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Noxious Weed Treatment Project

Final Environmental Impact Statement
Appendix A-R

Volume 2 – Part 1

Modoc National Forest

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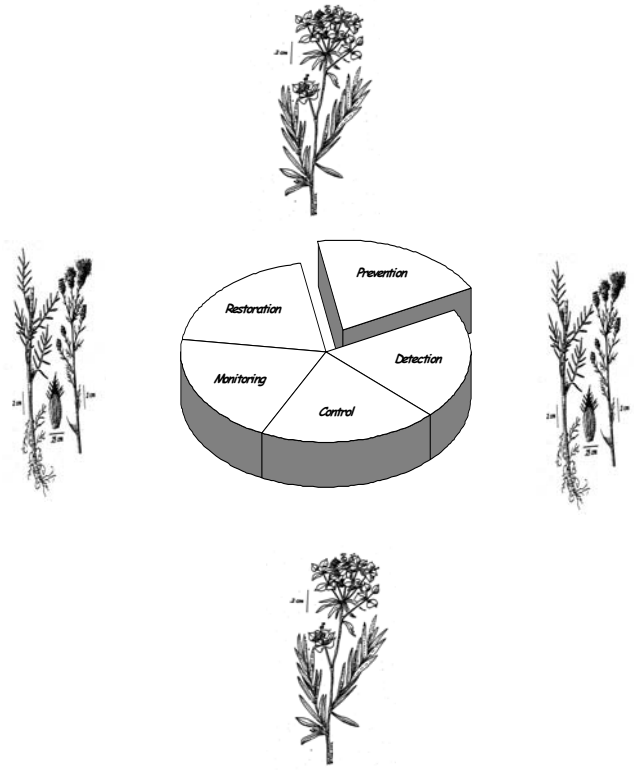
Integrated Weed Management Strategy - 2005

INTEGRATED WEED MANAGEMENT STRATEGY

USDA Forest Service
Modoc National Forest
September 2005



Approved by: Elizabeth Cavassa Date: September 30, 2005

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Forest Supervisor

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MODOC NATIONAL FOREST

INTEGRATED WEED MANAGEMENT STRATEGY

Introduction

This Integrated Weed Management Strategy was developed by compiling existing National and Regional direction, policy, programs, and laws into a short operational guide for the Modoc National Forest. It outlines an integrated weed management approach necessary to prevent, control, and/or eliminate noxious and invasive weeds on the Modoc National Forest. The primary emphasis of this strategy is on prevention and management strategies to eradicate or control noxious weeds. .

The Region 5 Strategic Plan highlights how the spread of invasive weeds in the Pacific Southwest Region is threatening the health of our Forest and rangeland ecosystems. The spread of noxious and non-native invasive plant species reduces biological diversity, impacts threatened and endangered species, degrades wildlife habitat, modifies vegetative structure and species composition, changes fire and nutrient cycles, and degrades soil structure.

In 2003, Forest Service Chief Dale Bosworth identified four inter-related threats to our ability to protect and restore our forests to health conditions. The major threats identified are: fuels and fires, invasive species, loss of open space, and unmanaged recreation.

Millions of acres of public lands in the West are rapidly undergoing degradation because of the spread of invasive non-native plants. Nationwide, the invasion of non-native invasive species (NNIS) into forest and rangeland threatens forest health by displacing native species.

During the Pacific Southwest Region Forest Forum in January 2005, presentations by numerous speakers from throughout the Pacific Southwest area discussed not only the regional and western aspects of the impacts of noxious weeds but the global need to act aggressively when noxious weeds are encountered.

In the last 20 years in California, studies show that yellow starthistle alone has increased from 1 million to at least 12 million acres - about 12 percent of the state's land base (as reported by California Department of Food and Agriculture). Current inventories show that weeds are spreading throughout the area. In 1995, the Forest Service revised its national policy on noxious weed management (FS Manual 2080). The policy places stronger emphasis on integrated weed management. It outlines responsibilities for integrated pest management, prevention and control measures, cooperation and information collection and reporting. Forest Supervisor responsibilities as outlined in Forest Service Manual (FSM) 2080 include: goals and objectives identified in the Forest Land and Resource Management Plan (LRMP); maintaining a noxious weed inventory for the Forest in accord with Forest Service Manual and Handbook direction; and Coordinating with State and County agencies and landowners in prevention, control, containment, and monitoring efforts involved with the management of noxious weeds.

In 1998, the Forest Service, in conjunction with other federal agencies, developed a strategy for the management of noxious weeds. That strategy, entitled Pulling Together: A National Strategy for Invasive Plant Management, focused on three primary goals; prevention, control, and restoration. The Forest

Service also developed its own national strategy focusing on five areas: prevention and education; control; inventory, mapping, and monitoring; research; and administration and planning.

Increased public awareness has also prompted changes in noxious weed management in the state. Weed Management Areas (WMAs) cover much of the state, recognizing the need for coordinated management and control of noxious weeds across jurisdictional boundaries. National forests have become active participants in WMAs. The California Department of Food and Agriculture (CDFA), along with County Agricultural Commissioners, have increased their efforts to address the statewide noxious weed problem. Locally, the Modoc National Forest (Forest) is an active participant in the county Weed Management Area and the Modoc County Noxious Weed Working Group. The Forest also works cooperatively with the Lassen, Siskiyou, and Plumas/Sierra Weed Management Areas.

Under the National Forest Management Act (NFMA) and the Forest and Range Renewable Resource Planning Act (RPA), forests were given the task of preparing Land and Resource Management Plans (LRMPs) to establish management direction along with long-range goals and objectives.

In response to national direction and regional needs, the Forest developed the Noxious Weed Management Strategy and Action Plan (2003) in conjunction with the Modoc County Noxious Weed Working Group. The 2003 Strategy was updated in 2005 based on comments received during the Noxious Weed Treatment Project DEIS comment period. Tiered to the regional and national strategies, the Forest strategy stresses those actions to: promote the management of noxious weeds, prevent the spread of weeds, control weed infestations, and promote noxious weed management into all Forest Service activities.

Departmental Regulation 9500-10 (DR 9500-10) sets forth Departmental policy for the management and coordination of noxious weed activities among agencies of the Department of Agriculture and other executive agencies, organizations, and individuals. DR 9500-10 specifically establishes Integrated Pest Management (FSM 2080.5) as the preferred approach to noxious weed prevention, control, and eradication. The Modoc NF Integrated Weed Management Strategy is designed to insure that an integrated pest management approach is taken in relation to the noxious weed treatment program on the Forest.

Other agencies including the Bureau of Land Management, National Park Service, and the Fish and Wildlife Service in the area are partners in the Modoc County Weed Abatement Area have active noxious weed programs on the lands they administer. Two federally recognized tribes, Pit River Tribe and Fort Bidwell Indian Council, have active noxious weed eradication programs on trust lands in partnership with the Bureau of Indian Affairs and the Bureau of Land Management.

The Modoc National Forest utilizes an integrated weed management approach to control and contain the spread of noxious weeds on National Forest System lands and from National Forest System lands to adjacent lands. Specific objectives to be achieved through noxious weed management include:

Prevention of the introduction and establishment of noxious weed infestations.
Containment and suppression of existing noxious weed infestations.
Formal and informal cooperation with State agencies, local landowners, weed control districts and boards, and other Federal agencies in the management and control of noxious weeds.
Education and awareness of employees, users of National Forest System lands, adjacent landowners, and State agencies about noxious weed threats to native plant communities and ecosystems.

The National Environmental Policy Act (42 U.S.C. 4321-4346) and implementing regulations found at 40 CFR Parts 1500-1508 (FSM 1950; FSH 1909.15) govern environmental analysis and disclosure

requirements conducted by the Forest Service on National Forest System lands for proposed noxious weed control activities, such as ground disturbing activities, herbicide application, or changes in use of resources. The Modoc National Forest Integrated Weed Management Strategy does not require NEPA analysis as it as an administrative document that pulls together the various laws, regulations, and policies. The Strategy calls for NEPA analysis of all ground disturbing activities, herbicide applications, or changes in use of resources.

This document discusses the area within the Forest administrative boundary. The Forest falls within three counties in the northeastern corner of California. The majority of the Forest is within Modoc County, with the second largest percentage in Lassen County and only a small portion falling within Siskiyou County.

The Forest consists of four Ranger Districts. Each district has a predominant habitat type. Warner Mountain Ranger District includes the California portion of the Warner Mountains Range. Big Valley Ranger District is predominantly forested and is considered the northern terminus of the Sierra Nevada. Doublehead Ranger District, while also having habitats similar to Big Valley, has large expanses of lava flow-influenced forests. This district includes the Medicine Lake Highlands and surrounds the Lava Beds National Monument. Devil's Garden Ranger District is predominantly juniper/sagebrush expanses with pockets of ponderosa pine forests. All districts have had past timber harvest, recreation use, and livestock grazing activities. All but Devil's Garden has had some mining activity, including pumice, gold and/or geothermal exploration. Major utility corridors run through Doublehead and Big Valley districts with additional minor corridors on the Warner Mountain and Devil's Garden districts.

The primary goals of this noxious weed strategy are to:

- Increase the understanding and awareness of noxious weeds and the adverse effects they have on wildland ecosystems.
- Develop and promote implementation of a consistent integrated weed management (IWM) approach. Institutionalize consideration of noxious weeds in all planning and project analyses.
- Develop strong partnerships and cooperation with private landowners, county, state and tribal governments, and state and federal agencies for a consolidated and united approach to managing invasive species.

The Forest strategy uses six emphasis areas to address the goals identified above. They are:

1. Coordination and Cooperation
2. Prevention and Education
3. Control/Project Planning
4. Administration and Planning
5. Inventory, Mapping, and Monitoring
6. Research

Within each emphasis area, the strategy identifies objectives and action items to carry the Forest noxious weed program forward.

Status and Threat

The Forest recognizes as noxious plant species those listed by either the state of California, Modoc County or at the National level. The State of California Noxious Weed list and County rates noxious weed species into five categories, the first three of which are of primary consideration on National Forest lands. These ratings show the statewide importance of the pest, the likelihood that eradication or control efforts

would be successful, and the present distribution of the pest within the State. Ratings reflect the most appropriate action to take against a pest under general circumstances. Forty plant species are currently listed as noxious weeds on State and County lists. Of these 33 species listed as suspected in Modoc, Lassen and Siskiyou counties, only 15 are known and mapped on the Forest.

The Modoc County Agriculture Commissioner has determined that several state C rated species are still capable of being eradicated in the area of the Modoc National Forest. Thus, Klamath Weed and Yellow Star Thistle are included as species to be eradicated.

Table 1-1: State of California Noxious Weed Ratings

Rating	Explanation
A	Noxious weed and noxious weed seed: eradication, containment, rejection, or other holding action at the state-county level. Quarantine interceptions to be rejected or treated at any point in the state.
B	Noxious weed and noxious weed seed: eradication, containment, control or other holding action at the discretion of the commissioner.
C	Noxious weed and noxious weed seed: state-endorsed holding action and eradication only when found in a nursery; action to retard spread outside of nurseries at the discretion of the commissioner; reject only when found in a crop seed for planting or at the discretion of the commissioner. Designated noxious weeds in the CA Code of Regulations.
N	Non-Rated
Q	Noxious weed and noxious weed seed: temporary "A" action outside of nurseries at the state-county level pending determination of a permanent rating.

