizing carrion (e.g., dead cows), waterfowl, and fish; however, ground squirrel and snake remains have also been found under active nests.

One of the threats to bald eagle has been the ingestion of poisonous substances (USDA 2007b). Between 1947 and 1970, reproduction in most bald eagle populations had declined drastically (various authors in USFWS 1986). Research in the late 1950's through the 1960's indicated that certain organochlorine pesticides (e.g., DDE, the environmental form of DDT) caused excessive eggshell thinning, thereby interfering with productivity (various authors in USFWS 1986). This trend has reversed with the decrease of these pesticides in the environment; however, there is still concern about potential effects to bald eagles from environmental contaminants (USFWS 1986).

Noise and potential harassment of eagles from management activities is also a concern. The most intensive disturbance would come from crews treating the weeds. In a model that assesses the effects of disturbance on breeding bald eagles, researchers found eagles responded differently to stimuli depending on the type and duration of disturbance (Grubb and King 1991). Their findings indicated that pedestrian activities near active nests provided the greatest amount of disturbance, and aircraft provided the least. They also found the distance to the disturbance was the most important aspect of human disturbance. Many studies on eagle and human disturbance have recommended buffers be placed around eagles. The width of these buffers varies with time of the year and the type of disturbance. Grubb and King (1991) recommended that a minimum buffer of 600 meters be instituted around breeding bald eagles. Values of 500 meters (Fraser et al. 1985) and 450 meters (Knight and Knight 1984) for nesting eagles and feeding eagles, respectively, have also been recommended. The restriction used in the Modoc Land and Resource Management Plan (Forest Plan) exceeds these recommendations. The Forest Plan direction is to institute a limited operating period within a ¼ (no line of sight to nest) to ½ mile (line of sight to nest) radius around active nest trees from November to mid August; this period equates to nest maintenance, courtship, incubation, rearing, and fledging of young.

Key Bald Eagle Habitat Factor(s) for the Analysis: The proposed project, the removal of noxious weeds from Forest System Lands, would have no effect on large nest trees, pilot trees, or foraging habitat for bald eagle; bald eagles are not directly tied to the noxious weeds food cover or food. The potential effects consist of the potential ingestion of contaminated prey and disturbance to nesting birds.

Bald Eagle Analysis Area for Project-level Effects Analysis: The analysis area for bald eagle is limited to the 22,300 acres of occupied and potential habitat on the Forest. This habitat is mainly located on the Devil's Garden and Big Valley RD, with scattered location on the rest of the Forest near suitable water bodies.

Alternative Analysis Effects for Bald Eagle Habitat

Alternative 1 (Current Management)

Direct and Indirect Effects to Habitat: The Forest Service currently treats 20 to 30 acres a year by physical + methods. Currently, the Forest does not use herbicides to treat noxious weeds.

Implementing weed treatments under Alternative 1 would have no effect on bald eagle habitat. There would be no change in the current or future amount of nest or pilot trees by the treatment of noxious weeds. Habitat for prey would remain the same or potentially improve. Zero % of the

current bald eagle habitat in the analysis area would be affected by implementation of Alternative 1.

Cumulative Effects to Habitat: Because there is no direct or indirect effect to bald eagle habitat, there are no cumulative effects to bald eagle habitat under this Alternative.

Alternatives 2 to 6

Direct and Indirect Effects to Habitat: GIS runs indicate that there are six noxious weed locations within ½ mile of bald eagle nests, and one noxious weed occurrence within potential habitat on National Forest System lands. There is a maximum of 4.74 acres of physical + treatments and a maximum 4.73 acres of herbicide treatments within occupied bald eagle habitat. Chemical treatments could be significantly less if the 3.84 acres of Mediterranean sage occurrence is treated using physical + methods.

There is an additional 0.08 acres of weeds that could be sprayed in areas typed as potential bald eagle habitat. The Canada thistle (WM009CIAR4) occurrence consists of a series of old beaver ponds that are mostly sedimented into meadow habitat and do not contain fish (M. Yamagiwa, pers. comm.). They were typed as potential bald eagle habitat, due to an artifact in the data set. Therefore, there would be no effect to bald eagle or its habitat by the treatment of this weed occurrence.

Table 3 - 73. Weed Treatments by Alternative in Occupied Bald Eagle Habitat

ID Number	Weed Name	Acres	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6
DG018SAAE	Mediterranean sage	0.53	mech&phys	mech&phys	mech&phys	mech&phys	P/H
DG019SAAE	Mediterranean sage	3.84	mech&phys	mech&phys	mech&phys	mech&phys	P/H
BV186ONAC	Scotch thistle	0.09	P/H	mech&phys	P/H	mech&phys	P/H
BV185ONAC	Scotch thistle	0.09	P/H	mech&phys	P/H	mech&phys	P/H
BV194ONAC	Scotch thistle	0.09	P/H	mech&phys	P/H	mech&phys	P/H
DG006CIAR4	Canada thistle	0.09	none	none	none	mech&phys	herbicide
Total Herbicide			0.27	0	0.27	0	4.73
Total Physical			4.64	4.64	4.64	4.74	4.64

There would be no direct effects to bald eagle habitat by physical + or chemical removal of weeds. No potential nest or pilot trees would be affected by this project.

Terrestrial prey habitat would not be affected by the treatment of current weed occurrences. The largest weed occurrence, the 3.84-acre site of Mediterranean Sage DG019SAAE, is along the river and the highway. It is not a homogenous patch of weeds, so there would be other plants that would remain on site once the areas are treated (B. Raymond and C. Beyer, pers. comm.). All the other weed occurrences are small enough that there would be sufficient prey for eagles to utilize. Using Design Standards for no spray areas that protect Threatened and Endangered Species (TES) aquatic species as well as water quality, should minimize potential contamination of fish.

There may be a beneficial effect to prey habitat by weed removal. Although bald eagles on the Modoc tend to forage on fish, waterfowl, and carrion, there have been remains of ground squirrels and other animals found under active nests. Eliminating weeds, thereby allowing native plants to thrive, could improve potential cover and food for some types of prey.

Under Early Detection/Rapid Response management under Alternatives 4 to 6, additional weed occurrences could be treated. The Forest Service must consult with USFWS before treatment of any new sites in occupied bald eagle habitat is undertaken, in order to mitigate potential negative

effects. Therefore, there are no direct or indirect effects to bald eagle habitat expected by the implementation of any Alternative.

Cumulative Effects to Habitat: Because there are no direct or indirect effects to bald eagle habitat, there are no cumulative effects to bald eagle habitat under this Alternative.

Bald Eagle Population Status and Trend at the Forest Scale

The Standards and Guidelines for bald eagle management found in the Modoc NF Forest Plan (as amended by the SNFPA 2001) focus on the implementation of the Pacific Bald Eagle Recovery Plan, as well as monitoring nesting and wintering bald eagle status. The sections below summarize population status and trend data for the bald eagle. This information is drawn from the detailed information on population trends in the Modoc National Forest MIS Report (USDA 2007b), which is hereby incorporated by reference.

Population Status and Trend at the Bioregional Scale and Local Scales

Population monitoring data is collected by the Modoc NF, as well as state and federal partners. The CDFG has coordinated annual, statewide breeding surveys since 1973 (CDFG 2006). During 1996, 1997, and 1998, 32 new bald eagle breeding territories were reported in California, resulting in a total of 180 territories known to have been occupied at sometime in the 1990s (CDFG 2006). The breeding range has expanded from portions of eight counties in 1981 to 27 of California's 58 counties currently. In addition to a constant upward trend in population, productivity data for the past ten years show that the recovery plan target fledgling rate has been met and relatively constant over this period (SNFPA 2001). Bald eagles have been monitored on Breeding Bird Survey (BBS) routes throughout California. California-wide BBS data for the period of 1966-2004 classifies bald eagle as “Definitely increasing” (Siegel and DeSante 1999) with a significant increase of 12.3% (range 9.2 to 15.3) per year.

Table 3 - 74. Bald Eagle Breeding Population Data for California, 1990 - 1999

Year	No. of Known Territories	No. of Territories Surveyed	No. of Territories Occupied	No. of Young Produced	No. of Young Fledged Per Territory
1990	107	102	94	95	1.1
1991	111	105	90	82	1.0
1992	120	110	99	82	1.1
1993	127	116	102	103	1.1
1994	142	129	116	120	1.1
1995	146	129	105	89	0.9
1996	160	144	124	128	1.1
1997	171	160	142	140	1.1
1998	180	168	148	125	0.9
1999	188	180	151	138	1.0

At the Sierra Nevada scale for the period of 1966-2004, bald eagles were detected at two BBS routes within the Sierra Nevada with a non-significant increase of 52.3% (range 5.5 to 99.2%) per year. Although the Regional Credibility ranking is "Red", due to small sample size and low abundance, this increasing trend is consistent with the trends observed at the State and Survey-wide scales.

Locally, bald eagles have increased as well. Before the Modoc National Forest Forest Plan was finalized, there were 10 active bald eagle territories on the Forest. During the planning phase for the Modoc Forest Plan, a recovery goal of 21 territories of bald eagle was established (USDA 1991b). As of 2005, there were 33 territories found on the Modoc National Forest. The current amount of viable territories is well above the recovery plan and Forest Forest Plan goals. In the last five years, 31 out of 33 territories have produced offspring,, often annually. The distribution for bald eagle has expanded since the time of the Modoc Forest Plan.

Table 3 - 75. Status of Bald Eagle Territories as of April 2006

Modoc National Forest Bald Eagle Breeding Territory Summary	
Number of BE territories before Forest Plan was finalized in 1991	10
Forest Recovery Goal for the # of BE territories per the Forest Plan Final EIS, pg. 3-98	21
Current Number of BE territories on Modoc National Forest as of 2005	33
Number of BE territories with documented nesting activity from 2000-2005	32
Number of BE territories which have produced young from 2000-2005	31

Direct and Indirect Effects of Physical + Methods for all Alternatives on Bald Eagle Populations

Alternatives 3 and 5, as well as the physical + portions of 2, 4, and 6 would have no effect to bald eagles for the following reasons. There would be no chemicals utilized to treat weeds; therefore there would be no chance of ingestion of contaminated prey. In addition, any weed sites to be treated in a given year that are in bald-eagle nesting areas would be surveyed in order to determine reproductive status. If nesting eagles are present, a Limited Operating Period would be instituted up to ½ mile line of sight around active nest sites to minimize disturbance to nesting birds.

Direct and Indirect Effects of the Use of Herbicides (Alternatives 2, 4, and 6) on Bald Eagle Populations

Four out of thirty-three territories currently have weed occurrences that include the use of herbicides under Alternatives 2, 4, and 6. Assuming a maximum of 4.73 acres (0.02%) out of 22,300 acres of occupied and potential habitat Forest-wide could be treated with herbicides.

As can be seen by the table below, the only chemical of concern for bald eagle is 2, 4-D, which has hazard quotient ratings above 1.0 for a predatory bird consuming contaminated fish scenario. This table was generated based on information provided by Syracuse Environmental Research Associates, Inc. and provided by David Bakke, Region 5 USFS Pesticide-Use Specialist and Invasive Plants Coordinator. No other herbicides at the rates proposed for treatment, have hazard quotient ratings over 1.0 for either consumption of contaminated fish or mammals.

Table 3 - 76. Risk Assessment Values and Hazard Quotient Ratings for Acute Toxicity Levels for the Consumption of Contaminated Fish and Contaminated Small Mammals by a Predatory Bird by Chemical. (Acute scenario assumes the consumption of contaminated fish by piscivorous bird after an accidental spill of the pesticide into a pond.)

Chemical/Application Rate	Exposure Assessment Value mg/kg/day or mg/kg/event			Hazard Quotient Rating*		
	Central	Lower	Upper	Central	Lower	Upper
2,4 – D contaminated fish						
a) 1.5 lbs/ac	21.8	7.72	40.9	2.0	0.8	4.0
b) 2.0 lbs/ac	29.1	10.3	54.5	3.0	1.0	5.0
2,4 – D contaminated mammals						
a) 1.5 lbs/ac	4.8	4.8	4.8	0.5	0.5	0.5
b) 2.0 lbs/ac	6.46	6.46	6.46	0.4	0.4	0.4
Chlorsulfuron contaminated fish						
a) 1.0 oz/ac	0.059	0.02	0.1	4×10^{-5}	1×10^{-5}	6×10^{-5}
Chlorsulfuron contaminated mammals						
a) 1.0 oz/ac	0.2	0.2	0.2	1×10^{-4}	1×10^{-4}	1×10^{-4}
Clopyralid contaminated fish						
a) .25 lb/ac	0.09	0.03	0.1	1×10^{-4}	5×10^{-5}	3×10^{-4}
Clopyralid contaminated mammals						
a) .25 lb/ac	0.8	0.8	0.8	1×10^{-3}	1×10^{-3}	1×10^{-3}
Dicamba contaminated fish						
a) 1.0 lb/ac	0.24	0.08	0.4	0.02	6×10^{-3}	3×10^{-2}
b) 2.0 lbs/ac	0.4	0.17	0.899	0.04	0.01	0.07
Dicamba contaminated mammals						
a) 1.0 lb/ac	3.23	3.23	6.46	0.2	0.2	0.2
b) 2.0 lbs/ac	6.46	6.46	6.46	0.5	0.5	0.5
Glyphosate contaminated fish						
a) 3.75 lbs/ac	0.7	0.2	1.3	1×10^{-3}	5×10^{-4}	2×10^{-3}
Glyphosate contaminated mammals						
a) 3.75 lbs/ac	12.1	12.1	12.1	0.02	0.02	0.02
Triclopyr (Acid) contaminated fish						
a) 1.5 lbs/ac	0.452	0.16	0.848	8×10^{-4}	3×10^{-4}	2×10^{-3}
Triclopyr (Acid) contaminated mammals						
a) 1.5 lbs/ac	4.8	4.8	4.8	9×10^{-3}	9×10^{-3}	9×10^{-3}
Triclopyr (BEE) contaminated fish						
a) 1.5 lbs/ac	0.45	0.16	0.848	1×10^{-3}	4×10^{-4}	2×10^{-3}
Triclopyr (BEE) contaminated mammals						
a) 1.5 lbs/ac	4.85	4.85	4.85	0.01	0.01	0.01
NPE contaminated fish **	0.6	0.3	0.9	0.06	0.03	0.09

* Hazard Quotient is a value used to measure risk; values above 1 means there is a potential risk to the species by use of the chemicals at the given rate for the given scenario.

** No contaminated mammal values available

The largest concentration of weeds that could be sprayed in one territory is 4.37 acres along Highway 299. These occurrences of Mediterranean Sage (DG018SAAE and DG019SAAE) do not have a history of foraging use, so ingestion of potentially contaminated materials in this territory is unlikely.

There are 0.36 acres remaining Forest-wide in occupied bald eagle habitat that could be treated using herbicides. There is no concern for treating the 0.36 acres in occupied bald eagle habitat under Alternatives 2 and 4, because none of the weed occurrences use 2, 4-D under either Alternative. Under Alternative 6, only 0.27 acres Forest-wide could be treated with 2, 4-D either by itself or in a tank mix. Canada thistle (DG006CIAR4) is within 25 feet from the water's edge. Based on information from Tony Hawkes, USFWS, a no-spray area of 25 feet from the water's edge is used as the distance for a "Not likely to adversely affect" determination and would be

sufficient for bald eagle protection, especially given our spot treatment of weeds (Design Standard DS-13). It is unlikely to the point of being discountable that bald eagles could consume sufficient amounts of contaminated prey to cause any direct or indirect effects to these birds.

There is little potential of a spill effecting bald eagles on the remaining 0.27 acres Forest-wide in an occupied bald eagle habitat for the following reasons. Weed occurrence of Scotch thistle (BV0186ONAC) is not within 100 feet of a stream, thereby negating the likelihood that a spill would reach fish- bearing waters. The remaining 0.18 acres of weed occurrences are at least 25 feet from water; and Design Standard DS-13 should minimize the potential for contamination of fish. Even using a worst-case scenario, where the two weed occurrences of 0.09 acres (or 0.03% to 0.018% of a territory) in two separate bald eagle habitats had spills, it is not realistic that 100% of an eagles' diet would contain contaminated prey. Therefore, treatment of weed occurrences within occupied bald eagle habitat is not expected to affect bald eagle individuals or the population of bald eagles on the Forest.

Since nests are located within ½ mile of weed occurrences, there is a potential for disturbance to nesting birds. The largest concentration of weeds that could be sprayed in one habitat is 4.37 acres along Highway 299; it is at the edge of that particular territory and would not pose additional significant amount of disturbance. Other sites would be reviewed annually to determine potential for disturbance. Any potential disturbance would be mitigated by the use of a Limited Operating Period (LOP), if needed (DS 10). Annually, a program of work would be presented to biologists, so they can survey nests to determine if the nests are active and require a limited operating period to protect the bald eagle pair.

In light of the information presented above, it is unlikely that there would be direct or indirect effects to individual birds ("Not likely to adversely affect"); there would be no direct or indirect effects to the bald eagle population on the Forest.

Cumulative Effects to Bald Eagle Populations: Because there are no direct or indirect effects to the bald eagle population, there are no cumulative effects to bald eagle population under any action Alternative.

Effects on Habitat and Populations at the Bioregional Scale for the Bald Eagle

The cumulative effects of the Action Alternatives of the Noxious Weeds Project will result in no decrease in Forest-wide habitat for bald eagle. There is no potential effect to the population on the Forest. Therefore, the impact of the Noxious Weeds Project will not alter the existing Forest-wide trend in habitat, nor will it change the existing bioregional-wide trend population distribution of the bald eagle.

Table 3 - 77. Summary of Approximate Annual Acres of Noxious Weed Treatment, by Jurisdiction

	Modoc NF	Other Federal	Tribal*	Private	Total
Pre-Modoc FEIS					
Hand treatments	30	505	26	87	648
Herbicide treatments	0	2,753	23	11,263	14,580
Post Modoc FEIS					
Hand treatments	1,500**	505	26	87	2,118
Herbicide treatments	1,500***	2,753	23	11,263	16,080

* This data includes Ft. Bidwell and Pit River lands

** Maximum treated under Alternative 3

*** Maximum treated under Alternatives 2 and 4; Alternative 6 is a maximum of 522 acres/year

The majority of the bald eagles nesting on the Modoc NF, forage on the Forest, although there is some use of areas off of the Forest, such as Goose Lake. Physical + treatments obviously will not cause any potential poisoning issues. The agricultural fields become more important to foraging eagles in the winter, when spraying does not occur.

There could be a maximum of 1,500 acres sprayed annually on the Forest, or 0.089% of the Forest. Under Alternative 6 that number would decrease to a maximum of 522 acres, or 0.031% of the Forest. About 16,080 acres could have herbicides in roughly 3.5 million acres (Modoc NF and surrounding areas), which would be 0.46% of that gross area.

Given the fact that most eagle foraging occurs away of the weed infestations during the time of active spraying, the small percentage of the area that is treated, and the Design Standards that protect eagles on the Forest specific to the Noxious Weed Treatment Project, there are no cumulative effects expected to bald eagles with implementation of activities in the Noxious Weed Treatment Project in light of other jurisdictions.

T&E Species (Bald Eagle) Determination

Based on the analysis of effects of the project by Wildlife Biologist Mary Flores and with the concurrence of the US Fish and Wildlife Service, it is determined that the Alternatives have the following effects:
Implementation of the Alternative 1 will have “No Effect” on the bald eagle or its habitat.
Implementation of the Alternatives 2, 4, and 6, “May affect, but is not likely to adversely affect” the bald eagle or its habitat.
Implementation of Alternatives 3 and 5 and the physical + treatments under 2, 4, and 6 will have a “No Effect” determination with implementation of the required surveys and limited operating periods (Design Standards).

Sensitive Terrestrial Wildlife Species

The Affected Environment and Environmental Consequences of Sensitive Terrestrial Wildlife Species are displayed below under the Pacific Southwest Region (R5) Sensitive Species and R5 Sensitive Species That Are Also Modoc NF Management Indicator Species headings. R5 Sensitive Species that are also Modoc NF Management Indicator Species are not duplicated in the Management Indicator Species Section. Sensitive Species are described in full in the Biological Evaluation located in Appendix V.

Region 5 Sensitive Species

California Spotted Owl

There are two sub-species of spotted owl found on the Forest: northern spotted owl (*Strix occidentalis caurina*) and California spotted owl (*Strix occidentalis occidentalis*). The northern spotted owl sub-species is addressed in the terrestrial BA prepared for this project. The California spotted owl is discussed below.

Direction in the Sierra Nevada Forest Plan Amendment ROD (USDA 2004) includes the maintenance of Spotted Owl Protected Activity Centers (PACs). Management for the California Spotted Owl was one of the driving forces behind the Sierra Nevada Forest Plan Amendment.

There is only one California spotted owl PAC on the Forest, although extensive surveys (approximately 90,000 acres) to protocol have been conducted throughout the Forest. This PAC is on the Big Valley Ranger District near Manazanita Mountain. There was a pair of California

spotted owls in this PAC during 1993, but since then only single birds have been detected through the 2006 field season (J. Rechtin, pers. comm.). During the assessment of habitats found within California, the California Spotted Owl Team did not delineate the rest of the Modoc National Forest within the main range for the California spotted owl (Verner et al. 1992). The scientists felt that the Modoc NF would be considered a population sink, where individual owls or pairs may establish themselves, but would not contribute genetic material into the main population.

California spotted owls in northern Sierra Nevada are associated with mixed conifer and true fir types that have high canopy covers (>70% for nesting) and medium to large trees (Verner et al. 1992). The Manzanita Mountain owls are found in upper elevation mixed conifer habitat characterized by large old trees, with dense understory stocking of second growth. To date, no nesting or production of young have been documented. There are 1,151.5 acres within the one California spotted owl Protected Activity Center (PAC) on the Forest.

The following information concerning food habits was obtained from Verner et al. (1992). Spotted owls consume a variety of different foods: small mammals, birds, frogs, bats, and insects. The most common prey items for spotted owls consists mainly of northern flying squirrels, woodrats, and gophers. Owls tend to forage in areas with medium to large trees, higher canopy closure, and large amounts of snags and logs, although they have been observed to forage for insects from bark, the ground, and even hawking them from the air (Neal et al. 1989 in Verner et al. 1992).

Effects of the Alternatives on the California Spotted Owl

Key Habitat Factor(s) for the Analysis: The proposed project, the removal of noxious weeds from Forest System Lands, will have no affect on California spotted owl habitat. The spotted owls prefer older seral stage stands with large trees and snags, as well as logs. The potential effects are limited to the consumption of herbicide-contaminated prey materials, and disturbance.

Alternative 1 (Current Management)

Direct and Indirect Effects: The Forest Service currently treats 20 to 30 acres a year by physical + methods. Currently, the Forest does not use herbicides to treat noxious weeds. Therefore, there would be no potential for the consumption of contaminated prey.

Implementing weed treatments under Alternative 1 would have no effect to spotted owl habitat. There would be no change in the current or future amount of large trees and snags or dead and downed materials by the treatment of noxious weeds. There would be no change in the amount of late seral stage habitat. Zero % of the current spotted owl habitat in the analysis area would be affected by implementation of Alternative 1.

Cumulative Effects: Because there would be no direct or indirect effect to the California spotted owl or its habitat, there would be no cumulative effects to spotted owl or its habitat under this Alternative.

Alternatives 2 to 6

Direct and Indirect Effects

Currently, there is one weed occurrence along the road system for a total of 0.1 acres that could be treated within the California spotted owl PAC. This occurrence could be treated by either physical or herbicide means.

Weed treatment by either herbicide or physical means would have no effect on spotted owl habitat. There would be no removal of potential nest/roost trees. Weed treatments of 0.1 acre

would still provide ample residual native vegetation for any potential prey within the 1,151.5-acre PAC. Therefore, weed treatments would have no impact to owl habitat under any alternative.

Disturbance and potential ingestion of contaminated prey are the greatest concerns to the spotted owl. Although there have been no known nest sites within the PAC (including FY 2006), pre-treatment surveys would be conducted to protect nesting owls from disturbance. If owls are actively nesting, a Limited Operating Period (LOP), for weed treatment activities would be instituted to protect nest sites.

There is little chance of owls being affected by the contamination of herbicides. Only 0.009% of the current PAC could receive herbicides. It is highly unlikely that 10% to 100% of the owl's diet would be composed of contaminated prey on such a small site. In addition, none of the herbicides has a hazard quotient above 1 for a predatory bird ingesting contaminated mammals, making the risk of using these herbicides low (Table 3-78). Given the small acreage and the low risk from the herbicides proposed for use, there will be no discernable direct or indirect effects expected to the spotted owl by the implementation of herbicide treatments.

Table 3 - 78. Risk Assessment Values and Hazard Quotient Ratings for Acute Toxicity Levels for the Consumption of Contaminated Small Mammals by a Predatory Bird, by Herbicide Rates

Herbicide/Application Rate	Exposure Assessment Value mg/kg/day or mg/kg/event			Hazard Quotient Rating		
	Central	Lower	Upper	Central	Lower	Upper
2,4 – D						
a) 1.5 lbs/ac	4.8	4.8	4.8	0.5	0.5	0.5
b) 2.0 lbs/ac	6.46	6.46	6.46	0.4	0.4	0.4
Chlorsulfuron 1.0 oz/ac	0.2	0.2	0.2	1 x10-4	1 x10-4	1 x10-4
Clopyralid 0.25 lb/ac	0.8	0.8	0.8	1 x10-3	1 x10-3	1 x10-3
Dicamba						
a) 1.0 lb/ac	3.23	3.23	6.46	0.2	0.2	0.2
b) 2.0 lbs/ac	6.46	6.46	6.46	0.5	0.5	0.5
Glyphosate 3.75 lbs/ac	12.1	12.1	12.1	0.02	0.02	0.02
Triclopyr (Acid) 1.5 lbs/ac	4.8	4.8	4.8	9x10-3	9x10-3	9x10-3
Triclopyr (BEE) 1.5 lbs/ac	4.85	4.85	4.85	0.01	0.01	0.01
NPE	No data	No data	No data	No data	No data	No data

Under the alternatives with Early Detection - Rapid Response activities, new occurrences would be reviewed by wildlife biologists prior to implementation. If concerns for spotted owl surface, additional Design Standards could be added if weed treatments were not consistent with the conditions analyzed above.

Cumulative Effects

Past activities that have affected California spotted owls, or their habitat include the California Pines development (CalPines) which is adjacent to the National Forest. The CalPines area appears to have provided potential habitat for spotted owls at one time. The extensive system of roads, utility corridors and developed lots probably has reduced the suitability for spotted owls. Commercial timber harvest has also occurred on private lands adjacent to the National Forest. These actions included salvage harvest and regeneration harvest prescriptions. Regeneration harvest appears to have removed habitat in the past. Planned private activities include fuel break

construction and maintenance within the CalPines development. Planned Federal activities within the area where California spotted owls may occur include the Rush2 Vegetation treatment project, which is proposing to treat approximately 3,600 acres of National Forest, including the owl-protected activity center and the owl home range core area. Thus, the proposed action for noxious-weed treatment would affect approximately 0.01% of the amount of land affected by the Rush2 project. This proposed project would have no direct effects and would have the indirect effect of potentially affecting a handful of prey items. Thus, the effects of this proposed action are undetectable against the backdrop of on-going projects and insignificant in scope and impact. Thus, this project would not contribute to any cumulative effect trend either positively or negatively.

California Wolverine and Sierra Nevada Red Fox

These species were lumped within this analysis for the following reasons. First, they are both large mammalian carnivores. Second, there is no current definitive evidence that they currently inhabit the Modoc NF. Third, their numbers would probably be low, if they currently exist based on historical sighting information. Finally, their ranges would be restricted to the upper elevations on the Forest, even though they might utilize different habitats within these areas. Therefore, the effects of implementation are similar, even if the magnitudes of potentially affected acreages are different.

The SNFPA FEIS ROD states “Detection of a wolverine or Sierra Nevada red fox will be evaluated by a Forest carnivore specialist. When verified sightings occur, conduct an analysis to determine if activities within five miles of the detection have a potential to affect the species. If necessary, apply limited operating period from January 1 to June 30 to avoid adverse impacts to potential breeding. Evaluate activities of the Wolverine and Sierra Nevada Red Fox for a two-year period for detections not associated with a den site.” (SNFPA FSEIS Record of Decision (ROD), page 54, D-32). (USDA 2004).

Wolverines in California were thought to be rare and declining in the 1950s (Banci in Ruggiero et al. (1994)). There are only a few old unconfirmed sightings of this wide-ranging Forest carnivore on the Forest. Wolverine presence has not been detected during track plate surveys, nor is there any presence of wolverine at baited camera stations placed to detect Forest carnivores. To the south, there have been no confirmed sightings of wolverine on the Lassen National Forest since at least 1980 (B. Turner, pers. comm.).

Habitats used in the northern Sierra Nevada include mixed conifer, red fir, lodgepole pine, and dwarf alpine shrub (Zeiner and others 1990). Wolverines use a wide variety of habitats; caves, hollows in cliffs, hollow logs, rock outcrops, and burrows may be used for cover and dens. “Habitat is probably best defined in terms of adequate year-round food supplies in large, sparsely inhabited wilderness areas, rather than in terms of particular types of topography or plant associations” (Kelsall 1981 in Ruggiero et al. 1994). There are 130,121 acres of the potential wolverine habitat on the Forest. The model utilized a combination vegetation types at elevations 7,000 and greater. The dominant vegetation types included sagebrush and shrub communities, east-side pine, white and red fir, mixed conifer and lodgepole.

Wolverine foraging information came from Ruggiero et al. (1994). Wolverines are considered opportunistic omnivores in the summer and scavengers in the winter. Carrion from large ungulates is considered important. “Wolverines are too large to survive on only small prey”, although small prey are important when large mammal carrion is unavailable.

There were Sierra Nevada red foxes (SNRF) sighted in the Medicine Lake Highlands previous to the 1960s; there was also an unconfirmed sighting of a red fox in the Warner Mountains in the Bucher Creek area (Schempf and White 1977). Although there was a recent sighting of an

unknown red fox near Hackamore on the Devil's Garden RD in pine/bitterbrush habitat in the summer, biologists felt that it was probably an escaped domesticated red fox (Tom Ratcliff, pers. comm.). The most recent sightings of Sierra Nevada red fox occur in the Lassen National Park/Lassen National Forest vicinity. According to Campbell et al. (2000), this species historically maintained a continuous distribution in high-elevation habitats in the Sierra Nevada; it “historically occurred in low densities”.

Habitat for the red fox is not well understood. This fox usually resides in areas above 7,000 feet and seldom is detected below 5,000 feet (Schempf and White 1977). It appears to utilize mixed conifer, red fir and lodge pole pine forests, especially in proximity to meadows and riparian areas as well as brush fields. Forested habitats are used for reproduction and cover; young may be reared in cavities or spaces within rock piles or talus slopes (Campbell et al. 2000). The GIS query for potential habitat included the various vegetation types around wet meadows that occurred above 7,000 feet. The dominant vegetation types in the potential habitat include white fir, mixed conifer, lodgepole pine and wet meadows. There were 18,940 acres of potential habitat modeled for Sierra Nevada red fox (SNRF) on the Forest.

The Sierra Nevada red fox prefers open areas while hunting, grassy parks and meadows, and open Forest stands (various authors in Schempf and White 1977). Diets for SNRF includes small mammals, birds, carrion, and fruits (Zeiner et al. 1990); in the western United States, the red fox diet was composed of mice, chipmunks, microtines, woodrats, squirrels, pikas, and rabbits/hares (various authors in Campbell et al. 2000). Territory size for SNRF is estimated to be greater than 1,700 to 3,900 acres, because the prey base is more limited in the Sierras (Duncan Interagency Workgroup in Campbell et al. 2000).

Effects of the Alternatives on the California Wolverine and Sierra Nevada Red Fox

Key Habitat Factor(s) for the Analysis: The proposed project, the removal of noxious weeds from Forest System Lands, will have no effect on potential wolverine or SNRF habitat. These species use cavities and hollows to rear their young; they do not rely on weeds for food. The potential effects are limited to the consumption of herbicide-contaminated prey and disturbance.

Alternative 1 (Current Management)

Direct and Indirect Effects

The Forest Service currently treats 20 to 30 acres a year by physical + methods. Currently, the Forest does not use herbicides to treat noxious weeds. Therefore, there would be no potential for the consumption of contaminated prey.

Implementing weed treatments under Alternative 1 would have no effect to potential wolverine or SNRF habitat, nor would it affect any individual animals. None of the weed treatments occur within potential habitat for either species. There will be no change in the current or future amount of preferred denning or foraging habitats. Zero % of the current wolverine and SNRF habitat in the analysis area, would be affected by implementation of Alternative 1.

Cumulative Effects

Because there is no direct or indirect effect to the wolverine or SNRF or their habitats, there are no cumulative effects to either species or their habitats under this Alternative.

Alternatives 2 to 6

Direct and Indirect Effects

There are no current occurrences for either species on the Forest. Both of these species are rare, and were included in the analysis because there are historical sightings on the Forest.

There are no weed occurrences within potential SNRF habitat (Table 3-79). Therefore, there will be no effect to either SNRF or its habitat by the implementation of any Alternative.

There is no chance of consumption of contaminated prey for wolverine under Alternatives 3 and 5 (Alternatives where no herbicides will be used), or the physical + treatments in 2, 4, and 6. There are 3.55 acres of weed occurrences within the highest potential wolverine habitat that could be treated by physical + or herbicide means under all five action Alternatives (Table 3-79). Therefore, a maximum of 0.003% of the modeled 130,121 acres of wolverine habitat would be treated by either physical + treatment or herbicides. Treating this small acreage with physical + or herbicide methods will have no biological relevance for a species with a home range greater than 50 miles (home range values from Banci 1994 in Campbell et al. 2000).

Table 3 - 79. Proposed Treatment Acres within Potential Wolverine and SNRF Habitat

Species	Total Acres of Potential Habitat Forest wide	Total Maximum Acres of Physical + Treatments *	Total Maximum Acres of Herbicide Treatments *
Wolverine	130,121	3.55	3.55
Sierra Nevada Red Fox	18,940	0.00	0.00

*This figure includes the maximum, where physical + or herbicide methods may be employed

The maximum acres of potential wolverine habitat treated with herbicide under Alternatives 2 and 4 are 1.5 acres Forest-wide (or 0.001 % of the 130,121 acres potential habitat); under Alternative 6, the maximum acres of habitat treated with herbicide would be 3.55 (or 0.003 % of the potential habitat). The largest weed occurrence is 1.03 acres. None of the weed occurrences are in the Medicine Lake Highlands, which have the highest potential to support wolverine.

No potential den sites will be affected by the implementation of any action Alternative. Potential prey will not be affected; therefore, there are no anticipated direct or indirect effects to denning or foraging habitat for wolverine.

With the small acreage to be treated and its large home range, it is highly unlikely that wolverines would be affected by the consumption of contaminated prey. In addition, the hazard quotient ratings for all the herbicides that could be used to treat weeds on the Forest are less than 1, meaning there is little risk to the animals described given the parameters of the scenario (Table 3-79).

Table 3 - 80. Hazard Quotient for Acute Levels for Mammal Eating Contaminated Mammals

Herbicide/Application Rate	Exposure Assessment Rate			Hazard Quotient Rating		
	Central	Lower	Upper	Central	Lower	Upper
2,4 - D						
a) 1.5 lbs/ac	3.15	3.15	3.15	0.3	0.3	0.3
b) 2.0 lbs/ac	4.2	4.2	4.2	0.4	0.4	0.4
Chlorsulfuron 1.0 lb/ac	0.131	0.131	0.131	0.002	0.002	0.002
Clopyralid 0.25 lb/ac	0.525	0.525	0.525	0.007	0.007	0.007
Dicamba						
a) 1.0 lb/ac	2.1	2.1	2.1	0.05	0.05	0.05

Herbicide/Application Rate	Exposure Assessment Rate			Hazard Quotient Rating		
	Central	Lower	Upper	Central	Lower	Upper
b) 2.0 lbs/ac	4.2	4.2	4.2	0.09	0.09	0.09
Glyphosate 3.75 lbs/ac	7.87	7.87	7.87	0.04	0.04	0.04
Triclopyr (Acid & BEE) 1.5 lbs/ac	3.15	3.15	3.15	0.03	0.03	0.03

When reviewing the literature, disturbance is the most likely potential effect to wolverine or SNRF. Wolverines choose natal den sites with high-elevation rocky substrates; the California sites were under rocky ledges above 10,000 feet elevation (various authors in Campbell 2000). Denning occurs in late winter and early spring for wolverine (Campbell 2000). SNRF young are born March to May (Zeiner et al. 1990). It is unlikely that weed treatment activities will affect wolverine or SNRF, because the habitats with the greatest potential of occupancy will be inaccessible during weed treatment implementation times. Under the Alternatives with Early Detection/Rapid Response activities, new occurrences will be reviewed by wildlife biologists prior to control implementation; if concerns for wolverine or SNRF surface, additional requirements could be added, if weed treatment areas were outside of the conditions analyzed within the FEIS.

Given the small acreage to be treated, the low risk associated with the herbicides proposed for use on these species, and the low potential for disturbance, there are no direct or indirect effects for wolverine or SNRF or their habitats by the implementation of Alternatives 2 through 6.

Cumulative Effects: Because there are no direct or indirect effects to the wolverine or SNRF or their habitat, there are no cumulative effects to either species or their habitats under Alternatives 2-6.

Great Gray Owl

Great gray owls have been detected near Medicine Lake (Doublehead). In addition, a great gray owl was seen at Crowder Flat Guard Station (Devil's Garden) on a few occasions in 1993 (T. Ratcliff and M. Flores, pers. comm.). During the planning process for Sierra Nevada Forest Plan Amendment (USDA 2004), three great gray owl Protected Activity Centers (PACs) were established on the Warner Mountains, although there has never been conclusive evidence of occupancy. Great gray owls are uncommon throughout their range (Bull et al. 1989b).

The Sierra Nevada Forest Plan Amendment ROD (USDA 2004) direction manages these owls using a series of Protected Activity Centers and survey. Maintaining meadow vegetation within and adjacent to PACs will improve habitat for voles and pocket gophers, the Great Gray Owl's prey. (SNFPA FEIS, page 292 and the Final Supplemental Environmental Impact Statement (FSEIS ROD, page 39) (USDA 2004).

Although they are usually associated with dense, timbered stands with large, open meadows nearby, great gray owls in northeastern Oregon nested in all types of forests; however, nests were more prevalent in over-mature or remnant stands of Douglas fir and grand fir Forest on north facing slopes (Bull and Duncan 1993, Bull et al. 1988). On the average, there are 3.2 larger live trees per acre (19.6 inches DBH) and 1 larger diameter snag (19.6 inches DBH). On their study site, Bull et al. (1988) found that 68% of the stick nests used by great gray owls were originally made by northern goshawks. Roosts sites were also in stands with 11 to 59% canopy cover.

Habitat on the Forest for great gray owl was estimated in the following manner: quantification of the acreages within the PACs, and modeling of potential habitat. Within the great gray owl PAC's set up by the Sierra Nevada Forest Plan Amendment (USDA 2004), there are a total of 598 acres of assorted vegetation types: lodgepole pine, Sierran mixed conifer, white fir, wet meadow, and sagebrush. An additional 2,025 acres of potential nesting habitat were modeled using EVEG data: mixed conifer, eastside pine, ponderosa pine, Jeffrey pine, Douglas-fir, white fir, red fir, and

lodgepole pine with a tree size = 4, 5, 6 and canopy cover = 40% or greater, that were within 1,000 feet of meadows.

Meadows associated with nest stands need to contain enough cover to provide for prey. Diets for great gray owls consisted mainly of voles and pocket gophers (Bull et al. 1989a). Males preferentially foraged in stands with 11 to 59% canopy cover, and avoided clearings.

Effects of the Alternatives on the Great Gray Owl

Key Habitat Factor(s) for the Analysis: The proposed project, the removal of noxious weeds from Forest System Lands, will have no affect on great gray owl habitat. Great gray owls prefer older seral stage stands with large trees and snags, as well as logs near meadows. The main potential effect is limited to the consumption of herbicide-contaminated prey materials.

Alternative 1 (Current Management)

Direct and Indirect Effects

The Forest Service currently treats 20 to 30 acres a year by physical + methods. Currently, the Forest does not use herbicides to treat noxious weeds. Therefore, there would be no potential for the consumption of contaminated prey. None of the treatment areas are within the great gray owl PAC's, therefore there will be no disturbance to owls by physical + treatments.

Implementing weed treatments under Alternative 1 would have no effect on great gray owl habitat. There will be no change in the current or future amount of large trees and snags or dead and downed materials by the treatment of noxious weeds. There would also be no change in the amount of late seral stage or meadow habitat. Therefore, 0% of the current great gray habitat in the analysis area would be affected by implementation of Alternative 1.

Cumulative Effects

Because there is no direct or indirect effect to the great gray owl or its habitat, there are no cumulative effects to great gray or its habitat under this Alternative.

Alternatives 2 to 6

Direct and Indirect Effects

There are no weed treatments within any PAC or any potential habitat, so no great gray owl habitat would be affected by weed treatments. Nor would there be any disturbance or consumption of contaminated prey expected with implementation of the project. Therefore, there would be no effects to individual birds.

Under the Alternatives with Early Detection/Rapid Response activities, new occurrences would be reviewed by wildlife biologists prior to implementation. The herbicides proposed for use have low hazard ratings for predatory birds consuming contaminated prey (Table 3-78). Depending on the size of the new weed occurrences, there should be little risk of effects by the consumption of contaminated prey. If concerns for great gray owl surface, additional Design Standards could be added if weed treatment areas were outside of the conditions analyzed within the FEIS.

As stated above, there would be no treatments within any great gray owl PACs or potential habitat. Therefore, there will be no direct or indirect effects to great gray owl or its habitat by implementation of Alternatives 2 through 6.

Cumulative Effects

Because there is no direct or indirect effect to the great gray owl or its habitat, there are no cumulative effects to the great gray owl or its habitat under these Alternatives.

Pallid and Townsend's Big-eared Bats

These species were lumped within this analysis for the following reasons. First, they are both mammalian insectivores. Second, there would not be any proposed treatment of roost sites for either species. Therefore, the effects of implementation are similar even if the magnitudes of potentially affected acreages are different.

Although not highlighted specifically in the SNFPA Record of Decision, pallid bat direction consists of conservation measures listed in Volume 3 of the Sierra Nevada Forest Plan Amendment (USDA 2001, page 55 of Chapter 3, part 4.4). These measures are paraphrased as follows: Provide for hardwood stands into the future (especially older stands, to produce healthy hardwood crowns or regeneration as well as adequate flight space), adopt mine and cave plans, and develop a mosaic of stands in chaparral.

Pallid bats have been found during hazard-tree removal and snag topping projects on the Forest; the individuals found were roosting under the bark of large pine snags.

Pallid bats appear to prefer open, dry habitats with rocky areas for roosting and foraging (Zeiner et al. 1990, Philpott 1997). Radio tracking surveys by Southern Oregon State College found pallid bats roosting most commonly in large pine snags and occasionally in large live pine. They will also, on occasion, roost in rock crevices (Vaughan and O'Shea 1976) or man-made structures; a maternity roost with 39 bats was found in the side entrance way of a college boarding house in Inyo County (Szewczak et al. 1998). Night roosts in central Oregon were located in buildings, under rock overhangs, and under bridges (Lewis 1994). There are approximately 256,000 acres of habitat with a large pine component that could act as potential habitat Forest wide.

Pallid bats are mainly insectivorous; however, they have been known to eat lizards and smaller bats while in captivity, as well as fruits and seeds (although there is speculation as to whether these events happened incidentally, while bats were feeding on insects on the plant parts) (Hermanson and O'Shea 1983). These bats may feed on insects taken from the ground or from the surfaces of vegetation (Hermanson and O'Shea 1983, Zeiner et al. 1990), but may also forage over open ground 0.5 to 2.5 meters (1.6 to 8 feet) above the ground (Zeiner et al. 1990). Pallid bats were documented to forage 1 to 3 miles from their day roost (Zeiner et al. 1990).

Townsend's big-eared bats (TBEB) roost in the lava caves on Doublehead RD near Lava Beds National Monument. There are scattered mine shafts elsewhere on the Forest that have the potential to support these bats. The High Grade Area in the northern Warner Mountains has the highest concentration of mines; however, there are also small, localized areas in the Medicine Lake Highlands, Adin Pass, and the Stone Coal area.

This species is dependent upon caves, mines and buildings for roosting habitat (Campbell and MacFarlane 2000; Zeiner et al. 1990). Caves need to meet specific microclimatic conditions for successful roosting, and this species is very susceptible to disturbance (Campbell and MacFarlane 2000). In the Inyo Mountains, this species has been seen roosting in lava tube caves (Szewczak et al. 1998). This species has been documented to use sage-brush-grass steppe, juniper woodlands, and mountain brush communities in Utah (Sherwin et al. 2000). There are approximately 214,000 acres of foraging habitat within 10.5 kilometer of occupied caves. The habitat types from this query include bitterbrush, eastside pine, sagebrush, juniper, and mixed conifer. There is no GIS data for lava tube and mines, so additional potential habitat could not be modeled.

TBEBs utilize caves, mine tunnels, and buildings for nursery colonies (Pierson 1988); they will return to these areas annually, if not disturbed. Hibernating sites tend to be structurally stable caves (Pierson 1988). In the Inyo and White Mountains, hibernation was considered to occur from November to March (Szewczak et al. 1998).

They feed in a wide variety of habitats from open agricultural fields to dense Forest (Pierson 1988). Foraging habitats are varied, but this species concentrates primarily on moths (Zeiner et al. 1990). Although they are very specialized in their diet and take mostly moths, they have also been observed to feed on Neuroptera, Coleotera, Diptera, Hymenoptera (Kunz and Martin 1982). Data from California show that these bats may forage up to 10.5 km from the day roost, as well as tended to forage in the same areas each night (Fellers and Pierson 2002). There are reports of these bats gleaning insects from foliage (Zeiner et al. 1990); however, in a study from California, they usually capture prey 10 to 30 meters off the ground between mid to top of the canopy (Fellers and Pierson 2002).

Effects of the Alternatives on the Pallid and Townsend's Big-eared Bats

Key Habitat Factor(s) for the Analysis: The proposed project, the removal of noxious weeds from Forest System Lands, will have no affect on pallid bat or TBEB habitat. These bats roost in large trees, snags, caves, and rock crevices; none of these structures will be affected by weed-treatment activities. The potential effects are limited to the consumption of herbicide-contaminated prey and disturbance.

Alternative 1 (Current Management)

Direct and Indirect Effects The Forest Service currently treats 20 to 30 acres a year by physical + methods. Currently, the Forest does not use herbicides to treat noxious weeds. Therefore, there would be no potential for the consumption of contaminated prey.

Implementing weed treatments under Alternative 1 would have no effect on the habitat for either bat species. There will be no change in the current or future amount of large trees and snags or caves by the treatment of noxious weeds. There would be no change in the amount of potential prey habitat, as there will be ample native plants for insects to use as food and cover. Therefore, 0% of the current bat habitat in the analysis area would be affected by implementation of Alternative 1.

Cumulative Effects Because there is no direct or indirect effect to the pallid or TBEB or their habitat, there are no cumulative effects to pallid or TBEB or their habitat under this Alternative.

Alternatives 2 to 6

Direct and Indirect Effects

Physical + and herbicide weed treatments will not affect pallid and TBEB roosting or foraging habitat by implementation of any action Alternatives. As stated in the SNFPA FSEIS (p. 419) roost sites are the primary limiting factor for Pallid and Townsend's Big-eared bats (USDA 2004). A maximum of 2,586.59 acres of pallid bat potential habitat could receive physical + treatments and a maximum of 2,582.8 acres could receive herbicide treatments. A maximum of 1,939.23 acres for physical + treatment and a maximum of 1933.8 acres for herbicide treatments could occur in potential TBEB habitat. Therefore, 0.91% of the 214,000 acres of potential TBEB habitat could be treated Forest-wide and 1.01% of the 256,000 acres of potential pallid bat habitat Forest-wide could be treated (Table 3-81).

Table 3 - 81. Proposed Treatment Acres within Potential Pallid and Townsend's Big-eared Bat Habitat

Species	Total Acres of Potential Habitat Forest wide	Total Maximum Acres of Physical + Treatments *	Total Maximum Acres of Herbicide Treatments *
Pallid bat	256,000	2,586.59	2,582.8
Townsend's big-eared bat	214,000	1,939.23	1,933.8

*This figure includes the maximum, where physical + or herbicide methods may be employed

Although there are large acreages of weeds that could be treated either physical + ly or with herbicides within the potential foraging habitat for both species under Alternatives 2, 3 and 4, the effect to prey habitat should be minor for the following reasons. First, the vast majority of the weed patches are less than one acre (33 out of 35 weed occurrences for TBEB and 101 out of 109 for pallid bat). There are native plants that these insects can use in the matrix and directly adjacent to the weed occurrence. Second, revegetation of bare areas will provide food and cover for insects in the absence of the weeds. Finally, both bats utilize a wide variety of habitats for foraging, so they are not tied to one given area or vegetation type.

Disturbance is not an issue for Townsend's big eared bats, since weed treatment activities would be away from caves. Based on personal observations during snag improvement projects, George Studinksi (pers.comm.) noted that pallid bats did not fly from roost trees when contractors were within stands working on the habitat improvement projects; therefore, physical + treatments and pump sprayers (which are quieter than chainsaws) are expected to cause little disturbance; the exception would be weed whackers, which could be noisy and provide a source for disturbance.

Pallid bats would have a potential risk of both direct contact with the herbicides and ingestion of contaminated insects, since they have been known to forage on the ground or from the surface of the vegetation. The drying times for herbicides are such that herbicides sprayed in the later afternoon would not be dry until after dark, when pallid bats would be out. The greatest potential for effect would be under Alternatives 2 and 4 in DH013ISTI (dyer's woad), where up to 2,500 acres could be treated with herbicides. There would be little potential effect for direct contact under Alternative 6, because only the fringes of this weed occurrence would be treated.

Townsend's big eared bats (TBEB) are aerial foragers (Campbell and MacFarlane 2000); therefore, there should be no direct contact with herbicides. However, some contaminated insects could be sprayed and consequently ingested, especially within larger weed occurrences.

The herbicides with the highest risk are 2, 4 –D and their associated tank mixes and Dicamba (2 lbs/acre) at all rates, as well as the higher concentrations of Dicamba (1 lbs/acre), Glyphosate, and Triclopyr (Table 3-82). The herbicide 2, 4-D is of the greatest concern under this scenario, because the hazard quotient exceeds 1 in all levels. Based on the SERA for 2, 4-D, the effects to small mammals includes neurotoxicity and some degenerative changes to various organs; these effects, although not fatal, could certainly make individual animals more susceptible to predation depending on the amount of herbicide consumed. It is important to note that this risk scenario assumes that 100% of the bats' diet would be contaminated. The two bat species' foraging behaviors only make this scenario realistic within the larger weed occurrences.

Table 3 - 82. Hazard Quotient for Acute Levels for Small Mammal Eating Contaminated Insects (100% of the diet)

Herbicide/Application Rate	Exposure Assessment Rate			Hazard Quotient Rating		
	Central	Lower	Upper	Central	Lower	Upper
2,4 - D						

Herbicide/Application Rate	Exposure Assessment Rate			Hazard Quotient Rating		
	Central	Lower	Upper	Central	Lower	Upper
a) 1.5 lbs/ac	34.7	34.7	104	3.0	3.0	10.0
b) 2.0 lbs/ac	46.3	46.3	139	5.0	5.0	14.0
Chlorsulfuron 1.0 lb/ac	1.45	1.45	4.34	0.02	0.02	0.06
Clopyralid 0.25 lb/ac	5.78	5.78	17.3	0.08	0.08	0.2
Dicamba						
a) 1.0 lb/ac	23.1	23.1	69.4	0.5	0.5	1.5
b) 2.0 lbs/ac	46.3	46.3	139	1.0	1.0	3.0
Glyphosate 3.75 lbs/ac	86.7	86.7	260	0.5	0.5	1.5
Triclopyr (Acid & BEE) 1.5 lbs/ac	34.7	34.7	104.0	0.3	0.3	1.0

For both TBEB and pallid bats, herbicide treatment of DH013ISTI (dyer's woad) could have negative effects under Alternatives 2 and 4, where a roughly 2,000-acre block would be sprayed. Since bats may forage in the same areas each night, individuals for either species might ingest a significant portion of contaminated insects. This is not the case for this weed occurrence under Alternative 6, where only the treatment of the periphery of this occurrence is planned.

Outside of the DH013ISTI (dyer's woad), there are 4.06 acres of potential Townsend's big-eared bat habitat that could be treated. There is 1 acre of DH001HYPE (Klamathweed) that is scheduled for physical + treatment under Alternatives 2 and 4; it could be treated with either physical + or herbicidal methods under Alternative 6. The remaining 3.06 acres are dispersed among 19 weed occurrences, and do not appear to have risks associated with implementation of Alternatives 2, 4 and 6, because of their small sizes.

In potential pallid bat habitat, eight additional weed occurrences are greater than one acre (outside of the DH013ISTI [dyer's woad]). Two weed occurrences (WM002CEDI3 [diffuse knapweed] and DG024SAAE [dyer's woad]) are scheduled for physical + treatments under all Alternatives and would therefore pose no risk to pallid bats.

The remaining occurrences could have herbicidal treatments and therefore may pose a risk to pallid bats. Under Alternatives 2 and 4, 30.98 acres of BV001CRVU2 (Crupina) could be sprayed. Since bats may forage in the same areas each night, individual pallid bats might ingest a significant portion of their diet in contaminated insects. Although Glyphosate is the preferred herbicide for the treatment of crupina, 2, 4-D could be used. As stated above, the hazard quotient is above 1.0 for all levels of 2, 4-D (Table 3-82). Therefore, some individuals could consume 100% of their diet in contaminated insects and consequently could suffer effects (including making them more susceptible to predation). This is not the case for the weed occurrences under Alternative 6, because only the periphery is proposed for treatment for this crupina occurrence.

About seven acres of BV006LIDA (Dalmatian toadflax) could be sprayed under Alternatives 2 and 4. Bats foraging in a seven-acre block that has been treated with herbicides could undergo effects of herbicide ingestion, especially from 2, 4-D. However, the lava country does not produce the same amount of insects as the more mesic sites; therefore, it would be difficult for bats foraging in an area this size to consume 100% of their diet (B. Turner, pers. comm.). Under Alternative 6, only small satellites from the main weed occurrence could be sprayed; treatment of BV006LIDA (Dalmatian toadflax), which would pose no risk to pallid bats.

Potentially, 32.20 acres of WM003LIDA (Dalmatian toadflax) could be treated with herbicides under Alternatives 2, 4 and 6. The impact is relatively small for the following reasons. Under Alternatives 2 and 4, there would be no 2, 4-D used on the site, because it is within 1,000 feet of water. Under Alternative 6, there would be no 2, 4-D used on the site, because it is larger than 2 acres. Design Standard DS-12b caps the size of weed occurrences treated with 2, 4-D to less than 2 acres. The other herbicides do not have hazard quotient ratings above 1.0 at the lower and central levels, and therefore pose less risk to mammals consuming insects under the above

scenario. The second reason is the relatively small amount of toadflax present in the weed occurrence. The site is basically a large, contiguous matrix of native plants with small clumps of weeds (many of the patches of weeds were 10 feet by 10 feet). Although the entire weed occurrence encompasses roughly 40 acres, the weeds are actually distributed in small clumps, found in lava rock talus, an old road bed, and along old, dry, rocky streambeds. There were no toadflax plants along the main channels of Lassen Creek. Consequently, the chance of a pallid bat's diet containing 10% to 100% contaminated insects would be remote under Alternatives 2, 4 or 6 for this weed occurrence.

There are two additional weed occurrences above 1.0 acre in potential pallid bat habitat, where herbicides may be applied. There are 2.46 acres in BV302ONAC (Scotch thistle) and 1.13 acres in WM018ISTI (dyer's woad). These occurrences are not expected to be large enough areas, where pallid bats could consume 100% of their diet in contaminated insects given the bats' prey and foraging habits. As stated previously, the remaining 101 out of 109 sites are small (less than one acre) and scattered throughout the Forest, so there would not be large acreages where herbicides are concentrated within potential pallid bat habitat. Therefore, there is little anticipated risk for pallid bats to consume harmful levels of contaminated insects outside of DH013ISTI (dyer's woad) and BV001CRVU2 (crupina).

Under the Alternatives with Early Detection/Rapid Response activities, up to 100 acres per year could be treated Forest-wide. New occurrences will be reviewed by wildlife biologists prior to implementation to insure protection requirements are in place.

To reiterate, the action Alternatives may impact individuals, but they are not likely to cause a trend toward listing for Townsend's big-eared bat. The potential effects under Alternative 6 are vastly smaller than Alternatives 2 and 4 for TBEB, because only 4.06 acres could be treated with herbicides Forest-wide. In addition, no roost site will be affected, which is the primary limiting factor for this species.

The action Alternatives may impact individuals, but they are not likely to cause a trend toward listing for pallid bat. The potential effects under Alternative 6 are vastly smaller than Alternatives 2 and 4, because only the periphery of the large weed occurrences could be treated. As with the TBEB, no roost site will be affected, this is also a limiting factor for pallid bats.

Cumulative Effects

There are past, present, and reasonably foreseeable activities that cause disturbances to both bat species. Disturbance at roost sites is a critical issue for both species, and the potential effects of timber management, recreation and mineral development at known roost sites would need to be addressed site specifically under the appropriate NEPA decision, or working with the special-use coordinator.

There are weed treatments using herbicides on the Lava Beds National Monument that could occur in potential Townsend's big-eared bat (TBEB) foraging habitat. Weed treatments on the Lava Beds National Monument consist of a combination of physical + and herbicide treatment using Glyphosate. The Park personnel treated 473 acres, spraying approximately 10% of the area. There would be a low risk from additional consumption of contaminated insects, because the hazard quotient for Glyphosate exceeds one only at the upper levels. Under the upper-level scenario, the bats would need to consume 100% of their diets in contaminated insects. Given TBEB foraging strategies and prey preferences, this scenario is unlikely. For pallid bats, there are no known additional herbicides within the foraging habitat for the Modoc National Forest.

Based on the information presented in this cumulative effects section, the implementation of Alternatives 2 through 6 may have an incremental impact on individual Townsend's big-eared

and pallid bats; however, no roosts will be affected by the implementation of activities described within the Noxious Weeds Treatment Project. According to the SNFPA Final Supplement Impact Statement (2004) (Appendix C page 419), "They [pallid and Townsend's big-eared bats] appear to be most impacted by physical + changes or human disturbance of roost sites." Therefore, Alternatives 2 through 6 may impact individuals, but are not likely to cause a trend to federal listing or a loss of viability for either species.

Introduction to Management Indicator Species

Over the past fifteen years there have been changes to the status of the species covered under the Modoc NF MIS list. The federally listed and Forest Service sensitive species were based on the lists current for 1991. For example, in 1991, peregrine falcon was a federally listed species; currently, it is a Forests Service sensitive species.

The Forest-wide MIS report summarizes the current known information about the Forest-scale population distributions and relationships to habitat of the MIS listed within the Modoc NF Forest Plan (USDA Forest Service 1991). The Modoc NF Forest Plan (USDA Forest Service 1991) requires a combination of species monitoring and habitat status, depending on the MIS (Table 3-83). Appendix E of the Sierra Nevada Forest Plan Amendment (SNFPA) FEIS (USDA Forest Service 2001) as adopted by the 2004 SNFPA Record of Decision (ROD; USDA Forest Service 2004) amended the direction for species monitoring. The requirements for habitat monitoring are still found in the Modoc NF Forest Plan (USDA Forest Service 1991, Chapter 5, pages 5-1 to 5-22). Table 1 displays the Modoc National Forest MIS and their current monitoring requirements.

Table 3 - 83. Monitoring Requirements for the MIS on the Forest (USDA 2001 as amended by SNFPA 2004)

MIS	MIS Monitoring Requirements	
	Habitat[b]	Population[a]
American Marten	Vegetation mapping, down log & snag transects	Bioregional - status & change in geographic distribution
Bald Eagle	Vegetation surveys, Habitat capability analyses	Recovery Plan
Bighorn Sheep	N/A - Extirpated	N/A - Extirpated
Blue/Sooty Grouse	Vegetation mapping	Distribution population
Brook Trout	Stream/lake habitat surveys	Distribution population
Brown Trout	Stream/lake habitat surveys	Distribution population
Canada Goose	Livestock utilization measurements	Distribution population
Golden Eagle	Habitat utilization assessment	Distribution population
Goose Lake Redband Trout	Stream surveys, Photo points	Distribution / relative abundance
Greater Sandhill Crane	Livestock utilization measurements	Distribution population
Hairy Woodpecker	Snag, down log transects; vegetation mapping	Distribution population
Largemouth Bass	Stream/lake habitat surveys	Distribution population
Lost River Sucker	Stream surveys, Photo points	Recovery Plan
Mallard	Livestock utilization measurements	Distribution population
Modoc Sucker	Stream surveys, Channel profiles, Photo points	Population sampling [b]
Mule Deer	Vegetation sampling and mapping	Distribution population
Northern Goshawk	Ground surveys and vegetation measurement	Bioregional - status & change
Osprey	Habitat utilization assessment	Distribution population
Peregrine Falcon	Ground surveys during and after reintroduction efforts	Distribution population

MIS	MIS Monitoring Requirements	
	Habitat[b]	Population[a]
Pileated Woodpecker	Snag transects, down log transects, vegetation mapping	Distribution population
Prairie Falcon	Habitat utilization assessment	Distribution population
Pronghorn	Habitat surveys including ecological condition (e.g., vegetation mapping, condition and trend, etc.)	Distribution population
Rainbow Trout	Stream/lake habitat surveys	Distribution population
Red-breasted Sapsucker	Vegetation sampling, photo points	Distribution population
Red-naped Sapsucker	Vegetation sampling, photo points	Distribution[c]
Sage Grouse	Habitat surveys including ecological condition (e.g., vegetation mapping, condition and trend, etc.)	Distribution population
Shortnose Sucker	Stream surveys, Photo points	Recovery Plan
Spotted Owl, Northern	Vegetation mapping / analysis	Recovery Plan
Swainson's Hawk	Habitat utilization assessment	Distribution / relative abundance
Western Gray Squirrel	Vegetation mapping	Distribution population
Willow Flycatcher	Vegetation sampling, photo points	Bioregional status and change
Yellow Warbler	Vegetation sampling, photo points	Distribution population

[a] Sierra Nevada Forest Plan Amendment, Appendix E

[b] Modoc NF Forest Plan (USDA Forest Service 1991)

[c] Monitoring requirements are in essence the same as the “Distribution population” data.

As discussed in Appendix E of the 2001 SNFPA (USDA Forest Service 2001), there is a wide range of monitoring data that can be used to describe the change in populations. Some of these methodologies involve following the recovery plan for any listed species. Other monitoring is conducted as part of a larger, bioregional effort such as the information collected for willow flycatcher. Under the SNFPA, two additional types of monitoring were introduced into the Modoc National Forest Forest Plan requirements: distribution population monitoring and relative abundance population monitoring.

Distribution population monitoring consists of collecting presence data for the MIS across a number of locations. Over time, changes in the distribution of the MIS may be identified and tracked. Presence data is collected using a number of direct and indirect methodologies, including but not limited to, bird point counts, herd composition counts run by California Department of Fish and Game, tracking numbers and locations of hunter takes, as well as queries of various databases housed at universities.

Relative abundance population monitoring consists of monitoring sites that have been occupied by MIS within a given sample area as an index of abundance. Changes in occupancy over time are noted. This information is tracked in combination with distribution population monitoring to get information for species that have limited distributions.

Population monitoring and survey data are not generally gathered for site-specific projects. The Modoc NF collects and consolidates presence data for various species in cooperation with State and federal agency partners (including California Department of Fish and game (CDFG)), U.S. Geological survey, and US Department of the Interior Fish and Wildlife Service) as well as other conservation partners (including Point Reyes Bird Observatory and Klamath Bird Observatory). The monitoring program for harvest species (i.e. species that are hunted, fished, or trapped) has been designed to be implemented in cooperation CDFG. This direction is consistent with both the 1982 Planning rule to monitor Forest-level MIS population trends in cooperation with state fish

and wildlife agencies to the extent practicable (36 CFR 219.9(a)(6)), as well as Modoc Forest Plan direction.

To be biologically meaningful for a wide-ranging MIS, presence data are collected and tracked not only at the Forest scale, but also at larger scales such as range-wide, state, province (Sierra Nevada for example), or management unit (for example, Deer Assessment Unit). Population data at various scales are important to both assess and provide meaningful context for population status and trend at the Forest-scale. Appendix E of the 2001 SNFPA FEIS and Chapter 2 of the 2004 SNFPA SEIS identify specific monitoring requirements for species, where landscape or bioregional scale is used (e.g., California spotted owl and American marten; USDA Forest Service 2006).

The Modoc National Forest MIS report consists of species accounts for each MIS. The species accounts are based on the best current information on life history, habitat relationships, suitable habitat, and changes in distribution information for each MIS. Species distribution information is discussed at a variety of spatial scales, including the range of the species, State (i.e., California), Province (e.g., Sierra Nevada), and Forest. This information is discussed in terms of the current amount of habitat and the current species distribution from a Forest perspective. For each MIS, the time frame for the changes in distribution as well as trend in habitat is the adoption of the Forest Plan to the present. The current quantity of habitat present on the Forest has been delineated for each species based on GIS models, which incorporate changes in habitat since the Modoc Forest Plan was finalized.

Region 5 Sensitive Species That Are Also Modoc NF Management Indicator Species

American Marten

Direction for marten under the Modoc NF Forest Plan consisted of designating a minimum of 13 marten territories Forest-wide (four on the Doublehead District and nine on the Warner Mountain District). These territories were to encompass 2,000 acres and be managed to provide late seral habitat. They were established in areas that had previous sightings or provided the best potential to serve as marten habitat.

Both the Northwest Forest Plan (USDA/USDI 1994) and the Sierra Nevada Forest Plan Amendment ROD (USDA 2004) amended the Modoc National Forest Land and Resource Management Plan direction. Both large-scale amendments to our Forest Plan stress the protection and management of late-seral habitats. Other direction involves the protection of marten den sites from disturbance from management treatments with a limited operating period (LOP) from May 1 through July 31, as long as habitat remains suitable (FSEIS Record of Decision (ROD), page 62, D-88 and D-89.) (USDA 2004).

The intent of Late Successional Reserves and Managed Late Successional Areas (where the occupied den site is located) is to 1) Provide a distribution, quantity, and quality of old-growth forest habitat, sufficient to avoid foreclosure of future management options, 2) Provide habitat for populations of species that are associated with late-successional forests (specifically to protect the Scientific Advisory Team's list of species closely associated with old growth), and 3) To help ensure that late-successional species diversity will be conserved, Riparian Conservation Areas and Critical Aquatic Refuges were established to benefit aquatic species, as well as provide for greater connectivity of late-successional forest habitat, which in turn improves travel and dispersal corridors for terrestrial animals and plants. Direction in the Sierra Nevada Forest Plan Amendment (USDA 2004) requires the identification of 100 acres of the highest quality habitat surrounding marten den sites. A biological evaluation for proposed vegetation treatments will

determine what breeding disturbance is permissible within the 100 acres from May 1 to July 31 (Limited Operating Period).

Habitat - Species Relationship for American Marten

Marten were found to prefer late-successional stands of mesic coniferous forest, especially those with complex physical structure near the ground (Buskirk and Powell, 1994 in Ruggiero et al. 1994). Suitable habitats on the Modoc consist of dense (>40% crown closure) coniferous forests that have significant amounts of snags and logs. Small clearings and riparian areas may also be used for foraging. Marten occur at elevations ranging from 4,000-13,000 feet in the northern Sierras. Habitat associations are characterized by dense canopied, multi-storied, multi-species climax coniferous forest with a high number of large snags and downed woody material. Habitat preference includes mature mesic forests of red fir, red fir/white fir mix, lodgepole pine, Sierran mixed conifer and Klamath mixed conifer. Current models suggest that 2.5 - 20 logs per acre and >3 snags per acre (>15"DBH) be left in managed areas to provide moderate suitability for marten. On the Modoc National Forest, marten have been sighted in mixed conifer (white fir dominated) and lodgepole pine habitats.

Marten habitats on the Modoc National Forest are similar to the neighboring Lassen National Forest. Extensive survey work for Forest carnivores on the Lassen National Forest has included over 22,000 trap-nights (14,000 on the Eagle Lake Ranger District; and 8,000 on the Hat Creek Ranger District) with no detections of marten in eastside pine habitats (B. Turner and T. Rickman, pers. comm.).

There are about 39,200 acres of various vegetation types found within Modoc NF marten territories. The major vegetation types are located within these territories: white fir, red fir, Sierran mixed conifer, and lodgepole pine. There are an additional 17,606 acres of potential marten habitat Forest wide, which is often located adjacent to these Forest marten territories. The vegetation types for this query included mixed conifer, Douglas-fir, white fir, lodgepole pine, and red fir with larger tree sizes and denser canopies.

Home range sizes for males are larger than females and vary in size between 0.6 square miles (422 acres) and 1.7 square miles (1,088 acres) (Freel 1991). Marten give birth to their young in March and April; they are weaned in about 42 days (Ruggiero et al. 1994).

The following information concerning food habits was obtained from Ruggiero et al. (1994). Marten consume a variety of different foods: small mammals, birds, fruit, carrion, and insects. The most common prey items for marten consists mainly of small mammals: voles, ground squirrels, and Douglas squirrels. Marten often forage in meadows and/or shrub patches.

Habitat Status and Trend at the Forest Scale for American Marten

The trend for habitat in the Medicine Lake Highlands (MLH) is stable to increasing, in the higher elevation sites, and decreasing at the lower elevation sites, based on the following information. Fire exclusion and commercial timber management activities of the past 70 years or so, have resulted in elevated stand densities, insect and disease activity, which have augmented fuel loadings in most vegetation types in the MLH, thus increasing the risk of crown fire and large stand replacing fire events. The current trend for marten habitat within the area amended by the Sierra Nevada Forest Plan Amendment ROD (USDA 2004) maintains the current level of potential marten habitat on the Modoc National Forest.

Project-level Effects Analysis based on American Marten Habitat

Key Habitat Factor(s) for the Analysis: The proposed project, the removal of noxious weeds from Forest System Lands, will have no effect on American marten habitat. The marten prefer older seral stage stands with large snags, stumps, and logs; enhancing riparian areas under the Riparian Management Prescription were thought to improve potential marten prey (USDA 1991b, Page 3-104). The potential effects are limited to the potential consumption of herbicide-contaminated prey and disturbance.

Analysis Area for Project-level Effects Analysis: The analysis area for marten is limited to the 39,200 acres within the thirteen Modoc NF marten territories and the additional 17,606 acres of potential habitat Forest-wide. This habitat is limited to the upper elevations of the Forest that have mixed conifer, white and red fir, and lodgepole pine. In general, the marten territories and additional potential marten habitat include the Warner Mountain Ranger District and the Medicine Lake Highlands.

Alternative 1 (Current Management)

Direct and Indirect Effects to Habitat

The Forest Service currently treats 20 to 30 acres a year by physical + methods. Currently, the Forest does not use herbicides to treat noxious weeds.

Implementing weed treatments under Alternative 1 would have no effect marten habitat. There will be no change in the current or future amount of large trees, snags, or dead and downed materials by the treatment of noxious weeds. Nor would there be any change in the amount of late seral stage habitat. Zero % of the current marten habitat in the analysis area, would be affected by implementation of Alternative 1.