Crews from the Modoc County Department of Agriculture, the California Department of Food and Agriculture, and the Forest Service mapped known sites of noxious weeds to generate a database of populations on the Modoc National Forest. The Forest used the State's definitions to categorize weed species infestation levels on the forest. Surveys continued through the summer of 2002. In 2002, fifteen different noxious weeds were inventoried and documented on an estimated 8,836 acres at 646 locations on all Ranger Districts of the Forest. The most prevalent species are Scotch thistle, dyers woad, and Mediterranean sage. Fewer sites of knapweeds, dalmatian toadflax, yellow starthistle, musk thistle, Canada thistle, and plumeless thistle exist. Two primary noxious weed species make up the largest percent of infestations on the Modoc National Forest. Scotch thistle is the dominant species, making up 40% of weed infestations on the Forest and Dyer's woad comprises 26% of infestations on the Forest.

Table 1-2: Summary Of The Known Infestation Sites By Species, State Rating, Gross Acres, And Number Of Sites In 2003.

Common Name	Species*	Species Rank	Estimated Acres (2005)	Known Infestation Sites
Canada thistle	Cirsium arvense	B	13.33	33
Common crupina or bearded creeper◄	*Crupina vulgaris*	A	158.66	1
Dalmatian toadflax	*Linaria dalmatica*	A	902.55	12
Diffuse knapweed	*Centaurea diffusa*	A	3.89	12
Dyers woad	*Isatis tinctoria*	B	5,725.8	64
Klamath weed or St. Johnswort	*Hypericum perforatum*	C	2.7	9
Mediterranean sage	*Salvia aethiopis*	B	9.15	26
Musk thistle	*Carduus nutans*	A	9.43	12
Plumeless thistle	*Carduus acanthoides*	A	0.1	1
Scotch thistle	*Onopordum acanthium*	A	80.44	340

Common Name	Species*	Species Rank	Estimated Acres (2005)	Known Infestation Sites
Spotted knapweed	*Centaurea maculosa*	A	3.96	14
Squarrose knapweed	*Centaurea squarrosa*	A	.5	5
Tall whitetop or perennial pepperweed	*Lepidium latifolium*	B	0.2	2
Yellow starthistle	*Centaurea solstitialis*	C	2.67	10
Totals			6,913.38	541

* Species added to the Region 5 noxious weed list in the future that are found on the forest or nearby (see Table 1-3) may be considered for treatment if the scope of application methods and effects are within the range of the selected alternative.

Geographic information system analysis of site locations indicates that 82% of the weed sites are located along roads. Roads appear to be the major vector (means of spread) of noxious weeds on Forest Service Lands. The remaining 18% of noxious weeds appears to be split between fire occurrences and past logging landings near roads. The largest infestation of noxious weeds (5,657.76 acres of Dyers woad) on the Forest appeared after the Long Damon Fire probably as a result of weed occurrences along fire control lines. Noxious weeds have also been found in other areas of both wild and prescribed fire making fire the second major vector of weeds on the Forest. Past logging operations which occurred prior to restrictions on equipment washing were in place appears to be the third major vector. Many in the public sector believe that cattle are a major vector for the spread of noxious weeds the Modoc National Forest does not have any evidence of numerous weed infestations located more than a ¼ mile from roads, historic logging sites, or fire occurrence areas that could be attributed to cattle being a major vector on the Forest.

In addition to the inventoried species and sites above the following noxious weeds have been located in Modoc County and pose a threat to lands administered by the Forest Service. The shaded species below have been identified on the Modoc National Forest but have not yet been extensively inventoried.

Table 1-3: Noxious Weeds That are Threats to the Modoc National Forest.

"A" RATED	
Halogeton	Halogeton glomeratus
Leafy spurge	Euphorbia esula
Longleaf ground cherry	Physalis longifolia
Perennial sowthistle	Sonchus arvensis
Skeletonweed	Chondrilla juncea
Yellowspine thistle	Cirsium ochrocentrum
"B" RATED	
Austrian fieldcress	Rorippa austriaca
Globepodded hoarycress	Cardaria pubescens
Heart-podded hoarycress	Cardaria draba
Japanese knotweed	Polygonum cuspidatum
Purple loosestrife	Lythrum salicaria
Quackgrass	Agropyron repens
"C" RATED	
Common Russian thistle	Salsola tragus
Field bindweed	Convolvulus arvensis
Medusahead	Taeniatherum caput-medusae

Povertyweed	Iva axillaris
Puncturevine	Tribulus terrestris

Priority Setting

Individual site-specific projects will determine the factors that favor the establishment and spread of noxious weeds and design management practices or prescriptions to reduce the risk of infestation or spread of noxious weeds.

Where funds and other resources do not permit undertaking all desired measures, address and schedule noxious weed prevention and control in the following order:

First Priority: Prevent the introduction of new invaders. This Strategy requires noxious weed risk assessments are an integral part of project planning including permit issuance for special uses such as grazing and mining.
Second Priority: Conduct early treatment of new infestations, and
Third Priority: Contain and control established infestations.

When assigning management priorities for prevention and control measures, utilize Noxious Weed Classification Systems developed at the State, county, or local level to provide a coordinated approach. Particular consideration should be given to emergency staging areas, trailheads, campgrounds, and gravel pits.

Ensure that environmental controls and objectives are met for threatened and endangered or other species, as specified in applicable laws, policy, and regulations for project-level noxious weed control actions, as provided in the National Environmental Policy Act process.

1. Coordination and Cooperation

The spread of invasive weeds ignores all boundaries. The only way that the Forest Service can succeed in the control and prevention of noxious weeds is through coordination and cooperation with our neighbors and partners. Coordination with other individual landowners, agencies and groups in the management of noxious weeds is the key to the success of this strategy.

Objectives:

- Use Modoc County Noxious Weed Working Group to consolidate and coordinate weed issues across jurisdictional boundaries.
- Ensure that adequate scientific expertise, organizational and technical skill, and administrative support is available for local weed management efforts.
- Minimize barriers to noxious weed prevention and control efforts.

Actions:

- Continue to be an active participant in the Modoc, Lassen, and Siskiyou County Noxious Weed Working Group,
- Coordinate with Federal, state, local agencies, tribal government and private groups to: Control Weed Occurrences, Inventory and monitor weeds and treatment efforts, Support research regarding weed control/management, Implement prevention programs to prevent spread of weeds, Develop education program to support weed prevention, Work specifically with local tribes to identify and control noxious weeds in areas of concern to tribal government.

- The Forest will work toward funding a noxious weed technician to inventory and monitor known weed locations on the Forest.
- The Forest Weed Coordinator will participate with the Working Group as well as other local agencies to produce and present educational materials to county residents.
- Arrange to meet yearly with appropriate tribal personnel to review upcoming treatment locations and to coordinate areas of high priority for treatment.
- Conduct yearly noxious weed education sessions for Forest personnel.
- Use a memorandum of understanding (MOU) or a cooperative agreement (FSM 1580) to outline ways of cooperating with State or other Federal agencies to prevent, contain, and control noxious weeds. Use a cooperative agreement when funds are exchanged. Any project-level MOU or cooperative agreement must, as a minimum:
- Specify in cooperative agreements the contributions to be made by each party.

2. Prevention

Prevention can help slow or avoid the introduction and/or establishment of noxious weeds in wildland ecosystems. Education is an integral part of prevention. Having an informed workforce, along with cooperators and the public is essential to the management of invasive species as prevention is one of the most cost effective methods to control the spread of noxious weeds.

In 2001 the Region released a Prevention Measures and Practices Guide Book for use by Forests. Noxious weed risk assessments are currently being prepared as an integral part of project planning. Weed prevention practices and mitigation measures are being incorporated into all Forest activities using these risk assessments. Contract clauses are now incorporated into Forest Service contracts and permits, requiring equipment cleaning and highlighting prevention measures.

Working in conjunction with the Noxious Weed Working Groups, educational materials have been developed and are being circulated to increase public awareness of noxious weed issues.

At line officer's discretion, the practices described in this section may also be applied to non-native invasive plants that are not defined as "noxious".

Objectives:

- Educate the public, contractors, and Forest Service employees to increase awareness of noxious weed issues in conjunction with other agencies and across resource areas with in the Forest Service.
- Institute prevention measures such as weed-free forage, straw, and fill requirements.
- Incorporate weed prevention practices and mitigation measures into all Forest activities.

Actions:

- Require the use of weed-free materials (gravel, fill, seed mixes) in facilities maintenance and construction.
- Meet yearly with Forest contract officer representatives for updates on new and existing standard contract clauses.
- Ensure that when vehicles return from the field dirty they are cleaned before they are used again. Vehicles will be kept clean both inside and out.
- Implement Project Prevention Practices that are listed below as appropriate.

Project Prevention Practices

This Strategy provides a comprehensive directory of weed prevention practices for use in Forest Service planning and wildland resource management activities and operations. This section will help employees and cooperators identify weed prevention practices that mitigate identified risks of weed introduction and spread for a project or program.

These Prevention Practices support implementation of the February 3, 1999 Executive Order on Invasive Species. Federal agencies are expected to follow the direction in the Executive Order.

Development of weed prevention practices is supported by the Forest Service noxious weed policy and strategy. Forest Service policy (FSM 2080) identifies prevention of the introduction and establishment of noxious weed infestations as an agency objective. This policy directs the Forest Service to: (1) determine the factors that favor establishment and spread of noxious weeds, (2) analyze weed risks in resource management projects, and (3) design management practices to reduce these risks. The Forest Service Noxious Weed Strategy identifies development of practices for prevention and mitigation during ground-disturbing activities as a long-term emphasis item. The February 1999 Executive Order on Invasive Species requires Federal agencies to use relevant programs and authorities to prevent the introduction of invasive species and not authorize or carry out actions that are likely to cause the introduction or spread of invasive species unless the agency has determined, and made public, documentation that shows that the benefits of such actions clearly outweigh the potential harm, and all feasible and prudent measures to minimize risk of harm will need to be taken in conjunction with the actions.

All resource management projects need to analyze weed risks in the planning stage. Risk includes identifying the likelihood of weeds spreading to the project area and determining the consequence of weed establishment in the project area. Resource programs undertaking maintenance operations need to analyze weed risks when preparing operating plans. A finding of risk is the basis for identifying the appropriate weed prevention practices which are likely to be effective in a particular project situation.

These Noxious Weed Prevention Practices provide a toolbox of ideas for use in mitigating identified weed risks in resource management operations. The practices do not add new requirements or regulations.

In 2001 two weed prevention practices are required by Forest Service policy:

For forested vegetation management operations, use equipment cleaning contract provisions WO-C/CT 6.36 (see Appendix 1)

Post and enforce weed-free feed orders, where they exist. (FSM 2081.03).

All other weed prevention practices in this section are optional for use based upon an analysis of weed risks. This list of practices, if applied, is considered to be good overall direction, however, not all of these practices can be implemented in every project.

When considering the use of a weed prevention practice for a specific project or resource program, evaluate the efficacy of the weed prevention practice to meet the goal, its feasibility to implement in the specific situation, and its cost-effectiveness. A determination of cost-effectiveness may consider the

probability and cost of weed control if a weed prevention practice is not used and the relative contribution of the project or activity to the overall weed risk at the site.

The intent of this part of the Strategy is for managers to first identify and apply the General Weed Prevention practices and then supplement those practices with the appropriate resource activity specific guidance.

General Weed Prevention Practices for Site-disturbing Projects and Maintenance Programs

Prevention Goal 1: *Incorporate weed prevention and control into project layout, design, alternative evaluation, and project decisions.*

> **Practice 1:** Environmental analysis for projects and maintenance programs will assess weed risks, analyze potential treatment of high-risk sites for weed establishment and spread, and identify prevention practices. Determine prevention and maintenance needs, to include the use of herbicides, if needed, at the onset of project planning.

Prevention Goal 2: *Avoid or remove sources of weed seed and propagules to prevent new weed infestations and the spread of existing weeds.*

> **Practice 2:** Before ground-disturbing activities begin, inventory and prioritize weed infestations for treatment in project operating areas and along access routes. Identify what weeds are on site, or within reasonably expected potential invasion vicinity, and do a risk assessment accordingly.
>
> **Practice 3:** To reduce risk of spreading weed infestations, begin project operations in uninfested areas before operating in weed-infested areas.
>
> **Practice 4:** Locate and use weed-free project staging areas. Avoid or minimize travel through weed-infested areas, or restrict to those periods when spread of seed or propagules are least likely.
>
> **Practice 5:** Determine the need for, and when appropriate, identify sites where equipment can be cleaned. Clean equipment before entering National Forest System lands; a Forest Officer, in coordination with the Unit Invasive Species Coordinator, needs to approve use of on-Forest cleaning sites in advance. This practice does not apply to service vehicles traveling frequently in and out of the project area that will remain on the roadway. Seeds and plant parts need to be collected when practical and incinerated. Remove mud, dirt, and plant parts from project equipment before moving it into a project area.
>
> **Practice 6:** Clean equipment, before leaving the project site, if operating in areas infested with weeds. Determine the need for, and when appropriate, identify sites where equipment can be cleaned. Seeds and plant parts need to be collected when practical and incinerated.
>
> **Practice 7:** Workers need to inspect, remove, and properly dispose of weed seed and plant parts found on their clothing and equipment. Proper disposal means bagging the seeds and plant parts and incinerating them.
>
> **Practice 8:** Evaluate options, including closure, to regulate the flow of traffic on sites where desired vegetation needs to be established. Sites could include road and trail rights-of-way, and other areas of disturbed soils.

Prevention Goal 3*: Prevent the introduction and spread of weeds caused by moving infested sand, gravel, borrow, and fill material in Forest Service, contractor and cooperator operations. For practices 10 through 12 below, work with the responsible transportation agencies to voluntarily adopt these practices*

where county and state governments have responsibility for maintenance of roads that cross National Forest System lands.

Practice 9: Inspect material sources on site, and ensure that they are weed-free before use and transport. Treat weed-infested sources for eradication, and strip and stockpile contaminated material before any use of pit material.

Practice 10: Inspect and document the area where material from treated weed-infested sources is used, annually for at least three years after project completion, to ensure that any weeds transported to the site are promptly detected and controlled.

Practice 11: Maintain stockpiled, uninfested material in a weed-free condition.

Prevention Goal 4: *In those vegetation types with relatively closed canopies, retain shade to the extent possible to suppress weeds and prevent their establishment and growth.*

Practice 12: Retain native vegetation in and around project activity to the maximum extent possible consistent with project objectives.

Prevention Goal 5: *Avoid creating soil conditions that promote weed germination and establishment.*

Practice 13: Minimize soil disturbance to the extent practical, consistent with project objectives.

Prevention Goal 6: *Where project disturbance creates bare ground, consistent with project objectives, re-establish vegetation to prevent conditions to establish weeds.*

Practice 14: Revegetate disturbed soil (except travelways on surfaced projects) in a manner that optimizes plant establishment for that specific site. Define for each project what constitutes disturbed soil and objectives for plant cover revegetation.

Practice 15: Revegetation may include topsoil replacement, planting, seeding, fertilization, liming, and weed-free mulching as necessary. Use native material where appropriate and feasible. Use certified weed-free or weed-seed-free hay or straw where certified materials are required and/or are reasonably available. Where practical, stockpile weed-seed-free topsoil and replace it on disturbed areas (e.g. road embankments or landings)

Practice 16: Use local seeding guidelines to determine detailed procedures and appropriate mixes. To avoid weed-contamination, a certified seed laboratory needs to test each lot against the all-State noxious weed list to Association of Seed Technologists and Analysts (AOSTA) standards, and provide documentation of the seed inspection test. There are plant species not on State and Federal noxious weed lists that the Forest Service would consider non-native invasive weeds. Check State and Federal lists to see if any local weeds need to be added prior to testing. Seed lots labeled as certified weed free at time of sale may still contain some weed seed contamination. Non-certified seed should first be tested before use.

Practice 17: Inspect and document all limited term ground-disturbing operations in noxious weed infested areas for at least three (3) growing seasons following completion of the project. For on-going projects, continue to monitor until reasonable certainty is obtained that no weeds have occurred. Provide for follow-up treatments based on inspection results.

Prevention Goal 7: *Improve effectiveness of prevention practices through weed awareness and education.*

Practice 18: Provide information, training and appropriate weed identification materials to people potentially involved in weed introduction, establishment, and spread on National Forest System lands, including agency managers, employees, forest workers, permit holders, and recreational visitors. Educate them to an appropriate level in weed identification, biology, impacts, and effective prevention measures.

Practice 19: Encourage proficient weed management expertise at each administrative unit. Expertise means that necessary skills are available and corporate knowledge is maintained.

Practice 20: Develop incentive programs encouraging weed awareness detection, reporting, and for locating new invaders.

Prevention Goal 8: *Set the example; maintain weed-free administrative sites.*

Practice 21: Treat weeds at administrative sites and use weed prevention practices to maintain sites in a weed-free condition.

Fire Management

Pre-fire, Pre-incident Training

Prevention Goal 9: *Improve effectiveness of prevention practices through weed awareness and education.*

Practice 22: Increase weed awareness and weed prevention in fire training.

Practice 23: Include weed risk factors and weed prevention practices in Resource Advisor duties on Incident Management Teams and Burn Rehabilitation Teams.

Fire Plans

Prevention Goal 10: *Improve effectiveness of prevention practices through weed awareness and education.*

Practice 24: Annual Fire Management Plan review will include direction for inclusion of appropriate practices from the Forest Integrated Weed Management Strategy in all fire planning activities.

Practice 25: Assign a local weed specialist or include in Resource Advisor duties to the Incident Management Team when wildfire or control operations occur in or near a noxious weed area.

Practice 26: Resource Advisors need to provide briefings that identify operational practices to reduce weed spread, (for example: avoiding known weed infestation areas when locating fire lines). Include this information in shift briefings.

Practice 27: Provide weed identification aids to Field Observers.

Wildfires

The wildfire weed prevention goals below apply except in instances where human life or property is at risk.

Prevention Goal 11: *Avoid or remove sources of weed seed and propagules to prevent new weed infestations and the spread of existing weeds.*

Practice 28: Ensure that rental equipment is free of weed seed and propagules before the contracting officers' representative accepts it.

Practice 29: Maintain a network of airports, helibases, camps, and staging areas in a noxious weed-free condition.

Practice 30: Inspect and treat weeds that establish at equipment cleaning sites after fire incidents.

Prevention Goal 12: *Avoid creating soil conditions that promote weed germination and establishment.*

Practice 31: Use appropriate suppression tactics to reduce suppression-induced disturbances to soil and vegetation while minimizing seedbed creation due to disturbance from fire effects. .

Practice 32: Avoid moving water buckets from infested lakes to lakes that are not infested prior to inspection and cleaning. There is no hazard in using water infested with aquatic weeds on terrestrial sites.

Prescribed Fire

Prevention Goal 13: *To prevent new weed infestations and the spread of existing weeds, avoid or remove sources of weed seed and propagules or manage fire as an aid in control of weeds.*

Practice 33: Ensure that rental equipment is free of weed seed and propagules before the contracting officer's representative accepts it.

Practice 34: Avoid ignition and burning in areas at high risk for weed establishment or spread due to fire effects. Treat weeds that establish or spread because of unplanned burning of weed infestations.

Practice 35: When possible use staging areas and helibases that are maintained in a weed-free condition.

Practice 36: Pre-inventory project area and evaluate weeds present with regard to the effects on the weed spread relative to the fire prescription.

Prevention Goal 14: *Avoid creating soil conditions that promote weed germination and establishment.*

Practice 37: Use appropriate preparation and suppression tactics to reduce disturbances to soil and vegetation.

Fire Rehabilitation

Prevention Goal 15: *Incorporate weed prevention into project layout, design, alternative evaluation, and decisions.*

Practice 38: Evaluate weed status and risks in Burned Area Emergency Rehabilitation plans. When appropriate, apply for Burned Area Emergency Rehabilitation and restoration funding.

Prevention Goal 16: *To prevent conditions favoring weed establishment, re-establish vegetation on bare ground caused by project disturbance as soon as possible using either natural recovery or artificial techniques as appropriate to the site objectives.*

Practice 39: To prevent weed spread, treat weeds in burned areas as part of the Burned Area Emergency Rehabilitation plan. For known infestations that will likely increase, the first preference is prevention, such as planting species to compete with unwanted plants.

Practice 40: Inspect and document weed establishment at fire access roads, cleaning sites, all disturbed staging areas, and within burned areas; control infestations to prevent spread within burned areas. If you suspect the presence of noxious weeds, request BAER funds to inspect and document for emergence in the spring. Request BAER funds for control if noxious weeds are present and NEPA has already been approved.

Practice 41: Seed and straw mulch to be used for burn rehabilitation (for wattles, straw bales, dams, etc.) all need to be inspected and certified that they are free of weed seed and propagules.

Practice 42: Regulate human, pack animal, and livestock entry into burned areas at risk for weed invasion until desirable site vegetation has recovered sufficiently to resist weed invasion.

Forest Vegetation Management

Timber Harvest Operations & Stewardship Contracting

Prevention Goal 17: *Avoid or remove sources of weed seed and propagules to prevent new weed infestations and the spread of existing weeds.*

> **Practice 43:** Treat weeds on projects used by contractors, emphasizing treatment of weed infestations on existing landings, skid trails, and helibases before activities commence.
>
> **Practice 44:** Train contract administrators to identify noxious weeds and select lower risk sites for landings and skid trails.
>
> **Practice 45:** Encourage operators to maintain weed-free mill yards, equipment parking, and staging areas.
>
> **Practice 46:** Use standard timber sale contract provisions such as WO-C/CT 6.36 to ensure appropriate equipment cleaning

Forest Service Timber Sale Contract Provisions - WO-C6.36

C6.36 – EQUIPMENT CLEANING: (5/01) and **CT6.36 – EQUIPMENT CLEANING: (5/01)**

Unless the entire Sale Area is already infested with specific noxious weed species of concern, Purchaser shall ensure that prior to moving on to the Sale Area all off-road equipment, which last operated in areas known by Forest Service to be infested with specific noxious weeds of concern, is free of soil, seeds, vegetative matter, or other debris that could contain or hold seeds. Purchaser shall certify in writing that off-road equipment is free of noxious weeds prior to each start-up of timber sale operations and for subsequent moves of equipment to Sale Area. The certification shall indicate the measures taken to ensure that off-road equipment is free of noxious weeds will be identified. "Off-road equipment" includes all logging and construction machinery, except for log trucks, chip vans, service vehicles, water trucks, pickup trucks, cars, and similar vehicles. A current list of noxious weeds of concern to Forest Service is available at the Forest Supervisor's Office.

Purchaser must clean off-road equipment prior to moving between cutting units on this timber sale that are known to be infested with noxious weeds and other units, if any, that are free of such weeds. Sale Area Map shows areas, known by Forest Service prior to timber sale advertisement, that are infested with specific noxious weed species of concern.

Purchaser shall employ whatever cleaning methods are necessary to ensure that off-road equipment is free of noxious weeds. Equipment shall be considered free of soil, seeds, and other such debris when a visual inspection does not disclose such material. Disassembly of equipment components or specialized inspection tools is not required.