Cumulative Effects to Habitat

Because there are no direct or indirect effects to marten habitat, there are no cumulative effects to marten habitat under this Alternative.

Alternatives 2 to 6

Direct and Indirect Effects to Habitat: A maximum of 0.1 acres could receive physical + treatments and a maximum of 0.29 acres could receive herbicide treatment within marten Forest Plan territories (Table 3-84). A maximum of 2.039 acres within potential marten habitat could receive herbicide treatments (Table 3-84). Therefore, a maximum of 0.004% of the 56,806 acres of marten habitat Forest-wide could receive treatment.

Table 3 - 84. Proposed Treatment Acres within Marten Territories, Modoc National Forest

Type of Marten Habitat	Total Acres of Marten Habitat Forest wide	Total Maximum Acres of Physical + Treatments *	Total Maximum Acres of Herbicide Treatments *
Forest Plan territories	39,200	0.1	0.29
Potential	17,606	0.0	2.039

*This figure includes the maximum, where physical + or herbicide methods may be employed

No marten den site would be removed by the implementation of Alternatives 2 through 6, nor would there be any reduction in habitat suitability for this species Forest-wide. In addition, none of the weed treatments is proposed near the known den site in the Medicine Lake Highlands.

There should be no change in the amount or food resources available to marten. Marten have been documented to eat fruit; however, they are not known to consume noxious weeds. Although, some of the potential prey (small mammals and birds) could potentially use the thistle seeds as food on the WM008CIAR4 and WM004CIAR4 (Canada thistle) sites, there are several other species of native thistles in the Warner Mountains that could provide foraging opportunities for prey. The removal of weeds would also have no effect on insects, because there are still ample native plants to provide food and cover for them. Therefore, the decrease of a maximum of 2.039 acres of thistle would have no discernible effect on the amount of potential marten food.

Cumulative Effects to Habitat: Because there are no direct or indirect effects to marten habitat, there are no cumulative effects to marten habitat under these Alternatives.

Project-level Effects Analysis based on American Marten Population

Summary of Population Status and Trend at the Forest Scale: The Modoc NF Forest Plan (as amended by the SNFPA) requires bioregional-scale distribution population monitoring for marten. The sections below summarize population status and trend data for the marten. This information is drawn from the detailed information on population trends in the Modoc National Forest MIS Report (USDA 2007b), which is hereby incorporated by reference.

American Marten Population Status and Trend at the Bioregional Scale and Local Scales

The California Natural Diversity Database (CNDDB) rank is “G5S3S4”: Global 5 indicates marten is globally “demonstrably secure; commonly found throughout its historic range”; State 3 / State 4 indicates that, in California, marten is between being ‘apparently secure’(G4) and ‘restricted range/rare’(G3).

Recent studies and sightings indicate that martens are relatively well distributed in a pattern similar to their historical distribution in the Sierra Nevada (Kucera et al.1995). Marten have been tracked and monitored throughout the Sierra Nevada using a variety of survey techniques, including project level surveys; the Pacific Southwest Research Station (PSW) retrospective database (which incorporates CDFG information, historic data back to Grinnell et al. 1937 in Ruggiero et al (1994); and systematic surveys conducted from 1992 to 2002 by Zielinski, Truex, Carroll, Clevenger, and Campbell).

Track plate and camera surveys to detect marten have been conducted at various locations on the Modoc National Forest from 1992 to 2007. The only known marten den site on the Forest is located near Medicine Lake (Doublehead Ranger District); however, there have been scattered incidental sightings of marten in the mixed conifer and white fir habitats north of Adin on the Big Valley Ranger District, and at various sites throughout the Warner Mountains. The pattern of distribution for marten, based on incidental sightings, has expanded to include the Big Valley Ranger District, since the time of the Modoc Forest Plan.

Effects of the Alternatives on American Marten

There is no chance of consumption of contaminated prey under Alternatives 3 and 5 (Alternatives where no herbicides will be used), or the physical + treatments in 2, 4, and 6. There is a chance for disturbance at potential den sites; it should be a low likelihood, because these weed occurrences are usually inaccessible until later in June due to snow.

There is a total of 0.19 acres that could be treated in a total of 5,279 acres within marten territories in the northern and central Warner Mountain District (2,560 acres in Pine Creek and 2,719 acres in the Payne Peak territories). There would be a slight potential for ingestion of

contaminated mammals, if both roughly .1 acre weed occurrences, were sprayed. According to information from the SERA reports, none of the herbicides has a hazard quotient above one, so the risk to marten from a cumulative treatment of .2 acres is very low (See Table 3-79 in the wolverine/SNRF section of this document).

Based on field studies, there appears to be little effect to potential prey from the use of herbicides under certain situations. Johnson and Hansen (1969) found litter size for deer mice was little affected by 2, 4-D. Sullivan (1990) found that the survival rate, body mass and growth rates of deer mice and Oregon vole were not affected by exposure to herbicides, and that this finding would indicate that there were little or no adverse effects on metabolic or general physiological processes in the development of young. McMurry et al. (1993) found that the woodrat population density was the highest on areas treated with Triclopyr, and postulated that there was an increase in forage and nest-building material, which supported the higher numbers of animals. These authors also found that there was no difference in reproductive activity, mean body weight, or animal condition between treated and control sites. Given the small acreage to be treated (0.4 acres total) and the low risks to prey presented by these small acreages, there would be inconsequential direct and no indirect effects to marten by implementation of Alternatives 2, 4, and 6.

Under the Alternatives with Early Detection/Rapid Response activities, wildlife biologists would review new noxious weed treatment sites prior to implementation. If concerns for marten surface, (including conditions not covered within the analysis for the FEIS), additional Design Standards could be added.

Cumulative Effects to Populations: There are few cumulative effects associated with physical + or herbicide treatments for the following reasons. The Pine Creek territory currently receives little use from recreationists, wood cutters, cattle, and mineral developments. There is little additional activity that could cause additional disturbances to denning animals.

The Payne territory is fairly well roaded and does receive more use, especially near Dry Creek Basin and Upper Deep Creek, where there is a moderate level of camping, hunter, wood cutter, and cattle use. However, the unconfirmed marten sighting was in the northern portion of the territory in a canyon accessible only by foot. There is very little activity in this canyon, which is roughly two miles from the weed occurrences. Repeated weed treatments may cause a small amount of disturbance, but this is not expected to cause any loss of marten habitat or cause mortality.

To reiterate, there would be inconsequential direct, no indirect, and inconsequential cumulative effects for marten by implementation of Alternatives 2 through 6 for the following reasons: Only a very small amount of weeds would be treated in marten territories and potential habitat, disturbance is expected to be minimal, and the low risk associated with these herbicides to predatory mammals consuming prey.

Relationship of Project-Level Impacts to Forest-Scale Habitat and Bioregional-Scale Population Trends for the American Marten

The cumulative effects of the Action Alternatives of the Noxious Weeds Project will result in no decrease in Forest-wide habitat for marten. Nor is there any potential effect to the marten population on the Forest. Therefore, implementation of the Noxious Weeds Project will not alter the existing Forest-wide trend in habitat, nor will it change the existing bioregional-wide trend in population distribution of marten.

Greater Sandhill Crane

The greater sandhill crane is a terrestrial MIS, a Forest Service Sensitive, and a California state threatened, fully protected species.

Management Direction: Improve habitat quality by protecting meadows and wetlands associated with livestock grazing. Over time this would improve population status for the Greater Sandhill Cranes. (SNFPA Final Supplemental Environmental Impact Statement (FSEIS) USDA 2004, Appendix C, page 420).

Habitat - Species Relationship

This species is most commonly found in and near wetlands, especially along margins of shallow water (Baker et al. 1995, Littlefield 1995a, Zeiner et al. 1990). Nesting has been documented on islands as well. Some more unusual nest sites include sagebrush and oak-dominated hillside (Ellis and Haskins 1985), black greasewood (Littlefield 1994), alkali bulrush (Littlefield 1994), Canada thistle (Littlefield 1994), desert saltgrass (Littlefield 1994), and barley (Littlefield 1994). Most (71%) of the nests that were in atypical habitats were destroyed or unsuccessful.

A 210-acre area, which equates to the average size of a territory (Zeiner et al. 1990), was analyzed around each nest to approximate acreage of occupied habitat. According to the data in the query, there are roughly 10,000 acres of occupied habitat on the Forest. The major vegetation types found in proximity to the nest sites include the following: water, sagebrush, juniper, eastside pine, wet meadow/sedge, and annual grassland. An additional 181,521 acres of potential habitat were modeled using the EVEG data and extending 200 meters around all of the wetlands in the corporate Modoc National Forest lakes layer. Lack of concealing vegetation was a significant factor in loss of nest, which made nests more open to predation. Littlefield and Paullin (1990) found that nesting success in the absence of predator control was lower on wetlands grazed by livestock than on ungrazed wetlands. Coyotes, raccoons, and common ravens were common predators (Littlefield 1999, Littlefield 1995a, Littlefield 1995b). Nest success in the Ash Creek Wildlife Area (northeast of Bieber) was 36%, and Ash Creek Valley (16 km west of Madeline) was 0% (Littlefield 1995a). However, drought was likely to be a significant factor.

Foraging habitat for sandhill cranes is varied and includes open grasslands, agricultural fields, as well as shallow marshes with emergent vegetation (Zeiner et al. 1990, Tacha et al 1992). Sandhill cranes are omnivorous, exploiting subsurface food items by probing with bills or by gleaning seeds and other foods from the ground. Foods vary widely, depending on seasonal availability (Tacha et al 1992). Non-migratory subspecies eat insects and their larvae, snails, reptiles, amphibians, nestling birds, small mammals, seeds of various plants, and berries (Tacha et al 1992). To illustrate this ability to utilize a broad scope of foods, Tacha et al. (1992) cite an example of sandhill crane diets of adults and young in southeastern Wisconsin. Both adult and young birds consumed invertebrates and small mammals and reptiles during early brood rearing; non-breeding adults ate mostly tubers of aquatic plants in spring and early summer, and then switched to cultivated grains in late summer.

Habitat Status and Trend at the Forest Scale for the Greater Sandhill Crane

There were two foci in the Forest Plan to maintain or enhance crane habitat within the Modoc: development of wetlands and control of livestock grazing. In 1965, a program was initiated to increase wetland habitats; this program has been greatly expanded since the time of the Modoc Forest Plan. As of 2001, the majority of the wetlands development had been completed. New grazing practices have been implemented since the release of the Modoc Forest Plan. The retention of cover in addition to changes in livestock management (e.g., alteration of rotations,

fencing pastures to exclude cattle at critical times) have helped provide for the increase in sandhill cranes seen on the Forest. Between wetland development and implementation of the Riparian Area Management Prescription, the trend for sandhill crane habitat on the Modoc National Forest is stable. It could potentially increase with further wetland development or livestock management changes, pending future funding.

Project-level Effects Analysis based on Greater Sandhill Crane Habitat

Key Habitat Factor(s) for the Analysis: The proposed project, the removal of noxious weeds from Forest System Lands, will benefit sandhill crane. Cranes are not directly tied to the noxious weeds for cover or food. In fact, the replacement of natural cover by weeds has a detrimental effect to potential nesting cover. As stated above, the majority of sandhill crane nests that were placed in atypical plant cover were destroyed or unsuccessful.

The potential effects from the implementation of the activities in the Noxious Weeds FEIS are limited to the consumption of herbicide contaminated plants and prey, as well as disturbance to nesting birds.

Analysis Area for Project-level Effects Analysis: The analysis area for sandhill crane includes the estimated 10,000 acres of occupied habitat and the 181,521 acres of potential habitat. A majority of this habitat is located on the Devil's Garden District, but is also scattered adjacent to wetlands across the Forest.

Alternative 1 (Current Management)

Direct and Indirect Effects to Habitat

The Forest Service currently treats 20 to 30 acres a year by physical + methods. Currently, the Forest does not use herbicides to treat noxious weeds.

Implementing weed treatments under Alternative 1 would have no effect on sandhill crane habitat. There would be no change in the current or future amount of nesting and foraging cover by the treatment of noxious weeds. Vegetation diversity is expected to remain basically the same on the 30 acres. Therefore, 0% of the current sandhill crane habitat in the analysis area would be affected by implementation of Alternative 1.

Conversely, the effect of not treating the habitat could cause a significant decrease in the amount of potential cover for cranes.

Cumulative Effects to Habitat

Because there is no direct or indirect effect to sandhill crane habitat, there are no cumulative effects to sandhill crane habitat under this Alternative.

Alternatives 2 to 6

Direct and Indirect Effects to Habitat

There could be a maximum of 238.81 acres of physical + treatments and 236.99 acres of treatment with herbicides within the potential crane habitat. A maximum of 2.41 acres of herbicide and/or physical + treatments could take place within occupied crane habitat (Table 3-85). A maximum of 0.131% of the potential and a maximum of .0241% of occupied sandhill crane habitat Forest-wide could receive herbicide treatments.

Table 3 - 85. Proposed Treatment Acres within Greater Sandhill Crane Habitat

Type of Crane Habitat	Total Acres of Crane Habitat Forest wide	Total Maximum Acres of Physical + Treatments *	Total Maximum Acres of Herbicide Treatments *
Occupied	10,000	2.41	2.41
Potential	181,521	238.81	236.99

*This figure includes the maximum, where physical + or herbicide methods may be employed

Direct effects to crane habitat include the potential loss of nesting cover and foraging habitat. As stated above, weeds do not provide adequate nesting cover, so removal of weeds, especially with revegetation efforts, would benefit cranes.

Foraging habitat should either remain the same or improve. Cranes are not known to use noxious weeds as food; therefore, removal of weeds should not decrease the amount of food available to them. The removal of the weeds should provide improved habitat for small animals and insects. Subsequent replanting of bare areas would decrease the potential for reinfestation by weeds and provide better cover (depending on the plant species chosen for revegetation treatments). Therefore, there should be no negative direct or indirect effects to sandhill crane habitat by the implementation of Alternatives 2 through 6.

Cumulative Effects to Habitat

The cumulative effects to sandhill crane habitat under any Alternatives would be the increase of nesting and foraging habitat. As stated above, changes made to livestock management and the development of wetlands have helped provide for the increase in sandhill cranes seen on the Forest as evidenced in the increased numbers and distribution, since the time of the Modoc NF Forest Plan.

Project-level Effects Analysis based on Greater Sandhill Crane Populations

Summary of Population Status and Trend at the Forest Scale: The Modoc NF Forest Plan (as amended by the SNFPA) requires Forest-scale distribution population monitoring for greater sandhill crane. The sections below summarize population status and trend data for the sandhill crane. This information is drawn from the detailed information on population trends in the Modoc National Forest MIS Report (USDA 2007b), which is hereby incorporated by reference.

Population Status and Trend at the Bioregional Scale and Local Scales for the Sandhill Crane

Greater sandhill crane is “S2” in California (NatureServe). This ranking stands for “Imperiled” at the state/province; this ranking is given to species/subspecies because of “rarity due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the nation or state/province”. One factor may be where the sandhill cranes in California are nesting. Ivey and Herziger (2001) found the majority (63%) of sandhill crane territories in the 2000 statewide survey were on private lands, which may not provide secure habitat over time. However, when referring to the crane status in Oregon and California, Littlefield and Ivey (2001) stated that the upward trend should continue provided reproductive success was sufficient, breeding habitat remained secure and wintering habitats were protected.

Although there are some Breeding Bird Survey (BBS) routes with decreasing trends in California, most of the routes had stable to increasing trends. In a statewide survey conducted specifically for sandhill cranes, Ivey and Herziger (2001) recorded a 68% increase in the total number of pairs recorded between the 1988 statewide survey to the 2000 statewide survey.

At the Sierra Nevada scale for the period of 1968-2005, Sierra Nevada-wide BBS data classifies sandhill crane as 21.6, which is a positive trend. However, the Regional Credibility ranking is "red", due in part to the sample size of two. A better measure of trend in the Sierra Nevada is the work completed by Ivey and Herziger (2001). They recorded increases in many of the sites in the Sierra Nevada between the 1988 statewide survey to the 2000 statewide survey, although there were localized decreases. An additional paper by Roberts et al. (1996) noted that the pairs in the South Fork of the Pit River (Modoc County) were stable as well.

The Modoc NF uses data collected on, and adjacent to, the Forest in both Forest-level as well as project-level planning. Modoc NF staff has monitored sandhill cranes for various project-induced surveys and Forest Plan monitoring efforts from mid-1980 to the present. There were approximately 10 pairs of sandhill cranes in the late 1980's during the development of the Modoc National Forest Forest Plan (US Forest Service 1991b – page 3-107). Currently, the Modoc National Forest has at least 40 locations where sandhill cranes have nested. The number of territories exceeds the Modoc NF Forest Plan goal of "approximately 20 pairs" (USDA 1991a. Page 4-28), and the distribution of cranes has expanded since the time of the Forest Plan.

Effects of the Alternatives on the Greater Sandhill Crane

Direct and Indirect Effects: The two potential effects to sandhill crane populations come from disturbance to nesting birds and consumption of contaminated food. Weed treatments, both physical + and herbicide, would occur annually until both the weeds and their seed banks are eliminated, so there would be a slight chance for potential disturbance over time. Gary Ivey, sandhill crane species expert, stated that that crane nest success is generally about 50%, and brood survival is usually less than 10%, so caution [in implementing management activities] is advised. Design Standard DS-10 has been developed to provide a Limited Operating Period for nesting sandhill cranes, as recommended by Gary Ivey. Pre-season work plans (DS 02) are a critical component to implementation. Use of surveys and a limited operating period for nesting animals should minimize potential disturbance problems.

As for the contamination risk from herbicides, there is little concern within occupied habitat for the following reasons. First, a maximum of 2.53 acres or .0253% Forest-wide could be treated with herbicides. The two largest occurrences (DG059ONAC (Scotch thistle) and DG001ISTI (dyer's woad) are found in one territory; therefore, the vast majority of the herbicides used Forest-wide in occupied habitat (2.43 acres treated with herbicides out 2.73 acres of weed occurrences in occupied habitat Forest-wide) will be centralized in one territory.

Second, the herbicide with the highest hazard quotients, 2, 4-D, will not be used under any Alternative. Both weed occurrences are within 1,000 feet of water (DG059ONAC is within the 300 foot SMZ and DG001ISTI (dyer's woad) is within 10 feet of the water's edge). Under Alternatives 2 and 4, 2, 4-D would not be used within 1,000 feet of water. Under Alternative 6, these occurrences would only be treated with physical + means.

Third, these weed occurrences are located along a railroad outside of the wetland where the crane pair forages, which is mainly along the reservoir shores (J. Irvin, pers. comm.). Therefore, there would be no effect from consumption of contaminated materials by cranes within occupied habitat.

Owing to the size of the following weed occurrences, there could be effects to sandhill cranes, who reside in potential habitat. Of the 236.99 acres within potential sandhill crane habitat that could receive herbicide treatments, 227.19 acres are included within two weed occurrences: BV006LIDA [Dalmatian toadflax] (217.19 acres in potential crane habitat) and WM009CIAR4 [Canada thistle] (10 acres in potential crane habitat).

BV006LIDA (Dalmatian toadflax) - The majority of the area is lava reef country with open conifer stands. The entire weed occurrence is roughly 850 acres. In the area adjacent to Lava Lake, the toadflax has a patchy distribution consisting of small clumps of plants that are less than 0.001 acre in size. No toadflax occurrences were observed in the riparian margin of the lake where the potential crane habitat exists. There is a lava reef that surrounds the lake, so there is no chance of direct spray to any crane, nor is there a chance of drift. The chance of disturbance from treatment activity to nesting cranes is also low because of the presence of the lava reef, and wet road conditions do not allow access until late June. Therefore, under Alternatives 2 and 4, there would be no effect to sandhill crane by treatment of this weed occurrence. Under Alternative 6, only the exterior satellites of the weed occurrence would be treated, which are not within the potential crane habitat. There would be no risk to cranes by treatment of this weed occurrence under Alternative 6 as well.

WM009CIAR4 (Canada thistle) - The site includes an old beaver pond that has sedimented in, surrounded by remnant aspen and scattered lodgepole pine and white fir; this area is tucked in the upper portion of the Mill Creek watershed and does not have potential habitat for nesting cranes (M. Flores, results of aspen monitoring within the area). It was listed as potential crane habitat, because of an artifact in the data set. Therefore, there would be no effect to cranes by the treatment of this occurrence under any Alternative.

There are five other weed occurrences ranging from 1.0 to 1.43 acres. The potential effects to cranes by the treatment of DG059ONAC (Scotch thistle) and DG001ISTI (dyer's woad) were discussed above in the paragraphs on occupied habitat. BV309ONAC would not be treated with herbicides under any Alternative. The occurrence near Snag Hill, BV307ONAC (Scotch thistle), has no known crane occupancy. Any potential effects would be very limited to cranes, due to the size and the isolation of this one small reservoir. Except for these five weed occurrences, the remaining 9.8 acres are weed occurrences that are less than one acre, and the vast majority of these occurrences are 0.1 acres or less; the treatment of these 0.1 acre weed occurrences is not expected to cause any significant adverse effects to cranes.

Papers have shown that herbicides do drift and can affect wildlife (Ernst et al. 1991). The risk assessment for the re-registration for 2, 4-D states plainly that there could be concerns from volatilization and off-site deposition of 2, 4-D esters (US EPA 2005). The authors of this risk assessment add that the effect of volatility of 2, 4-D esters on non-target organisms should be viewed as a source of uncertainty in their assessment. Other authors have found upslope transport of pesticides (LeNoir et al. 1999), and that there may be evidence linking the presence of pesticides with declines in amphibians (Davidson et al. 2001; Davidson et al. 2002). However, the difference between amounts of herbicides used in these studies is a factor of 1,000 larger, when compared to the amount proposed in the Weed Treatment FEIS. In addition, these papers do not discuss spot treatments of noxious weeds, but boom applications (the Forest does not propose using boom application). Given the small size of the weed occurrences and the type of herbicide application, volatilization and drift are not expected to affect sandhill cranes.

Under the Alternatives with Early Detection/Rapid Response activities, wildlife biologists will review new noxious weed treatment sites prior to implementation. If concerns for sandhill crane surface (including conditions not covered within the analysis for the FEIS), additional Design Standards could be added.

To summarize, there is a small potential for direct effects and no indirect effects to individual cranes by the implementation of Alternatives 2-6. Relatively few acres Forest-wide could be treated in occupied or potential habitat and the vast majority of these occurrences are less than 0.1 acre, thereby minimizing the potential consumption of contaminated food. Disturbance would be minimized (hence the need for pre-treatment surveys and the LOP described in Design Standard

DS-10). Therefore, the action Alternatives in the Noxious Weed FEIS may have some minor impacts to individuals, but will not lead trend toward listing. Nor will the weed treatment activities affect sandhill crane populations on the Forest.

Cumulative Effects to Populations

There is one territory Forest-wide, where herbicide treatment poses the greatest risk to cranes. There is a significant amount of human activity in the Hackamore Reservoir area based on information from Jim Irvin. (Mr. Irvin has 21 years as a Range Conservationist on the Modoc NF, and is very familiar with this area). Timber harvest activities include both commercial thinning and planting in plantations that are east, south, and west of the reservoir. There was also a prescribed fire south of the Reservoir in 2004; one of the objectives of this burn was to improve elk habitat. Water is drafted from the Reservoir during August and September for sheep use, but may be drafted from late July on if there is road maintenance that is needed. The drafting site is about ½ mile west of the nest site, so there is a low potential for disturbance. Grazing would be considered moderate to heavy; however, the area is in a pasture system, so it is not grazed two out of three years until after July 15, to promote waterfowl habitat. There are sheep corrals where gathering occurs northwest of the Reservoir. Potential effects to cranes from grazing would be fairly low, because of the timing and of activities. A low amount of fishing occurs from May until the end of June, so there is minimal potential disturbance to nesting cranes. Waterfowl hunting occurs from October to early January; the cranes usually have migrated outside of the area then, so potential impacts to cranes are light. All activities discussed above are either out of the nesting area or outside of the critical nesting time, and consequently pose little potential disturbance to cranes.

Forest-wide, currently there are roughly 3,000 acres of utility corridors and 1,500 acres of communications facilities under permit, where vegetation removal may be conducted by the special-use permit holders. The Department of Defense had a radar installation south of Doublehead Mountain in open juniper/sage habitats. The area was roughly 1,000 acres, enclosed by an eight-foot fence. The installation is currently being dismantled, and would receive no further vegetation treatments. There is a 16- to 20- acre corridor that Bonneville Power Utility might spray annually, which flanks Highway 139 outside of crane habitat. Finally, there are communications sites that total roughly an acre of habitats that could be sprayed across the Forest. The rest of vegetation treatments involve usually hand grubbing, but may also include the felling of trees beneath telephone lines.

Currently none of the other special-use permit holders are spraying herbicides. They will not be able to use herbicides unless they have authorization in writing from the Forest Service prior to any treatment. The Forest Service would utilize the guidelines outlined in the Noxious Weed FEIS for any herbicide treatments. Given the various Design Standards, there would be no cumulative effect from consumption of contaminated materials to the sandhill crane distribution on the Modoc National Forest.

There could be a maximum of 1,500 acres sprayed annually on the Forest or 0.089% of the Forest. Under Alternative 6, that number would decrease to a maximum of 522 acres or 0.031% of the Forest. About 16,080 acres could have herbicides in roughly 3.5 million acres (state, private, tribal and other federal lands), which would be 0.46% of that gross area (see the Noxious Weeds Terrestrial BA for more detailed information).

The sandhill cranes are foraging on the Forest in areas far away from these weed infestations on private, tribal and other federal lands during the time of active spraying. Once cranes utilize these areas during the staging period for migration, weeds are not usually being treated. Therefore, there are few additional cumulative effects expected to sandhill cranes from herbicides both on and surrounding the Modoc NF.

Relationship of Project-Level Impacts to Forest-Scale Habitat and Population Trends for the Greater Sandhill Crane

The cumulative effects of the Action Alternatives of the Noxious Weeds Project will result in no decrease in Forest-wide habitat for greater sandhill crane. Nor is there any potential effect to the sandhill crane population on the Forest. Therefore, implementation of the Noxious Weeds Project will not alter the existing Forest-wide trend in habitat, nor will it change the existing Forest-wide trend in population distribution of greater sandhill crane.

Northern Goshawk

The Modoc National Forest Land and Resource Management Plan (Forest Plan) (USDA 1991a) selected goshawk as an indicator of old Forest ecosystems; it is also considered an old-forest-associated species under the Sierra Nevada Forest Plan Amendment (USDA 2004).

The Modoc National Forest direction for goshawk management specifies that the Forest will maintain 100 goshawk territories. Each territory consists of a minimum of 100 acres for primary and alternate nest stands.

The Sierra Nevada Forest Plan Amendment direction (USDA 2004), which amended the Modoc Forest Plan, includes the use of monitoring and the establishment of Protected Activity Centers (PACs) to maintain northern goshawk viability across the Sierra Nevada (USDA 2004 Record of Decision, Pages 59, 60, 54, D34). These areas increased to 200 acres under this direction (USDA 2004 Record of Decision. Page 38). Limited Operating Periods have also increased to February 15 through September 15 (USDA 2004 Record of Decision, Page 60). The Big Valley Sustained Yield Unit is an exception to the SNFPA direction. In the Big Valley Sustained Yield Unit, northern goshawks may be managed under the direction of the Modoc NF Forest Plan (1991).

In the Medicine Lake Highlands, which are managed under the direction of the Northwest Forest Plan (1994), there are no northern goshawk Protected Activity Centers. However, northern goshawk management is provided by the direction for the Managed Late Successional Area assessments.

Habitat - Species Relationship: The attributes of northern goshawk nesting habitat are well documented. Research in northern California has shown that territory occupancy is positively correlated with the nest stand size. Occupancy nears 100 % for stands greater than 151 acres. Occupancy was 75-80 % at 100 acres (Woodbridge and Detrich 1994). Nest stands have relatively high tree canopy cover and a high density of large trees (Reynolds 1992). Richter (2000) did radio tracking in areas close to this project area and in similar habitat, and found an average canopy closure at the nest site of 84 %. Austin (1993) also concluded that adult goshawks generally avoid open (<40% canopy cover) Forest conditions. Desimone (1997) found occupied goshawk territories on the Fremont National Forest to have more closed, mid- to late-seral forest (>50% crown closure) than territories where goshawks could not be found. On the Lassen National Forest, Rickman (2001) found goshawk roost sites in all seasons to average 74 % canopy cover. The studies did not all use the same method for quantifying vegetation, but all show relatively high tree canopy densities. Local surveys on the Big Valley District support the density and tree size research; however, there are some instances locally where goshawks will select small inclusions in open habitat that would not be otherwise considered suitable. Ingraldi (1995) also found a similar trend with goshawks in Arizona where the birds selected larger and taller trees, a nest tree that was part of a clump, and often in the lower third of the slope.

Fewer studies, however, have concentrated on the characteristics of suitable foraging habitat. Information from the Region 3 northern goshawk guidelines, states that the following characteristics are important for foraging stands: Portions of the foraging area should have mature

to older stands with a minimum of 40% canopy cover, at least two large (greater than 18 inches DBH/30 foot tall) snags per acre, at least three large downed logs per acre, and a minimum of 3 to 5 mature and old trees per acre in groups or stringers with interlocking crowns (Reynolds et al. 1992). The snag dimensions were selected to meet the minimum requirement for prey species (Reynolds et al. 1992). Initial findings from one study in Arizona echo the Region 3 information indicating that "some goshawks selected for habitats with more and larger trees" (Beier 1995). Locally on the Modoc National Forest, other biologists have noted this trend for goshawks to use the large trees as perches for hunting (G. Studinski, pers. comm.). Although nest stands tend to have dense overstory canopy, a mixture of habitat types including riparian areas, is utilized for foraging. Prey remains under nests found on the Modoc National Forest indicate that these birds take both avian and mammalian prey (Studinski, pers. comm.; Promessi, Matson, and Flores 2004).

Habitat Status and Trend at the Forest Scale for the Northern Goshawk

There are approximately 23,600 acres of various vegetation types within northern goshawk PAC's set up during the Sierra Nevada Forest Plan Amendment (USDA 2004) analysis process. Vegetation types included within PAC's are as follows: eastside pine, Sierran mixed conifer, white fir, and lodgepole pine with inclusions of sagebrush, montane chaparral, and various minor constituents. There are an additional 96,377 acres of potential goshawk habitat Forest-wide, which includes dense stands of mixed conifer, eastside pine, and white fir.

The trend for goshawk habitat on the Modoc National Forest within the area amended by the Sierra Nevada Forest Plan Amendment (USDA 2004) is stable, since timber harvest is located outside of later successional stands.

Project-level Effects Analysis based on Habitat for the Northern Goshawk

Key Habitat Factor(s) for the Analysis: The proposed project, the removal of noxious weeds from Forest System Lands, will have no effect on habitat for northern goshawk. Northern goshawks are tied to late-seral conifer stands and do not use noxious weeds for cover or food. The main potential effects are limited to the potential ingestion of contaminated prey and disturbance to nesting birds.

Analysis Area for Project-level Effects Analysis: The analysis area for northern goshawk is limited to the 23,600 acres of occupied habitat and 96,377 acres of potential habitat on the Forest. This habitat is clustered on the Warner Mountain and Big Valley Districts, but is also localized on portions of the Modoc NF in later seral coniferous habitat.

Alternative 1 (Current Management)

Direct and Indirect Effects to Habitat

The Forest Service currently treats 20 to 30 acres a year by physical + methods. Currently, the Forest does not use herbicides to treat noxious weeds.

Implementing weed treatments under Alternative 1 would have no effect on northern goshawk habitat. There will be no change in the current or future amount of large trees or late-seral coniferous habitat. Vegetation diversity is expected to remain unchanged. Aspen and meadow habitat, which are prime foraging areas, may be improved in very site specific locations. Zero % of the current northern goshawk habitat in the analysis area would be affected by implementation of Alternative 1.

Cumulative Effects to Habitat

Because there is no direct or indirect effect to northern goshawk habitat, there are no cumulative effects to goshawk habitat under this Alternative.

Alternatives 2 to 6

Direct and Indirect Effects to Habitat:

There is a maximum of 4.48 acres of physical + treatment and 4.04 acres that could be receive herbicide treatments within occupied goshawk PAC's. Eleven PAC's could receive treatment; however, the majority of the treatment (3.48 out of 4.04 acres) would be in PAC R05F09D53T07. Although there are no PACs in the Medicine Lake Highlands, the weed treatments in the Highlands are physical + , and outside of the areas of known goshawk occupancy.

A maximum of 325.07 acres of potential habitat could receive physical + treatments and 323.72 acres of herbicide treatments. Therefore, a maximum of 0.34% of the 96,377 acres of potential goshawk habitat Forest-wide could receive herbicide treatment (table below).

Table 3 - 86. Proposed Treatment Within Occupied and Potential Northern Goshawk Habitat

Type of Goshawk Habitat	Total Acres of Goshawk Habitat Forest wide	Total Maximum Acres of Physical + Treatments *	Total Maximum Acres of Herbicide Treatments *
Occupied	23,600	4.48	4.04
Potential	96,377	325.07	323.72

*This figure includes the maximum, where physical + or herbicide methods may be employed

There would be no direct effect to goshawk nest tree or plucking posts from any type of weed treatment activity in either occupied or potential habitat. Nor would there be any changes to the overstory in late-seral coniferous habitat.

Physical + and herbicide treatments would not affect potential prey habitat in occupied goshawk habitat, either Forest-wide or in R05F09D53T07. Twelve of the 14 weed occurrences are in occupied goshawk habitat are 0.1 acre or less, except for the weed occurrences within R05F09D53T07, which are not a homogeneous. Prey still would have both native plants for food and cover. Although some prey species could utilize weeds for food and cover, no prey species totally depends upon weed species; native vegetation would provide at least the same degree, if not, far surpassing weeds as prey habitat.

The removal of the weeds should provide improved habitat for small animals. The only weed occurrence that could cause problems to prey habitat in potential goshawk habitat is DH013ITI (dyer's woad). Subsequent replanting of large bare areas would decrease the potential for reinfestation by weeds, and provide better cover for prey. Therefore, there would be no negative direct or indirect effects to goshawk habitat by the implementation of Alternatives 2 through 6.

Cumulative Effects to Habitat: Because there are no direct or indirect effects to northern goshawk habitat, there are no cumulative effects to goshawk habitat under these Alternatives.

Project-level Effects Analysis based on Populations for the Northern Goshawk

Summary of Population Status and Trend at the Forest Scale

The Modoc NF Forest Plan (as amended by the SNFPA) requires bioregional-scale distribution population monitoring for northern goshawk. The sections below summarize population status and trend data for the goshawk. This information is drawn from the detailed information on population trends in the Modoc National Forest MIS Report (USDA 2007b), which is hereby incorporated by reference.

Population Status and Trend at the Bioregional Scale and Local Scales for the Northern Goshawk.

Northern goshawk has been monitored on many of the National Forests within California. There is concern that northern goshawk populations and reproduction may be declining in North America and California, due to changes in the amount and distribution in habitat quality (various authors in USDA 2001 Volume 3 Chapter 3. Page 113). The trend for the northern goshawk was analyzed by the USFWS in the 1990's. According to the section on the California Region, there was currently not sufficient evidence of a wholesale decline that would warrant listing (USFWS 1998).

The Modoc National Forest initiated goshawk full scale monitoring in 1975, using intensive stand searches and monitoring of historic nest stands. Current surveys are completed per the Regional northern goshawk protocol. At the time of the development of the Modoc National Forest Forest Plan, the Forest had 81 pairs and territories. The Modoc National Forest currently manages for 143 northern goshawk Protected Activity Centers across the Forest, primarily in pine or mixed conifer stands. The current number of territories exceeds those recognized Modoc Forest Plan. However, the distribution of northern goshawk is similar to the pattern found in during the time of the Modoc NF Forest Plan.