Purchaser shall notify Forest Service at least 5 days prior to moving each piece of off-road equipment on to the Sale Area, unless otherwise agreed. Notification will include identifying the location of the equipment's most recent operations. If the prior location of the off-road equipment cannot be identified, Forest Service may assume that it was infested with noxious weed seeds. Upon request of Forest Service, Purchaser must arrange for Forest Service to inspect each piece of off-road equipment prior to it being placed in service.

If Purchaser desires to clean off-road equipment on National Forest land, such as at the end of a project or prior to moving to a new unit that is free of noxious weeds, Purchaser and Forest Service shall agree on methods of cleaning, locations for the cleaning, and control of off-site impacts, if any.

New infestations of noxious weeds, of concern to Forest Service and identified by either Purchaser or Forest Service on the Sale Area, shall be promptly reported to the other party. Purchaser and Forest

Service shall agree on treatment methods to reduce or stop the spread of noxious weeds when new infestations are found. In the event of contract modification under this Subsection, Purchaser shall be reimbursed for any additional protection required, provided that any work or extra protection required shall be subject to prior approval by Forest Service. Amount of reimbursement shall be determined by Forest Service and shall be in the form of a reduction in stumpage rates, unless agreed otherwise in writing. However, in no event may stumpage rates be reduced below Base Rates.

Prevention Goal 18: *To prevent weed germination and establishment, retain native vegetation in and around project activity and keep soil disturbance to a minimum consistent with project objectives.*

Practice 47: Minimize soil disturbance to no more than needed to meet project objectives. Logging practices to reduce soil disturbance include, but are not limited to:

Practice 48: Over-snow logging, Skyline or helicopter logging, Reuse landings, skid trails and helibases when they are weed free

Practice 49: Minimize period from end of logging to site preparation, revegetation, and contract closure.

Post Vegetation Management Operations

Prevention Goal 19: *To prevent weed germination and establishment, retain native vegetation in and around project activity and keep soil disturbance to a minimum consistent with project objectives.*

Practice 50: Minimize soil disturbance to no more than needed to meet vegetation management objectives. Prevention practices to reduce soil disturbance include, but are not limited to: Treating fuels in place instead of piling, Minimizing heat transfer to soil in burning, Minimizing fireline construction

Prevention Goal 20: *To prevent favorable conditions for weed establishment, re-establish vegetation on bare ground caused by project disturbance.*

Practice 51: For long-term restoration and weed suppression where forested vegetation management has created openings, recognize the need for prompt reforestation.

Grazing Management

Prevention Goal 21: *Consider noxious weed prevention and control practices in the management of grazing allotments.*

Practice 52: Include weed prevention practices, inspection and reporting direction and provisions for inspection of livestock concentration areas in allotment management plans and annual operating instructions for active grazing allotments.

Practice 53: For each grazing allotment containing existing weed infestations, include prevention practices focused on preventing weed spread and cooperative management of weeds in the annual operating instructions. Prevention practices may include, but are not limited to: altering season of use, exclusion, activities to minimize potential ground disturbance, preventing weed seed transportation, maintaining healthy vegetation, weed control methods, revegetation, inspection, reporting, and education.

Prevention Goal 21: *Avoid or remove sources of weed seed and propagules to prevent new weed infestations and the spread of existing weeds. Minimize transport of weed seed into and within allotments.*

Practice 54: If livestock are potentially a contributing factor to seed spread, schedule use by livestock in units with existing weed infestations which are known to be susceptible to spread by livestock, to be prior to seed-set or after seed has fallen.

Practice 55: If livestock were transported from a weed-infested area, annually inspect and treat allotment entry units for new weed infestations.

Practice 56: Close pastures to livestock grazing when the pastures are infested to the degree that livestock grazing will continue to either exacerbate the condition on site or contribute to weed seed spread. Designate those pastures as unsuitable range until weed infestations are controlled.

Prevention Goal 22: *Maintain healthy, desirable vegetation that is resistant to weed establishment.*

Practice 57: Through the allotment management plan or annual operating instructions, manage the timing, intensity (utilization), duration, and frequency of livestock activities associated with harvest of forage and browse resources to maintain the vigor of desirable plant species and retain live plant cover and litter.

Practice 58: Manage livestock grazing on restoration areas to ensure that vegetation is well established. This may involve exclusion for a period of time consistent with site objectives and conditions. Consider practices to minimize wildlife grazing on the areas if needed.

Prevention Goal 23: *Minimize disturbed ground conditions favorable for weed establishment in the management of livestock grazing.*

Practice 59: Include weed prevention practices that reduce ground disturbance in allotment management plans and annual operating instructions. Consider for example: changes in the timing, intensity, duration, or frequency of livestock use; location and changes in salt grounds; restoration or protection of watering sites; and restoration of yarding/loafing areas, corrals, and other areas of concentrated livestock use.

Practice 60: Inspect known areas of concentrated livestock use for weed invasion. Inventory and manage new infestations.

Prevention Goal 24: *Improve effectiveness of weed prevention practices through awareness programs and education. Promote weed awareness and prevention efforts among range permittees.*

Practice 61: Use education programs or annual operating instructions to increase weed awareness and prevent weed spread associated with permittees' livestock management practices.

Practice 62: To aid in their participation in allotment weed control programs, encourage permittees to become certified pesticide use applicators.

Lands and Special Uses

Prevention Goal 25: *Avoid or remove sources of weed seed and propagules to prevent new weed infestations and the spread of existing weeds.*

Practice 63: Consider weed status of lands when making land adjustment decisions.

Practice 64: Conduct weed inventories of all lands considered for acquisition.

Practice 65: As a condition of land adjustment decisions, the Forest Service may require the nonfederal proponent to treat weeds, to federal standards, on the land proposed for federal acquisition.

Practice 66: Include a weed prevention and control provision in all new special-use authorizations such as, permits, easements or leases involving ground-disturbing activities when authorized activities present a high risk for weed infestation or the location of the activity is vulnerable to weed introduction or spread. Include weed prevention and control provision in existing authorizations that authorize ground-disturbing activities when the authorization is amended for other reasons; consider the need to amend an authorization directly, when ground-

disturbing activities are involved. These provisions can be accomplished through the development and incorporation of a supplemental clause, or as a requirement in an associated operation and maintenance plan.

Minerals

Prevention Goal 26: *Incorporate weed prevention into project layout, design, alternative evaluation, and decisions.*

Practice 67: Include weed prevention measures, including project inspection and documentation, in operation and reclamation plans.

Practice 68: To prevent conditions favoring weed establishment, minimize bare soil conditions and re-establish vegetation on bare ground caused by project disturbance.

Practice 69: Retain bonds until reclamation requirements are completed, including weed treatments, based on inspection and documentation.

Recreation, Wilderness, and Special Management Areas

Prevention Goal 27: *To prevent new weed infestations and the spread of existing weeds, avoid or remove sources of weed seed and propagules.*

Practice 70: Encourage public land users before recreating on public lands, to inspect and clean motorized and mechanized trail vehicles of weeds and their seeds.

Practice 71: On designated public lands, issue closure orders that specify the use of weed free or weed-seed-free feed, hay, straw, and mulch. Refer to 36 CFR 251.50. Cooperate with State, County, Tribal governments, and other agencies to develop and support publicly available weed-free materials.

Practice 72: Where they exist, post and enforce weed-free feed orders. (FSM 2081.03)

Practice 73: Encourage backcountry pack and saddle stock users to feed stock only weed-free feed for several days before travel on National Forest System lands.

Practice 74: Inspect, brush, and clean animals, especially hooves and legs before entering public land. Inspect and clean tack and equipment.

Practice 75: Tie or hold stock in ways that minimize soil disturbance and avoid loss of desirable native vegetation.

Practice 76: Annually inspect all campgrounds, trailheads, and recreation areas that are open to public vehicle use for weeds; treat new infestations.

Practice 77: Maintain trailheads, boat launches, outfitter and public camps, picnic areas, airstrips, roads leading to trailheads, and other areas of concentrated public use in a weed-free condition. Consider high use recreation areas as high priority for weed eradication.

Practice 78: Consider seasonal or full time closure to campgrounds, picnic areas, and other recreation use areas until weeds are reduced to levels that minimize potentials for spread.

Practice 79: In areas susceptible to weed infestation, limit vehicles to designated, maintained travel routes. Inspect and document inspections on travelways for weeds and treat as necessary.

Prevention Goal 28: *Improve effectiveness of prevention practices through weed awareness and education.*

Practice 80: Post weeds awareness messages and prevention practices at strategic locations such as trailheads, roads, boat launches, and forest portals.

Practice 81: In weed-infested areas, post weeds awareness messages and prevention practices at roadsides.

Road Management

New and Reconstruction

Prevention Goal 29: *Incorporate weed prevention into project layout, design, alternative evaluation, and decisions.*

Practice 82: For timber sale purchaser road maintenance and decommissioning, use standard timber sale contract provisions such as WO-C/CT 6.36 to ensure appropriate equipment cleaning.

Practice 83: For road new and reconstruction conducted as part of public works (construction) contracts and service contracts include contract language for equipment cleaning such as is in WO-C/CT 6.36.

Road Maintenance and Decommissioning

Prevention Goal 30: *Minimize roadside sources of weed seed that could be transported to other areas.*

Practice 84: Periodically inspect system roads and rights-of-way for invasion of noxious weeds. Train road maintenance staff to recognize weeds and report locations to the local weed specialist. Inventory weed infestations and schedule them for treatment.

Practice 85: Schedule and coordinate blading or pulling of noxious weed-infested roadsides or ditches in consultation with the local weed specialist. Do not blade or pull roadsides and ditches that are infested with noxious weeds unless doing so is required for public safety or protection of the roadway. If the ditch must be pulled, ensure the weeds remain on-site. Blade from least infested to most infested areas. When it is necessary to blade noxious weed-infested roadsides or ditches, schedule activity when seeds or propagules are least likely to be viable and to be spread. Minimize soil surface disturbance and contain bladed material on the infested site.

Practice 86: Avoid acquiring water for dust abatement where access to the water is through weed-infested sites.

Practice 87: Treat weeds in road decommissioning and reclamation projects before roads are made impassable. Re-inspect and follow-up based on initial inspection and documentation.

Watershed Management

Prevention Goal 31: *Avoid or remove sources of weed seed and propagules to prevent new weed infestations and the spread of existing weeds.*

Practice 88: Inspect and document for early detection of noxious weed establishment and spread in riparian areas and wetlands. Eradicate new infestations before they become established.

Practice 89: Address noxious weed risks in watershed restoration projects and water quality management plans.

Practice 90: Pay particular attention to practices listed under “General Weed Prevention Practices for Site-disturbing Projects and Maintenance Programs” and Aquatic Weed Prevention Practices”.

Wildlife

Prevention Goal 32: *Avoid creating soil conditions that promote weed germination and establishment.*

Practice 91: Periodically inspect and document those areas where wildlife concentrate in the winter and spring resulting in overuse or soil scarification.

Practice 92: Use weed-free materials at big game baiting stations.

3. Control/Project Planning

The Forest is also complying with direction in the Forest Land and Resource Management Plan and the Sierra Nevada Forest Plan Amendment to complete a Noxious Weed Risk Assessment for all planned projects on the Forest. The risk assessment assigns an expected risk level to proposed activities and identifies any weed-related actions that need implementation before, during or after project implementation.

During development of control projects Appendix A – Noxious Weed Characteristics of inventoried weeds and Appendix B-Treatment Methods Available for use on the Modoc National of this document may be utilized to develop focused environmental documents and aid in the treatment methods to be analyzed.