Effects of the Alternatives considered within the Noxious Weeds FEIS for the Northern Goshawk

Goshawks could potentially be affected by the ingestion of contaminated prey and disturbance at nest sites. Within occupied habitat, there is little concern for consumption of contaminated prey, because of the small acreage to be treated Forest-wide. The largest concentration of work in occupied habitat would be 3.48 acres in PAC RO5F09D53T07, where both WM001ISTI and WM002ISTI (dyer's woad) could be sprayed under Alternative 6.

There is little potential risk from raptors eating contaminated mammals; none of the hazard quotients are above 1.0 (see Table 3-78 in the spotted owl section of this document). Plus, the weed sites are small enough to make it unlikely that 10% to 100% of the goshawk's diet would contain contaminated prey. Given the small acreage to be treated and low risk associated with these herbicides to raptors, use of herbicides should not impact individual goshawks.

Basically, the same is true for potential goshawk habitat. Although there are 325.28 acres of weed occurrences that fall within potential goshawk habitat, the vast majority consists of 321.82 acres in DH013ISTI (dyer's woad). The habitat in this weed occurrence was burned under a series of fires, and has no known goshawk occupancy. The next-largest weed occurrence in potential habitat, DG024SAAE (Mediterranean sage), is scheduled for physical + treatments only. The remaining weed occurrences are 0.3 acres and less. Because the herbicides proposed for use have hazard quotients less than 1.0, there is little risk to goshawk by the use of herbicides on these

small acreages. Therefore, the treatment of weed occurrences under any Alternative is not expected to affect northern goshawk.

The greatest potential for impacts to all goshawks is from disturbance during the nesting season. Physical + and herbicide weed treatments could occur annually. Eleven of the 143 PACs could receive physical + or herbicide treatments. Limited Operating Periods are standard clauses for all contracts, because the potential for disturbance to cause abandonment of nests and young. It is vital that annual pre-treatment surveys be conducted, so active nest sites could be protected.

Under the Alternatives with Early Detection/Rapid Response activities, wildlife biologists would review new noxious weed treatment sites prior to implementation. If concerns for northern goshawk surface (including conditions not covered within the analysis for the FEIS), additional Design Standards could be added.

To summarize, there are inconsequential direct effects and no indirect effects expected to goshawk by the implementation of Alternatives 2-6. The weed occurrences are small and scattered throughout the Forest. There is a low risk associated with these herbicides to raptors. Pre-treatment surveys and LOPS will protect nesting birds. Therefore, there may be impacts to individuals, but there will be no trend toward listing, nor would there be any effect to goshawk population viability.

Cumulative Effects to Populations: With respect to disturbance, there would be a light to moderate amount of activities from recreation, wood cutting, and mineral use within the potentially affected PACs on all the Districts. There are rock quarries adjacent to two PACs on the Big Valley District; the potential for disturbance to goshawks is low because of the quarry and the time of year when materials are accessed. Current timber sales include clauses to implement a limited operating period where birds are actively nesting. Grazing is light to moderate in many of the PAC's, because of their stand densities (little forage available). There are some areas of more concentrated livestock use near Cary Reservoir and Buck Creek (the Del Pratt territory). However, given the persistence of the territories with regard to goshawk reproduction, grazing does not appear to have affected northern goshawk. Given the rather small acreage Forest wide that could be treated in addition to the use of surveys, and Limited operating periods, there are no expected cumulative effects from implementation of Alternatives 2 through 6 on northern goshawk.

Relationship of Project-Level Impacts to Forest-Scale Habitat and Bioregional-Scale Population Trends for the Northern Goshawk

The cumulative effects of the Action Alternatives of the Noxious Weeds Project will result in no decrease in Forest-wide habitat for northern goshawk. Nor is there any potential effect to the goshawk population on the Forest. Therefore, implementation of the Noxious Weeds Project will not alter the existing Forest-wide trend in habitat, nor will it change the existing bioregional-wide trend in population distribution of northern goshawk.

Sage Grouse

Management direction for sage grouse under the Modoc Forest Plan (1991) is as follows: Within designated sage grouse habitat, manage big sagebrush and low sagebrush within an eight-mile radius of all identified leks (strutting grounds) in accordance with the moderate habitat capability level for sage grouse. Manage meadows, seeps, springs, and riparian areas within a two-mile radius of leks according to the Riparian Area Management Prescription to provide forbs desirable for sage grouse, such as dandelion (Taraxacum), yarrow (Achilla), and aster (Aster).

Habitat - Species Relationship: As the name implies, this species is heavily dependent on sagebrush habitats. Sage grouse utilize sagebrush stands as both winter and nesting habitat; leks

are often located in open areas surrounding sagebrush (Connelly et al. 2000). Nesting habitat also appears to contain tall grass cover (Gregg et al. 1994) and denser shrub cover of intermediate height (DeLong et al. 1995). Many studies have focused on the importance of herbaceous cover as a key influencing the fate of sage grouse nests (various authors in Sveum et al. 1998). Sveum et al. (1998) believed disturbances the following factors negatively impacted sage grouse nesting habitat: damage to shrubs, reduction in herbaceous cover, and invasion of exotic plants into native plant communities.

Sage grouse nesting usually begins in April and may continue into late May or early June in northeastern California and northwestern Nevada (E. Flores, pers. comm.).

Sage grouse diets consist of forbs, sagebrush, and insects (Klebenow and Gray 1968); they rely on sagebrush in the winter (Zeiner et al. 1990). Sage grouse chicks were dependent on insects, but moved to more forbs as they aged (Klebenow and Gray 1968).

Sage Grouse Habitat Status and Trend at the Forest Scale

A habitat analysis of the condition of sage grouse habitat was completed for the Clear Lake/Devil's Garden area for inclusion in the "Draft Conservation Strategy for Sage Grouse and Sagebrush Ecosystems Within the Devil's Garden/Clear Lake Population Management Unit" (August 15, 2006). Based on this analysis, the habitat was categorized as follows: a) 27 % of the Active Management Area of the Population Management Unit (PMU) on National Forest land has the desired species composition to provide adequate cover and forage to meet the seasonal needs of sage grouse; b) 13.5 % has the potential to produce sagebrush plant communities that have good understory composition of desired grasses and forbs, but lack adequate sagebrush canopy cover; c) 11.6 % with potential to produce sagebrush communities, but which are in transition to juniper woodland; d) 44.4 % which have crossed the threshold from sagebrush plant communities into juniper woodland.

As part of the Noxious Weeds FEIS analysis, sage grouse habitat was modeled utilizing a four-mile radius buffer from the radio telemetry from collared sage grouse. The analysis area for sage grouse is roughly 53,300 acres of various habitat types within 4 miles of these areas. Scott Gardner, California Department of Fish and Game Sage Grouse Coordinator and Environmental Scientist with the Upland Game Program, recommended this figure would provide a good estimation of potential habitat for this project. The four mile radius is also greater than the two-mile figure recommended in Connelly et al.(2000). Mr. Gardner's recommendation and the Connelly et al. (2000) information constitute the most recent recommendations and were followed in lieu of the habitat management recommendation cited in the Modoc NF Forest Plan (1991) to model occupied sage grouse habitat. It is important to note that 21,080 acres of the analysis area are of water, Clear Lake. The following are the major vegetation types: low sagebrush, juniper, sagebrush, water, annual grassland, and barren ground.

The distribution, quantity, and quality of sage grouse habitat on the Forest has been affected by factors similar to those across the range of the sage grouse. The encroachment of western juniper into the sagebrush steppe has been a major factor, as well as many large fires within the area where the sage grouse leks were concentrated. Other factors affecting sage grouse habitat include the invasion of exotic grasses including cheatgrass and medusa head. According to the Modoc Forest Plan, major reasons for sage grouse decline include overgrazing before the 1950's, sagebrush control, conversion of habitat to agricultural uses, maturation and decadence of sagebrush communities, juniper encroachment, and indiscriminant hunting (USDA 1991b. Page 3-108).

Over the past two years, efforts by a multi-agency Local Sage Grouse Working Group have resulted in a Draft "Conservation Strategy for Sage Grouse (*Centrocercus urophasianus*) within

the Devil's Garden/Clear Lake Population Management Unit". This plan sets the stage for cooperative efforts to restore sage grouse habitat within this PMU. Sage grouse habitat restoration projects, involving juniper removal, are currently in progress (2006) adjacent to Clear Lake, both on the Modoc National Forest and on the Clear Lake National Wildlife Refuge. In addition, juniper removal on a larger scale is currently under environmental analysis through the Sagebrush Steppe Ecosystem Restoration Project Environmental Impact Statement. Pending the implementation of restoration efforts, habitat has declined for sage grouse on the Forest since the time of the Modoc Forest Plan.

Sage Grouse Project-level Effects Analysis Based on Habitat

Key Habitat Factor(s) for the Analysis: The proposed project, the removal of noxious weeds from Forest System Lands, will have no affect on habitat for sage grouse. Sage grouse use shrubs, native forbs and grasses as food and cover, and are not directly tied to the noxious weeds. The main potential effect is limited to the potential consumption of herbicide contaminated plant and insect materials by grouse.

Analysis Area for Project-level Effects Analysis: The analysis area for sage grouse is 21,080 acres and located near Clear Lake.

Alternative 1 (current management)

Direct and Indirect Effects to Habitat

The Forest Service currently treats 20 to 30 acres a year by physical + methods. Currently, the Forest does not use herbicides to treat noxious weeds.

Implementing weed treatments under Alternative 1 would have no effect to sage grouse habitat. There would be no change in the current or future amount of sagebrush by the treatment of noxious weeds. The treatments are not in occupied habitat; therefore, there would be no inadvertent decrease of grasses or forbs utilized by these grouse. Zero % of the current sage grouse habitat in the analysis area would be affected by implementation of Alternative 1.

Conversely, the effect of not treating the habitat could cause a significant decrease in the amount of potential food and cover for grouse. Sveum et al. (1998) documented exotic plants (cheatgrass and knapweed) negatively impacted sage grouse nesting habitat; they believed that restoring native sagebrush communities would provide better [sage grouse] habitat.

Cumulative Effects to Habitat

Because there is no direct or indirect effect to sage grouse habitat, there are no cumulative effects to sage grouse habitat under this Alternative.

Alternatives 2 to 6

Direct and Indirect Effects to Habitat

There are no physical + treatments proposed within four miles of occupied sage grouse habitat (Table 3-87). However, there are three locations where Canada thistle may be treated using herbicides near areas where radio collared birds have been detected. Each of the treatment areas is 0.10 acre for a total of 0.3 acres of herbicide use within sage grouse habitat. Therefore, a maximum of 0.0009% of the modeled 32,220 acres of sage grouse habitat could be treated.

Table 3 - 87. Proposed treatment Within Occupied and Potential Sage Grouse Habitat

Type of Sage Grouse Habitat	Total Acres of Sage Grouse Habitat Forest wide	Total Maximum Acres of Physical + Treatments *	Total Maximum Acres of Herbicide Treatments *
Occupied/Potential	32,220	0.0	0.3

*This figure includes the maximum, where physical + or herbicide methods may be employed

Herbicides, when utilized to kill sagebrush as has been done in the past, can cause a reduction in the quantity and quality of sage grouse habitat by the decrease in the quantity of sagebrush in treatment blocks (various authors in Connelly et al. 2000). This activity is not proposed under the Noxious Weed Project FEIS.

The removal of a maximum of 0.3 acres of weeds is anticipated to improve habitat quality for the grouse. Sveum et al. (1998) stated, “Increasing native perennial bunchgrasses and forbs would enhance both cover and food in sagebrush cover types” [for sage grouse]. There would be no removal of sagebrush or preferred grasses and forbs for cover and food. Sage grouse are not known to use noxious weeds as food; therefore, removal of weeds should not decrease the amount of food available to them. The removal of the weeds will not affect insects, since there are ample native plants to provide insect food and cover. Subsequent replanting of bare areas would decrease the potential for reinfestation by weeds and provide better cover (depending on the plant species chosen for revegetation treatments). An interesting side note is that two publications recommended the judicious use of several management tools including herbicides to improve sage grouse habitat (DeLong et al. 1995, Connelly et al. 2000). Therefore, there should be inconsequential beneficial direct or indirect effects to sage grouse habitat by the implementation of Alternatives 2 through 6, because there is only 0.3 acres of sage grouse habitat planned for treatment.

Cumulative Effects to Habitat: Because there are no direct or indirect effects to sage grouse habitat, there are no cumulative effects to sage grouse habitat under these Alternatives.

Project-level Effects Analysis based on Sage Grouse Populations

Summary of Population Status and Trend at the Forest Scale: The Modoc NF Forest Plan (as amended by the SNFPA) requires Forest-scale distribution population monitoring for sage grouse. The sections below summarize population status and trend data for the sage grouse. This information is drawn from the detailed information on population trends in the Modoc National Forest MIS Report (USDA 2007b), which is hereby incorporated by reference.

Population Status and Trend at the Bioregional Scale and Local Scales for Sage Grouse

Sage-grouse range in California includes portions of the Modoc Plateau and the Great Basin in parts of Modoc, Lassen, Mono and Inyo Counties (Grinnell and Miller 1944). Greater sage grouse in northeastern California are most abundant in eastern Lassen County (north of Honey Lake) and east of Eagle Lake, and in the Surprise Valley in northeastern Modoc County. These areas contain approximately two-thirds of all of California's sage-grouse populations (Hall 1995).

Little published information is available on California sage grouse population trends. According to Connelly et al. (2004), the proportion of active leks in California has remained relatively stable between 1965 and 2003, with five-year averages varying from 77% to 90% between 1965 and 2003. Modoc County appears to be the exception.

California Department of Fish and Game records indicate there were thousands of sage grouse in northwestern Modoc County in the 1920s. By the 1950s, there were dramatic declines on the Devil's Garden Plateau, where local populations were down to 75 to 150 birds. In the vicinity of Clear Lake on the Doublehead District, there were 46 active leks in the late 1940s and only nine active leks as of 1977.

In the remainder of western Modoc County today, areas occupied by sage grouse include one active lek on the 'Likely Tables' southeast of Alturas, and anecdotal reports of sage grouse near Big Valley (recent counts of historic leks in the Big Valley area have turned up negative for sage grouse presence). The largest numbers of sage grouse in Modoc County are in the Surprise Valley northeast of the Modoc NF. Sage grouse on the Devil's Garden Plateau reached peak population levels in the 1930s, but experienced dramatic declines after the 1960s (CDFG unpublished data).

Count data for the majority of leks on and near the Modoc National Forest were spotty until the 1990's, when regular counts of the lek at Clear Lake began. The only known remaining active sage grouse lek on Modoc NF is near Clear Lake. Based on the lek counts between 1989 and 2004, the estimated population of sage grouse on the Devil's Garden plateau dropped from a peak during that period of 160 birds in 1990 to 31 in 2004.

Effects of the Alternatives on Sage Grouse Populations

The ingestion and consequent incorporation of some herbicides could harm sage grouse. Blus et al. 1989 (in Connelly et al. 2000) reported "die offs" of sage grouse that were exposed to methamidiphos and dimethoate. The Noxious Weed FEIS does not propose use of either of these herbicides, nor does it propose treatment of plant species other than noxious weeds.

However, grouse could consume non-target forbs affected by overspray or contaminated insects. Under the scenario for a bird consuming contaminated vegetation, 2, 4-D, and Triclopyr have hazard quotient ratings above one (Table 3-88). 2, 4-D is of greatest concern, because the hazard quotient rating is above one for every application rate. Under the scenarios for 2, 4 –D at the lower levels, only 10% consumption of contaminated vegetation in the animals diet caused potential health effects. Owing to the dearth of studies conducted on wild bird species, there is ambiguity in the extent of the effects due to ingestion of 2, 4-D. Utilizing the mammal information as a proxy for birds from the SERA report on 2, 4-D, there could be a chance of some degenerative changes to various organs. Depending on the extent of effect, an individual animal certainly could be at greater risk of predation.

Table 3 - 88. Herbicides and their Application Rates for Chronic Exposures to Large Birds (goose sized) Consuming Contaminated Vegetation Where There is a no-Spray Buffer and a Boom-Application Method on Site

Herbicide/Application Rate	Exposure Assessment Rate mg/kg/day or mg/kg/event			Hazard Quotient Rating		
	Central	Lower	Upper	Central	Lower	Upper
2,4 - D						
a) 1.5 lbs/ac	2.69	0.896	25.3	3.0	0.9	25
b) 2.0 lbs/ac	3.58	1.19	33.7	4.0	1.2	34
Chlorsulfuron 1.0 oz/ac	0.212	0.0708	2.0	0.002	5 x 10-4	0.01
Clopyralid 0.25 lb/ac	0.815	0.217	10.0	0.05	0.01	0.7
Dicamba						
a) 1.0 lb/ac	1.16	0.388	11.0	0.09	0.03	0.8
b) 2.0 lbs/ac	2.33	0.776	21.9	0.2	0.06	1.6
Glyphosate 3.75 lbs/ac	16.6	5.53	156	0.2	0.06	1.6
Triclopyr (Acid & BEE) 1.5 lbs/ac	5.92	1.52	75.2	0.6	0.2	8.0
NPE	0.216	0.0576	2.85	0.02	0.006	0.3

Note: Data for boom-sprayer application is for comparison purposes only. The Forest does not propose using mechanical boom sprayers.

For the small bird consuming contaminated insects scenario, 2, 4-D (alone or in a tank mix), Dicamba, and the surfactant NPE all exceed hazard quotient ratings of 1 (table below).

Table 3 - 89. Hazard Quotient Ratings for a Small Bird eating Contaminated Insects – Acute Toxicity (100% of diet)

Herbicide/Application Rate	Exposure Assessment Rate mg/kg/day			Hazard Quotient Rating		
	Central	Lower	Upper	Central	Lower	Upper
2,4 - D						
a) 1.5 lbs/ac	56.4	56.4	169.0	6.0	6.0	17.0
b) 2.0 lbs/ac	75.2	75.2	226.0	8.0	8.0	23.0
Chlorsulfuron 1.0 lb/ac	2.35	2.35	7.05	0.001	0.001	0.004
Clopyralid 0.25 lb/ac	9.4	9.4	28.2	0.01	0.01	0.04
Dicamba						
a) 1.0 lb/ac	37.6	37.6	113.0	3.0	3.0	8.0
b) 2.0 lbs/ac	75.2	75.2	226.0	6.0	6.0	17.0
Glyphosate 3.75 lbs/ac	141.0	141.0	423.0	0.3	0.3	0.8
Triclopyr (Acid & BEE) 1.5 lbs/ac	56.4	56.4	169	0.1	0.1	0.3 (ACID) 0.4 (BEE)
NPE	62.6	50.0	263.0	6.0	5.0	26.0

Design Standard DS-12a (no 2, 4-D or Dicamba in occupied sage grouse habitat) limits the types of herbicides that may be used to those with Hazard Quotients less than 1.0 in occupied sage grouse habitat. Under Alternatives 2, 4 and 6, the weeds would be treated with Glyphosate or chlorsulfuron, which have a low risk of toxic effects to birds eating contaminated vegetation or insects under the lower to central levels, which would be the most realistic scenarios.

As to the potential effects from NPE, research indicates that surfactants such as NPE can have assorted detrimental effects on various species. Relyea (2005) suggested that the mortality in amphibians associated with Roundup (a brand of Glyphosate) was associated with the POEA surfactant found in the formulation. NPE has been documented to induce reproductive abnormalities in rats, specifically causing oxidative stress in the sperm (Chitra, Latchoumycandane and Mathur 2002). Although the doses in their study were well below what is in the above chart (1, 10, and 100 micrograms of 98% NPE/kg of animal weight), the rats were dosed for 45 days. The scenario for a small bird consuming contaminated insects assumes that 100% of the diet consists of NPE-contaminated materials. Given the small patch sizes of the weed occurrences (0.1 acre each, or 0.0009% of the potential sage grouse habitat); it is unlikely there would be enough contaminated insects in the diet to sustain the doses that would cause a risk.

Treatment of noxious weeds (whether it is physical + or herbicide) could cause potential disturbance to birds. Therefore, the District Biologist would be consulted before treatment occurs in any given year in order to conduct surveys that may be needed to protect nesting birds.

Under the Alternatives with Early Detection/Rapid Response activities, new occurrences would be reviewed by wildlife biologists prior to implementation; if concerns for sage grouse surface, additional Design Standards could be added if weed treatment areas were outside of the conditions analyzed within the FEIS.

To summarize, there are few direct effects and no indirect effects expected to sage grouse by the implementation of Alternatives 2 through 6. The three weed occurrences are small and constitute significantly less than 1% (0.0009%) of the habitat. Design Standards will be implemented to further protect the birds. Therefore, there may be impacts to individuals, but there will be no trend toward listing, nor would there be any effect to the sage grouse population on the Forest.

Cumulative Effects to Sage Grouse Populations: The following information on the other activities occurring in the area was provided by Jim Irvin, who was associated with the Devil's Garden/Doublehead District and is familiar with the area where the weeds occur. Access is limited near the weed occurrences in sage grouse habitat, so there would be little activity as far as hunting and fishing are concerned. There is a moderate amount of grazing by domestic livestock and wild horses in the area. There is both juniper removal and controlled burning to restore sage grouse habitat being planned. There could be a potential disturbance to sage grouse, but this issue would be handled through the Annual Allotment Instructions or project implementation phase (for the juniper removal and the prescribed fire). Therefore, the removal of a maximum of 0.3 acre of Canada thistle is not anticipated to have significant direct, indirect or cumulative effects to grouse under Alternatives 2 through 6.

Relationship of Project-Level Impacts to Forest-Scale Habitat and Population Trends for the Sage Grouse

The cumulative effects of the Action Alternatives of the Noxious Weeds Project will result in no decrease in Forest-wide habitat for sage grouse. Nor is there any potential effect to the sage grouse population on the Forest. Therefore, implementation of the Noxious Weeds Project will not alter the existing Forest-wide trend in habitat, nor will it change the existing Forest-wide trend in population distribution of sage grouse.

Swainson's Hawk

The Swainson's hawk is a terrestrial MIS, a Forest Service Sensitive, and a California State threatened species.

Habitat - Species Relationship: Nesting habitat for Swainson's hawk includes open habitats in scattered trees or small groves (Zeiner et al. 1990). Suitable nesting habitat includes the presence of adequate prey, open grasslands and occasional trees that are suitable for nesting (Bloom 1980). Locally, Swainson's hawk have nested in western juniper, ponderosa, elm and sagebrush (Woodbridge et al. 1995), especially along agricultural fields. Normally found in grassland / Forest interface, this species is not common on the Forest. Juniper encroachment may have contributed to a decline in the amount of potential Swainson's hawk nesting and foraging habitat (Bloom 1980).

Swainson's hawk foraging habitats include grasslands, sagebrush, alfalfa fields and hay fields. In Woodbridge et al. (1995), the authors state that cultivated alfalfa appears to have become a critical habitat element replacing the native grasslands. Risebrough et al. (1989) noted that the replacement of native grasses with sagebrush forming less botanically diverse stands may be a reason for the decline near our area. Woodbridge (1987) found similar Swainson's hawk use of open habitats; foraging activity in dense sage-steppe grasslands was not observed. Average home ranges in northeastern California were 69 to 2,884 hectares (170 to 7,126 acres) (Woodbridge 1998).

Diets of Swainson's hawks differ markedly between the breeding and non-breeding periods. Over most of the species' range, breeding Swainson's hawks show a strong dependence on ground squirrels, voles, or other abundant small mammal prey. Montane vole are consumed in NE California (Woodbridge 1991) and California vole in central California (Estep 1989). Prey species for the Great Basin area include California vole (*Microtus californicus)*, Belding's ground squirrel (*Spermophilus beldingi*), and other various open-habitat grassland species of birds and reptiles (Bloom 1980). Insects comprise a large proportion of total individuals, but a negligible proportion of prey biomass during the breeding season.

Following the breeding season, this species shifts from small mammals to insect prey. In northeastern California, montane voles and Belding's ground squirrels contributed over 70% of prey items identified by Woodbridge (1991). After the young fledge and begin to attain independence, diets begin to shift to insect prey. In northeastern California, pellets regurgitated by both adult and fledgling Swainson's hawks in August consisted almost entirely of grasshopper (*Dichroplus* sp.) parts.

Swainson's Hawk Habitat Status and Trend at the Forest Scale

Due to its association with grassland and agricultural fields, Swainson's hawk is not common on the Modoc National Forest. Most of the foraging habitat is privately owned (USDA 1991b. Page 3-107). The known historic concentration of nest sites on the Modoc is in the extreme northwestern portion of the Forest on the Doublehead Ranger District, where 12 nest sites have been documented. This area is dominated by grasses, including Idaho fescue, bluebunch wheatgrass, Sandberg bluegrass, and Thurber needlegrass. Juniper trees occurring in the area are widely scattered and serve as the nesting substrate.

To approximate occupied habitat for Swainson's hawks on the Forest, a 0.7 mile radius, which equates to the average home range size of a Swainson's hawk territory in northeastern California (Woodbridge 1998), was analyzed around each nest site. Based on this model, approximately 8,300 acres of occupied habitat are estimated to occur on the Modoc National Forest. Vegetation types in occupied habitat include wet meadows, sagebrush, agricultural fields, bitterbrush, and annual grassland. An additional 230,882 acres of potential habitat for Swainson's hawk nesting and foraging habitat are available based on a vegetation query for juniper woodland with 0 to 9 % canopy closure, sage, perennial grasslands, alfalfa, fallow fields, and dry land pasture.

Historically, this species was probably much more abundant on the Forest than it is currently. Juniper encroachment, resulting from fire suppression, and heavy livestock grazing in late 1800s and early 1900s, rendered much of the Forest unsuitable for nesting habitat. Removal of small diameter junipers, while leaving the larger trees, would enhance nesting habitat for Swainson's hawks (USDA 1991b. Page 3-107). Juniper removal is currently under environmental analysis through the Sagebrush Steppe Ecosystem Restoration Project Environmental Impact Statement. This planning effort is on a landscape scale and includes National Forest and Bureau of Land Management land in Northeastern California. The draft EIS was released in 2007. Because of an increase in herbaceous non-native plant species (including cheatgrasses) and juniper on the Forest, the current trend for the habitat is decreasing for Swainson's hawk, since the time of the Modoc Forest Plan.

Project-level Effects Analysis Based on Swainson's Hawk Habitat

Key Habitat Factor(s) for the Analysis: The proposed project, the removal of noxious weeds from Forest System Lands, will have no effect on Swainson's hawk habitat. The potential effects are limited to the consumption of herbicide-contaminated prey and disturbance.

Analysis Area for Project-level Effects Analysis: The analysis area for Swainson's hawk consists of the 8,300-acre nest cluster on the Doublehead District and the 230,882 acres of potential habitat found elsewhere on the Forest. This habitat is limited to the lower elevations of the Forest, mainly in open shrub and juniper stands. In general, these areas are found on the interface between the Forest and the agricultural lands, as well as portions of the Doublehead and Devil's Garden Districts. The only known occupied habitat is in the extreme northwestern corner of the Forest on the Doublehead District.

Alternative 1 (Current Management)

Direct and Indirect Effects to Habitat

The Forest Service currently treats 20 to 30 acres a year by physical + methods. Currently, the Forest does not use herbicides to treat noxious weeds.

Implementing weed treatments under Alternative 1 would have no effect to Swainson's hawk habitat. There would be no change in the current or future amount of nesting or foraging habitat by the treatment of noxious weeds. Zero % of the current Swainson's hawk habitat in the analysis area would be affected by implementation of Alternative 1.

Leaving weeds untreated can have some serious effects to Swainson's hawk. Habitats dominated by exotic plant species can reduce prey availability. In northeastern California, weedy ruderal fields (growing where natural vegetational cover has been disturbed or removed) and cheatgrass-dominated grazing lands supported low prey populations and received little use by foraging Swainson's hawks (Woodbridge 1991). Estep (1989) reported a similar pattern in the Central Valley of California. Invasion by Russian thistle, cheatgrass and tumble-mustard (Symbrissum sp.) also results in increased fire potential, further reducing cover of less fire-resistant native perennial grasses and shrubs.

Cumulative Effects to Habitat

Because there is no direct or indirect effect to Swainson's hawk habitat, there are no cumulative effects to Swainson's hawk habitat under this Alternative.

Alternatives 2 to 6

Direct and Indirect Effects to Habitat

There are no weed treatments planned within 15 miles of occupied habitat. There would be a maximum of 23.02 acres of physical + treatments and 22.76 acres of herbicide treatments in the 230,882 acres, or 0.01% of potential Swainson's hawk habitat Forest-wide.

Table 3 - 90. Proposed Treatments within Occupied and Potential Swainson's Hawk Habitat

Type of Swainson's Hawk Habitat	Total Acres of Swainson's Hawk Habitat Forest wide	Total Maximum Acres of Physical + Treatments	Total Maximum Acres of Herbicide Treatments
Occupied	8,300	0.0	0.0
Potential	230,882	23.06	22.76

*This figure includes the maximum, where physical + or herbicide methods may be employed

No nest trees or foraging habitat would be removed under any action Alternative. Most of the weed occurrences have native plants within their matrix; therefore, there would be native plants left to provide food and cover for potential prey. Based on the information from the previous section, prey habitat should be improved by the removal of noxious weeds. Although there may be beneficial direct or indirect effects to Swainson's hawk habitat under any action Alternative, the extent of this beneficial effect is inconsequential, given their in relation to occupied habitat; therefore, there are no direct or indirect effects to Swainson's hawk habitat.

Cumulative Effects to Swainson's Hawk Habitat

Because there are no direct or indirect effects to Swainson's hawk habitat, there are no cumulative effects to Swainson's hawk habitat under these Alternatives.

Project-level Effects Analysis based on Swainson's Hawk Population

Summary of Population Status and Trend at the Forest Scale: The Modoc NF Forest Plan (as amended by the SNFPA) requires Forest-scale distribution population and relative abundance monitoring for Swainson's hawk. The sections below summarize population status and trend data for the Swainson's hawk. This information is drawn from the detailed information on population trends in the Modoc National Forest MIS Report (USDA 2007b), which is hereby incorporated by reference.

Swainson's Hawk Population Status and Trend at the Bioregional Scale and Local Scale

The Swainson's hawk is currently identified as "Imperiled" in California (NatureServe 2006). Imperiled is defined as a result of rarity due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the nation or state/province. The Swainson's hawk has been detected on 19 BBS routes in California.

Bloom (1980) reviewed historical records and egg collections to estimate the historical distribution of Swainson's hawks in California, and found that the current range of this species has been reduced dramatically from what it was historically.

Currently, Swainson's hawks are absent from much of their historic breeding range in the central and southern portions of California, and overall may have declined by as much as 90% (Bloom 1980). In the ButteValley in northern California, the population has been stable at 65 to 80 pairs since the mid-1980s; however, reproductive success has declined post-1992 (Woodbridge unpub.). During the same time period, the adjacent Klamath Basin population declined by approximately 90%; from 40 pairs to <5 pairs (Risebrough et al. 1989). Large numbers of Swainson's hawks still occupy the Central Valley (estimated 420 to 1,000 pairs), but annual losses of territories to residential development and riparian habitat removal, and agricultural intensification are reported (CDFG 1988, Estep 1989). Conversely, Bloom (unpub.) reports apparent recolonization of historic habitats in Los Angeles County (Antelope Valley), and population increases in Owens valley, suggesting that the species' populations can respond to improved habitat conditions. Likewise, modest increases in small populations in Lassen County and the east side of the Sierra Nevada are likely linked to expansion of alfalfa cultivation (Bloom unpub.).

The Modoc National Forest and various partners (e.g., Pete Bloom, a raptor expert) collect surveys and incidental sightings data on and adjacent to the Forest. Recent surveys have been conducted in 2001 to 2006 near the agricultural-Forest interface near Big Valley/Devil's Garden Districts. No nesting birds have been detected on the Forest during these recent surveys.

During the planning phase for the Modoc NF Forest Plan, there were 11 known nest sites on or immediately adjacent to the Modoc NF (UDSA 1991b. Page 3-107). To date, there are 15 occurrences and 12 nest sites located on the Forest in the extreme northwestern portion of the Doublehead Ranger District. The current Swainson's hawk distribution and relative abundance are basically the same as described in the Modoc Forest Plan.

Effects of the Alternatives on Swainson's Hawk

The historic Swainson's hawk nests are in the extreme northwest corner of the Forest. There are no weed occurrences planned for treatment within 15 miles of any historic Swainson's hawk nest. Therefore, there is no disturbance to these species expected with implementation of the project. Limited Operating Periods on newly found active nests would further mitigate potential effects.

There would be no potential for consumption of contaminated prey under Alternatives 3 and 5 and the physical + treatments under 2, 4 and 6. A maximum of 22.76 acres, or 0.01% modeled potential habitat could receive herbicide treatments under Alternatives 2, 4 and 6. None of those occurrences is near occupied habitat. The weed occurrences of greatest concern would be BV284ONAC (Scotch thistle), WM008LIDA, and WM010LIDA (Dalmatian toadflax), and DG019SAAE (Mediterranean sage).

BV284ONAC (Scotch thistle) – The lower portion of the weed occurrence near the private land provides the best potential Swainson's hawk habitat. There are patches of Scotch thistle all the way down the creek to the private land. Very little of the 12.66 acres of this weed occurrence located in potential Swainson's hawk habitat would receive herbicides, because most thistle patches are small clumps of plants. The largest patch was roughly .1 acre. Some of the Scotch thistle stands were dense; however, there are native and non-native plants outside of these clumps, and often within them as well. Under Alternatives 2, 4 and 6, this weed occurrence may be treated with physical + or herbicide means (which includes goat grazing under Alternative 6). Because the condition of the weed occurrence, only a small acreage within the entire 12.66 acres would be treated, making it unlikely that a Swainson's hawk would consume 100% of its diet in contaminated prey. Therefore, there are no anticipated effects by the treatment of this weed occurrence under Alternatives 2, 4, or 6 to Swainson's hawk.

There are 5.76 acres of two weed occurrences (WM008LIDA and WM010LIDA [Dalmatian toadflax]) near New Pine Creek on steep, timbered slopes that would probably not be used by nesting or foraging pairs. Throughout the Forest and the state, Swainson's hawk foraging habitat is largely confined to the agricultural lands surrounding their nests. It is highly unlikely the birds would ingest a significant portion of their diet in contaminated mammals or insects from these two sites. Under Alternatives 2, 4, and 6, these occurrences are scheduled for Glyphosate. Glyphosate does not have a hazard quotient above 1.0 for either the consumption of contaminated mammals or contaminated insects scenarios. Therefore, treatment of these two occurrences is not expected to affect Swainson's hawk for Alternatives 2, 4 and 6.

There are 2.81 acres of DG019SAAE (Mediterranean sage) within potential Swainson's hawk habitat. This occurrence would only be treated by physical + means under Alternatives 2 and 4. It could be treated by either physical + or herbicide methods under Alternative 6. It would not be treated with 2, 4-D under Alternative 6 because of Design Standard 12b, which limits the size of the weed sites that can be treated with 2, 4-D to less than 2 acres. Treatment of this weed occurrence under Alternative 6 is not expected to affect Swainson's hawk, because the herbicides planned for use have lower hazard quotients, the area is considered potential habitat with no history of occupancy, and because of the small size of this occurrence.

The rest of the 1.84 acres of weed occurrences in potential Swainson's hawk habitat are less than one acre and scattered throughout the Forest. It is extremely unlikely that Swainson's hawk would consume 100% of their diet in contaminated prey, where potential effects from herbicides would manifest themselves (i.e. cause harm to the bird).

Under the Alternatives with Early Detection/Rapid Response activities, new occurrences would be reviewed by wildlife biologists prior to implementation; if concerns for Swainson's hawk surface, additional Design Standards could be added if weed treatment areas are outside of the conditions analyzed within the FEIS.

Based on the information presented above, there inconsequential direct and no indirect effects to Swainson's hawk by the implementation of any action Alternative.