Objectives:

Secure appropriate funding to identify and eradicate noxious weed species on National Forest Lands.
Complete appropriate treatment of noxious weed infestations on the Forest.
Use an Integrated Weed Management (IWM) approach to noxious weed management that includes prevention measures, biological control, mechanical, cultural and chemical controls.
Ensure that at least one Forest employee is trained in wildland weed ecology and pesticide application.
Prepare noxious weed risk assessments for all ground disturbing projects.

Actions:

- Complete Noxious Weed Treatment EIS to allow the treatment of existing noxious weed sites to control or eradicate noxious weeds. EIS will be used to assist in securing future treatment funding.
- Ensure that the Forest Noxious Weed Coordinator has received and can maintain, at a minimum, state pesticide applicator certification.
- Utilize the updated Region 5 Native Plant Policy, which includes relevant references to noxious weed management in project noxious weed risk assessments.
- Ensure that the Forest Noxious Weed Coordinator attends continuing education training for noxious weed ecology and management.
- Include needed training in the Individual Development Plan for the Forest Noxious Weed Coordinator to complete appropriate pesticide certification.
- Ensure that revegetation occurs, where appropriate, following treatment.
- Complete appropriate environmental analysis prior to ground disturbing activities and use all methods in the control and eradication of noxious weeds.

Treatment priorities -

- First Priority: Eradicate small existing infestation sites
- Second Priority: Conduct early treatment of new infestations, and

- Second Priority: Contain and control established infestations.

4. Administration and Planning

The Sierra Nevada Forest Plan Amendment (SNFPA) made changes to the Modoc NF LRMP with standards and guidelines for management of noxious weeds. To attain an aggressive noxious weed management program, these standard and guidelines need to be consistently implemented.

Prior to SNFPA, consideration of noxious weed issues was limited or lacking in many project plans and analyses. The situation was due to a combination of factors, including the limited funds available for noxious weed management on the Forest. Limited funds, resources and staffing, result in low visibility and priority for the noxious weed program.

Budget continues to be a limiting factor in noxious weed issues. Developing the Strategy and outlining clear projects will better prepare the Forest when requesting funding for the future. Establishing good baseline data to be used in reporting and in project planning requires increases in funding. Continuing existing inventory and monitoring projects will show the need for additional funding to implement the noxious weed program of work.

The completion of the Noxious Weed Strategy will lend direction to the program for planning and treatment priorities and identify needed funding.

Objectives:

- Keep this strategy current.
- Improve visibility in the management of noxious weeds; become more competitive for “cost share” funds; increase interaction and participation with local partners to help with funding opportunities; become more active with local weed groups; increase or improve inventories.
- Market the noxious weed program to receive higher funding levels based on the factors that make the Modoc unique.

Proposed Actions:

- Request Regional support for developing grant proposals and cost-share projects.
- Work with Forest Leadership to establish direction for noxious weed program and integrating it into Forest budget development.

5. Inventory, Mapping and Monitoring

Early detection and containment of noxious weeds is the most efficient method of controlling their spread. Key to early detection is the development and maintenance of an accurate inventory and mapping system. A complete inventory with Geographical Information System (GIS) capabilities is critical for the Forest to effectively compete for regional and national funding opportunities, report and track existing infestations, and treat known populations of noxious weeds. It is equally important that the Forest share information with our neighbors and partners.

Monitoring is essential to provide information necessary for long-term planning and decision-making. A monitoring program was developed for the Modoc National Forest Treatment Project of 2005 FEIS is needed to evaluate changes in plant populations and whether management activities, noxious weed control projects, and prevention programs are achieving their desired goals.

Because noxious weed spread is affected by environmental conditions and new weeds are introduced regularly, inventories are ongoing activities. Mapping efforts need to be persistent and accurate in order to plan treatment activities, and are crucial for monitoring efforts. To appropriately use an Integrated Weed Management Plan, noxious weed locations need to be monitored for the effectiveness of the methods that have been chosen so that if they are not accomplishing the desired results, the course of action can be shifted.

Objectives:

- Determine the distribution of noxious weed species on the Forest through systematic inventories
- Re-inventory at set intervals to determine the rate of spread and detect new weed infestations.
- Develop and implement a database for the storage and retrieval of noxious weed information.
- Coordinate inventory standards with Bureau of Land Management, California Department of Food and Agriculture, and other state and county agencies.

Actions:

- Ensure the Forest Noxious Weed Coordinator completes training in the use of the NRIS database system.
- Transfer data into Forest Service national database, the Terra module of Natural Resource Information System (NRIS).
- Develop procedures to periodically share noxious weed information with the State of California, Department of Food and Agriculture.
- Accomplish inventory and monitoring across the Forest within 3 years.
- Update the Forest GIS noxious weed layer annually following seasonal inventories/monitoring.
- Include training opportunities for NRIS in the Individual Development Plan for the Forest Noxious Weed Coordinator.
- Meet with State GIS personnel to set up data transfer methods and frequency.
- Prepare a yearly project work plan for distribution.
- Ensure that monitoring standards meet Regional short- and long-term requirements.
- The Forest will report annually to the Region, the number of acres treated or retreated during the previous fiscal year using the Management Attainment Reporting (MAR) system (FSH 1909.13, sec. 38.3 and ch. 50). For acres treated biologically, report only those acres which had biological agents introduced on them during the reporting period (FSM 6550; FSH 6509.11k).

6. Research

Research efforts are continually needed to examine new IWM strategies for the control of noxious weeds. The region presently cooperates with several California universities by providing research sites for studies.

The Forest does not itself initiate research projects. The Forest will continue to participate with Forest Service personnel from research units, cooperate with research institutes and support State and County efforts. No specific actions are proposed at this time.

Objectives:

- Strive to utilize the most relevant research results.
- Report research needs to the Regional office.

- Facilitate continued research opportunities on NFS lands.

Actions:

- Develop a list of research needs to forward to the Regional office for coordination with PSW.
- Use the Forest website to access available research results.
- Utilize most relevant research results in the risk assessment process for all activities.
- Promote interagency research through the Modoc Noxious Weed Working Group.

Definitions

The following special terms are used in this strategy :

Cooperative Agreement: A written agreement between the Forest Service and a county, State, or Federal agency entered into pursuant to the Federal Noxious Weed Act of 1974, as amended by section 1453 of the Food, Agriculture, Conservation and Trade Act of 1990, when there is an exchange of funds from one agency to another (FSM 1580).

Integrated Weed Management: An interdisciplinary pest management approach for selecting methods for preventing, containing, and controlling noxious weeds in coordination with other resource management activities to achieve optimum management goals and objectives. Methods include: education, preventive measures, herbicide, cultural, physical or mechanical methods, biological control agents, and general land management practices, such as manipulation of livestock or wildlife grazing strategies, that accomplish vegetation management objectives.

Memorandum of Understanding: A written agreement between the Forest Service and local, State, or Federal entities entered into pursuant to the Federal Noxious Weed Act of 1974, as amended by section 1453 of the Food, Agriculture, Conservation, and Trade Act of 1990, when there is no exchange of funds from one agency to another (FSM 1580).

Noxious Weed: Those plant species designated as noxious weeds by the Secretary of Agriculture or by the responsible State official. Noxious weeds generally possess one or more of the following characteristics: aggressive and difficult to manage, poisonous, toxic, parasitic, a carrier or host of serious insects or disease, and being native or new to or not common to the United States or parts thereof.

State Agency: A State department of agriculture, other State agency, or political subdivision thereof, responsible for the administration or implementation of State laws pertaining to noxious weeds, exotic, and undesirable plants.

Undesirable Plants: Plant species that are classified as undesirable, noxious, harmful, exotic, injurious, or poisonous pursuant to State or Federal laws. Species listed as threatened or endangered by the Secretary of the Interior according to the Endangered Species Act of 1973 are not classified as undesirable plants.

References

CEQ, 40 CFR Parts 1500-1508 (FSM 1950; FSH 1909.15)

Executive Order 13112, Invasive Species,

National Environmental Policy Act (42 U.S.C. 4321-4346)

Tu, M., C. Hurd, and J. Randall. 2001. "Weed Control Methods Handbook: Tools and Techniques for Use in Natural Areas" The Nature Conservancy: http://tncweeds.ucdavis.edu,.

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USDA Forest Service, 1991 "Modoc National Forest Land and Resources Management Plan"

USDA Forest Service, 1998. "Stemming the Invasive Tide, Forest Service Strategy for Noxious and Nonnative Invasive Plant Management" pp.29.

USDA Forest Service, February 3, 1999 "Guide to Noxious Weed Prevention Practices, Northern Region"

USDA Forest Service, Forest Service Manual 1950

USDA Forest Service, Forest Service Manual 2080

USDA Forest Service, October 2004, "National Strategy and Implementation Plan for Invasive Species Management" FS-805

USDA, Departmental Regulation 9500-10 (DR 9500-10)

Appendix A: Weed Characteristics

Combining the following weed characteristics of noxious weeds with the weed treatment methods found in Appendix B will aid managers in determining what integrated weed management methods are available for use on the Modoc National Forest.

COMMON NAME	SCIENTIFIC NAME		CHARACTERISTICS
Canada thistle	Cirsium arvense	B	Creeping rootstock Rootstock creeping; tapered at base, sometimes decurrent as spiny wings
Crupina	Crupina vulgaris	A	Inconspicuous purple flowers, seed dark, large Tap-root
Dalmatian toadflax	Linaria genistifolia ssp.	A	Yellow bilaterally symmetric flowers, clasping leaves Reproducing by seed and underground rootstock
Diffuse knapweed	Centaurea diffusa	A	Finely divided leaves with short hairs (seedlings), involucres of yellow spines with teeth appearing as a comb along the margins Tap-root; and has a root bud
Dyer's Woad	Isatis tinctoria	B	Petals white to yellowish white, leaves with white nerve on upper surface, fruit dark Black tip obtuse to rounded
Klamathweed	Hypericum perforatum	C	Leaves have little holes that can be seen with a hand lens Tap-root
Mediterranean sage	Salvia aethiopis	B	Stout taproot squarish stem, opposite leaves and deep-rooted perennial plant Stout taproot squarish stem, and deep-rooted perennial plant
Musk thistle	Carduus nutans	A	Leaves extend onto stem giving winged appearance, flowers deep rose subtended by spine-tipped bracts, nodding Annual or biennials
Plumeless thistle	Carduus acanthoides	A	Pappus of flat, minutely barbed bristles (not plumose); flowers ½ to 1 inch in diameter; winged stems, candelabra appearance Large fleshy taproot; spreads only by seed Biennial
Scotch thistle	Onopordum acanthium	A	Leaves colored with white hairs give a blue-green color, stems appear to have wings, flowers violet to reddish1 to 2 inches in diameter, bracts spine-tipped biennial.
Spotted knapweed	Centaurea maculosa	A	Leaves deeply divided on rosettes, involucres with dark spots tipped with fringe Tap-root
Squarrose knapweed	Centaurea squarrosa	A	Flower-head with recurved involucres tips Tap-root
Tall Whitetop	Lepidium latifolium	B	Deep-rooted perennial plant with extensive vigorous creeping root system which reproducers both vegetatively from roots as well as by seed Deep-seated root stocks which make this weed difficult to control
Yellow starthistle	Centaurea solstitialis	C	Germinates from seeds in the Fall Tap-root

Appendix B: Modoc National Forest Weed Treatment Method Considerations

Table B-1: Weed Treatment Methods

Method	Description
Inventory	
Visiting Site	Visiting weed infestation while conducting inventory or treatment. All visits of noxious weeds sites cause the same initial flight disturbance impact to wildlife species.
Manual	
Hand pulling, grubbing, digging,	Hand pulling is easy to plan and implement, and is often the best way to control small infestations, such as when a weed is first detected in an area. Hand pulling may be a good alternative in sites where herbicides or other methods cannot be used. The key to effective hand pulling is to remove as much of the root as possible while minimizing soil disturbance. For many species, any root fragments left behind have the potential to re-sprout, and pulling is not effective on plants with deep and/or easily broken roots. Annuals and tap-rooted plants are particularly susceptible to control by hand-pulling. It is not as effective against many perennial weeds with deep underground stems and roots that are often left behind to re-sprout.
Clipping	Hand clipping the plant or seedpod to prevent seed production. Requires several visits to site annually to insure plant does not produce seeds. Method does not remove infestation of perennial plants. Does not control rhizomatous plants. Clipping should be a last resort to keep seeds from spreading.
Mechanical	
Mowing	Mowing can reduce seed production and restrict weed growth, especially in annuals cut before they flower and set seed. Some species however, re-sprout vigorously when cut, replacing one or a few stems with many that can quickly flower and set seed. Mowing is not considered practical on the Forest as the rocky terrain damages equipment and when the rocks are hit by mowing equipment fires can easily be started. In addition mowing adversely affects native plant populations. May me used after site specific analysis
Weedeater	Handheld 'Weedeater' used to cut the plant or seed pod. Does not remove the plant or infestation. It does prevent the spread of new seeds.
Tilling	Tilling, or the turning-over of soil, is often used for weed control in agricultural crops. Tilling destroys the soil profile and produces large areas for noxious weeds to be introduced. The extremely rocky and shallow soils of the Modoc National Forest do not lend to utilization of this method generally across the Forest. On the Modoc NF most weed sites occur in areas where the soil was disturbed so while tilling may be effective for some noxious weed species it would probably lead to the introduction or spread of other species.
Cultural	
Competitive seeding	Seeding of desirable species as determined by the Forest Botanist should be utilized whenever any forest treatment leaves barren areas that could allow the spread or introduction of noxious weeds. May not be effective during the dry months.
Cattle and Sheep Grazing animals intensely over large areas	Intensive grazing requires grazing livestock at levels above forest wide standard and guidelines to remove noxious weeds. Not practical as this method is non-selective and may provide for noxious weed re-establishment in a denser stand. Intensive grazing also damages watersheds and increases soil compaction. "Cattle will graze invasive grasses, can trample inedible weed species, and can incorporate native seeds into soil. Horses can also be used to control invasive grasses, but horses tend to be more selective than cattle." (TU ET AL. (2001)) Grazing or other actions of grazing animals (wallowing, pawing up soil) can cause significant damage to a system, and promote the spread and survival of invasive weeds. Overgrazing can reduce native plant cover, disturb soils, weaken native communities, and allow exotic weeds to invade. In addition, animals that are moved from pasture to pasture can spread invasive plant seeds. In general, the specific weed and desirable native plants will determine the number and species of animal grazers and the duration and frequency of grazing. (TU ET AL. (2001))
Goat Grazing intensely on 5-10 acres for specific plants	Grazing can either promote or reduce weed abundance at a particular site. By itself, grazing will rarely, if ever, completely eradicate invasive plants. However, when grazing treatments are combined with other control techniques, such as herbicides or biocontrol, severe infestations can be reduced and small infestations may be eliminated.

Method	Description
	Grazing or other actions of grazing animals (wallowing, pawing up soil) can cause significant damage and promote the spread and survival of invasive weeds. Overgrazing can reduce native plant cover, disturb soils, weaken native communities, and allow exotic weeds to invade. In addition, animals that are moved from pasture to pasture can spread invasive plant seeds. In general, the specific weed and desirable native plants will determine the number and species of animal grazers and the duration and frequency of grazing. (TU ET AL. (2001))
Fertilization	Application of fertilizers to stimulate the growth of desired species. While fertilization could improve the success of desirable species it could also provide improve growth and spread of noxious weeds. This activity could be considered in conjunction with the analysis of other vegetative management treatment projects.
Mulching	Cover the ground and/or seedlings with mulch (hay, grass clippings, wood chips, etc.) or other type of ground cover (newspaper clippings). This prevents weed seeds and seedlings from receiving sunlight necessary to survive and grow. Mulching can be used on relatively small areas, but will often stunt or stop growth of desirable native species. Mulching cannot control some perennial weeds because their extensive food reserves allow them to continue to grow up through the mulch.
Tarping (Soil solarization)	Placing Tarps over an area to shade out undesirable plants. “Soil solarization is the technique of placing a cover (usually black or clear plastic) over the soil surface to trap solar radiation and cause an increase in soil temperatures to levels that kill plants, seeds, plant pathogens, and insects. In addition, when black plastic or other opaque materials are used, sunlight is blocked which can kill existing plants (Katan et al. 1987). Soil solarization however, can cause significant biological, physical, and chemical changes in the soil that can last up to two years, and deter the growth of desirable native species. Soil solarization is used in horticulture and for a few high value agriculture crops like strawberries. This method has not been used extensively for weed control in natural settings. The effectiveness of soil solarization depends, in part, on how susceptible weed seeds are to temperature increases. It is most effective against winter annual weeds that germinate under cool conditions (Elmore 1990). Summer annuals and other species adapted to higher temperatures, which germinate during warmer parts of the year, are less susceptible. Soil solarization is most effective during the summer months, and may be less effective in cooler climates (DeVay 1990). The higher the temperature, the more quickly a kill is achieved. Solarization is effective only if done in wet soil. Where soils are typically dry, they must first be irrigated until soil from the surface to 50 to 60 cm deep is at field capacity (Grinstein & Hetzroni 1991). “(TU ET AL. (2001)) The Salmon River Restoration Council on the Six Rivers National Forest has used this method on a limited basis on a few sites. It is not considered for widespread use in this EIS because of concerns about visual impacts, adverse impacts to non-target species and soil, and the high winds experienced over long periods of time on the Modoc National Forest. In addition the Salmon River area receives over 4 times a much rainfall as the Modoc NF annually. The dry conditions on the Modoc NF soils are not conducive to widespread use of this method. “Soil solarization is beneficial in that it releases nutrients that are tied up in the organic component of the soil, and that it can kill unwanted plants without the use of chemicals (Stapleton 1990). However, solarization leaves an open substrate that can be readily invaded by new organisms, both native and non-native once the plastic is removed (Stapleton 1990). The influx of nutrients that results from solarization can be advantageous to restoration efforts, but can promote aggressive, ruderal plants that typically thrive in nutrient-rich soils.” (TU ET AL. (2001))
Biological	
Parasites, Predators, and Pathogens	Most effect when integrated with other strategies; does not achieve eradication; not effective on all invasive plants; long term process required. “Biological control (biocontrol for short) is the use of animals, fungi, or other microbes to feed upon, parasitize or otherwise interfere with a targeted pest species. Successful biocontrol programs usually significantly reduce the abundance of the pest, but in some cases, they simply prevent the damage caused by the pest (e.g. by preventing it from feeding on valued crops) without reducing pest abundance (Lockwood 2000). Biocontrol is often viewed as a progressive and environmentally friendly way to control pest organisms because it leaves behind no chemical residues that might have harmful impacts on humans or other organisms, and when successful, it can provide essentially permanent, widespread control with a very favorable cost-

Method	Description
	benefit ratio. However, some biocontrol programs have resulted in significant, irreversible harm to untargeted (non-pest) organisms and to ecological processes. Of course, all pest control methods have the potential to harm non-target native species, and the pests themselves can cause harm to non-target species if they are left uncontrolled. Therefore, before releasing a biocontrol agent (or using other methods), it is important to balance its potential to benefit conservation targets and management goals against its potential to cause harm." (TU ET AL. (2001)) Prior to the release of a new agent an environmental analysis is prepared by APHIS (Agricultural Plant Health Inspection Service). The analysis assumes that agents will spread throughout North America, to wherever the target species exists. It is intended that this analysis will satisfy the intent of NEPA for the release and distribution of the agent in the United States. The Forest Service has no control over the release of agents on adjacent lands. It is highly likely, even a certainty that agents will spread onto National Forest system lands regardless of any action the Forest Service may take. In few instances will the Forest Service have any further information to add to the analysis of risk and non-target effects. The Modoc National Forest will cooperate with other Federal, State, and Local agencies in analysis and use of biological controls on lands administered by the Forest Service.
Herbicides	
Ground Application with wands or wicks applied directly to individual plants	Herbicide applied directly to the plant with a wick is much like applying paint to a wall with a roller. Provides maximum control of herbicides application directly to plants without drift or droplets hitting the ground/water. Used most effectively over water or in riparian areas.
Ground Application using spot herbicide applications using backpack or motorized sprayers.	Herbicides applied directly to the target plant (s) with backpack or motorized sprayers. Provides control of herbicides application with minimal drift or impact to adjacent plants.
Ground application with booms or broadcast applications of granules	Most appropriate for large areas on flat ground. Herbicide is delivered by tractor, truck, trailer or ATV mounted pressurized tanks with 6 foot or larger booms which spray all plants in an infested area. Potential for off-site drift and affects on non-target species. The Modoc NF will need to complete an analysis for proposals that include ground application with booms or broadcast applications of granules.
Aerial application	Most appropriate for large, relatively inaccessible infestations Potential for off-site drift and on non-target species. The Modoc NF will need to complete site specific analysis for proposals that include aerial application.
Other Treatment Methods	
Prescribed Fire	Fire can be used to remove flammable fuels, such as stands of annual grasses, to reduce the risk of a wildfire. However, a single, low intensity fire will not effectively control most weeds because it does not get hot enough to prevent re-sprouting from crowns or re-establishment from seeds in the soil. Fire may create the type of disturbance that promotes the colonization of many weeds. However, when prescribed burns are coordinated in conjunction with other vegetation management techniques, it can be a very effective means of increasing the vulnerability and susceptibility of species such as Buffel grass to other methods of control.
Burning using torches	Spot-burning invasive weeds with a propane torch can be cheaper and easier than implementing a prescribed fire (permits are still required), but is only effective when the infestation is small. Spot-burning can be used to burn individual plants, groups of plants in a small area, or to ignite brush piles. Propane torches can be used in areas where there is little or no fine fuel to carry a prescribed fire, and can also be used to kill plants when conditions are wet.
Native American Burning	The Forest Service may utilize Native American Burning upon development and analysis of specific proposals and methods are submitted by recognized tribal governments.
Burning using Lazer	Use of lazer technology to cut or kill specific plants is being researched by university and private companies but is not an accepted or available treatment method on the Modoc National Forest.