Cumulative Effects to Populations

The four weed occurrences mentioned above have little activity that would contribute to cumulative effects. WM008LIDA and WM010LIDA (Dalmatian toadflax) are on the edge of the Warner Mountain District in an area that does not have grazing, timber harvest, mining or recreation that occurs farther up the canyon (J. Irvin and M. Flores, pers. comm.). DG019SAAE (Mediterranean sage) is located by a quarry. No Forest Service activities occur in the area (J. Irvin, pers. comm.). BV284ONAC (Scotch thistle) is a gated area that is no longer used as a primary timber haul route. The area receives grazing, but otherwise there is only a small amount of hunting outside of the reproductive period. (B. Landoski, pers. comm.) Therefore, implementation of Alternatives 2-6 would have no cumulative effects to Swainson's hawk individuals or populations.

Relationship of Project-Level Impacts to Forest-Scale Habitat and Population Trends for the Swainson's hawk

The cumulative effects of the Action Alternatives of the Noxious Weeds Project will result in no decrease in Forest-wide habitat for Swainson's hawk. Nor is there any potential effect to the Swainson's hawk population on the Forest. Therefore, implementation of the Noxious Weeds Project will not alter the existing Forest-wide trend in habitat, nor will it change the existing Forest-wide trend in population distribution of Swainson's hawk.

Willow Flycatcher

The flycatcher is a terrestrial MIS, a Forest Service Sensitive, and a California State Endangered species.

The Modoc National Forest Land and Resource Management Plan (Forest Plan) (USDA 1991a) states that application of the Riparian Area Management Prescription will maintain viable populations for this species (page 4-26). During the development of the Forest Plan, willow flycatchers were selected as an MIS, because they needed not only the presence of willows, but also a specific type of structure within riparian areas (USDA 1991b page 3-103). Currently, willow flycatchers are managed through a combination of surveys, livestock management, and protection of riparian ecosystems and meadows (USDA 2004 Record of Decision (ROD), page 11, 56-58.).

Habitat - Species Relationship: The willow flycatcher is a summer resident of the Sierra Nevada and Cascade Ranges in elevations from 2,000 to 8,000 feet. They are most often associated with broad, open river valleys or large (> 20 acres) mountain meadows. However, they have been documented to use meadows that were an average of 10 acres (Harris et al. 1987) and as small as 0.62 acres (Scully 1995, Kings River Conservation District 1985). On the Modoc National Forest, they have also been detected in narrow riparian canyons (T. Ratcliff, pers. comm.). Dense willow thickets are necessary for cover, nesting, and roosting (Scully 1995, Sedgwick and Knopf 1992, Fowler et al. 1991). Willow stands interspersed with openings are preferred habitat (Sedgwick and Knopf 1992, Fowler et al. 1991); large patches of contiguous willow do not appear to be suitable (Sanders and Flett 1989).

The presence of water appears to be an important component for suitable habitat (Bombay et al. 2001, Scully 1995). Drier conditions may have reduced or eliminated potential breeding sites for insects in the Sierra Nevada (Bombay et al. 2000). Insects are a primary staple for this species (Zeiner et al. 1990).

Willow Flycatcher Habitat Status and Trend at the Forest Scale: Willow flycatcher habitat was modeled using the polygons delineated during the planning phase for the Sierra Nevada

Forest Plan Amendment, with an additional fifty-meter buffer. The fifty-meter value approximates a willow flycatcher territory (T. Benson, pers. comm.), so the buffer provided a conservative estimate of willow flycatcher habitat on the Forest. Based on this GIS query for willow flycatcher, there are 2,450 acres of occupied/potential/emphasis willow flycatcher habitat on the Forest. The following habitat types were included: wet meadow, sagebrush, juniper, and aspen. The sagebrush and juniper types are an artifact of the query.

The authors of the wildlife sections of the Forest Plan and its supporting Final Environmental Impact Statement (FEIS) noted that livestock grazing and use of willows by beavers were two threats to willow habitat and subsequently the presence of willow flycatchers (USDA 1991b page 3-103). At the time of the FEIS, willow planting occurred on all of the Districts. Willow form and distribution appears to be stable to increasing on the Warner Mountain and Devil's Garden Districts in the occupied and emphasis willow flycatcher habitat, since the time of the Modoc Forest Plan.

Willow Flycatcher Project-level Effects Analysis based on Habitat

Key Habitat Factor(s) for the Analysis: The proposed project, the removal of noxious weeds from Forest System Lands, will have no effect on habitat for willow flycatcher; willow flycatchers are not tied to the noxious weeds for cover or food. The main potential effect is limited to the ingestion of contaminated insects.

Analysis Area for Project-level Effects Analysis: The analysis area for willow flycatcher is 2,450 acres, which includes the occupied, potential and emphasis habitat used during the Sierra Nevada Forest Plan Amendment Project (USDA 2001). This habitat is found mainly on the Warner Mountain District, but occurs in scattered localized patches on the Forest.

Alternative 1 (Current Management)

Direct and Indirect Effects to Habitat

The Forest Service currently treats 20 to 30 acres a year by physical + methods. Currently, the Forest does not use herbicides to treat noxious weeds.

Implementing weed treatments under Alternative 1 would have no effect on willow flycatcher habitat. There will be no change in the current or future amount of willow habitat by the treatment of noxious weeds. Zero % of the current willow flycatcher habitat in the analysis area would be affected by implementation of Alternative 1.

Cumulative Effects to Habitat

Because there is no direct or indirect effect to willow flycatcher habitat, there are no cumulative effects to willow flycatcher habitat under this Alternative.

Alternatives 2 to 6

Direct and Indirect Effects to Habitat: There would be no treatment within any habitat with previous sightings, although three areas within potential habitat may be treated Forest-wide. A maximum of 0.3 acres or 0.012% of the 2,450 acres of potential willow flycatcher habitat Forest-wide could receive physical + or herbicide treatments. (table below)

Table 3 - 91. Proposed treatment within Occupied and Potential Willow Flycatcher Habitat

Type of Willow Flycatcher Habitat	Total Acres Willow Flycatcher Habitat Forest wide	Total Maximum Acres of Physical + Treatments	Total Maximum Acres of Herbicide Treatments
Occupied	0.0	0.0	0.0
Potential/Emphasis	2,450	0.3	0.3

*This figure includes the maximum, where physical + or herbicide methods may be employed

These birds nest in shrubs; no nesting habitat would be removed under any action Alternative. Willow flycatchers are primarily an aerial forager, including both hawking and hover-gleaning (various authors in Sedgwick, J. A. 2000). Prey habitat would not be affected, because there are currently no native insects that are reliant on weeds for food or cover. Moreover, sufficient native plants exist outside of the boundaries of the current weed occurrences. Therefore, there should be no negative direct or indirect effects to willow flycatcher habitat by the implementation of Alternatives 2 through 6.

Cumulative Effects to Habitat: Because there are no direct or indirect effects to willow flycatcher habitat, there are no cumulative effects to willow flycatcher habitat under these Alternatives.

Project-level Effects Analysis to Willow Flycatcher Populations

Summary of Population Status and Trend at the Forest Scale: The Modoc NF Forest Plan (as amended by the SNFPA) requires monitoring of the bioregional status and change in distribution for willow flycatcher. The sections below summarize population status and trend data for the willow flycatcher. This information is drawn from the detailed information on population trends in the Modoc National Forest MIS Report (USDA 2007b), which is hereby incorporated by reference.

Willow Flycatcher Population Status and Trend at the Bioregional Scale and Local Scales

Historically, willow flycatchers nested throughout California wherever thickets of riparian deciduous shrubs occurred (primarily *Salix* spp.). In the last four decades, however, willow flycatcher breeding populations have been extirpated from most of the lower-elevation riparian areas in California, and it appears that the species may no longer breed at elevations below 3,000 feet in the Sierra Nevada, in the Central Valley, and in the valleys of the Central Coast. Historic records combined with recent survey efforts indicate a long-term decline of willow flycatchers at elevations above 3,000 feet in the Sierra Nevada as well.

Statewide willow flycatcher BBS data between 1966 to 2005 had a huge positive trend. The regional rating is red for meaning there is data with an important deficiency, and therefore caution needs to be used in utilizing the data. According to the California Partners in Flight Conservation Plan, there are insufficient data to determine trends in California of any subspecies of willow flycatchers.

The current range of the Sierra Nevada subspecies of willow flycatchers (*Empidonax traillii adastus* and *E. t. brewsteri*) consists of isolated sites at relatively high elevations, between approximately 1,200 and 2,500 m (4,000 and 8,000 ft). Current estimates of the willow flycatcher population in the Sierra Nevada bioregion range between 300 to 400 individuals; the effective population size (number of breeding adults) is likely to be smaller. Records compiled from National Forests, researchers, scientific literature, and museum collections document 135 known locations within the bioregion. In most sites, only one willow flycatcher territory is recorded, but other sites have 3, 5, or as many as 32 willow flycatcher territories.

Population trends within the Sierra Nevada Demographic study sites indicate that the willow flycatcher population has experienced a significant decline since 1997. Although in 2002-2004, the number of territories detected has remained stable (range = 37 to 39), nesting success has remained lower than other values reported for passerines.

The willow flycatcher data for the Modoc NF has been collected during both province-wide and project-specific willow flycatcher surveys, as well as from incidental sightings made by private citizens. This species has nested infrequently on the Modoc National Wildlife Refuge as well. Willow flycatchers have not been detected during any BBS surveys locally. Although occasional sightings have been found over time in six locations throughout the Modoc National Forest, there is no stable population of this species on the Forest. The current distribution of willow flycatcher is similar to the pattern described in the Modoc Forest Plan.

Effects of the Alternatives on Willow Flycatchers

Direct and Indirect Effects

Under Alternatives 3 and 5, as well as the physical + portions of 2, 4 and 6, there would be no potential for willow flycatchers to consume contaminated vegetation.

The ingestion of contaminated insects is not expected to affect willow flycatchers for the following reasons for the herbicide portions of Alternatives 2, 4, and 6. First, none of the weed occurrences have had occupancy. Second, the areas where treatment could occur do not have a high potential for bird use. The two dyer's woad sites (DH005ISTI and DH007ISTI) are in the road prism and would not affect potential foraging habitat. The birds, if present, would be in the willow thickets along the creek (P. Buettner, pers. comm.). The 0.07-acre weed occurrence on Lassen Creek is outside of the willow thicket in a draw off the main channel; therefore, it has little potential for foraging willow flycatchers. Third, it is very unlikely that a bird could consume 100% of its diet on these sites because they are all 0.13 acres or less. Finally, none of the sites would be treated with 2, 4-D (the herbicide of greatest concern) under Alternatives 2 and 4, because they all lie within 1,000 feet of water. Under Alternative 6, any of the herbicides could be used. However, given the small size of the weed occurrences and their locations outside of foraging habitat, it is unlikely that there would be an effect to willow flycatcher, even under Alternative 6. Therefore, there may be an impact to individuals, but no trend toward listing for implementation of the actions in the Noxious Weeds FEIS under Alternatives 2, 4, and 6.

Under the Alternatives with Early Detection/Rapid Response activities, new occurrences would be reviewed by wildlife biologists prior to implementation; all weed treatment sites would need to meet water quality standards, and therefore will be limited in acre size as per the BMPs and Design Standards. Consequently, there are inconsequential direct and no indirect effects to willow flycatchers by the implementation of any action Alternative.

Cumulative Effects

A limited amount of hunting and fishing occur near the Lassen Creek weed occurrence. Fishing is regulated along Lassen Creek, due to the presence of red-band trout. The majority of the hunting would be in the fall for deer. The area is grazed under a rotation system developed to protect red-band trout in order to avoid listing of the species. Given light use in the area and no other herbicide use adjacent to the 0.07 acre of potential treatment, there would be no expected additional cumulative effects to willow flycatchers by implementation of any Alternative at the Lassen Creek site.

Jim Irvin provided information on activities for the Doublehead sites. Grazing and recreation are the primary activities. The creek is within an enclosure, where grazing was excluded for a number of years. The area is now lightly grazed, but controlled to ensure riparian habitat improvement.

There is a light amount of fishing, because this seasonally flowing creek becomes more of a series of pools once the spring flush has occurred. There are inconsequential direct, no indirect, and no cumulative effects expected with treatment at the Doublehead sites under Alternatives 2 - 6.

Relationship of Project-Level Impacts to Forest-Scale Habitat and Bioregional-Scale Population Trends for the Willow Flycatcher

The cumulative effects of the Action Alternatives of the Noxious Weeds Project will result in no decrease in Forest-wide habitat for willow flycatcher. Nor is there any potential effect to the willow flycatcher population on the Forest. Therefore, implementation of the Noxious Weeds Project will not alter the existing Forest-wide trend in habitat, nor will it change the existing bioregional-wide trend population distribution of flycatcher.

Summary of Sensitive Species Determinations

In order to clarify, the determinations were put into tabular form. The May Impact cell means, "May impact individuals, but not likely to cause a trend to federal listing or a loss of viability."

Table 3 - 92. Summary of Sensitive-Species Determination

Species	Alt 1*	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6
American Marten	No Impact	May Impact**	No Impact	May Impact**	No Impact	May Impact**
California Spotted Owl	No Impact	May Impact**	No Impact	May Impact**	No Impact	May Impact**
California Wolverine	No Impact	No Impact	No Impact	No Impact	No Impact	No Impact
Greater Sandhill Crane	No Impact	May Impact	No Impact	May Impact	No Impact	May Impact
Great Gray Owl	No Impact	No Impact	No Impact	No Impact	No Impact	No Impact
Northern Goshawk	No Impact	May Impact**	No Impact	May Impact**	No Impact	May Impact**
Pallid Bat	No Impact	May Impact	May Impact	May Impact	No Impact	May Impact**
Sage Grouse	No Impact	May Impact**	No Impact	May Impact**	No Impact	May Impact**
Sierra Nevada Red Fox	No Impact	No Impact	No Impact	No Impact	No Impact	No Impact
Swainson's Hawk	No Impact	May Impact**	No Impact	May Impact**	No Impact	May Impact**
Townsend's Big-eared Bat	No Impact	May Impact	May Impact	May Impact	No Impact	May Impact**
Willow Flycatcher	No Impact	May Impact**	No Impact	May Impact**	No Impact	May Impact**

* There would be no impact in the short term, but significant increases in weeds could affect most species

** Minor potential effects to species – only 1 pair, only potential habitat or only small acreages affected

Modoc NF Management Indicator Species

Blue Grouse (now known as Sooty Grouse)

The sooty/blue grouse is a terrestrial MIS, as well as a game species in California.

Habitat - Species Relationship: Sooty/blue grouse have a patchy distribution throughout the Forest in various coniferous habitats. Information on sooty/blue grouse distribution is based mostly on incidental sightings; however, the California Department of Fish and Game has conducted bag checks, hoot count transects, and habitat surveys sporadically since the 1950s.

Sooty/blue grouse use open to mature stands of conifer types that are interspersed with openings and water (Zeiner et al. 1990a). Sooty/blue grouse use dense conifer cover for roosting. They nest on the ground in an area that has cover either next to a log or in brushy areas. They will brood their young in grass and forb stands. Locally on the Modoc National Forest, they are also frequently found in conjunction with aspen stands.

Sooty/blue grouse consume mostly plant materials (conifer needles; buds, fruits, flowers, and seeds of various plants), but will also eat insects, snails, and spiders (Zeiner et al. 1990a). They pluck conifer needles from trees; however, they will also eat forbs and glean insects from vegetation and the ground. In Montana, the average summer home range size was 126 acres, and the average territory size was seven acres.

Project-level Effects Analysis Based on Habitat

Key Habitat Factor(s) for the Analysis

The proposed project, the removal of noxious weeds from Forest System Lands, will have no effect on habitat for sooty/blue grouse; sooty/blue grouse are not directly tied to the noxious weeds for cover or food. The main potential effect is limited to the potential consumption of herbicide contaminated plant and insect materials by grouse.

Analysis Area for Project-level Effects Analysis

The analysis area for sooty/blue grouse is limited to the 161,000 acres of potential habitat on the Forest. This habitat is limited to the upper elevations of the Forest that have mixed conifer, white fir, and red fir. In general, the areas include the Warner Mountain Ranger District, the Medicine Lake Highlands, roughly half of the Big Valley District, and localized portions of the Devil's Garden District.

Alternative 1 (Current Management)

Direct and Indirect Effects to Habitat

The Forest Service currently treats 20 to 30 acres a year by physical + methods. Currently, the Forest does not use herbicides to treat noxious weeds.

Implementing weed treatments under Alternative 1 would have no effect on sooty/blue grouse habitat. There would be no change in the current or future amount of dead and downed materials by the treatment of noxious weeds. Vegetation diversity is expected to remain the same or very site specifically, be improved on the 30 acres; the same is true for aspen and meadow habitat. Zero % of the current sooty/blue grouse habitat in the analysis area would be affected by implementation of Alternative 1. Conversely, the effect of not treating the habitat could cause a significant decrease in the amount of potential food sources for grouse.

Cumulative Effects to Habitat

Because there is no direct or indirect effect to sooty/blue grouse habitat, there are no cumulative effects to sooty/blue grouse habitat under this Alternative.

Alternatives 2 to 6

Direct and Indirect Effects to Habitat

The Forest Service could spray a maximum of 39.25 acres or 0.024% of potential sooty/blue grouse habitat each year under this Alternative. Physical + treatments could occur on a maximum of 35.55 acres each year, which equals 0.025% of the total Forest-wide potential sooty/blue grouse habitat. There are a total of 161,000 acres of potential sooty/blue grouse habitat Forest-wide. (Table 3 - 73)

Table 3 - 93. Proposed Treatment within Potential Sooty/Blue Grouse Habitat

Total Acres of Potential Habitat - Forest wide	Total Maximum Acres of Physical + Treatments*	Total Maximum Acres of Herbicide Treatments*
161,000	39.55	39.25

* This figure includes the maximum, where physical + or herbicide methods may be employed.

Implementing weed treatments under Alternatives 2 through 6 would have no effect on sooty/blue grouse habitat. There would be no change in the current or future amount of dead and downed materials or vegetative diversity by the treatment of noxious weeds. Although the condition of aspen stands and meadows could be enhanced by decreasing the competition to native species from weeds, currently there would not be a discernable benefit to sooty/blue grouse habitat on a Forest-wide scale, because the proposed treatments blocks are small and scattered. Therefore, there are no direct or indirect effects to sooty/blue grouse habitat by the implementation of Alternatives 2-6.

Cumulative Effects to Habitat

Because there are no direct or indirect effects to sooty/blue grouse habitat, there are no cumulative effects to sooty/blue grouse habitat under these Alternatives.

Summary of Population Status and Trend at the Forest Scale

The Modoc NF Forest Plan (as amended by the SNFPA) requires Forest-scale distribution population monitoring for sooty/blue grouse. The sections below summarize population status and trend data for the sooty/blue grouse. This information is drawn from the detailed information on population trends in the Modoc National Forest MIS Report (USDA 2007b), which is hereby incorporated by reference.

Population Status and Trend at the Bioregional Scale and Local Scales

Population monitoring data collected by the Modoc NF and partners at the bioregional scale indicate that sooty/blue grouse have an “increasing tendency” for the Sierra Nevada (Siegel and DeSante 1999). The distribution for sooty/blue grouse appears to be the same on the Forest as the one in 1991, when the Forest Plan was released.

Effects of the Alternatives Considered Within the Noxious Weeds FEIS.

Physical + treatments under any Alternative would cause no risk of ingestion of contaminated vegetation. Sooty/blue grouse could ingest both contaminated plants and animals under Alternatives 2, 4 and 6. It is unlikely that the sooty/blue grouse would ingest sufficient herbicides to reach the acute toxicities scenario listed in Table 3 - 74 for any Alternative for the following reasons.

First, the scenarios were developed for a boom application; the action Alternatives would spot treat noxious weeds (not use booms). Although there may be some overspray, the entire area would not receive a complete blanket of herbicide. Second, very little of the potential grouse habitat would be treated, and most of those weed occurrences are small blocks. Within the 161,000 acres of potential sooty/blue grouse habitat, there could be a total of 39.55 acres or 0.025% Forest-wide habitat affected by herbicides. Third, the majority of the weed occurrences within potential sooty/blue grouse habitat are less than one acre parcels (the majority are 0.1 acre) except for the following: [dyer’s woad] WM001ISTI (5.9 acres), WM002ISTI (5.78 acres),

WM003ISTI (1.82 acres), WM004ISTI (6.51 acres), WM005ISTI (5.26 acres), WM008ISTI (2.02 acres) as well as WM009CIAR4 [Canada thistle] (5.84 acres).

For the acute scenario, there appears to be no effect to the sooty/blue grouse population on the Forest for the following reasons. Treating the largest occurrence (5.9 acres) in potential sooty/blue grouse habitat would cover 4.68% of the total 126-acre home range. The assumption is that 100% of the birds' diet would consist of contaminated vegetation or insect materials. The likelihood of a grouse ingesting 100% of its diet on these small areas is remote. In addition, dyer's woad is found in many areas in the County and on the Forest; these six occurrences are not high priorities for treatment with herbicide. The WM009CIAR4 (Canada thistle) is scheduled to receive Clopyralid, which has hazard quotient ratings below 1.0, and therefore, is not considered a risk (Tables 3 - 93 and 3 - 88). In addition, all of these weed occurrences are localized in the northern Warner Mountain District, so the remaining sooty/blue grouse Forest-wide would be unaffected.

Table 3 - 94. Hazard Quotient Ratings for Acute Toxicity, Small Bird Eating Contaminated Insects (100% of diet)

Herbicide/Application Rate	Exposure Assessment Rate mg/kg/day			Hazard Quotient Rating		
	Central	Lower	Upper	Central	Lower	Upper
2, 4-D						
a) 1.5 lbs/ac	56.4	56.4	169.0	6.0	6.0	17.0
b) 2.0 lbs/ac	75.2	75.2	226.0	8.0	8.0	23.0
Chlorsulfuron 1.0 lb/ac	2.35	2.35	7.05	0.001	0.001	0.004
Clopyralid 0.25 lb/ac	9.4	9.4	28.2	0.01	0.01	0.04
Dicamba						
a) 1.0 lb/ac	37.6	37.6	113.0	3.0	3.0	8.0
b) 2.0 lbs/ac	75.2	75.2	226.0	6.0	6.0	17.0
Glyphosate 3.75 lbs/ac	141.0	141.0	423.0	0.3	0.3	0.8
Triclopyr (Acid & BEE) 1.5 lbs/ac	56.4	56.4	169	0.1	0.1	0..3 (ACID) 0.4 (BEE)
NPE	62.6	50.0	263.0	6.0	5.0	26.0

The chronic scenario for ingestion of vegetation has a greater probability of reality. Under the lower and central scenario, the assumption is that the birds' diet is 10% and 30% contaminated vegetation, which is realistic at the sites that are greater than five acres or in the same general location (the cluster of sites T47N, R15E, in occupied grouse habitat). At the lower or central rate of applications, the only herbicide with a hazard quotient rating above 1.0 for the chronic ingestion of contaminated vegetation (on site) is 2, 4-D (either alone or in a tank mix) (Table 3 - 88).

Under Alternatives 2 and 4, there is no concern for the use of 2, 4-D because all of these weed occurrences are within 1,000 feet of water; therefore, 2, 4-D will not be used to treat them. Under Alternative 6, Design Standard DS-12b lessens the potential effect by limiting the size of a weed occurrence that could receive 2, 4-D to 2 acres and less. There is only one 1.82-acre dyer's woad polygon that is in potential sooty/blue grouse habitat, which could receive 2, 4-D. This area would constitute 1.4% of a 126-acre territory making it unlikely that grouse could consume sufficient amounts of 2, 4-D to cause adverse effects. Given the implementation of Design Standards to minimize the potential risk to grouse and the use of spot treatments of noxious weeds (as opposed to boom sprayers), the use of herbicides will have little chronic effect to single grouse and will have no effect on the distribution of blue/sooty grouse on the Modoc National Forest.

Under the Alternatives with Early Detection/Rapid Response activities, wildlife biologists would review new noxious weed treatment sites prior to implementation. If concerns for sooty/blue grouse surface (including conditions not covered within the analysis for the FEIS), additional Design Standards could be added.

The sooty/blue grouse is well distributed across the Modoc NF. Because only a few individual birds could be affected in localized in the northern Warner Mountain District, implementation of Alternatives 2 through 6 would have no impact on the distribution of sooty/blue grouse. Nor would there be any direct or indirect effects to the whole population of sooty/blue grouse.

Cumulative Effects to Populations: Since there are no direct or indirect effects to the sooty/blue grouse population, there would be no cumulative effects.

Relationship of Project-Level Impacts to Forest-Scale Habitat and Population Trends for the Sooty/blue grouse

The cumulative effects of Alternatives 2 through 6 of the Noxious Weeds Project will result in no decrease in Forest-wide habitat for sooty/blue grouse. The potential effect to the population is that no one potential home range would be affected by herbicides, although small portions of three potential home ranges could be. Therefore, the impact of the Noxious Weeds Project will not alter the existing Forest-wide trend in habitat, nor will it change the existing Forest-wide population distribution trend for sooty/blue grouse.

Canada Goose and Mallard

The Canada goose and mallard are terrestrial MIS as well as a game species in California.

Habitat - Species Relationship: Canada geese have a patchy distribution throughout the Forest, focused near lakes and streams; they use the Modoc NF for nesting and brood-rearing activities. Nest sites include scrapes in dense herbaceous vegetation, cliffs, platform nests in trees, hollows in trees, and on nesting islands (various authors in Bellrose 1980, Frost 1988). Although Canada geese will use a variety of nest substrates, there are three characteristics of nests sites that are fairly consistent: a close proximity to water, cover for the nest, and an uninterrupted view for the incubating bird (Bellrose 1980). About 90% of the nest sites were located within 50 yards of water (Bellrose 1980).

Both adult and young Canada geese are primarily grazers (Cadieux, Gauthier, and Hughes 2004, Sedinger 1986). Canada geese feed on agricultural crops and wild grasses and forbs (Zeiner et al. 1990a).

Mallards have the same patchy distribution throughout the Forest as Canada geese; according to Bellrose (1980), the results of most studies show that the majority of mallard nests are within 100 yards of water. Mallards also use the Modoc NF for nesting and brood rearing. Typical nesting habitat for mallards consists of scrapes in upland herbaceous vegetation in proximity to water (Drilling, Titman and McKinney 2002). Both seasonal and permanent water bodies are utilized (Drilling, Titman and McKinney 2002). Cover surrounding the nests in herbaceous vegetation is usually dense and about 24 inches in height (Bellrose 1980). Brood habitat for mallards includes riparian areas, with a mixture of open water with emergent vegetative cover.

Mallards are mainly herbivorous utilizing domestic grains, forb seeds, and aquatic plants; they will however, also consume insects, invertebrates, tadpoles and small fish (Zeiner et al. 1990). Hatchlings basically feed on insects, but shift to seeds by six weeks (Chura 1961 in Zeiner et al. 1990a). Territory sizes varied from 163 acres to 1,797 acres (Zeiner et al. 1990a).

Project-level Effects Analysis based on Canada Goose and Mallard Habitat

Key Habitat Factor(s) for the Analysis

The proposed project, the removal of noxious weeds from Forest System Lands, will have no effect on habitat for Canada geese or mallards; neither species is directly tied to the noxious weeds for cover or food. Tall whitetop has been shown to out-compete grasses, thereby decreasing waterfowl food resources (Bossard, Randal, and Hoshovsky 2000). Weeds provide less cover and may lead to greater predation. Mallard nests that are in poor cover, routinely fail on the Modoc National Forest (G. Studinski and M. Flores, pers. comm.). The main potential effect of the implementation of the Noxious Weed FEIS is limited to the potential consumption of herbicide-contaminated plant and insect materials by geese and mallards.

Analysis Area for Project-level Effects Analysis

The analysis area for Canada goose is 19,264 acres of potential nesting habitat on the Modoc National Forest (75,713 total acres modeled-56,449 acres of water). This habitat occurs to a large extent on the reservoirs on Devil's Garden and Doublehead Ranger Districts, with small inclusions on habitat scattered on the rest of the Forest.

The analysis area for mallard is 54,292 acres of potential mallard nesting habitat on the Modoc National Forest (111,037 total acres modeled-56,449 acres of water). This area is basically the same as the goose, except that it expands further from the water's edge.

Alternative 1 (Current Management)

Direct and Indirect Effects to Habitat

The Forest Service currently treats 20 to 30 acres a year by physical + methods. Currently, the Forest does not use herbicides to treat noxious weeds.

Implementing weed treatments under Alternative 1 would have no effect on Canada goose and mallard habitat. There would be no change in the current or future wetland habitat, because most of the work is outside of riparian habitats. Zero % of the current habitat for either species on the Forest would be affected by implementation of Alternative 1. Conversely, the effect of not treating the habitat could cause a significant decrease in the amount of potential food and cover for Canada goose and mallard.

Cumulative Effects to Habitat

Because there is no direct or indirect effect to Canada goose or mallard habitat, there are no cumulative effects to habitat for either species under this Alternative.

Alternatives 2 to 6

Direct and Indirect Effects to Habitat

Physical + treatments could occur on a maximum of 31.06 acres out of 19,264 acres, or 0.016% of potential goose habitat Forest-wide. There could be 119.31 acres of physical + treatments out of 54,292 acres or 0.22% of potential mallard. A maximum of 30.46 acres out of 19,264 acres, or 0.16% of potential habitat Forest-wide for goose habitat could be treated with herbicides; there would be 118.20 acres out of 54,292 acres, or .22% potential mallard habitat sprayed Forest-wide (Table 3 - 76).

Table 3 - 95. Proposed Treatment Acres within Potential Canada Goose and Mallard Habitat

Species	Total Acres of Potential Habitat Forest-wide	Total Maximum Acres of Physical + Treatments*	Total Maximum Acres of Herbicide Treatments*
Canada goose	19,264	31.06	30.46
Mallard	54,292	119.31	118.20

*This figure includes the maximum, where physical + or herbicide methods may be employed.

Noxious weeds do not provide optimal nesting or foraging cover. Nests located in poor cover routinely fail. In addition, revegetation of bare areas could provide cover currently being taken up by the weeds.

Although treatment of noxious weeds would benefit both Canada goose and mallard foraging and nesting habitat, the potential beneficial effects on less than 0.5% of the habitat would not be discernable to Canada goose or mallard habitat by the implementation of Alternatives 2 through 6 on a Forest-wide scale (see paragraph above). Therefore, there are no direct or indirect effects to Canada goose and mallard habitat by the implementation of Alternatives 2 through 6.

Cumulative Effects to Habitat

Because there are no direct or indirect effects to Canada goose or mallard habitat, there are no cumulative effects to habitat for either species under these Alternatives.

Summary of Canada Goose and Mallard Population Status and Trend at the Forest Scale

The Modoc NF Forest Plan (as amended by the SNFPA), requires Forest-scale distribution population monitoring for Canada goose and mallard. The sections below summarize population status and trend data for the both of these species. This information is drawn from the detailed information on population trends in the Modoc National Forest MIS Report (USDA 2007b), which is hereby incorporated by reference.

Canada Goose and Mallard Population Status and Trend at the Bioregional Scale and Local Scales

Population information for Canada goose has been obtained both by Modoc NF personnel and various state and federal partners. Based on California-wide BBS data for the period of 1966 to 2004, Canada goose is classified as “Likely increasing” (Siegel and DeSante 1999), with a non-significant increase of 3.2% (range -7.2 to 13.5) per year over the 39 routes. At the Sierra Nevada scale, for the period of 1966 to 2004, Sierra Nevada-wide BBS data classifies Canada goose as “increasing tendency” (Siegel and DeSante 1999) with a non-significant increase of 10.8% (range -5.8 to 27.4%) per year.

Brood counts were conducted for geese and ducks for the Devil’s Garden District in 1975 to 1989, 1991, 1993, 2002, 2003, and 2006. Other information for the Forest consists of incidental sightings. According to Modoc NF data, Canada geese have expanded on the Forest since the time of the Forest Plan.

The mallard is the most abundant waterfowl species in the Sierra Nevada. Population information for Canada goose has been obtained both by Modoc NF personnel and various state and federal partners. Sierra Nevada-wide BBS data for the period of 1966 to 2004 classifies mallard as “Definitely increasing” (Siegel and DeSante 1999), with a significant increase of 15.5% (range 5.6 to 25.4%) per year over 12 routes. The 2005 Midwinter Waterfowl Survey index for all ducks

in California was 3.8 million, an increase of 18 % from 2004 and 20 % above the 10-year average. Generally, there was an upward trend among duck species such as mallard.

Brood counts were conducted for all ducks including mallard on the Devil's Garden District in 1975 to 1989, 1991, 1993, 2002, 2003, and 2006. Other information for the Forest consists of incidental sightings. Monitoring results documented in the Forest Plan FEIS indicate each nesting island annually produces 5 to 6 ducklings (USDA 1991b. Page 3-105). Based on brood count data, mallard production trends appear to have been stable to increasing on the Modoc National Forest since the time of the Forest Plan. Data from the adjacent Modoc National Wildlife Refuge for the past decade indicate that locally mallard populations are stable (barring drought cycles) (S. Clay, pers. comm.).

Effects of the Alternatives on the Canada Goose and Mallard

Direct and Indirect Effects

Physical + treatments under any Alternative would cause no ingestion of contaminated materials. Canada geese and mallards could potentially ingest both contaminated plants and animals under Alternatives 2, 4 and 6.

The vast majority of the weed occurrences in potential Canada goose habitat are less than 1.0 acres (30 occurrences of the total 32 occurrences on the Forest); all but 6 out of 32 occurrences are less than 0.1 acre. The weed occurrences of greatest concern are to Canada goose are BV006LIDA (Dalmatian toadflax) and WM009CIAR4 (Canada thistle).

BV006LIDA (Dalmatian toadflax) – The majority of the area is lava reef country with open conifer stands. The entire weed occurrence is roughly 850 acres. In the area adjacent to Lava Lake, the toadflax has a patchy distribution consisting of small clumps of plants that are less than .001 acre in size. No toadflax occurrences were observed in the riparian margin of the lake. A lava reef surrounds the lake, so there is no chance of direct spray of any MIS, nor is there a chance of drift. The chance of disturbance to nesting waterfowl is low, because of the lava reef buffer as well as the delayed accessibility into the area (the native surface roads don't allow access until late June). Under Alternatives 2 and 4, the entire occurrence could be treated. There are 22.32 acres of potential Canada goose habitat that fall within the entire 850-acre weed occurrence; however, based on a site visit, no weeds would be treated in this potential habitat. Under Alternative 6, only the exterior satellites of the weed occurrence would be treated, which are not within the potential Canada goose habitat. Therefore, there would be no risk to Canada goose by treatment of this weed occurrence under any Alternative.

WM009CIAR4 (Canada thistle) – This site consists of a heavily disturbed meadow, fringed by aspen and mixed conifer. The combination of the effects from beaver, livestock grazing, and the road system have led to an infestation of weeds in the meadow and along the road. Although the site was modeled as potential Canada goose habitat, the reality of the situation is the area consists of a series of old beaver ponds, which have become sedimented in to become meadows. The area does not have open water to act as potential Canada goose habitat. Therefore, there would be no effect to Canada goose by the treatment of this occurrence under any Alternative.

The vast majority of the weed occurrences in mallard habitat are 0.1 acre or less (44 occurrences of the total 53 occurrences on the Forest). There are nine occurrences that are larger than 0.1 acre. Two of these occurrences are 0.13 and 0.75 acres, four of these occurrences are 1.0 acre, and one weed occurrence is 1.28 acres. Mallard territory sizes encompass hundreds of acres; therefore, it is very unlikely that a mallard would consume 10 to 30 % of its diet in contaminated vegetation or insects (even in a weed occurrence up to 1.23 acres). The largest two weed occurrences, where their treatment provides the greatest potential risk to mallards are BV006LIDA (Dalmatian

toadflax) and WM009CIAR4 (Canada thistle). As stated above, the riparian areas would not be treated with herbicide in BV006LIDA (Dalmatian toadflax) under any Alternative. The WM009CIAR4 (Canada thistle) is not considered potential mallard habitat. Therefore, treatment of either weed occurrences under any Alternative would not affect mallard.