Method	Description
Burning using steam	"Results of research conducted by Dr. Robert Kolberg and Dr. Lori J. Wiles (USDA-ARS, AERC, Colorado State University, Ft. Collins, CO) on the use steam for weed control revealed that the key factors in determining effectiveness are the amount of steam applied, the weed growth stage at treatment, and the particular weed species. This project evaluated steam application on weeds under field conditions at various growth stages and compared steam treatment with systemic and contact herbicide treatments. The researchers discovered that younger plants of the species studied were generally more susceptible to control by steam. Of the weed species tested, broad-leaved weeds were more susceptible than grasses. " (Robert Kolberg, 406-433-9408, rkolberg[at]sidney.ars.usda.gov)

Table B2 :Weed Treatment Comparasion for Typical Treatments untilized on the Modoc National Forest

COMMON NAME	SCIENTIFIC NAME			Pulling	Weed Whacker	Biological	Rx Fire	Herbicide	Grazing	IWM
Dalmatian toadflax	*Linaria dalmatica*	A	perennial	No	No		No	Yes Dicamba Glyphosate	No	No
Diffuse knapweed	*Centaurea diffusa*	A	biennial	Caution, use only on sites with few plants. Re-sprouting can occur. Hand pulling must be repeated 2-4 times a year.	May reduce but not eliminate seed production. Rosettes are generally too low for mowing.	Yes	Yes if followed by herbicides	Yes 2,4-D, dicamba, and clopyralid		Yes Reseeding with all treatments
Musk Thistle	*Carduus nutans*	A	annual or biennial	Yes	No Mowing 3 ft tall musk thistle plants to a 6 in stubble will prevent seed production, but thistles quickly recover from remaining buds near the base	Yes		Yes chlorsulfuron (0.37 - 0.75 oz ai/A) in early bloom stage reduced seed production by over 99%. Dicamba, 2,4-D, clopyralid, MCPA, glyphosate and combination	Limited Goats	Yes, Herbicides and grazing. Herbicide and Biological.
Plumeless thistle	*Carduus acanthoides*	A	winter annual or biennial	Yes	Same as Musk Thistle	Same as Musk Thistle	Same as Musk Thistle	Same as Musk Thistle	Same as Musk Thistle	Yes, Same as Musk Thistle

COMMON NAME	SCIENTIFIC NAME			Pulling	Weed Whacker	Biological	Rx Fire	Herbicide	Grazing	IWM
Scotch thistle	*Onopordum acanthium*	A	biennial	Caution, use only on sites with few plants. Make sure to remove entire root re-sprouting can occur. Hand pulling must be repeated 2-4 times a year	May reduce seed production					
Spotted knapweed	*Centaurea maculosa*	A	biennial		Same as Diffuse knapweed	Same as Diffuse knapweed	Same as Diffuse knapweed	Same as Diffuse knapweed	Same as Diffuse knapweed	Yes, Same as Diffuse knapweed
Squarrose knapweed	*Centaurea squarrosa*	A	perennial		Same as Diffuse knapweed	Same as Diffuse knapweed	Same as Diffuse knapweed	Same as Diffuse knapweed	Same as Diffuse knapweed	Yes, Same as Diffuse knapweed
Crupina	*Crupina vulgaris*	A	winter annual	Yes Before flowering small infestations. Infestations should be checked every two to four weeks	Little information	No		Dicamba (0.5 lb ae/A) + 2,4-D (1.0 lb ae/A) Glyphosate (1.0 lb ae/A) clopyralid (0.13 lb ae/A) triclopyr (.25 lb ae/A) Clopyralid (Transline)		Yes, reseeding perennial grasses in the fall or Yes, spring
Canada thistle	*Cirsium arvense*	B	perennial	No	No. Does not result in complete kill; may be more effect when combined with	No	No Canada thistle may respond both positively and negatively to burning	Yes The rate, timing, and effectivenes s of these treatments may vary.		No

COMMON NAME	SCIENTIFIC NAME			Pulling	Weed Whacker	Biological	Rx Fire	Herbicide	Grazing	IWM
					herbicide treatments Must be repeated every 7-21 days.					
Dyer's Woad	*Isatis tinctoria*	B	biennial	Caution, make sure you the entire root re-sprouting from the crown can occur.	No -Not effective due to re-sprouting of root crown	No – not approved in CA		2,4-D chlorsulfuron		Yes
Mediterranean sage	*Salvia aethiopis*	B	biennial/ perennial	Caution; re-sprouting from the crown can occur. make sure you severe the root at least 3 inches below the soil surface. A shallower depth will result in crown re-sprouting	No -Not effective due to prostrate growth habit of the rosettes					No
Tall Whitetop (Perennial pepperweed)	*Lepidium latifolium*	B	perennial	No	Limited long-term impact	Yes		Dicamba and 2,4-D		Yes
Klamathweed	*Hypericum perforatum*	C	perennial	Caution, make sure you the entire root re-sprouting from the crown can occur.	No - Promotes vegetative spread of rhizomes	Yes	No – Spreads Infestation			Yes
Yellow	*Centaurea*	C	annual/	Yes only	No -Will not			Yes		

COMMON NAME	SCIENTIFIC NAME			Pulling	Weed Whacker	Biological	Rx Fire	Herbicide	Grazing	IWM
starthistle	*solstitialis*		biennial	very small infestations. Care not to disturb soil.	provide complete control, although it can be effective with moderate infestations and erect growth form.					

Appendix B:

Site Specific Information

Appendix B: Site-Specific Information and Treatments

Species, Location, and Treatments Analyzed in Alternatives, and Examples of How All Specific Sites Were Analyzed in Development of the FEIS

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Appendix B: Site-Specific Information (Species, Location, Size, and Treatment by Alternative)

Introduction

The purpose of this appendix is to explain how site-specific information was used in this analysis. It also shows how the Modoc NF, in doing its annual work planning, will evaluate, verify, and modify treatments to insure that treatment effects remain within the parameters of the analysis in the FEIS.

Following Table B1 are a brief description of the steps used in site analysis in the FEIS, and examples of what will be used in annual work planning.

Table B1-2 lists each known site and treatment analyzed in each Alternative of the FEIS. Using information from the FEIS, Table B1 (below), and Table B1-2, Forest personnel will determine what treatment is appropriate for each specific weed site, given that year's conditions.

In the table below are displayed the 103 data items that were used in evaluation of each noxious weed site. The following data will also be gathered and considered for any site treated under the Early Detection-Rapid Response strategy.

Table B-1. Site Information Used in FEIS Analysis and Annual Planning

Data	Unit of Measure
Site ID Number	Site-Specific Number
Species Name	Species Number
Site Population Size	Estimate Number of Plants When Available
6th Field Watershed Name	Watershed Name or Number
Acres	Size (smallest size considered at 1/10 acre of analysis)
Bald Eagle site	Yes or No
Blue Grouse habitat	Yes or No
California Spotted Owl site	Yes or No
Canada Goose habitat	Yes or No
Capability Availability and Suitable status from Forest Plan	Timber suitability not used in analysis
Critical Aquatic Refuge - within	Yes or No
Cultural Resource Area	Yes or No

Data	Unit of Measure
FACTS Herbaceous Information	Yes or No
Fire History	Most Recent Fire
Fish TES stream	Yes or No
Golden Eagle site	Yes or No
Goshawk Protected Activity Center site	Yes or No
Great Gray Owl site	Yes or No
Hairy Woodpecker habitat	Yes or No
FS Ownership	Yes or No
Lek Site - Active site	Yes or No
Lek Site - Inactive and Historical site	Yes or No
Mallard habitat	Yes or No
Martin site	Yes or No
Mule Deer habitat	Yes or No
Northern Spotted Owl Protected Activity Center site	Yes or No
Northern Spotted Owl Range	Yes or No
Osprey site	Yes or No
Pallid Bat habitat	Yes or No
Prairie Falcon site	Yes or No

Data	Unit of Measure
Pasture Name	Name
Perennial Stream Within 10 ft	Yes or No
Pleated Woodpecker habitat	Yes or No
Pronghorn Antelope habitat	Yes or No
Proposed Action Treatment	Yes or No
Range Allotment Name	Yes or No
Ranger District	Ranger District Two Letter ID
Re-breasted Sapsucker habitat	Yes or No
Recreation Opportunity Spectrum	Number ID
Red-napped Sapsucker habitat	Yes or No
Regional Water Quality Board	Name
Research Natural Area	Yes or No
Sandhill Crane site	Yes or No
Section, Township, Range	Legal
Sensitive Soil Present	Yes or No
Shallow Soils Present	Yes or No
Sierra Nevada Forest Plan Amendment Old Growth	Yes or No
Sierra-Nevada Red Fox habitat	Yes or No
Special Interest Area	Yes or No
Swainson's Hawk site	Yes or No
TES Plants Present	Yes or No
Townsend's Big-Eared Bat - caves	Yes or No
Tribal Cultural Property	Yes or No
Tribal Gathering Area	Yes or No
Tribal Heritage Resource	Yes or No
Visual Quality Objective	Initial
Western Gray Squirrel habitat	Yes or No
Wilderness Area	Yes or No
Willow Flycatcher site	Yes or No
Within 1/4 a quarter mile of a road	Yes or No
Within 1/4 of a mile of Developed Recreation Site	Yes or No
Within 1/8 of a mile of Developed Recreation Site	Yes or No

Data	Unit of Measure
Within 10 ft of a Ephemeral Stream by 6th field watershed	Yes or No
Within 10 ft of a Intermittent Stream by 6th field watershed	Yes or No
Within 10 ft of a Lake	Yes or No
Within 10 ft of a Lake	Yes or No
Within 10 ft of a meadow by 6th field watershed	Yes or No
Within 10 ft of a Perennial Stream	Yes or No
Within 10 ft of a Perennial Stream	Yes or No
Within 10 ft of a Spring	Yes or No
Within 10 ft of Perennial Stream	Yes or No
Within 10 ft of Springs	Yes or No
Within 100 ft of a Lake	Yes or No
Within 100 ft of a Perennial Stream	Yes or No
Within 100 ft of a Perennial Stream	Yes or No
Within 100 ft of a Perennial Stream	Yes or No
Within 100 ft of a Spring	Yes or No
Within 150 ft of a Perennial Stream	Yes or No
Within 150 ft of a Perennial Stream	Yes or No
Within 25 ft of a Ephemeral Stream by 6th field watershed	Yes or No
Within 25 ft of a meadow by 6th field watershed	Yes or No
Within 25 ft of Ephemeral Stream	Yes or No
Within 25 ft of Intermittent Streams	Yes or No
Within 25 ft of Intermittent Streams by 6th field watershed	Yes or No
Within 25 ft of Lakes	Yes or No
Within 25 ft of Lakes	Yes or No
Within 25 ft of Perennial Stream	Yes or No
Within 25 ft of Perennial Stream	Yes or No
Within 25 ft of Springs	Yes or No
Within 25 ft of Springs	Yes or No
Within 300 ft of a Lake	Yes or No
Within 300 ft of a Perennial Stream	Yes or No

Data	Unit of Measure
Within 300 ft of a Spring	Yes or No
Within a Developed Recreation Site	Yes or No
Within a Managed Timber Plantation	Yes or No
Within a TES protection polygon	Yes or No
Within Big Valley Federal Sustained Yield Unit	Yes or No

Data	Unit of Measure
Within General Forest Area	Yes or No
Within Sage Steppe Ecosystem	Yes or No
Within Fire WUI	Yes or No
Wolverine habitat	Yes or No
Yellow Warbler habitat	Yes or No

Site-Specific Analysis Used in FEIS Development and Annual Work Planning.

Site-specific analysis requires consideration of the following information from the FEIS:

- Table 2-1: Weed Species of Modoc County by Category
- Table 2-3: Effectiveness of Weed Treatment Methods by Noxious Weed Species
- Table 2-4: the Design Standards
- Table 2-13: Comparison of Treatment Priorities
- Figure 2-2: Summary of Design Standards for Treatments in Relation to Surface Water.

The examples below demonstrate, for selected sites, how each site was considered during the NEPA analysis process. During the NEPA analysis, each resource specialist found specific sites that required detailed analysis of effects to demonstrate how the Design Standards, when followed, would reduce or eliminate potential adverse effects.

The examples show how Forest personnel will use the information during annual work planning. The annual work planning process is similar to the effects analysis used to develop the FEIS.

Annual work plan development will be done in accordance with the information and Design Standards from Chapter 2 of the FEIS. The purpose of the annual work plan is to evaluate, verify, and modify treatments planned, to insure they are within the parameters of the FEIS effects analysis, and follow the direction contained in the Record of Decision. Annual work planning will also verify that changes in site conditions are considered. It will also insure that any sites chosen under the Early Detection - Rapid Response approach are within the effects analysis parameters of the FEIS, and follow the appropriate Design Standards.