Under the Alternatives with Early Detection/Rapid Response treatments, new occurrences would be reviewed by wildlife biologists prior to implementation; all weed occurrence implementation sites would need to meet water quality standards, and therefore would be limited in acre size as per the Best Management Plan's (BMPs) and Design Standards. Additional Design Standards could be added, if weed treatment areas were outside of the conditions analyzed within the FEIS.

Canada goose and mallard are well distributed across the Modoc NF in riparian habitats. Because there is a low potential for weed treatments to affect individual birds, implementation of Alternatives 2 through 6 would have no impact on the population or the distribution of Canada goose and mallard.

Cumulative Effects to Canada Goose and Mallard Populations

Because there are no direct or indirect effects to Canada goose or mallard populations, there are no cumulative effects to the population of either species under any Alternative.

Relationship of Project-Level Impacts to Forest-Scale Habitat and Population Trends for the Canada Goose and Mallard

The cumulative effects of the Action Alternatives of the Noxious Weeds Project will result in no decrease in Forest-wide habitat for Canada goose or mallard. There is no potential effect to the population of either species. Therefore, the impact of the Noxious Weeds Project will not alter the existing Forest-wide trend in habitat, nor will it change the existing Forest-wide population distribution trend for Canada goose or mallard.

Golden Eagle and Prairie Falcon

The golden eagle and prairie falcon are both terrestrial MIS as well as Species of Special Concern in California. In addition, the golden eagle is listed as fully protected by California.

Habitat - Species Relationship

Golden eagles nest in open to semi-open habitat from sea level to 3,630 meters (Kochert et al. 2002). Preferred nesting habitat on the Modoc National Forest includes large trees (typically Ponderosa pine) and cliffs within eastside pine, western juniper, and sagebrush habitat types (USDA 1991b. Page 3-105). Golden eagles observed on and adjacent to the Modoc NF typically forage in open habitats such as grassland, shrub lands, and agricultural fields. Territory sizes ranged from 22 square miles in Idaho to 48 square miles in northern California (Zeiner et al 1990).

Golden eagles typically forage in open habitats such as grassland and shrub lands (Kochert et al. 2002). An early study from central California showed that mammals made up 77 % of golden eagle diets (specifically ground squirrels, jackrabbits, and black-tailed deer fawn), although there was also an assortment of birds (including turkey vulture), snakes, and a few fish (Carnie 1954). Golden eagles have been known to take pronghorn fawns as well (Dunbar et al. 1999) or forage in riparian areas on waterfowl, marmots, and rock doves, if sagebrush and hence jackrabbits were limited (Marzluff et al.1997).

Prairie falcons are found uncommonly throughout the Modoc National Forest in cliff and scarp habitats. They use open terrain for foraging interspersed with cliffs, canyons, and rock outcrops for nesting (Zeiner et al. 1990). The prairie falcon generally nests on cliffs that are 30 to 400 feet

in height. Migration is limited to elevational changes with season; the birds migrate to the lower elevations in the winter (USDA 1991b.Page 3-106).

They forage in open rangeland vegetation such as western juniper, sagebrush, east-side pine, and grasslands. These birds foraged over 300 km^2 in southwestern Idaho (roughly 74,000 acres) (Marzluff et al. 1997). Marzluff et al (1997) reported that ground squirrels were prairie falcons' primary prey, but would increase the amount of reptiles and birds, when ground squirrels were unavailable. Steenhof (1998) notes that falcon young forage on the ground and talus slopes for insects and lizards. In a study conducted in northeastern Wyoming, the authors found that prairie falcons selected foraging areas near their nest sites in areas of open grassland (Squires et al. 1993); preferred prey included ground squirrels and small passerines. These authors also noted that falcons could tolerate low levels of disturbance at their foraging sites as long as their eyries were protected from disturbance.

Project-level Effects Analysis based on Prairie Falcon and Golden Eagle Habitat

Key Habitat Factor(s) for the Analysis

The proposed project, the removal of noxious weeds from Forest System Lands, will have no affect on habitat for golden eagle or prairie falcon; neither species is directly tied to the noxious weeds for cover or food. Golden eagles use, large trees (typically ponderosa pine) or cliffs as nest sites. Prairie falcons utilize cliffs as nest substrate. The potential effects from activities discussed in the FEIS are from disturbance at the nest site and the potential consumption of herbicide contaminated prey by eagles or falcons.

Analysis Area for Project-level Effects Analysis

The analysis area for golden eagle consists of 93,884 acres of occupied and potential habitat on the Forest. There are 28,014 acres of occupied habitat within 0.5 miles of nest sites and 65,870 acres of potential golden eagle habitat Forest-wide. This habitat is focused on the outer fringes of the various Districts and within central portions of the Devil's Garden and Doublehead Districts.

Prairie falcons are found sporadically throughout the Forest, where suitable nesting cliffs are found. The Dome lands, the Pit River corridor, and the eastern scarp of the Warner Mountains provide the bulk of the concentrations of suitable habitat, although there are scattered cliffs throughout the Forest. The analysis area consists of concentric rings around known nest sites; there are 5,678 acres of habitat within 0.5 miles of known nest sites.

Both species forage in open habitats across the Forest, so they could encounter contaminated prey at numerous locations. However, the territory sizes are enormous (75,000 acres and greater); there would be no scenario under any of the Alternatives, where either species could consume 10% of their diet that contained contaminated prey.

Alternative 1 (Current Management)

Direct and Indirect Effects to Habitat

The Forest Service currently treats 20 to 30 acres a year by physical + methods. Currently, the Forest does not use herbicides to treat noxious weeds.

Implementing weed treatments under Alternative 1 would have no effect on golden eagle or prairie falcon habitat. There would be no change in the current or future amount of cliffs or large trees by the treatment of noxious weeds. Zero % of the current golden eagle or prairie falcon habitat in the analysis area would be affected by implementation of Alternative 1.

Cumulative Effects to Habitat

Because there is no direct or indirect effect to golden eagle or prairie falcon habitat, there are no cumulative effects to habitat for either species under this Alternative.

Alternatives 2 to 6

Direct and Indirect Effects

There are a maximum of 5.7 acres or 0.02% out of 28,014 acres Forest-wide that could receive physical + treatments and 4.7 acres or 0.017% of herbicide treatments in occupied golden eagle habitat (Table 3 - 77). Within potential golden eagle habitat, 10.86 acres or 0.016% of 65,879 acres Forest-wide could receive physical + treatments and 9.58 acres or 0.015% could receive treatments with herbicides.

There are 4.74 acres (0.083%) that could receive physical + treatments out of 5,678 acres of occupied prairie falcon habitat Forest-wide; there are 4.64 acres (0.082%) Forest-wide that could receive herbicide treatments (Table 3 – 77). Potential habitat was not modeled for prairie falcon, because of difficulties with the DEM model.

Table 3 - 96. Proposed treatment Within Golden Eagle and Prairie Falcon Habitat

Species	Total Acres of Habitat Forest -wide	Total Maximum Acres of Physical + Treatments*	Total Maximum Acres of Herbicide Treatments*
Golden - occupied	28,014	5.7	4.7
Golden - potential	65,870	10.86	9.58
Prairie falcon - occupied	5,678	4.74	4.64

* This figure includes the maximum, where physical + or herbicide methods may be employed

No eagle or falcon nesting habitat would be affected under any action Alternative. According to the Modoc Forest Plan (1991a), the Forest is to maintain or improve habitat for potential prey species of the golden eagle. Removal of weeds is expected to improve cover and forage for a variety of eagle and falcon prey species including birds, deer, jack rabbits, and ground squirrels. Regardless, the weed occurrences still contain native plants within or adjacent to them, so there would be no change in foraging habitat for golden eagle or prairie falcons adjacent to nest sites.

Cumulative Effects to Habitat

Because there are no direct or indirect effects to golden eagle or prairie falcon habitat, there are no cumulative effects to habitat for either species under any Alternative.

Summary of Population of Golden Eagle and Prairie Falcon Status and Trend at the Forest Scale

The Modoc NF Forest Plan (as amended by the SNFPA) (USDA 2001), requires Forest-scale distribution population monitoring for golden eagle and prairie falcon. The sections below summarize population status and trend data for these species. This information is drawn from the detailed information on population trends in the Modoc National Forest MIS Report (USDA 2007b), which is hereby incorporated by reference.

Golden Eagle and Prairie Falcon Population Status and Trend at the Bioregional Scale

According to the California Department of Fish and Game, golden eagles were once a common permanent resident throughout the open areas of California; numbers are now reduced near

human population centers (e.g., San Diego County), where they declined from an estimated 85 pairs in 1900 to 40 occupied territories in 1999, due to extensive residential development. In general, however, populations seem stable. Approximately 500 pairs are estimated to nest in California. California-wide BBS data for the period of 1966 to 2004 classifies the golden eagle as "Likely increasing" (Siegel and DeSante 1999) with a non-significant increase of 1.5% (range -1.6 to 4.5) per year over the 49 routes.

Historically, the prairie falcon was also a common permanent resident throughout California, except for the humid northwest coast and higher mountains. California-wide BBS data for the period of 1966 to 2004 classifies this falcon as "Possibly increasing" (Siegel and DeSante 1999), with a non-significant increase of 2.1% (range -1.5 to 5.7) per year over the 26 routes. In addition, results of Christmas Bird Counts seem to indicate an overall trend has been stable to increasing with quite a bit of annual fluctuation in numbers.

Effects of the Alternatives Considered within the Noxious Weeds FEIS

According to Forest Plan direction, eagle nests will be managed to minimize disturbance during the nesting season and to protect the nest tree; prairie falcon direction is to protect nesting birds from disturbance. Disturbance at active nest sites, as with all of the raptors, is the greatest source of concern. The Modoc Forest Plan allows for ¼ to ½ mile Limited Operating Period around active nests sites for both of these species. Utilizing these Limited Operating Periods in Design Standard DS-10 should ensure that there would be no direct effect to golden eagles or prairie falcons.

A maximum of 0.017% of the occupied golden eagle habitat could have herbicides and 0.015% of the potential habitat is scheduled for herbicide treatments on the Forest. A maximum of 0.082% of the areas around prairies falcon nest sites have the potential for herbicide treatments. Both of these species forage widely; eagles have minimum territories of 22 square miles and prairie falcons have been known to forage over 74,000 acres. There is very little chance that predatory bird species that range as widely as these two do could ingest a 10 to 100% of their diet in sprayed mammals to cause any toxicological effects. In addition, none of the herbicides at the rates proposed for use have Hazard Quotients over 1.0, therefore, there is little risk of herbicide effects to predatory birds ingesting contaminated mammals. There was no herbicide risk scenario for a predatory bird ingesting contaminated birds; this scenario is not realistic because birds would flush before being sprayed in the course of weed treatment in response to their innate "Fight or Flight" response. Therefore, treatment of noxious weeds under any Alternative will have no effect on golden eagle or prairie falcon populations .

Under the Alternatives with Early Detection/Rapid Response treatments, wildlife biologists would review new weed occurrences prior to implementation; if concerns for golden eagle or prairie falcon surfaced, additional Design Standards could be added if weed treatment areas were outside of the conditions analyzed within the FEIS.

Cumulative Effects to Populations

Because there are no direct or indirect effects to golden eagle or prairie falcon populations, there are no cumulative effects to populations for either species under any Alternative.

Relationship of Project-Level Impacts to Forest-Scale Habitat and Population Trends for the Golden Eagle and Prairie Falcon

The cumulative effects of the Action Alternatives of the Noxious Weeds Project will result in no decrease in Forest-wide habitat for golden eagle or prairie falcon. Nor will there be any potential effect to the population for either species. Therefore, the impact of the Noxious Weeds Project

will not alter the existing Forest-wide trend in habitat, nor will it change the existing Forest-wide population distribution trend for golden eagle or prairie falcon.

Hairy Woodpecker

Both the hairy and pileated woodpeckers are terrestrial MIS, as well as non-game species in California.

Habitat - Species Relationship: Habitat for hairy woodpeckers includes mixed conifer and riparian habitats with large trees present; tree canopy covers vary from sparse to intermediate (Zeiner et al. 1990a). Locally on the Modoc National Forest they have been observed in eastside pine as well (K. Romberger, pers. comm.). Hairy woodpeckers basically feed on insects; however, a small of their diet includes acorns, pine nuts, and sap (Zeiner et al. 1990a). They have been reported to forage at sapsucker wells (Ehrlich and Daily 1988), and glean materials off the edges exposed by pileated woodpeckers (Maxson and Maxson 1981). Hairy woodpeckers forage mainly in the crevices of the bark of live and dead trees as well as in logs and stumps (Zeiner et al. 1990a). Home range size, which equated to a territory, varied from 6 to 8 acres in central Oregon (Zeiner et al. 1990). Territories measured during nesting should be considered minimal areas (Jackson et al. 2002).

Habitat for pileated woodpeckers consists of mature coniferous stands with numerous large snags, logs and stumps (Zeiner et al. 1990a). According to the bird conservation plan developed for pileated woodpecker (Robinson 2000), they will also nest in aspen and other hardwoods. During development of the Modoc NF Forest Plan, the authors noted that pileated woodpeckers were found on the Modoc National Forest in mixed conifer and red fir types (USDA 1991b. Page 3-109). Pileated woodpeckers concentrate mostly on animal material; however, they will also use nuts, berries, and other fruit (Zeiner et al. 1990a); this species forages on decayed live and dead trees, logs and stumps. Home range size varies from 320 to 600 acres (Zeiner et al 1990).

Project-level Effects Analysis for the Hairy Woodpecker

Key Habitat Factor(s) for the Analysis

The proposed project, the removal of noxious weeds from Forest System Lands, will have no effect on habitat for either woodpecker species. Both species utilize snags and logs for foraging and nesting and are not directly tied to the noxious weeds for cover or food. The main potential effect is limited to the potential consumption of herbicide contaminated insect and plant materials.

Analysis Area for Project-level Effects Analysis

The analysis area for hairy woodpecker is limited to the 153,200 acres of potential habitat on the Forest; these conifer stands are scattered throughout the Forest.

The analysis area for pileated woodpecker is limited to the 173,500 acres of potential habitat on the Forest. Habitat is limited to the upper elevations of the Forest that have mixed conifer, white fir, and red fir. In general, the areas include the Warner Mountain Ranger District, the Medicine Lake Highlands, roughly half of the Big Valley District, and localized portions of the Devil's Garden District.

Alternative 1 (Current Management)

Direct and Indirect Effects to Habitat

The Forest Service currently treats 20 to 30 acres a year by physical methods. Currently, the Forest does not use of herbicides to treat noxious weeds.

Implementing weed treatments under Alternative 1 would have no affect on habitat for either woodpecker. There would be no change in the current or future amount of dead and downed materials from the treatment of noxious weeds. Coniferous vegetation diversity, especially in the later-seral stage coniferous stands for pileated woodpecker, is expected to remain the same or be improved on micro-sites in the coniferous stands; the same is true for aspen and meadow habitat. Zero % of the current hairy or pileated habitat in the analysis area would be affected by implementation of Alternative 1.

Cumulative Effects to Habitat

Because there is no direct or indirect effect to hairy or pileated woodpecker habitat, there are no cumulative effects to habitat for either species of woodpecker under this Alternative.

Alternatives 2 to 6

Direct and Indirect Effects to Habitat

There are a maximum of 60.69 acres (0.04%) Forest-wide of proposed physical + treatments and a maximum of 56.22 acres (0.037%) with herbicide treatments within potential hairy woodpecker habitat (Table 3 – 78). There are a maximum of 51.35 acres (0.03%) out 170,000 acres with physical + and 50.81 acres (0.03%) with herbicide treatment within potential pileated woodpecker habitat Forest-wide (Table 3 – 78).

Table 3 - 97. Proposed Treatment Within Potential Hairy and Pileated Woodpecker Habitat

Species	Total Acres of potential Habitat Forest-wide	Total Maximum Acres of Physical + Treatments*	Total Maximum Acres of Herbicide Treatments*
Hairy woodpecker	153,200	60.69	56.22
Pileated woodpecker	173,500	51.35	50.81

* This figure includes the maximum, where physical + or herbicide methods may be employed.

Implementing weed treatments under Alternatives 2 through 6 would have no effect on hairy or pileated woodpecker habitat. There would be no change in the amount of snags and logs, therefore, no nest or forage trees for either species would be removed under any action Alternative. There will be no change in the current or future amount of dead and downed materials by the treatment of noxious weeds. There will be no change to the overstory tree matrix by the implementation of noxious weed treatments, so there would be no change in vegetative diversity to effect either species.

Although both hairy and pileated woodpeckers will take seeds and fruits (Jackson et al. 2002 for hairy woodpecker and Bull and Jackson for pileated woodpecker 1995), neither species is known to consume noxious weeds. Aspen and meadow habitat could be stable to increasing by the implementation of any action Alternative, because the treatment decreases the competition to native species by noxious weeds in very small, localized areas. Therefore, 0% of the current hairy or pileated habitat in the analysis area would be negatively affected by implementation of any action Alternative. Therefore, there will be no direct or indirect effects to hairy or pileated woodpecker habitat under any action Alternative.

Cumulative Effects to Habitat

Because there are no direct or indirect effects to hairy or pileated woodpecker habitat, there are no cumulative effects to habitat for either woodpecker species under these Alternatives.

Summary of Hairy Woodpecker Population Status and Trend at the Forest Scale

The Modoc NF Forest Plan (as amended by the SNFPA) requires Forest-scale distribution population monitoring for both species of woodpecker. The sections below summarize population status and trend data for these species. This information is drawn from the detailed information on population trends in the Modoc National Forest MIS Report (USDA 2007b), which is hereby incorporated by reference.

Hairy Woodpecker Population Status and Trend at the Bioregional Scale

Population monitoring data collected by various partners at the bioregional scale indicate that hairy woodpeckers are "definitely stable" for California and the Sierra Nevada (Siegel and DeSante 1999).

Hairy woodpeckers are seen fairly frequently throughout the Modoc National Forest. They have been detected from 1910 to the present during a variety of surveys: turn-of-the-century surveys of avi-fauna (data from Natural History Collection for the University of California, Berkeley), Breeding Bird Survey routes, project-generated stand searches and point counts, as well as the Pacific Southwest Research Station (PSW) cavity-nesting bird study (Laudenslayer 2002). The distribution for hairy woodpecker appears to be the same as the one in 1991, when the Forest Plan was released.

Population monitoring data collected by various partners at the bioregional scale indicate that pileated woodpeckers are "definitely stable" for California and "Possibly decreasing with a non-significant decrease of -1.8% per year" for the Sierra Nevada (Siegel and DeSante 1999).

Pileated woodpeckers have been sighted infrequently on the Modoc National Forest. Data for pileated woodpecker consist of presence information from 1981 to the present, from Forest Service point counts, and various individual observers' incidental sightings. The distribution for pileated woodpecker appears to be the same as the one in 1991, when the Forest Plan was released.

Effects of the Alternatives on Hairy Woodpeckers

Direct and Indirect Effects

There is an insignificant chance of either species eating contaminated vegetation under any Alternative. Alternatives 3 and 5 propose no herbicide treatments. The discussion below focuses on the herbicide portions of Alternatives 2, 4 and 6.

There is little chance for ingesting contaminated materials for hairy woodpecker (i.e., prey species habitat), because they do not forage in weeds; they forage on snags, logs, and occasionally on a sapsucker well or on fruit. Therefore, the vast majority of their foraging areas would be uncontaminated. In northern California (near Truckee), "they (black-backed and hairy woodpeckers) foraged mostly on dead trees and drilled for their prey rather than gleaned." (Raphael and White 1984).

There are a five weed occurrences of sufficient size, where a significant amount of potentially contaminated insects could be ingested. The following section discusses occurrences within potential hairy woodpecker habitat.

BV006LIDA (Dalmatian toadflax) – The majority of the area is lava reef with open conifer stands. The entire weed occurrence is roughly 850 acres. In the area adjacent to Lava Lake, the toadflax has a patchy distribution consisting of small clumps of plants that are less than .001 acre

in size. Under Alternatives 2 and 4, the entire occurrence could be treated. There are 4.55 acres of potential hairy woodpecker habitat that could be treated, where insects could climb onto an adjacent snag and be potentially ingested. This could equate to roughly one territory or .003% of the potential hairy woodpecker habitat on the Forest. Given the hairy woodpeckers' feeding preferences and the hairy woodpecker habitat condition in this weed occurrence, it is unlikely that there would be any effect to hairy woodpeckers by implementation of Alternative 2 or 4. Under Alternative 6, only the exterior satellites of the weed occurrence would be treated, so there would be no risk to hairy woodpecker under this Alternative.

BV001CRVU2 (Crupina) – The area along Post Canyon has crupina present along the road into conifer at various levels of infestation. The largest concentrations are at the lower end of the canyon in the open sage habitats. Other plants, both native and exotic, are within the matrix. In Alternatives 2 and 4, the entire occurrence could be treated. Cumulatively, there are 16.11 acres of potential hairy woodpecker habitat that could have herbicide treatments within the entire 158 acre weed occurrence. The entire 16 acres equates to roughly two territories. The insects that would be found on herbaceous plants probably would not be the type that are found and consumed on snags and logs (R. Borys and D. Cluck, pers. comm.). In addition, crupina does not provide a fruit that would be ingested. Given the hairy woodpecker's feeding preferences and the condition of the site, implementation of Alternatives 2 or 4 are not expected to affect hairy woodpecker. Under Alternative 6, only the exterior satellites would be treated, so there would be no risk to hairy woodpecker for this weed occurrence.

WM003LIDA (Dalmatian toadflax) – The site is basically a large, contiguous matrix of native plants with small clumps of weeds (the patches of weeds are very small with most of them roughly 10 feet by 10 feet). Although the entire weed occurrence encompasses roughly 40 acres, the weeds are actually distributed in small clumps found in lava rock talus, an old road bed, and along old, dry, rocky streambeds. There were no toadflax plants along the main channels of Lassen Creek. There are 20.26 acres of potential hairy woodpecker habitat within the weed occurrence, but about one acre total of potential hairy woodpecker habitat would be treated. Consequently, the chance of a hairy woodpecker consuming 10 to 30% of its diet in contaminated insects would be improbable to the point of being discountable under Alternatives 2, 4 or 6.

WM009CIAR4 (Canada thistle) – This site consists of a heavily disturbed meadow, fringed by aspen and mixed conifer. The combination of the effects from beaver, livestock and the road system has led to an infestation of weeds in the meadow and along the road. Although there are 5.36 acres of potential hairy woodpecker habitat that could receive treatment, given the situation at the site, only an insignificantly small portion of the potential hairy habitat would be treated. The weeds are basically not within the coniferous stand: therefore, the potential for insects to be contaminated while on an herbaceous plant and show up in the diet of a species known for foraging on snags and logs is so low, to the point of being discountable, in this weed occurrence. Therefore, there would be no effect to hairy woodpecker by the treatment of this occurrence under any Alternative.

DH0131ISTI (dyer's woad) – There are 3.53 acres of potential hairy woodpecker habitat that could be treated within this roughly 5,500-acre occurrence. The area is largely unsuitable for hairy woodpecker, and it is extremely improbable to the point of insignificance that hairy woodpecker would ingest 10 to 30% of their diet in contaminated insects, given their habitat and food preferences and the conditions of the vegetation under Alternatives 2 and 4. Only the satellite weeds would be treated under Alternative 6, so there would be no effect to hairy woodpecker under Alternatives 2, 4 and 6.

Under the Alternatives with Early Detection/Rapid Response activities, wildlife biologists would review new noxious weed treatment sites prior to implementation. If concerns for hairy

woodpecker surface (including conditions not covered within the analysis for the FEIS), additional Design Standards could be added.

To summarize, there would be no direct or indirect effects to hairy woodpeckers by the implementation of Alternative 6. It is highly unlikely there would be any direct or indirect effects to hairy woodpeckers under Alternatives 2 and 4, given their preferences for foraging on snags and logs (which is what they are an indicator for on the Modoc National Forest), and the small amount of potential hairy woodpecker habitat to be treated, even in the largest weed occurrences.

Cumulative Effects to Populations: Because there are no direct or indirect effects to hairy woodpeckers, there are no cumulative effects to hairy woodpeckers under any Alternative.

These following paragraphs discuss occurrences within potential pileated woodpecker habitat and potential effects to pileated woodpeckers by their treatment.

WM001ISTI, WM002ISTI, WM004ISTI, WM005ISTI, and WM008ISTI (all are dyer's woad) are located in the northwestern corner of the Warner Mountain District. There are a total of 37.18 acres of dyer's woad in potential pileated woodpecker habitat that could be treated with herbicides. These occurrences could be located within one potential pileated woodpecker territory, which ranges from 320 to 600 acres in size. However, pileated woodpeckers primarily consume carpenter ants (wood-boring ants) and other insects (Bull and Jackson 1995). Assuming that these occurrences are in one territory, about 9% of the area would be treated (using the smallest potential territory size and the largest concentration of weeds to be treated). Even combining these weed occurrences, the effect is improbable that 10 to 30% of a woodpecker's diet would contain contaminated insects, because pileated woodpeckers do not forage on dyer's woad and the contaminated insects would have to migrate to preferred foraging structures; as stated above, insects that prefer herbaceous plant species generally do not migrate to conifers. Therefore, there will be no effect to pileated woodpecker by the implementation of any Alternative for these weed occurrences.

WM009CIAR4 (Canada thistle) – As stated above in the hairy woodpecker section, the majority of the weeds are outside of the conifer stand that could support pileated woodpecker. A total of 5.84 acres out of 320 to 600 acres within a potential territory could be treated. Even assuming that all of the insects in the area would be consumed, only 0.98% to 1.8% of the potential territory would be affected. The impact is so small that the effect can be discounted as insignificant. Therefore, treating this occurrence under any Alternative would not affect pileated woodpeckers.

To summarize, given their preference for foraging on woody plants and the effects are localized in one area on the Warner Mountain District, there would be no direct or indirect effects to pileated woodpecker distribution or population by the implementation of any Alternative.

Under the Alternatives with Early Detection/Rapid Response activities, wildlife biologists would review new noxious weed treatment sites prior to implementation. If concerns for pileated woodpecker surface (including conditions not covered within the analysis for the FEIS), additional Design Standards could be added.

Cumulative Effects to Populations

Because there is no direct or indirect effect to pileated woodpeckers, there are no cumulative effects to pileated woodpecker under any Alternative.

Relationship of Project-Level Impacts to Forest-Scale Habitat and Population Trends for the Hairy and Pileated Woodpecker

The implementation of the Noxious Weeds Project will not alter the existing Forest-wide trend in habitat, nor will it change the existing Forest-wide population distribution trend for hairy or pileated woodpeckers.

Mule Deer and Pronghorn

Both the mule deer and pronghorn antelope are terrestrial MIS, as well as a game species in California. Deer were selected as Management Indicator Species for the Forest, because it needs and prefers diverse habitats (USDA 1991b. Page 3-111). Antelope were selected as indicators of rangeland condition (USDA 1991b. Page 3-115).

Habitat - Species Relationship: Mule deer utilize almost every acre on the Modoc National Forest for winter, transition, and summer range, as well as fawning areas, with the exception of the barren areas like the Burnt Lava Flow or large bodies of water like Clear Lake. Habitat for deer includes early to intermediate successional forests and brushlands; they prefer a mosaic of various aged vegetation that provides woody cover, meadow and shrubby openings and free water (Zeiner 1990b). According to the Fish and Game publication "Report to the Fish and Game Commission: An assessment of mule and black-tailed deer habitats and populations in California with special emphasis on public lands administered by the Bureau of Land Management and the United States Forest Service." (California Dept. Fish and Game 1998), foraging habitat is a limiting factor for mule deer in northeastern California.

Pronghorn utilize the lower elevation sage habitats mainly on the Devil's Garden and Doublehead Districts. Pronghorn prefer open rangeland types that support a variety of vegetative types (Lee et al. 1998). Areas with low shrubs typify summer habitat with a diversity of native grasses and forbs (Gregg et al. 2001, Lee etal. 1998). According to Lee, et al. (1998), forbs were preferred, and "Thus, management decisions favoring the abundance of forb species are desirable to the welfare of pronghorn."

Project-level Effects Analysis based on Habitat

Key Habitat Factor(s) for the Analysis: The proposed project, the removal of noxious weeds from Forest System Lands, will have no negative affect on habitat for either mule deer or pronghorn; neither species is tied to the noxious weeds for cover or food. In fact, the removal of weeds on rangelands has been shown to benefit big game species. See the General Wildlife section of the Noxious Weeds FEIS for a discussion of the effects of noxious weeds on wildlife. The main potential effect is limited to the potential consumption of herbicide-contaminated plant materials.

Analysis Area for Project-level Effects Analysis: The analysis area for mule deer is 1,587,564 acres, which includes cover, foraging and fawning habitats. This area covers most of the land on the Forest.

The analysis area for pronghorn antelope is 791,867 acres of mainly lower-elevation habitat. The concentration areas include the Devil's Garden District, the eastern and northern half of the Doublehead District, and the outer fringes of the Warner Mountain and Big Valley Districts.

Alternative 1 (Current Management)

Direct and Indirect Effects to Habitat

The Forest Service currently treats 20 to 30 acres a year by physical + methods. Currently, the Forest does not use of herbicides to treat noxious weeds.

Implementing weed treatments under Alternative 1 would have no effect on habitat for mule deer or antelope. There would be no change in the current or future amount of preferred forage by the treatment of noxious weeds. There would be no change in the amount of cover. Zero % of the current mule deer and pronghorn habitat in the analysis areas would be affected by implementation of Alternative 1. Conversely, allowing weeds to increase in deer and pronghorn habitat would decrease habitat suitability.

Cumulative Effects to Habitat

Because there is no direct or indirect effect to mule deer or antelope habitat, there are no cumulative effects to habitat for either species under this Alternative.

Alternatives 2 to 6

Direct and Indirect Effects to Habitat

Deer are found on almost every acre of the Modoc NF; therefore, most of the Modoc NF is considered as occupied habitat. There are 1.74 acres of physical + treatments and 1.6 acres of herbicides that would not occur Forest-wide in deer habitat. Conversely, there is a maximum of 5,991.26 acres (0.38%) of physical + treatments and 6,866.4 acres (0.43%) of herbicide treatments that could occur in deer habitat Forest-wide. These figures do not include the Early Detection/Rapid response acres, which are discussed below.

There is a maximum of 1,964.04 acres (0.25%) that could receive physical + treatments and 1,960.02 acres (0.25%) that could receive herbicide treatments in potential pronghorn habitat Forest-wide (Table below). The acreages includes both occupied and potential pronghorn habitat.

Table 3 - 98. Proposed Treatment Acres Within Potential Mule Deer and Pronghorn Habitat

Species	Total Acres of Potential Habitat Forest-wide	Total Maximum Acres of Physical + Treatments*	Total Maximum Acres of Herbicide Treatments*
Mule deer	1,587,564	5,991.26	6,866.4
Pronghorn	791,867	1,964.04	1,960.02

* This figure includes the maximum, where physical + or herbicide methods may be employed

Since deer or pronghorn do not rely on noxious weeds as food or cover, there would be no change in the quantity of habitat by implementation under any Alternative for mule deer or pronghorn. Studies have shown that noxious weeds displace native herbaceous plants, thereby modifying the habitat suitability for various wildlife species or changing species interactions within ecosystems (e.g., grasslands can be modified to forb-dominated communities) (Belcher and Wilson 1989; Trammel and Butler 1995). Cheatgrass (*Bromus tectorum*) provides a classic example of this problem; cheatgrass is an introduced annual grass that has changed fire regimes, decreased above and below ground plant biomass, and altered ecosystem function (native grasses maintain live shoots into the summer that deer and antelope rely on, whereas cheatgrass does not) (Ogle et al. 2003)).

Mule deer use of favored foraging habitat on the Theodore Roosevelt National Park was reduced by 70 % after invasion by leafy spurge (Trammel and Butler 1995). Results of a study conducted in Montana showed that mule deer did not use spotted knapweed, although it was common on their winter range (Guenther 1989 in Beck 1994). A study in Montana on Russian knapweed showed that areas heavily infested with knapweed displaced both wildlife and native plant species, which resulted in a loss of rangeland biodiversity (Kurz 1995 in Laufenberg et al. 2005). This loss of rangeland diversity would directly affect both deer and pronghorn, which are rangeland MIS.

Revegetation of large, bare areas can improve habitat for deer and antelope. Design Standards DS-20 and DS-21 allow for the site-specific assessment in order to determine, if revegetation is needed depending on the amount of bare area post-treatment.

Although the removal of noxious weeds may benefit individual deer and antelope, the increase in habitat from the implementation of any Alternative would not be large enough to discern a change in the amount of habitat Forest-wide, because of the small percentages of habitat proposed for treatment. Therefore, there would be no direct or indirect effect to the amount of deer or pronghorn habitat by the implementation of Alternatives 2 through 6.

Cumulative Effects to Habitat

Because there are no direct or indirect effects to mule deer or pronghorn habitat, there are no cumulative effects to habitat for either species under any action Alternative.

Summary of Population Status and Trend at the Forest Scale

The Modoc NF Forest Plan (as amended by the SNFPA) requires Forest-scale distribution population monitoring for mule deer and pronghorn. The sections below summarize population status and trend data for both species. This information is drawn from the detailed information on population trends in the Modoc National Forest MIS Report (USDA 2007b), which is hereby incorporated by reference.

Population Status and Trend at the Bioregional Scale

Mule deer is "S5- secure" ("demonstrably widespread, abundant, and secure") in California (NatureServe 2006). Deer herds in California are tracked by Hunt Zones and by 11 deer assessment units, which include multiple hunt zones. The California Department of Fish and Game assesses mule deer population status and trend by both hunt zones and deer assessment units as part of their Environmental Documentation for the hunting program. Annual variation in deer population estimates may be high, due to annual changes in environmental conditions, and varies geographically.

Table 3 - 99. Mule Deer Population Trend for DAUs covering the Eldorado, Lassen, Modoc, Plumas, Sierra, and Stanislaus NFs. [1]

DAU No.	Name	Hunting Zones	Forests	Population Trend[1]
DAU 4	Cascade, Northern Sierra	C4	Lassen	Declining
DAU 5	Central Sierra Nevada	D3 to D7	Stanislaus, Sierra, Eldorado, Plumas (western)	Increasing
DAU 6	South Sierra	D8 to D10	Sierra, Stanislaus	Stable
DAU 9	Northeast California	X-4 and X-3a	Lassen, Modoc	Stable[2]
DAU 10	Northeast Sierra	X-6a and X-6b	Lassen, Plumas	Stable[2]

[1] CDFG 2003.

[2] Eastside deer populations (DAUs 9, 10) occupying Great Basin habitats experienced significant declines during 1990-1996. However, these populations appear to have stabilized based on recent trend estimates (CDFG 2003).

The Modoc National Forest is contained within Deer Assessment Unit 9. Deer are counted during the spring along fixed transects in order to provide an index to population trend within the DAU. The trend line for the data shows a downward trend, although not as significant downward trend as indicated by the r2 value near 0.5. The counts do show fluctuation in annual numbers that vary from +30% to -35% from the median value for the period. The trends thus appear to fluctuate, but do not show a sustained strong downward or upward trend.

Pronghorn is “S4- secure” (“demonstrably widespread, abundant, and secure”) in California (NatureServe 2006). Historically, the pronghorn was the most abundant big-game animal in California, and inhabited the valley and foothill regions of much of the State. The northeastern population is managed for a desired population of 5,600 to 7,000 animals. Population numbers declined to approximately 2,000 animals prior to 1960. After 1960, the statewide pronghorn population gradually increased until 1992 when California supported more than 8,000 animals. Population numbers declined as a result of severe weather conditions in northeastern California during the 1992/1993 winter. Although population numbers have not yet increased to their 1992 levels, the current population is well above levels recorded during the 1950s. Since the 1950s, the state-wide pronghorn numbers have more than doubled.

The population monitoring requirements for pronghorn antelope are based on distribution. Data on pronghorn numbers is based on input from California Fish and Game surveys, in addition to incidental sightings from Forest Service personnel. The distribution of antelope is the same as during the time of the Modoc Forest Plan. Since the 1992-93 winter kill, the antelope population has not increased, but has stabilized in the last few years.

Effects of the Alternatives Considered within the Noxious Weeds FEIS

Under Alternatives 3 and 5, as well as the physical + treatment aspects of Alternatives 2, 4, and 6, there would be no potential ingestion of contaminated vegetation.

Mule deer and pronghorn could ingest contaminated plants under Alternatives 2, 4 and 6. However, the greatest concern for potential toxic effects would only be in the largest weed occurrences. The assumptions for the scenarios developed to quantify hazard quotients, which provide a measure of risk, are as follows.

Large mammal eating contaminated vegetation (acute) - 100% for the diet Lower, Central and Upper levels

Large mammal eating contaminated vegetation (chronic on-site) - The diet would consist of contaminated materials; 10% for the Lower, 30% Central and 100% Upper levels.

Table 3 - 100. Herbicides and Their Application Rates for Acute Exposures to Large Mammals, Consuming Contaminated Vegetation, Where There is no Spray Buffer and a Boom Application Method

Herbicide/Application Rate	Exposure Assessment Rate mg/kg/day or mg/kg/event			Hazard Quotient Rating		
	Central	Lower	Upper	Central	Lower	Upper
2,4 – D						
a) 1.5 lbs/ac	25.8	25.8	72.8	3.0	3.0	7.0
b) 2.0 lbs/ac	34.4	34.4	97.1	3.0	3.0	10.0
Chlorsulfuron 1.0 oz/ac	1.07	1.07	3.04	.01	.01	0.04
Clopyralid 0.25 lb/ac	4.3	4.3	12.1	.06	.06	0.2
Dicamba						
a) 1.0 lb/ac	17.2	17.2	48.6	0.4	0.4	1.1
b) 2.0 lbs/ac	34.4	34.4	97.1	0.8	0.8	2.0
Glyphosate 3.75 lbs/ac	64.5	64.5	182	0.4	0.4	1.0
Triclopyr (Acid & BEE) 1.5 lbs/ac	25.8	25.8	72.8	0.3	0.3	0.7
NPE	28.7	23.0	113	3.0	2.0	11.0

Note: Data for boom-sprayer application is for comparison purposes only. The Forest does not propose using mechanical boom sprayers.

Table 3 - 101. Herbicides and Their Application Rates for Chronic Exposures (on site) to Large Mammals Consuming Contaminated Vegetation Where There is no Spray Buffer and a Boom Application Method

Herbicide/Application Rate	Exposure Assessment Rate mg/kg/day or mg/kg/event			Hazard Quotient Rating		
	Central	Lower	Upper	Central	Lower	Upper
2,4 - D						
a) 1.5 lbs/ac (on site)	1.72	0.572	16.2	1.7	0.6	16.0
b) 2.0 lbs/ac	2.29	0.763	21.5	2.0	0.8	22.0
Chlorsulfuron 1.0 oz/ac	0.136	0.0452	1.28	0.03	0.009	0.3
Clopyralid 0.25 lb/ac	0.521	0.138	6.39	0.03	0.009	0.4
Dicamba						
a) 1.0 lb/ac	0.744	0.248	7.00	0.02	0.006	0.2
b) 2.0 lbs/ac	1.49	0.496	14.0	0.03	0.01	0.3
Glyphosate 3.75 lbs/ac	10.6	3.53	99.7	0.06	0.02	0.6
Triclopyr (Acid & BEE) 1.5 lbs/ac	3.78	0.969	48.0	0.8	0.2	10.0
NPE	0.138	0.0368	1.82	0.01	0.004	0.2

Note: Data for boom-sprayer application is for comparison purposes only. The Forest does not propose using mechanical boom sprayers.

Under Alternatives 2 and 4, 0.43% % of potential deer habitat Forest-wide could receive herbicides. This value drops significantly under Alternative 6, where a maximum of 522 acres could be treated using herbicide (Chapter 2 of FEIS).

Home range size for does and fawns is approximately was 0.4 to 1.1 miles square (Zeiner et al 1990) or 256 to 704 acres. There is very little chance of mule deer receiving a large enough dose of contaminated vegetation in most weed occurrences for the following reasons. One, mule deer are not known to forage exclusively on the weed species selected for treatment. Two, most of the weed occurrences within potential habitat for deer are less than an acre. Therefore, it would be improbable to the point of insignificance that 10 to 100% of their diet would be in contaminated materials.

The exception would be in the larger weed occurrences. Although weeds are not considered forage, there easily could be overspray onto non-target plants within the weed occurrence (R. Wilson, pers. comm.), especially in the more densely packed weed occurrences. These larger occurrences, where there is a greater risk to deer, are discussed below.

DH013ISTI (dyer's woad) (5,658 acres) – This dyer's woad occurrence contains a variety of weed densities from homogeneous patches of weeds to single plants. The habitat includes plantations, burned east-side pine stands and shrub communities. About 1/3 of the weed occurrence consists of lava reefs, which do not have large amounts of suitable forage and cover for deer (J. Ivrin, pers. comm.). The deer that utilize the area of this occurrence typically are off-site (in Oregon) at the time of year treatment would occur. However, the area does contain winter deer range and a few residential animals could consume year-round (J. Irvin, pers.comm.). For the most part, when the deer are concentrated in this polygon, they are heavily utilizing browse.

Under Alternatives 2 and 4, the entire occurrence could be treated. Those resident deer would probably not suffer effects associated with acute toxicities, which would require 100% of the diet to consist of contaminated vegetation. However, they could exhibit signs of toxicity associated with chronic exposures, especially at the lower (10% of the diet) and central values (30% of the diet) (Table 3 - 82). The only herbicide with hazard quotients over 1.0 at the lower and central levels is 2, 4-D. According to information for mammals from the SERA report on 2, 4-D, this herbicide has a low chance to cause "frank signs of neurotoxicity", but has an 80% chance of

causing some degenerative changes to various organs. Although the effects do not appear to cause direct mortality to the animals, depending on the extent of the effect, individual animals could be at greater risk of predation. Treatment of this weed occurrence under Alternative 6 would cause no risk to the few resident deer, because only the outer edges would be sprayed to contain its spread.

BV006LIDA (Dalmatian toadflax) – The majority of the area is lava reef country with open conifer stands. The entire weed occurrence is roughly 850 acres. In many areas, the toadflax has a patchy distribution consisting of small clumps of plants that are less than .001 acre in size. Under Alternatives 2 and 4, the entire occurrence could be treated. However, there would still be a basic matrix of native plants to provide food for deer, so neither the acute nor the chronic scenarios is likely under Alternatives 2 and 4. Under Alternative 6, only the exterior satellites of the weed occurrence would be treated. Given the site conditions and deer food preferences, there would be no risk to mule deer under any action Alternative for this occurrence.

BV001CRVU2 (Crupina) – The area along Post Canyon has crupina present along the road into conifer at various levels of infestation. The largest concentrations were at the lower end of the canyon in the open sage habitats. Other plants, both native and exotic, were within the matrix. In Alternatives 2 and 4 the entire occurrence could be treated. The acute scenario of 100% of the diet consisting of contaminated vegetation is not likely, because deer are not documented to rely on crupina for food. However, like the large dyer's woad occurrence, some individual deer could be affected by 2, 4-D under Alternatives 2 and 4. Under Alternative 6, only the exterior satellites of the weed occurrence would be treated, so there would be no risk to mule deer because of the limited exposure.

Under the Alternatives with Early Detection/Rapid Response activities, wildlife biologists would review new noxious weed treatment sites prior to implementation. If concerns for deer surface, (including conditions not covered within the analysis for the FEIS), additional Design Standards could be added.

Mule deer are well distributed across the Modoc NF. Because only a few individual deer could be affected on three weed occurrences, implementation of Alternatives 2 through 6 would have no impact on the distribution of deer. Nor would there be any direct or indirect effects to the whole population of deer, because of the animal use patterns for these weed occurrences is outside of the time of greatest potential for risk.

Cumulative Effects to Populations of Mule Deer

Since there are no direct or indirect effects to the mule deer population , there would be no cumulative effects.

The potential effects to pronghorn from herbicide use are as follows. There are 229 weed occurrences that are one acre or less out of a total of 237 weed occurrences within potential pronghorn habitat. These occurrences are small to the point where there would not be sufficient contaminated vegetation to cause acute or chronic effects. DH013ISTI (dyer's woad), BV284ONAC (Scotch thistle), and BV001CRUV2 (Crupina) cause the greatest concern.

DH013ISTI (dyer's woad) accounts for 1,743.68 acres of the total in both herbicide and physical + . Although the 6,000-acre dyer's woad occurrence is within potential antelope habitat, it is north and west of the areas of greatest pronghorn concentration and use. During his 22 years on the Forest, Mr. Irvin has seen a maximum of twelve individual sightings of pronghorn in this weed occurrence (J. Irvin, pers. comm.). Plus, pronghorn daily movements have been documented to range from 0.06 to 0.5 miles (Zeiner et al 1990), so they would not remain in an area to perpetually consume contaminated vegetation. Therefore, treatment of noxious weeds with herbicides will not affect pronghorn under Alternatives 2, 4 and 6.

There are 157.89 acres of potential pronghorn habitat in BV001CRUV2 (Crupina). This weed occurrence, in reality, does not provide potential habitat and is typed as such, only because an artifact of the way the lines depicting potential pronghorn habitat were drawn (B. Turner, pers. comm.). Therefore, there would be no risk to pronghorn by the treatment of this occurrence under any Alternative.

BV284ONAC consists of small pockets of Scotch thistle that run the length of Messenger Gulch; although 16.31 acres of this polygon are typed as potential pronghorn habitat, very little of the total polygon would be treated because of the diffuse density of the weed distribution within the entire weed occurrence.

Under the Alternatives with Early Detection/Rapid Response activities, wildlife biologists will review new noxious weed treatment sites prior to implementation. If concerns for pronghorn surface, (including conditions not covered within the analysis for the FEIS), additional Design Standards could be added.

Pronghorn are well distributed across the Modoc NF within potential habitat. Because only a few individuals could be affected in localized areas, implementation of Alternatives 2 through 6 would have no impact on the distribution of pronghorn. Nor would there be any direct or indirect effects to the whole population of pronghorn, because pronghorn use patterns occurring outside of the large weed occurrences.

Cumulative Effects to Populations of Pronghorn Antelope

Because there are no direct or indirect effects to pronghorn antelope, there are no cumulative effects to pronghorn antelope populations or distribution under any Alternative.

Relationship of Project-Level Impacts to Forest-Scale Habitat and Population Trends for the Mule Deer and Pronghorn Antelope

The cumulative effects of the Action Alternatives of the Noxious Weeds Project will result in no decrease in Forest-wide habitat for mule deer or pronghorn antelope. There would be no effect to mule deer or pronghorn populations by the implementation of any action Alternative. Therefore, the impact of the Noxious Weeds Project will not alter the existing Forest-wide trend in habitat, nor will it change the existing Forest-wide population distribution trend for mule deer or pronghorn antelope.

Osprey

The osprey is both a terrestrial MIS as well as Species of Special Concern in California.

Habitat - Species Relationship: Osprey habitat varies greatly, but common denominators are (1) adequate supply of accessible fish within 10–20 km of nest; (2) open nest sites, which are generally elevated (e.g., trees, artificial platforms, towers, or bluffs); (3) ice-free season sufficiently long to allow fledging of young. In the western U.S. (Idaho, California, Oregon), most pairs (80–95%) nest in trees; historically in northeastern California (Tule Lake), 250 to 300 pairs nested in tall yellow pines (*Pinus ponderosa*) and junipers; nests were 12 to 30 meters from the ground. Ospreys on the Modoc National Forest utilize snags, platforms, or other structures in pine and mixed conifer habitats to situate their nests.

Microhabitat for foraging also varies greatly. Osprey forage along rivers, marshes, reservoirs, ponds and lakes, which have a ready supply of fish. Osprey are visual hunters; therefore, foraging is less successful in water with thick emergent and submerged vegetation. Reservoirs often provide ample expanses of shallow, clear water—ideal conditions for hunting. Live fish comprised at least 99% of prey items recorded in almost every published account with a wide

variety of fish species taken; osprey will also use birds, reptiles, small mammals, amphibians, and invertebrates (Zeiner et al. 1990a).

Nesting ospreys are able to adapt to certain level of disturbance (Bent 1937 and Palmer 1988a in USDA Forest Service 1994). Other authors have found that osprey will abandon the nest, especially when the disturbance is unexpected (various authors in USDA Forest Service 1994). Modoc NF has standards and guidelines in the form of Limited Operating Periods to protect nesting osprey.

Project-level Effects Analysis based on Osprey Habitat

Key Habitat Factor(s) for the Analysis: The proposed project, the removal of noxious weeds from Forest System Lands, will have no affect on habitat for osprey. Osprey utilize trees and snags for nests, and do not use noxious weeds for cover or food. The potential effects from the project are disturbance at the nest site and potential ingestion of contaminated prey.

Analysis Area for Project-level Effects Analysis: The analysis area for osprey is limited to the 13,238 acres of occupied habitat within 0.5 miles of nest sites and an additional 1,419 acres of potential habitat on the Modoc National Forest. This habitat is located around the reservoirs and lakes on the Forest; the greatest density is on the Devil's Garden and Big Valley Districts.

Alternatives 1 (Current Management)

Direct and Indirect Effects to Habitat

The Forest Service currently treats 20 to 30 acres a year by physical + methods. Currently, the Forest does not use herbicides to treat noxious weeds.

Implementing weed treatments under Alternative 1 would have no effect to osprey habitat. There would be no change in the current or future amount of large trees or snags by the treatment of noxious weeds. Zero % of the current osprey habitat in the analysis area would be affected by implementation of Alternative 1.

Cumulative Effects to Habitat

Because there is no direct or indirect effect to osprey habitat, there are no cumulative effects to osprey habitat.

Alternatives 2 to 6

There are a maximum of 0.46 acres (0.03%) that may be treated with physical + or herbicide means within the 13,238 acres of occupied habitat Forest-wide. There are an additional 9.99 acres (0.7%) of (WM009CIAR4) (Canada thistle) in potential habitat. (Table below)

Table 3 - 102. Proposed Treatment within Potential Osprey Habitat

Species	Total Acres of Habitat Forest- wide	Total Maximum Acres of Physical + Treatments*	Total Maximum Acres of Herbicide Treatments
Osprey – Occupied	13,238	0.46	0.46
Osprey - Potential	1,419	9.99	9.99

* This figure includes the maximum, where physical + or herbicide methods may be employed.

The WM009CIAR4 (Canada thistle) occurrence consists of old beaver ponds that are mostly sedimented into meadow habitat and do not contain fish (M. Yamagiwa, pers. comm.). They were

typed as potential osprey habitat, due to an artifact in the data set. Therefore, there will be no effect to osprey in treating this weed occurrence.

No nest trees or nesting habitat would be removed under any action Alternative. Prey habitat should benefit from the treatment of weeds, because weeds in riparian habitats may cause increased sedimentation. Purple loosestrife (*Lythrum salicaria*), tall whitetop (*Lepidium latifolium*), and Canada thistle (*Cirsium arvense*) have the potential to locally contribute to unstable stream banks. Not only do species like tall whitetop exclude native species, but these species do not have root systems that withstand erosive forces of water, and could allow increased sedimentation into creeks as well as loss of bank habitat (www.cal-ipc.org; FEIS invasive plant database; Bossard, Randal, and Hoshovsky 2000). However, the beneficial effects to osprey habitat Forest-wide are small at this point; therefore, there would be no direct or indirect effect to osprey habitat by implementation of Alternatives 2 through 6.

Cumulative Effects to Habitat

Because there is no direct or indirect effect to osprey habitat, there are no cumulative effects to osprey habitat.

Summary of Osprey Population Status and Trend at the Forest Scale

The Modoc NF Forest Plan (as amended by the SNFPA) requires Forest-scale distribution population monitoring for osprey. The sections below summarize population status and trend data for these species. This information is drawn from the detailed information on population trends in the Modoc National Forest MIS Report (USDA 2007b), which is hereby incorporated by reference.

Population Status and Trend at the Bioregional Scale

In California, the current osprey range is expanding south of San Francisco Bay along the southern limit of its range in western California and southward into the Sierra Nevada. California-wide BBS data for the period of 1966 to 2004 classifies osprey as “Definitely increasing” (Siegel and DeSante 1999), with a significant increase of 6.6% (range 2.3 to 10.9) per year over the 33 routes. At the Sierra Nevada scale, for the period of 1966 to 2004, Sierra Nevada-wide BBS data classifies osprey as “possibly increasing” (Siegel and DeSante 1999), with an increase of 33.6% (range 15.4 to 51.8%) per year over 5 routes. This trend is consistent with trends observed at the State and Survey-wide scales.

Nest locations to date have been derived through a combination of incidental sightings, intensive nest stand searches, and BBS data. At the time of preparation, the Forest Forest Plan FEIS described the Forest as having seven active nesting territories (USDA 1991b). Currently, there are at least 14 territories, or twice the number that occurred in 1991.

Effects of the Alternatives on Osprey

The only direct effect from physical + and herbicide treatments is the potential for disturbance to nesting osprey; literature has documented instances where osprey will abandon nests, if the activity is outside of their usual experience. The Modoc Forest Plan allows for up to 0.5 mile Limited operating periods around active nests sites. Pre-treatment surveys and Limited operating periods for active nest sites will take care of potential disturbance effects on nesting osprey.

There is a small potential for herbicides getting into adjacent reservoirs and streams, thereby contaminating water and potentially harming fish in occupied osprey habitat; fish are the osprey’s dietary staple. The direct effects to fish and their habitat would be short-term (especially in a stream situation) as well localized in small patches (0.09 acres is the largest weed occurrence

size). The use of treatment buffers and a spill plan should minimize this potential harm to prey. Regardless, treatment with herbicides on 0.26 acres Forest-wide would not cause 10 to100% of an osprey's diet to consist of contaminated fish.

Under the Alternatives with Early Detection/Rapid Response treatments, new occurrences would be reviewed by wildlife biologists prior to implementation. All weed occurrence implementation sites would need to meet fish habitat and water quality standards, and therefore would be limited in acre size; in addition, treatment buffers adjacent to water, as per the Best Management Practices (BMPs) and Design Standards, will add extra protection. If treatment of new occurrences is outside of the conditions examined under the Noxious Weeds Treatment FEIS, additional Design Standards could be added.

Cumulative Effects to Populations

Because there are no direct or indirect effects to osprey populations, there are no cumulative effects to osprey populations.

Relationship of Project-Level Impacts to Forest-Scale Habitat and Population Trends for the Osprey

The cumulative effects of the Action Alternatives of the Noxious Weeds Project will result in no decrease in Forest-wide habitat for osprey. Nor will there be any potential effect to the population for osprey. Therefore, the implementation of the Noxious Weeds Project will not alter the existing Forest-wide trend in habitat, nor will it change the existing Forest-wide population distribution trend for osprey.

Red-breasted and Red-naped Sapsuckers

Red-breasted and red-naped sapsuckers are both terrestrial MIS, as well as a non-game species in California. Both red-naped and red-breasted sapsuckers were selected as Management Indicator Species for the Forest, because of "their affinity for snags or live trees with heart rot in or near riparian zones". Both species prefer hardwoods for feeding and reflect the management of hardwood vegetation within riparian zones (US Forest Service 1991b. Page 3-110).

Habitat - Species Relationship

Habitats used by red-breasted sapsucker include riparian, deciduous hardwood and various conifer stands, especially those stands adjacent to meadows, lakes, and slow-moving streams (Zeiner et al. 1990a). "[The red-breasted sapsucker] frequents sparse to moderate canopy with suitable snags for nest and roost excavation, especially in the vicinity of aspens, wet meadows, clearings, lakes, and other open habitats (Zeiner et al. 1990a)". Data from Dr. Laudenslayer's study on the Modoc National Forest showed red-breasted sapsuckers nesting in dry, open east-side pine stand, with few pine snags and juniper in the understory in addition to riparian habitats.

Red-breasted sapsuckers forage mainly on deciduous hardwoods (Zeiner et al. 1990a), but sometimes conifers in east-side pine in northeastern California (Oliver 1970). The birds eat sap, cambium, and other tree tissues as well as arthropods (Zeiner et al. 1990a). Insects are gleaned or caught using a "fly catch" technique (Walters et al. 2002). Territory size was up to 15 acres around nest sites.

Habitat types used by red-naped sapsuckers include mixed conifer, aspen, and montane riparian habitats, especially those areas with aspen, willow, and cottonwood (Zeiner et al. 1990). Although they will use a variety of trees including conifers, they "apparently prefer to nest in aspen and montane riparian habitats"; they also require snags or live trees with rot for excavating cavities

(Zeiner et al. 1990a, Daily 1993). On the Humboldt-Toiyabe National Forest, red-naped sapsuckers used aspen more than any other habitats (Warkentin and Reed 1999).

Red-naped sapsuckers appear to be omnivorous, foraging on insects and sap (Crockett and Hadow 1975); Zeiner et al. (1990a) also included berries in their diet. In Colorado, red-naped sapsuckers made wells in willows, where large sections of the bark were torn down to the cambium (Ehrlich and Dailey 1988). A study conducted in northwestern Montana found that sapsuckers were almost entirely dependent on conifer sap in the spring when they first arrive on site; the sap from aspen and birch is not important until after these species leaf out. Insects are not abundant in their diets' until later in the season (Tobalske 1992). Territory size was up to 15 acres around nest sites.

Project-level Effects Analysis based on Sapsucker Habitat

Key Habitat Factor(s) for the Analysis

The proposed project, the removal of noxious weeds from Forest System Lands, will have no affect on riparian hardwood habitat, which is important for both sapsucker species. Neither species is known to use noxious weeds for cover or food. The main potential effect is limited to the potential consumption of herbicide contaminated insect and plant materials.

Analysis Area for Project-level Effects Analysis: The analysis area for red-breasted sapsucker is limited to the 107,300 of potential habitat on the Forest. These conifer stands are scattered throughout the Warner Mountain Ranger District Forest. In addition, they are concentrated in the portions of the Big Valley, Devil's Garden, and Doublehead Districts.

The analysis area for the red-naped sapsucker is limited to 45,600 acres of potential habitat on the Forest. Habitat is located in proximity to aspen stands. In general, the areas are concentrated on the Warner Mountain Ranger District, with a few scattered pockets in other portions of the Forest.

Alternative 1 (Current Management)

Direct and Indirect Effects to Habitat

The Forest Service currently treats 20 to 30 acres a year by physical + methods. Currently, the Forest does not use herbicides to treat noxious weeds.

Implementing weed treatments under Alternative 1 would have no effect on habitat for either sapsucker. There would be no change in the current or future amount of snags by the treatment of noxious weeds. There would be little if any change in the amount of willows and aspen. Zero % of the current red-breasted or red-naped sapsucker habitat in the analysis area would be affected by implementation of Alternative 1.

Cumulative Effects to Habitat

Because there is no direct or indirect effect to red-breasted or red-naped sapsucker habitat, there are no cumulative effects to habitat for either species of sapsucker under this Alternative.

Alternatives 2 to 6

Direct and Indirect Effects to Habitat

There are a maximum of 51.35 acres out of 107,300 acres (0.048%) where physical + treatments of potential red-breasted sapsucker habitat Forest-wide could occur (13). There are a maximum of 49.93 acres (0.047%), where herbicide treatments may be applied within potential red-breasted sapsucker habitat Forest-wide. There are a maximum of 14.7 acres out of 45,600 acres (0.032%)

where physical + or herbicide treatments could be applied within potential red-naped sapsucker habitat Forest-wide (Table below).

Table 3 - 103. Proposed Treatment within Potential Red-breasted and Red-naped Sapsucker Habitat

Species	Total Acres of Potential Habitat Forest-wide	Total Maximum Acres of Physical + Treatments*	Total Maximum Acres of Herbicide Treatments*
Red-breasted Sapsucker	107,300	51.35	49.93
Red-naped Sapsucker	45,600	14.7	14.7

* This figure includes the maximum, where physical + or herbicide methods may be employed.

Implementing weed treatments under Alternatives 2 through 6 would have no effect on red-breasted or red-naped sapsucker habitat. There will be no change in the current or future amount of snags for nesting or foraging trees, nor will there be any change in the amount of shrubs for foraging under implementation of any action Alternative. Aspen and meadow habitat could be stable to improved by the implementation of any action Alternative in very small areas, because the treatment decreases the competition to native species by noxious weeds.

Just like the hairy and pileated woodpeckers, the sapsuckers spend their time foraging in trees and willows. According to Walters et al. (2002), foraging red-breasted sapsuckers in a California study spent 73% of their time in trees, 21% on snags, 3% on logs, 1% on the ground and 1% in the air. Since native trees and shrubs will remain as part of this FEIS, there will be little if any change to potential prey habitat by implementation of any Alternative. Therefore, there will be no direct or indirect effects to habitat for either sapsucker under any action Alternative.

Cumulative Effects to Habitat

Because there are no direct or indirect effects to red-breasted or red-naped sapsucker habitat, there are no cumulative effects to habitat for either sapsucker species under these Alternatives.

Summary of Sapsucker Population Status and Trend at the Forest Scale

The Modoc NF Forest Plan (as amended by the SNFPA) requires Forest-scale distribution population monitoring for both sapsuckers. The sections below summarize population status and trend data for the red-breasted and red-naped sapsucker. This information is drawn from the detailed information on population trends in the Modoc National Forest MIS Report (USDA 2007a), which is hereby incorporated by reference.

Sapsucker Population Status and Trend at the Bioregional and Local Scales

Population monitoring data collected by various partners at the bioregional scale indicate that red-breasted sapsuckers as “possibly decreasing” (Siegel and DeSante 1999), with a non-significant decrease of -3.18% (range -7.8 to 1.6%) per year for the Sierra Nevada. Population trends have also been evaluated using the Institute for Bird Populations’ Monitoring Avian Productivity and Survivorship program (MAPS), which oversees a nationwide dataset of mist-netting stations. MAPS data for red-breasted sapsucker between 1992-2001 for the entire Northwest region, (which includes 12 MAPS stations in the Sierra Nevada) showed an average 2-year population change of 0.28% (s.e.= 7.3). These data infer that red-breasted sapsucker populations across most of their range may be stable.

Red-breasted sapsuckers have been detected from 1910 to the present during various surveys on the Modoc NF. Historical records of specimens collected from the Berkeley Natural History Museum date back to 1910 and the 1940's. More recently, red-breasted sapsucker presence/absence on the Modoc National Forest has been noted under the following efforts: project-generated stand searches conducted for various species, the Pacific Southwest Research Station (PSW) cavity nesting bird study (Laudenslayer 2002), and during province and Forest level surveys for willow flycatcher. The distribution for red-naped sapsuckers is the same as during the Modoc Forest Plan.

California has only a small sliver of the red-naped sapsucker range in North America. According to BBS staff biologists, there has only been one red-naped sapsucker sighting for California. This sighting was west of the Modoc NF. Siegel and DeSante (1999), who used BBS data as part of their conservation assessment, also stated that there was insufficient data to determine a trend for red-naped sapsucker for the Sierra Nevada. However, there is an increase in the trend of the red-naped sapsucker data for 1966 to 2003 in a large portion of the red-naped sapsucker range.

Red-naped sapsuckers have been sighted infrequently on the Modoc National Forest; the majority of the sightings are on the Warner Mountain Ranger District. Red-naped sapsuckers have been detected during stand searches conducted for various projects, the Pacific Southwest Research Station (PSW) cavity nesting bird study (Laudenslayer 2002), and project-level surveys for willow flycatcher. In addition, there are historical records of specimens collected from the Modoc NF at the Berkeley Natural History Museum. In the PSW study, red-naped sapsuckers were detected at various locations on the Modoc NF, however, no nest sites were found. The distribution for red-naped sapsuckers is basically the same as during the Modoc Forest Plan.

Effects of the Alternatives on Sapsuckers

There is very little chance of either species receiving a large enough dose of contaminated vegetation or insects to cause a risk to individual birds for the following reasons. They forage mainly on trees, willows, and snags. Most of the weed occurrences within potential habitat red-breasted or red-naped sapsuckers are less than an acre; therefore, it would be unlikely that 10 to 30% of their diet would be in contaminated materials. The larger occurrences, where there is a greater likelihood of contamination are discussed below. The weed occurrences in potential red-breasted sapsucker habitat are followed by the red-naped weed occurrences.

Red-breasted sapsucker occurrences

BV006LIDA (Dalmatian toadflax) – The majority of the area is lava reef country with open conifer stands. Under Alternatives 2 and 4, there are 4.55 acres within potential red-breasted sapsucker habitat in the entire 850 acre toadflax occurrence that could be treated. This 4.55-acre area would be included in one territory or 0.004% of the potential red-breasted sapsucker habitat on the Forest. It is highly unlikely that insects would climb from a weed onto an adjacent tree or willow and be ingested, because the insects tend to utilize specific types of plants (e.g., insects like carpenter ants utilize wood fiber and would not tend to concentrate on herbaceous weeds). Moreover, the toadflax has a patchy distribution consisting of small clumps weeds within a matrix of native plants, so herbicides would not be applied to a 4.55-acre block. Given their feeding preferences and the diffuse nature of the toadflax within the occurrence, it is unlikely to the point of being discountable that there would be any effect to red-breasted sapsuckers by implementation of Alternative 2 or 4. Under Alternative 6, only the exterior satellites of the weed occurrence would be treated, so there would be no risk to red-breasted sapsucker under this Alternative.

WM003LIDA (Dalmatian toadflax) – As stated under the hairy woodpecker discussion, this occurrence actually encompasses a series of very small patches. Although there are 20.26 acres of potential red-breasted sapsucker habitat, only about one acre of potential habitat would be treated. Consequently, the chance of a red-breasted sapsucker consuming 10 to 30% of its diet from treated plants would be remote under Alternatives 2, 4 and 6.

BV001CRVU2 (Crupina) – The area along Post Canyon had crupina present along the road into conifer at various levels of infestation. The largest concentrations were at the lower end of the canyon in the open sage habitats. Other plants, both native and exotic, are within the matrix. In Alternatives 2 and 4, the entire occurrence could be treated. There are 12.96 acres of potential red-breasted sapsucker habitat that could be treated. This could equate to one territory. Most of the insects would not cross over from herbaceous weeds to snags and logs. In addition, crupina does not provide a fruit that would be ingested either. Given the red-breasted sapsuckers' feeding preferences, implementation of Alternatives 2 or 4 are not expected to affect this sapsucker. Under Alternative 6, only the exterior satellites of the weed occurrence would be treated, so there would be no risk to red-breasted sapsucker.

BV302ONAC (Scotch thistle) – The site is within mixed conifer habitat with a high degree of incense cedar. Many of the trees are small diameter (sapling and pole sized) (J. Landoski, pers. comm.), and would not be considered prime potential red-breasted sapsucker habitat. According to the database, there are only 40 plants, so the potential for contamination of a large part of a sapsucker's diet would also be low. Given that only 2.41 acres of potential red-breasted sapsucker could be treated, the low suitability of the area for sapsuckers, and the low number of weeds to be treated, use of herbicides are not expected to have any affect to red-breasted sapsucker under any Alternative for this weed occurrence.

WM009CIAR4 (Canada thistle) – Although the beaver degraded this site, there could be potential red-breasted sapsucker in close juxtaposition to contaminated insects. The sapsuckers would not forage on thistles, but ants could be sprayed and move onto willows, where they could be consumed by sapsuckers. Assuming that a potential territory encompasses 15 acres, 3.21 acres or 21.4% of a potential territory could be treated. Clopyralid would be the preferred herbicide for treatment under Alternatives 2, 4 and 6; the hazard quotient for a small bird consuming insects is less than 1.0, so the risk of toxic effects to birds is small. Design Standard DS-12b would limit the use of 2, 4-D on the site, thereby further minimizing the potential for toxic effects to this species.

Under the Alternatives with Early Detection/Rapid Response activities, wildlife biologists would review new noxious weed treatment sites prior to implementation. If concerns for red-breasted sapsuckers surface (including conditions not covered within the analysis for the FEIS), additional Design Standards could be added.

To summarize, the use of herbicides will have discountable effects to single red-breasted sapsuckers and will have no direct or indirect effect on the distribution and population of red-breasted sapsucker on the Modoc National Forest for the following reasons. One, only a small amount of potential red-breasted sapsucker habitat is scheduled to be treated (even in the largest weed occurrences). Two, the treatment consists of spraying weeds not preferred foraging structures (trees, snags, logs, and willows). Three, prey should be largely unaffected, because there would be a small amount of insect migration from weeds to woody structures. Finally, the lower hazard quotient rating for herbicides scheduled for use.

Cumulative Effects to Populations: Because there are no direct or indirect effects to red-breasted sapsucker population and distribution , there are no cumulative effects to red-breasted sapsucker population or distribution under any Alternative.

Occurrences within potential red-naped sapsucker habitat and potential effects to this species by their treatment.

WM004ONAC (Scotch thistle) – The vegetation on this site is dominated by a pine plantation with most trees about 20 to 30 feet tall and is not considered red-naped sapsucker habitat. The vegetation understory was generally sparse consisting of shrubs, forbs and grasses. Therefore, implementation under Alternatives 2, 4 and 6 are not expected to effect red-naped sapsucker for this site.

WM009CIAR4 (Canada thistle) – The beaver severely degraded this potential red-naped sapsucker habitat site, so there is little chance for red-naped sapsucker to consume contaminated insects. Clopyralid would be the preferred herbicide for treatment under Alternatives 2, 4 and 6; the hazard quotient for a small bird consuming insects is less than 1.0, so the risk of toxic effects to birds is small. Design Standard 12b would limit the use of 2, 4-D on the site, thereby further minimizing the potential for toxic effects to this species. Therefore, treatment of this site is not expected to effect red-naped sapsucker under any Alternative.

Under the Alternatives with Early Detection/Rapid Response activities, wildlife biologists would review new noxious weed treatment sites prior to implementation. If concerns for red-naped sapsuckers surface (including conditions not covered within the analysis for the FEIS), additional Design Standards could be added.

Cumulative Effects to Populations: Because there are no direct or indirect effects to red-naped sapsuckers, there are no cumulative effects to red-naped sapsucker populations or distribution under any Alternative.

Relationship of Project-Level Impacts to Forest-Scale Habitat and Population Trends for the Red-naped and Red-breasted Sapsucker

The cumulative effects of the Action Alternatives of the Noxious Weeds Project will result in no decrease in Forest-wide habitat for either sapsucker species. There is the potential effect to one potential red-breasted sapsucker territory and no red-naped sapsucker territories. Therefore, the impact of the Noxious Weeds Project will not alter the existing Forest-wide trend in habitat, nor will it change the existing Forest-wide population distribution trend for red-breasted or red-naped sapsucker.

Western Gray Squirrel

The western gray squirrel is a terrestrial MIS, as well as a game species in California.

Habitat - Species Relationship: Habitat for this species includes dense stands of large trees and snags with abundant cavities and food, preferably near water; the authors went on to state that this species “require large trees, mast, and snags” (Zeiner et al. 1990). In the Mammalian Species Number 474: Sciurus griseus, they noted that gray squirrels utilize various habitats that have oaks (Carraway and Verts 1994). These authors also noted that gray squirrel’s use cavities that have been excavated by woodpeckers for raising young. Squirrels were found to prefer areas with a patchy understory that had a greater diversity of food producing trees and shrubs (Ryan and Carey 1995). These stands also needed to have connected tree canopies to allow arboreal travel especially within 66 yards of the nest (Ryan and Carey 1995). There are 1,447 acres of oak and an additional 125,473 acres of mixed conifer habitat on the Modoc N.F. that were modeled as potential habitat.

Food studies conducted in part in Shasta and Tehama Counties noted that squirrels mainly used hypogeous fungi and acorns, as well as a variety of plant and animal matter (Stienecker 1977,

Stienecker and Browning 1970). A study in Oregon found that gray squirrels used conifer seeds; some of the cones were cached for winter (Carraway and Verts 1994).

Project-level Effects Analysis based on Habitat

Key Habitat Factor(s) for the Analysis: The proposed project, the removal of noxious weeds from Forest System Lands, will have no affect on oak habitat for western gray squirrel; gray squirrel are not reliant on noxious weeds for cover or food. The main potential effect is limited to the potential consumption of herbicide contaminated plant and insect materials by gray squirrel.

Analysis Area for Project-level Effects Analysis: The analysis area for western gray squirrel is limited to the 126,920 acres of potential habitat on the Forest. The highest-quality oak habitat is limited to the Big Valley and Devil's Garden Districts. The low-incidence habitat is found on the Warner Mountain and Big Valley Districts.

Alternative 1 (Current Management)

Direct and Indirect Effects to Habitat

The Forest Service currently treats 20 to 30 acres a year by physical + methods. Currently, the Forest does not use of herbicides to treat noxious weeds.

Implementing weed treatments under Alternative 1 would have no effect on gray squirrel habitat. There will be no change in the current or future amount of oaks, which are a primary focus of the Forest Plan Standards and Guidelines for squirrel habitat. Nor will there be any change in the amount of large trees, which provide food and cover. Zero % of the current western gray squirrel habitat in the analysis area would be affected by implementation of Alternative 1.

Cumulative Effects to Habitat

Because there is no direct or indirect effect to western gray squirrel habitat, there are no cumulative effects to squirrel habitat under this Alternative.

Alternatives 2 to 6

Direct and Indirect Effects to Habitat

There were no noxious weed occurrences within the oak polygons found throughout the Forest, which is the habitat with the greatest amount of squirrels. Tree cavities and dreys would not be removed under any action Alternative. There is a maximum of 47.3 acres (0.038%) that could be treated with herbicides in low-incidence potential squirrel habitat (Table 3-85, below).

Table 3 - 104. Proposed Treatment within Low-Incidence Potential Gray Squirrel Habitat

Total Acres of Potential low incidence Habitat Forest-wide	Total Maximum Acres of Physical + Treatments*	Total Maximum Acres of Herbicide Treatments*
125,473	47.69	47.3

* This figure includes the maximum, where physical + or herbicide methods may be employed

According to food studies completed in northern California, the following foods were the highest volume in the samples: fungi, acorns, pine nuts, insects, and green vegetation (forbs) (Stienecker 1977, Stienecker and Browning 1970). Fungi, acorns, and pine nuts would not be affected by herbicides or physical + treatments of weeds. The removal of noxious weeds would not affect potential insect prey habitat, because there are currently no native insects that require weeds for

food or cover. In addition, sufficient native plants exist outside of the boundaries of the current weed occurrences to provide forbs for insects and squirrels. Therefore, there will be no direct or indirect effects to western gray squirrel habitat by implementation of any Alternative.

Cumulative Effects to Habitat

Because there are no direct or indirect effects to western gray squirrel habitat, there are no cumulative effects to gray squirrel habitat under these Alternatives.

Summary of Western Gray Squirrel Population Status and Trend at the Forest Scale

The Modoc NF Forest Plan (as amended by the SNFPA) requires Forest-scale distribution population monitoring for western gray squirrel. The sections below summarize population status and trend data for the gray squirrel. This information is drawn from the detailed information on population trends in the Modoc National Forest MIS Report (USDA 2007b), which is hereby incorporated by reference.

Western Gray Squirrel Population Status and Trend at the Bioregional and Local Scales

Western gray squirrel is "S4, Apparently Secure" ("Uncommon but not rare; some cause for long-term concern due to declines or other factors") in California (NatureServe 2006). With respect to northeastern California, Fish and Game personnel believe the gray squirrel population seems to be stable (Tim Burton and Scott Hill, pers. comm.). Richard Shinn noted that locally in Modoc County, the squirrel populations receive little hunting pressure (R. Shinn, pers. comm.). Dr. Laudenslayer is currently working with mammalogists from San Jose State University to determine if there has been a range extension of grey squirrels into Surprise Valley (east of the Modoc National Forest).

Data for gray squirrel on the Forest consists of series of incidental sightings data. Gray squirrels have been observed almost entirely in oak habitat on the Modoc National Forest. There are a few sightings in pine stands on the Devil's Garden Ranger District and a few sightings in higher-elevation mixed conifer habitats of the Big Valley and Warner Mountain Districts (George Studinski, Ken Romberger, and M. Flores, pers. comm). Gray squirrels have not been detected during mammalian surveys conducted at several locations on the Warner Mountain District by San Jose State University staff (J. Matson, pers. comm.). The vast majority of the gray squirrel observations east of the oak habitat on the Modoc NF have been in Surprise Valley (B. Laudenslayer, pers. comm.).

Effects of the Alternatives on Western Gray Squirrels

Direct and Indirect Effects

Under Alternatives 3 and 5 (non-herbicide Alternatives), as well as the physical + treatment aspects of Alternatives 2, 4, and 6, there would be no potential ingestion of contaminated materials.

The potential for ingestion of enough contaminated material to cause an effect to gray squirrel population would a very minor for the following reasons. First, there are no weed occurrences in the oak habitats, where the highest density of squirrels exist. Second, conifer, fungal materials, and native plants would remain on site. Finally, the largest weed occurrences within the low-incidence gray squirrel habitat are found on the Warner Mountains, where there are few gray squirrels.

There is a maximum of 47.0 acres (0.038%) in low-incidence gray squirrel/conifer habitat, which could be treated with herbicides Forest-wide. There have been no gray squirrels detected in the largest weed occurrences (WM001ISTI, WM002ISTI, WM003ISTI, WM004ISTI, and WM005ISTI – [dyer's woad] and WM009CIAR [Canada thistle]). The rest of the occurrences in potential low-incidence squirrel habitat are small and scattered. It is not likely that 10 to 100% of a gray squirrel's diet would consist of contaminated vegetation, because of the low density of squirrels on the Warner Mountain District in addition to the gray squirrels' feeding preferences (which do not appear to include weeds).

Under the Alternatives with Early Detection/Rapid Response activities, which wildlife biologists would review, prior to implementation; if concerns for western gray squirrel surface, additional Design Standards could be added, if weed treatment areas were outside of the conditions analyzed within the FEIS.

To summarize, the use of herbicides will have no direct or indirect effect on the distribution and population of gray squirrel on the Modoc National Forest for the following reasons. One, only a small amount of potential gray squirrel habitat is scheduled for treatment, and it is outside of the area of known occupancy. Two, the treatment consists of spraying weeds, not preferred foraging and reproductive structures. Three, food should be largely unaffected, because their foraging preferences.

Cumulative Effects to Populations

Since there are direct or indirect effects to western gray squirrels, there are no cumulative effects to western gray squirrel population or distribution.

Relationship of Project-Level Impacts to Forest-Scale Habitat and Population Trends for the Western Gray Squirrel

The cumulative effects of the Action Alternatives of the Noxious Weeds Project will result in no decrease in Forest-wide habitat for western gray squirrel. There are no potential effects to the squirrel population. Therefore, the Noxious Weeds Project will not alter the existing Forest-wide trend in habitat, nor will it change the existing Forest-wide population distribution trend for western gray squirrel.

Yellow Warbler

The yellow warbler is a terrestrial MIS as well as a Species of Special Concern in California.

Habitat - Species Relationship: Yellow warblers are found in various shrubby riparian areas in localized areas throughout the Forest. General habitat for yellow warblers includes both open-canopy riparian woodlands in addition to open conifer stands with substantial amounts of shrubs in the understory (Zeiner et al. 1990). King et al. (2001) found that yellow warblers on the Lassen National Forest and Lassen Volcanic National Park utilized "encroaching" lodgepole pine near meadows for nesting, perching, and singing. During the breeding season, open- to medium-density woodlands and Forests with a dense shrub understory are frequently used (Zeiner et al. 1990).

Yellow warblers forage in trees and shrubs; the males tended to forage in areas that were less dense, presumably to be more visible to aid in territory boundary defense (Busby and Sealy 1979). A study in Utah found that they never foraged on the ground; a similar study in Wyoming found that they foraged on the ground about 4% of the time (Lowther et al. 1999). Numerous authors have found that their diet is composed of arthropods; the diet varied based on the type of prey available (Busby and Sealy 1979; Lowther et al. 1999).

Project-level Effects Analysis based on Habitat

Key Habitat Factor(s) for the Analysis: The proposed project, the removal of noxious weeds from Forest System Lands, will have no effect on riparian habitat for yellow warbler; yellow warblers are not reliant on noxious weeds for cover or food. The main potential effect is limited to the potential consumption of herbicide contaminated insect materials by yellow warbler.

Analysis Area for Project-level Effects Analysis: The analysis area for yellow warbler is 53,000 acres of potential habitat Forest-wide. The habitat is distributed throughout the Big Valley and Warner Mountain Districts, with a few localized areas on the Devil's Garden and Doublehead Districts.

Alternative 1 (Current Management)

Direct and Indirect Effects to Habitat

The Forest Service currently treats 20 to 30 acres a year by physical + methods. Currently, the Forest does not use herbicides to treat noxious weeds.

Implementing weed treatments under Alternative 1 would have no effect on yellow warbler habitat. There would be no change in the riparian vegetation consisting of shrubs and trees that comprise nesting and foraging habitat. Zero % of the current yellow warbler habitat in the analysis area would be affected by implementation of Alternative 1.

Cumulative Effects to Habitat

Because there is no direct or indirect effect to yellow warbler habitat, there are no cumulative effects to yellow warbler habitat under this Alternative.

Alternatives 2 to 6

Direct and Indirect Effects to Habitat

A maximum of 0.2 acres (0.0004%) Forest-wide could receive physical + or herbicide treatments within potential yellow warbler habitat.(Table below) These warblers nest in trees and shrubs, so no nesting habitat would be removed under any action Alternative. A study in Utah found that they never foraged on the ground; a similar study in Wyoming found that they foraged on the ground about 4% of the time (Lowther et al. 1999). Prey habitat would not be affected, because there are currently no native insects that are reliant on weeds for food or cover. Moreover, sufficient native plants exist outside of the boundaries of the current weed occurrences to provide food and cover for prey. Therefore, no foraging habitat would be removed with implementation of any action Alternative. Since there will be no direct or indirect effect to nesting and foraging habitat, there will be no direct or indirect effect to yellow warbler habitat by the implementation of any Alternative.

Table 3 - 105. Proposed Treatment within Potential Yellow Warbler Habitat

Total Acres of Potential Habitat Forest-wide	Total Maximum Acres of Physical + Treatments*	Total Maximum Acres of Herbicide Treatments*
53,000	0.2	0.2

* This figure includes the maximum, where physical + or herbicide methods may be employed

Cumulative Effects to Habitat

Because there are no direct or indirect effects to yellow warbler habitat, there are no cumulative effects to yellow warbler habitat under these Alternatives.

Summary of Yellow Warbler Population Status and Trend at the Forest Scale

The Modoc NF Forest Plan (as amended by the SNFPA) requires Forest-scale distribution population monitoring for yellow warbler. The sections below summarize population status and trend data for the yellow warbler. This information is drawn from the detailed information on population trends in the Modoc National Forest MIS Report (USDA 2007b), which is hereby incorporated by reference.

Yellow Warbler Population Status and Trend at the Bioregional and Local Scales

Yellow warbler has been monitored throughout California. California-wide BBS data for the period of 1966 to 2004 classify yellow warbler as "possibly decreasing" (Siegel and DeSante 1999), with a non-significant decrease of -1.4% (range -3.3 to 0.4) per year. The Regional Credibility ranking is "Blue" ("data with larger sample size, at least moderate precision, and at least moderate abundance on routes"). The Christmas Bird Count for California data shows huge annual fluctuations in the yellow warbler numbers, but that the overall trend has increased.

At the Sierra Nevada scale for the period of 1966 to 2004, Sierra Nevada-wide BBS data classifies Yellow warbler as "possibly decreasing" (Siegel and DeSante 1999) with a non-significant decrease of -2.4% (range -6.2 to 1.5%) per year. The Regional Credibility ranking is "Blue" ("data with larger sample size, at least moderate precision, and at least moderate abundance on routes").

Yellow warblers have been sighted on the Modoc National Forest from 1910 to the present. This species is found sporadically in riparian areas containing a variety of shrub species throughout the Forest. Presence data has been collected as part of surveys for avi-fauna conducted in the early part of the century (1910 survey by Taylor and Bryant; 1920 survey by White), a series of incidental sightings by biologists and technicians, surveys conducted for the Tuscarora Pipeline Project, and during riparian point counts run for willow flycatcher. Yellow warbler appears to be distributed in various areas across the Forest similar to the pattern discussed in the Modoc Forest Plan.

Effects of the Alternatives on Yellow Warblers

Direct and Indirect Effects

Forest-wide a maximum of 0.2 acres could receive herbicide or physical + treatments. Under Alternatives 3 and 5 (non-herbicide Alternatives) as well as the physical + treatment aspects of Alternatives 2, 4, and 6, there would be no potential ingestion of contaminated materials. The effects discussed below pertain to herbicide treatments considered under Alternatives 2, 4 and 6.

According to the literature, yellow warblers feed on insects taken from shrubs and trees, although there is a low risk of gathering contaminated insects from the ground. Given that there are only 0.2 acres out of 53,000 acres (0.0004%) of potential habitat Forest-wide that could receive herbicides treatments and the fact that this species mainly gleans insects from trees and shrubs, direct and indirect effects are too small to the point of being discountable.

For the small bird consuming contaminated insects scenario, 2, 4-D (alone or in a tank mix), Dicamba, and the surfactant NPE all exceed hazard quotient ratings of 1.0. Neither of the two weed sites would be treated with 2, 4-D under Alternatives 2 and 4, because they both lie within 1,000 feet of water. Under Alternative 6, any of the herbicides could be used. However, the assumption behind this scenario is that 100% of the diet consists of contaminated insects. Given the small size of the weed occurrence and their foraging preferences, this potential effect is small to the point of being discountable.

Under the Alternatives with Early Detection/Rapid Response activities, new occurrences would be reviewed by wildlife biologists prior to implementation; all weed-occurrence implementation sites would need to meet water quality standards, and therefore will be limited in acre size as per the Best Management Practices (BMPs) and Design Standards. Consequently, there are inconsequential direct and indirect effects to individual yellow warblers and no direct or indirect effects to the yellow warbler distribution or population by the implementation of any Alternative.

Cumulative Effects to Populations

Since there are no direct or indirect effects to the yellow warbler distribution or population on the Forest, there are no cumulative effects to yellow warbler population.

Relationship of Project-Level Impacts to Forest-Scale Habitat and Population Trends for the Yellow Warbler

The cumulative effects of the Action Alternatives of the Noxious Weeds Project will result in no decrease in Forest-wide habitat for yellow warbler. There are also no potential effects to the Modoc NF yellow warbler population. Therefore, the Noxious Weeds Project will not alter the existing Forest-wide trend in habitat, nor will it change the existing Forest-wide population distribution trend for yellow warbler.

Terrestrial Invertebrates

Terrestrial invertebrates are important components of Forest and rangeland ecosystems. They serve many vital roles, including pollinating plants, enriching and aerating soils, and serving as food items for many larger species of animals. The diversity of invertebrate species on the Modoc National Forest probably includes thousands of species, but little is known about their identities, local distributions or abundance. Public comment was received concerning the potential impacts of the proposed herbicide use on terrestrial invertebrates.

It is difficult to evaluate the impacts of weed treatments to invertebrate populations on the Modoc National Forest for several reasons. Information on distribution of species across the Forest is lacking, especially for less collectable invertebrates. For example, no information on the distribution or even the species of earthworms present on the Modoc National Forest could be found. Various species of earthworms have been reported in coniferous forests, aspen groves, grassland/shrubland, pastures and cultivated lands (Gonzalez et al. 2003 and James 2000). However, in the Columbia Basin, Fender, in an undated personal communication with James (1995), reportedly believes areas of bitterbrush, juniper, and sagebrush lack earthworms. Due to the lack of specific information it must be assumed that earthworms, either native or introduced, exist on the Forest on all sites with sufficient soil. Arid sites with very shallow soils quite likely lack earthworms.

Other issues contributing to the difficulty of evaluating impacts of weed treatments on invertebrate populations including the following. Invertebrates are a highly diverse group, some with hard, dry, protective exoskeletons, while others have soft, moist skins. No doubt their physiologies and their sensitivities to habitat disruption and herbicides vary widely. And finally,

the published research that has been done on the impacts of herbicides on a relatively limited number of invertebrate species may not be representative of the thousands of species that are assumed to inhabit the Forest.

The analysis below expands on the DEIS and responds to the concern that the Forest should analyze the impacts to invertebrates.

Direct and Indirect Effects

Alternative 1 (The No Action Alternative)

Managing the Forest under this Alternative would result in unimpeded encroachment by noxious weeds, including species currently found on the Forest and new species likely to appear on the Forest in the future. These noxious weeds would compete with native plant communities on which many native invertebrate species depend. This may adversely affect some individual terrestrial invertebrates but is unlikely to affect populations of invertebrate species.

Alternatives 3 & 5 (The No Herbicide Alternatives)

Alternatives 3 and 5 rely on physical + and cultural methods to control or eradicate noxious weed infestations. These control methods would result in disturbance of the soil surface, alteration of the habitat of invertebrates, and temporary disruption of food sources for terrestrial invertebrate species. These impacts may adversely affect some individual terrestrial invertebrates, but are not expected to adversely affect terrestrial invertebrate populations.

Alternatives 2, 4 and 6 (The Herbicide Alternatives)

Alternatives 2, 4 and 6 rely on a combination of physical + , cultural and herbicide treatment methods to control or eradicate weed infestations. In addition to the possible direct and indirect effects of physical/cultural methods listed above, the possible effects on terrestrial invertebrates include death or injury due to toxic effects of herbicides, alteration of habitat by herbicides, depression of populations, and possible interruption of food supplies. The very small percentages of the Forest proposed for treatment under these Alternatives, and the mosaic of disturbed and undisturbed areas these treatments would produce, indicate the impacts to terrestrial invertebrate habitat would be very minimal. These Alternatives could result in adverse impacts to some individuals, but are not expected to adversely impact terrestrial invertebrate populations.

Cumulative Impacts

Alternative 1 (The No Action Alternative)

If no action is taken to control noxious weeds, soil disturbance caused by other Forest activities such as logging, thinning, prescribed fire and grazing may add to conditions that favor encroachment of noxious weeds, thereby increasing the noxious weed problem, however, the magnitude of this problem is not expected to adversely affect invertebrate populations, although some individuals may be adversely impacted.

Alternatives 3 and 5 (The No Herbicide Alternatives)

Other Forest activities such as logging, thinning, prescribed fire and/or grazing may result in habitat alteration, physical injury, and temporary interruption of food supplies for terrestrial invertebrates. These effects could add to the impacts of physical and cultural treatment methods. However, all of these activities combined involve very small percentages (in the range of 1 % or

less) of the Forest under each of these Alternatives, leaving the vast majority of Forest acres undisturbed by these activities.

And even within these "disturbed" project areas the management activities tend to leave a mosaic of treated and untreated areas, which would still provide usable habitat for many terrestrial invertebrates. Cumulative impacts of Forest activities under these "no herbicide" Alternatives, are not expected to result in adverse impacts to invertebrate populations, although some individuals may be adversely impacted.

Alternatives 2, 4 and 6 (The Herbicide Alternatives)

Other Forest activities such as logging, thinning, prescribed fire and/or grazing may result in habitat alteration, physical injury, and temporary interruption of food supplies for terrestrial invertebrates. These effects could add to the impacts of herbicides and physical + treatments on terrestrial invertebrates. However, all of these activities combined involve very small percentages (in the range of 1 % or less) of the Forest under each of these Alternatives, leaving the vast majority of Forest acres undisturbed by these activities. And even within these "disturbed" project areas the management activities tend to leave a mosaic of treated and untreated areas which would still provide usable habitat for many terrestrial invertebrates. Cumulative impacts of Forest activities under Alternatives 2, 4 and 6, are not expected to result in adverse impacts to invertebrate populations, although some individuals may be adversely impacted.

Consistency with Forest Plans and Other Laws and Policies

The Modoc National Forest Land and Resource Management Plan states in the Record of Decision that, "Maintaining the biodiversity of ecosystems, including the diversity of plants, fish, and wildlife and the age diversity of habitats, is a primary objective."

The National Forest Management Act includes direction to preserve and enhance the diversity of plant and animal communities, including endemic and desirable naturalized plant and animal species, so that the diversity is at least as great as that which would be expected in a natural forest and the diversity of tree species is similar to that existing in the planning area (36 CFR 219.26 and 219.27). Similarly, 36 CFR 219.19 states, "Fish and wildlife habitat shall be managed to maintain viable populations of existing native and desired non-native vertebrate species in the planning area. … In order to ensure that viable populations will be maintained, habitat must be provided to support, at least, a minimum number of reproductive individuals and that habitat must be well distributed so that those individuals can interact with others in the planning area."

In the absence of detailed knowledge of all the invertebrate species on the Forest, their life histories, distributions and population dynamics, the best approach to evaluating the potential effects of these treatment Alternatives is to ask the following questions. Will there be a significant amount of habitat in the study area that will not be affected by herbicides? And will that habitat be distributed so that individual invertebrates can interact with others in the planning area? The answer to both of these questions is yes. Therefore, the treatment activities proposed in the FEIS are unlikely to adversely affect any invertebrate populations, or reduce the diversity of invertebrate communities, and thus the treatment Alternatives are in compliance with applicable Forest Laws and Policy.

Findings

Short-term Uses and Long-Term Productivity

NEPA requires consideration of "the relationship between short-term uses of man's environment and the maintenance and enhancement of long-term productivity" (40 CFR 1502.16). As declared by Congress, this includes using all practicable means and measures, including financial and technical assistance, in a manner calculated to foster and promote the general welfare, to create and maintain conditions under which man and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of present and future generations of Americans (NEPA Section 101).

Implementation of any of the Alternatives may result in some unavoidable short-term effects. The Alternatives were designed to enhance conditions by controlling or eliminating noxious weed sites on the Forest, thus improving site productivity in the long term.

Unavoidable Adverse Effects

This FEIS discloses that there are no unavoidable adverse effects associated with implementation of any of the action Alternatives. The No Action Alternative (Alternative 1) would continue the adverse effect noxious weeds have on the natural, social, and economic resources of the Forest.

Irreversible and Irretrievable Commitments of Resources

Irreversible commitments of resources are those that cannot be regained, such as the extinction of a species or the removal of mined ore. Irretrievable commitments are those that are lost for a period of time such as the temporary loss of timber productivity in forested areas that are kept clear for use as a power line rights-of-way or road

Alternative 1, the no action Alternative, would result in the irretrievable loss of Forest resources. Under this Alternative, an irretrievable loss of site productivity would result as weeds spread uncontrolled at current sites of infestation. These sites would otherwise receive treatment through selection of any of the action Alternatives. In addition, additional irretrievable loss of soil productivity could occur under this Alternative due to the uncontrolled spread of noxious weeds into areas that are currently not infested. Under Alternative 1, there would also be irretrievable impacts to native plant communities if noxious weeds spread from untreated areas and dominate large areas that cannot be treated. The spread of noxious weeds on the Forest has the potential to disrupt and alter native plant communities.

Alternatives 2-6 would not result in any irretrievable or irreversible commitments of resources. Implementation of the Design Standards will result in no irretrievable or irreversible loss of Forest resources.

Legal and Regulatory Compliance

NEPA at 40 CFR 1502.25(a) directs "to the fullest extent possible, agencies shall prepare draft environmental impact statements concurrently with and integrated with …other environmental review laws and executive orders." The Proposed Action and Alternatives comply with the following laws and executive orders.

Forest Service Authorities for Invasive Species Management

The Forest Service has many unique characteristics and authorities to enable it to play a major role in the management of invasive species. Many of these authorities also apply to other Forest Service management activities which do not focus strictly on invasive species management, such as our authority to manage rangelands, conduct research, or enforce public use activities. In addition to these, invasive species are regulated and/or managed through a variety of statutes administered by the States such as State noxious weeds or animal pest species laws and the Forest Service cooperates with the States to implement those. Other Federal agencies also administer laws such as the Lacey Act, the Plant Protection Act, the Animal Damage Control Act, the Federal Seed Act, the Non-indigenous Aquatic Nuisance Prevention and Control Act, and the Alien Species Prevention and Enforcement Act to address invasive species issues.

The Modoc National Forest works cooperatively with various stakeholders to implement these authorities on as appropriate. The following orders or statutes are the primary authorities to allow the Forest Service to conduct invasive species management activities to meet resource management goals and objectives:

The Organic Administration Act (16 U.S.C. 551)

The USDA's authority to make rules and regulations protecting National Forests is set forth in section 1 of the Organic Administration Act (16U.S.C. 551). This provision provides broad authority to protect National Forests from "destruction by fire and depredations" and to issue regulations "as will insure the objects of such reservation, namely to regulate their occupancy and use and to preserve the Forest thereon from destruction." As shown in this FEIS noxious weed infestations are a destructive effect on the Forest environment and, therefore without implementing any of the action Alternatives the Modoc NF would violate this Act.

Multiple-Use Sustained-Yield Act of 1960 (MUSY, 16 U.S.C. 528-531)

USDA manages National Forests for multiple uses under the Multiple-Use Sustained-Yield Act of 1960 (MUSY, 16 U.S.C. 528-531). MUSY provides in part A that "the National Forests are established and shall be administered for outdoor recreations, range, timber, watershed, and wildlife and fish purposes" (16 U.S.C. 528). As shown in this FEIS noxious weed infestation are detrimental to outdoor recreation, range, timber, watershed, and wildlife and fish resources. Therefore without implementing any of the action Alternatives would violate this Act.

Forest and Rangeland Renewable Resources Planning Act of 1974, as amended by National Forest Management Act (16 U.S.C. 1604)

The Forest and Rangeland Renewable Resources Research Act of 1978 is the Department of Agriculture's primary authority to conduct research activities, including research relating to invasive species. The Act contains expansive authority to conduct research and technology development on, and with applications for, all U.S. lands related to the protection, conservation, and sustainable use of natural resources. The Act also authorizes competitive grants to conduct research, and authorizes cooperative agreements with university, industry, and other partners as needed to complement national program needs. The Act provides for the protection of soil productivity, evaluation of effects on management indicator species, and other standards and guidelines, especially those dealing with water quality.

The Modoc Forest Plan implements the provisions of the Act, and the Alternatives in the FEIS are consistent with the Act.

Federal Noxious Weed Act of 1974 (7 U.S.C. 2814)

Although the Plant Protection Act superseded and repealed most of the Federal Noxious Weed Act of 1974 (FNWA), it left intact section 15 of the act, "Management of undesirable plants on Federal lands" (7 U.S.C. 2814).

Section 15 of the FNWA requires Federal land management agencies to develop and establish a management program for control of undesirable plants that are classified under State or Federal law as undesirable, noxious, harmful, injurious, or poisonous, on Federal lands under the agency's jurisdiction (7 U.S.C. 2814(a)). The Act also requires the Federal land management agencies to enter into cooperative agreements to coordinate the management of undesirable plant species on Federal lands where similar programs are being implemented on State and private lands in the same area (7 U.S.C. 2814(c)). The Secretaries of Agriculture and the Interior must coordinate their respective control, research, and educational efforts relating to noxious weeds (7 U.S.C. 2814(f)). USDA's Departmental Regulation 9500-10 sets forth the Departmental policy relating to the management and coordination of noxious weeds activities among the agencies within USDA and other entities.

Selection of any of the action Alternatives would provide compliance with this act while the No Action Alternative (Alternative 1) would not provide the Forest with a “management program for control of undesirable plants that are classified … as … noxious, harmful, injurious, or poisonous …”. Selection of any of the action Alternatives would provide the Forest with a program to treat noxious weeds.

Public Rangelands Improvement Act of 1978; and Federal Land Policy and Management Act of 1976

Several statutes provide funding for rangeland rehabilitation and range improvements on public rangelands, including activities designed to control or manage invasive plants. Section 5 of the Public Rangelands Improvement Act of 1978 (43 U.S.C. 1904(c)) authorizes funding for on-the-ground rangeland rehabilitation and range improvements on some of the rangelands managed by the Forest Service. Additionally, range betterment funds, provided under section 401 of the Federal Land Policy and Management Act of 1976 (43 U.S.C. 1751), can be used for variety of range rehabilitation and improvement activities, specifically including weed control, on certain National Forest System rangelands. The Act of April 24, 1950, pertaining to range improvements, states that of the moneys received from grazing fees, a portion can be used for the "eradication of poisonous plants and noxious weeds in order to protect or improve the future productivity of the range" (16 U.S.C. 580(h)).

The actions proposed in this FEIS would be funded under the authority of this Act.

Cooperative Forestry Assistance Act of 1978

Under cooperative authorities, the Secretary of Agriculture may assist other Federal, State, and private entities in controlling and managing invasive species on other Federal lands and non-federal lands. The Secretary's primary cooperative authority for invasive species is section 8 of the Cooperative Forestry Assistance Act of 1978 (16 U.S.C. 2104).

Section 8(b) authorizes the Secretary of Agriculture to conduct activities and provide technical assistance relating to insect infestations and disease conditions affecting trees on National Forest System lands, on other Federal lands (in cooperation with other Federal Departments) and on

non-Federal lands (in cooperation with State officials, other entities, or individuals). These activities include in part: conducting surveys to detect and appraise insect infestation and disease conditions; determining biological, chemical, and mechanical measures necessary to prevent, retard, control or suppress incipient, potential, threatening, or emergency insect infestations and disease conditions affecting trees; planning, organizing, directing, and performance measures the Secretary determines necessary to prevent, retard, control, or suppress incipient potential, threatening, or emergency insect infestations and disease epidemics affecting trees; and providing technical assistance to maintain healthy Forests and manage the use of pesticides (16 U.S.C. 2104(b)).

Section 8(g) of the Act (16 U.S.C. 2104(g)) also authorizes the Secretary to provide financial assistance through the Forest Service to State entities and private forestry or other organizations to monitor Forest health and protect Forest lands. The Cooperative Forestry Assistance Act of 1978 as amended by the Federal Agriculture Improvement and Reform Act of 1996 Subtitle G Sect. 373, gives authority to provide support for good Forest management practices, including financial assistance to maintain healthy timber ecosystem to prevent incursion of invasive species, on privately owned non-industrial forestlands.

The Modoc National Forest anticipates utilizing cooperators and other agencies, tribes, and volunteers to meet the objectives of this FEIS through authorities granted under this Act.

Forest and Rangeland Renewable Resources Research Act of 1978

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National Environmental Policy Act (42 U.S.C. 4231 et seq.)

Compliance with the National Environmental Policy Act (NEPA) can serve to identify actions that are likely to affect invasive species or be affected by them. The rationale behind the NEPA process - that agencies should be fully informed of the consequences of their actions before making a decision - is especially important when dealing with an issue like invasive species, where problems are often unanticipated side effects of otherwise desirable actions. Analysis and interagency, intergovernmental, and public review and comment that identify potential problems for a particular Proposed Action may also yield ideas for Alternative methods of approaching an issue or other forms of mitigation.

In 2001 noxious weed treatments were stopped as the Forest Supervisor determined that actions could no longer occur under the 1981 NEPA Decision Notice. However, due to the complexity and lengthy NEPA processes involved completion of the project was not possible until now. Past NEPA documents were not completed primarily due to the analysis process and concern of the continuous appeals and/or litigation brought against all Forest Service projects involving the use of herbicides by several special interest groups.

Development of the DEIS, response to comments on the DEIS, and finalizing the FEIS have resulted in detailed documentation of the effects of treatments but is not anticipated to change the need to control noxious weeds or the eventual end results.

FEIS Chapter 2, and Appendix J and K document the extensive public involvement and collaboration efforts that were completed during development of this statement.

The extensive efforts and analysis paralyses involved in meeting Forest Service NEPA requirements and responding to public comments have delayed implementation of a noxious weed treatment program for two years.

The Draft EIS was made available to EPA and the Public on December 17, 2004 with a NOA published on December 29, 2004.

The FEIS does provide a 'hard look' at treatment methods, Alternatives, and effects. While the FEIS consideration of current scientific literature and other agency registrations and certifications of the methods provides evidence that none of the Proposed Actions will adversely affect the environment or human health when carried out in accordance with label instructions, there is a portion of the public that believe that no herbicides should be used because any risk is too great, regardless of the cost or effectiveness in relation to any other treatment method. This final EIS, which includes the Response to Comments on the draft EIS, displays the potential risks, costs associated with treatment methods, and effects of the Alternatives in accordance with the National Environmental Policy Act. Based on his review of this document, the supporting project record, and the review of public, agency, and tribal concerns, the Forest Supervisor will decide which treatments and mitigations will be applied to control or eliminate noxious weeds on the Modoc National Forest, or whether to take no action.

Executive Order 13175 of November 6, 2000 Consultation and Coordination with Indian Tribal Governments

This executive order directs Federal Agencies to develop an "accountable process" for ensuring meaningful and timely input by tribal officials in development of legislation and regulatory policies that have tribal implications. The Executive Order applies to regulations, legislative comments or proposed legislation, and other policies, statements, or actions that have substantial direct effects on one or more Tribes, on the relationship between the Federal Government and Tribes, or on the distribution of power and responsibilities between the Federal Government and Tribes. The Tribal Relations Section of Chapter 3 indicates that a thorough process of Tribal Consultation was carried out through the development of the DEIS and FEIS.

Invasive Species Executive Order 13112 of February 3, 1999

Directs federal agencies to use relevant programs and authorities to:

- Prevent the introduction of invasive species;
- Detect and respond rapidly to and control populations of such species in a cost-effective and environmentally sound manner;
- Monitor invasive species populations accurately and reliably;
- Provide for restoration of native species and habitat conditions in ecosystems that have been invaded;
- Conduct research on invasive species and develop technologies to prevent introduction and provide for environmentally sound control of invasive species; and

- Promote public education on invasive species and the means to address them; and
- Not authorize, fund, or carry out actions that it believes are likely to cause or promote the introduction or spread of invasive species in the United States or elsewhere unless, pursuant to guidelines that it has prescribed, the agency has determined and made public its determination that the benefits of such actions clearly outweigh the potential harm caused by invasive species; and that all feasible and prudent measures to minimize risk of harm will be taken in conjunction with the actions.
- Executive Order 13112 further requires federal agencies to pursue the duties set forth in this section in consultation with the National Invasive Species Council, consistent with the National Invasive Species Management Plan and in cooperation with stakeholders, as appropriate, and, as approved by the Department of State, when working with international organizations and foreign nations.

This FEIS is in response to the second bullet above specifically to provide the Modoc National Forest with the tools and program to "Detect and respond rapidly to and control populations of such species in a cost-effective and environmentally sound manner".

Other Principal Environmental Laws

The following laws contain requirements for protection of the environment that apply to the Proposed Action and Alternatives are discussed in the appropriate sections above:

- Endangered Species Act discussed in Vegetation and Wildlife Sections, of Chapter 3 and shows that none of the Alternatives will adversely affect endangered species.
- Clean Water Act discussed in Watershed Section and shows that all Alternatives comply with the Clean Water Act.
- Clean Air Act discussed in Air Section of Chapter 3 which shows there is no adverse impact to air resources.
- National Historic Preservation Act discussed in Heritage Resources Section of Chapter 3 and the Design Standards set in Chapter 2 protect resources under the National Historic Preservation Act.

Executive Orders

The following executive orders provide direction to federal agencies that apply to the Proposed Action and Alternatives:

- Indian Sacred Sites, Executive Order 13007 of May 24, 1996 is discussed in Heritage Resources Section. No impacts to Indian Sacred Sites have been identified.
- Protection of Wetlands, Executive Order 11990 of May 24, 1977 is discussed in Watershed Section. No adverse impacts are expected to occur from implementation of any of the Alternatives.
- Executive Order 12898 of February 11, 1994 (environmental justice) is discussed in the "Analysis of Social and Economic Effects" and "Environmental Justice" sections. No disparate or adverse effects are identified to groups of people identified in Civil Rights statutes or Executive Order 12898 from any of the Alternatives.