Treatment Determination for Physical and Mechanical Alternatives 3 and 5

Under Alternatives 3 and 5, selection of treatment methods for sites would be determined by evaluating the stage of growth of the noxious weed species to be treated, and by selecting species-appropriate treatment. Rhizomatous species under Alternative 3 would not be treated. Limited treatment of rhizomatous species would occur under Alternative 5 by digging and removing the entire plant.

Integrated Treatment Determination for Alternatives 2, 4, and 6

Treatment under these Alternatives follows the following considerations.

1. With 25 or fewer *non-rhizomatous* plants and infestation size of 1/10 acre or less, use physical+ treatment.
2. With 25 or fewer *rhizomatous* plants that are small and not well established (the entire root system can be removed), and infestation size of 1/10 acre or less, dig and remove the plant.
3. On sites greater than 1/10 acre with over 25 plants, consider physical+ or grazing, if conditions allow.
4. Do not use herbicides on plants that are about to seed. In these cases, remove the seed heads.
5. When herbicides are used, herbicide selection depends on weed species, level of infestation, location, other resource concerns (see Best Management Practices), and the applicability of herbicides. Herbicide selection considers, but is not limited to, the following criteria:
    - Herbicide effectiveness on target weed species
    - Proximity to water or other sensitive areas
    - Soil characteristics
    - Potential unintended impacts to non-target species such as conifers or shrubs
    - Adjacent treatments (private or state land)
    - Timing of treatment

Examples of Site-Specific Treatment Decisions for Annual Planning

The examples below are seven species from the known inventory analyzed in the FEIS, and are from Table B1-2.

Example 1

Appendix Example Number	SPECIES	ID_NUMBER	TOWN	RANGE	SECTION	ACRES	ALT2	ALT3	ALT4	ALT5	ALT6
1	Canada Thistle	BV001CIAR4	T39N	R10E	25	0.09	PT-H	NT	PT-H	P+	H

This site is a category B species (FEIS, Table 2-1), in the second priority for treatment in Alternatives 2 through 4, and first priority for treatment in Alternatives 5 and 6 (FEIS, Table 2-13). This is a small site, and a species with a low number of occurrences on the Forest. Therefore, this is a high priority for treatment.

The site is in the Ambrose quadrangle map above a road, is within ¼ mile of the road, and within 10 feet of a seasonally flowing stream.

Table 2-3 in the FEIS lists Canada thistle as a rhizomatous species best treated with chlorsulfuron, clopyralid, dicamba, glyphosate, tank mix 1, or tank mix 2 under Alternative 6. Under Alternative 5, since this is a small site, hand treatment may be effective if there are 25 plants or less, and if all root material can be removed. Canada thistle is perennial (living for more than two years). Removing all root structures is effective on new infestations in the early growing season. Since this site has existed for over five years, it is unlikely that removal of the root system is possible. Herbicide treatment using aquatic glyphosate with wick applicators, would be the most likely first treatment, if physical+ treatment is deemed not advisable during annual planning.

The items from Table B-1 indicate the following resource conditions: The site is not near nest sites, TES plant sites, nor is it on sensitive soils. It is in pronghorn antelope habitat, the Ash Valley Range Allotment, on the Big Valley Ranger District, in the Big Valley Federal Sustained Yield Unit, and in Sixth Field Watershed Number 1802000212. Based on a review of the Design Standards and the FEIS effects analysis, treatment as proposed would fall within the parameters of the effects stipulated in the FEIS.

Example 2

Appendix Example Number	SPECIES	ID_NUMBER	TOWN	RANGE	SECTION	ACRES	ALT2	ALT3	ALT4	ALT5	ALT6
2	Klamath Weed	BV003HYPE	T39N	R10E	8	0.09	P	P	P	P+	P+

Klamathweed is a Category C (FEIS, Table 2-1), non-rhizomatous species proposed for treatment due to its limited occurrence on the Forest. Since Klamathweed, or St. Johnswort, is used for medicinal purposes by some, treatment in all Alternatives is restricted to physical treatments (DS-35). This site is located on the Ambrose Valley quadrangle map in the map book.

This site is on shallow and sensitive soils in the Messenger Gulch 6th field watershed, and is not near TES plant or wildlife Management Indicator Species locations. It is in mule deer habitat. The site is within a fire wildland-urban interface area.

Based on a review of the Design Standards and the FEIS effects analysis, treatment as proposed would fall within the parameters of the effects stipulated in the FEIS.

Example 3

Appendix Example Number	SPECIES	ID_NUMBER	TOWN	RANGE	SECTION	ACRES	ALT2	ALT3	ALT4	ALT5	ALT6
3	Dyers Word	BV008ISTI	T39N	R11E	18	0.09	P	P	P	P+	P+
3	Scotch Thistle	BV256ONAC	T39N	R11E	18	0.09	P or H	P	P or H	P+	P or H

This site, containing two infestations of noxious weed species, is in the Ambrose Valley quadrangle map in the map book. These infestations are in the Big Valley Federal Sustained Yield Unit on the Big Valley Ranger District. They are within a managed timber plantation, in pronghorn antelope habitat, red-breasted sapsucker habitat, 6th Field Watershed numbered

1802000212. The site is within 10 feet of a meadow habitat in the Ash Valley Range Allotment. It is not near water or TES plants or animals. These infestations are within a fire wildland-urban interface area within ¼ mile of a road. The site does not include sensitive or shallow soils.

Dyer's woad is a Category B (FEIS, Table 2-1), non-rhizomatous species that is listed in Table 2-3 of the FEIS as best treated by herbicides 2,4-D or chlorsulfuron. The population at the time of initial inventory was one plant, which is why the FEIS analysis prescribes treatment by physical means.

Scotch thistle is a Category B (FEIS, Table 2-1), species that is listed in Table 2-3 of the FEIS. It may be removed using physical+ methods of digging out the entire root, or hand pulling that is repeated two to four times a year. Mechanical mowing may reduce seed production. It is best treated with dicamba, 2,4-D, or clopyralid. The population of Scotch thistle is estimated to be over 100 plants.

Due to the number of plants, overall the most efficient and effective treatment of the combined infestations would be to use 2,4-D.

Based on a review of the Design Standards and the FEIS effects analysis, treatment as proposed would fall within the parameters of the effects stipulated in the FEIS.

Example 4

Appendix Example Number	SPECIES	ID_NUMBER	TOWN	RANGE	SECTION	ACRES	ALT2	ALT3	ALT4	ALT5	ALT6
4	Scotch Thistle	BV284ONAC	T39N	R10E	8	16.3	P	P	P	G or P+	G P+ or H

Scotch thistle is a Category B (FEIS, Table 2-1) species that may be removed by digging the entire root or hand pulling. (This must be repeated two to four times a year.) Mechanical mowing may reduce seed production. Scotch thistle is best treated with dicamba, 2,4-D, or clopyralid. Also, goats can be effective on larger areas and populations (Table 2-3 of the FEIS).

This site overlays Messenger Gulch and a parallel road, as shown on the Ambrose Valley quadrangle in the Map Book. The road running through the site would make goat grazing difficult. Grazing would be a preferred treatment if available at a reasonable price and the herder were willing to manage by placing the goats on tethers. (This is probably not practical or cost effective.) This site would be treated with amine formulations of 2,4-D on those plants further than 10 feet from the High Water Mark. From the High Water Mark up10 feet, physical plus methods would be necessary.

Based on a review of the Design Standards and the FEIS effects analysis, treatment as proposed would fall within the parameters of the effects stipulated in the FEIS.

Example 5

Appendix Example Number	SPECIES	ID_NUMBER	TOWN	RANGE	SECTION	ACRES	ALT2	ALT3	ALT4	ALT5	ALT6
5	Yellow Starthistle	DG003CESO3	T43N	R9E	12	0.05	P or H	P	P or H	P+	P+ or H

This yellow starthisle site is on the Ambrose quadrangle map in the Map Book. Yellow starthisle is a category C-rated species (FEIS, Table 2-1). Since yellow starthisle occurs at very low levels on the Modoc National Forest, it is in the highest priority for treatment.

This site is on the Devil's Garden Ranger District and within the sage steppe ecosystem in the Howard's Gulch range allotment. It is within a 1/4 mile of a developed recreation site, and within an inactive historical lek site.

Yellow starthistle can be treated using hand pulling and digging on very small infestations, taking care not to disturb the soil. It is best treated using 2,4-D, dicamba, triclopyr, glyphosate, or chlorsulfuron (Table 2-3 of the FEIS).

This small site should be treated by hand only if the infestation is small and the soil is not greatly disturbed; otherwise, the herbicides above are listed in order of effectiveness.

Based on a review of the Design Standards and the FEIS effects analysis, treatment as proposed would fall within the parameters of the effects stipulated in the FEIS.

Example 6

Appendix Example Number	SPECIES	ID_NUMBER	TOWN	RANGE	SECTION	ACRES	ALT2	ALT3	ALT4	ALT5	ALT6
6	Spotted Knapweed	DG013CEMA4	T43N	R9E	28	0.09	P or H	P	P or H	P+	P+ or H

Spotted knapweed is a Category A species (FEIS, Table 2-1), the first priority for treatment in Alternatives 2, 3, and 4; and the second priority for treatment in Alternatives 5 and 6. This site is displayed on the Ambrose quadrangle in the map book.

This site is on the Devil's Garden Ranger District and may have shallow soils. It is in the Blacks Canyon 6th field watershed, in the Howard's Gulch range allotment, and in mule deer habitat. It is not within 300 feet of water, nor are TES plants or animals nearby. The site may be larger than a 1/10 of an acre at this time.

Spotted knapweed is best treated using 2,4-D, dicamba, or clopyralid. Pulling or digging may be used only on sites with few plants. Because re-sprouting can occur, hand pulling must be repeated two to four times a year (Table 2-3 of the FEIS). Therefore, this site would probably be treated using herbicides.

Based on a review of the Design Standards and the FEIS effects analysis, treatment as proposed would fall within the parameters of the effects stipulated in the FEIS.

Table B1-1. Key to Treatment Symbols in Table B1-2

SYMBOL	TREATMENT
P	Physical – hand pulling, hoeing, grubbing
P+	Physical+ - hand pulling, hoeing, grubbing, clipping seed head or plant, trimming with weedeater, mulching, and placing of tarps
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
NT	Not Treated

Data Accuracy—The Forest Service uses the most current and complete data available. GIS data and product accuracy may vary. They may be developed from sources of differing accuracy, accurate only at certain scales, based on modeling or interpretation, incomplete while being created revised, etc. Using GIS products for purposes other than those for which they were created may yield inaccurate or misleading results. Tables are from GIS queries developed from 2004 data; the data are subject to change and correction. The Forest Service reserves the right to correct, update, modify, or replace GIS products without notification.

The Forest would implement this project over several years as funding allows, until no more treatments are needed, or until conditions change enough to outdate this FEIS. Site-specific conditions may change during the life of the project: (1) Treated infestations could diminish in size, (2) untreated infestations could continue to spread, (3) specific non-target plant or animal species of local interest could change, and (4) new invasive plants could become established within the project area. The effects analysis considers a range of treatments applied to a range of site conditions to accommodate the possible changes associated with project implementation.

Table B1-2. Site-Specific Information, Including Treatments Proposed Under each Alternative

(The database used for this analysis was last updated on September 2, 2005.)

SPECIES	ID_NUMBER	TOWN	RANGE	SECTION	ACRES	ALT2	ALT3	ALT4	ALT5	ALT6
CANADA THISTLE	BV001CIAR4	T39N	R10E	25	0.09	PT-H	NT	PT-H	P+	H
CANADA THISTLE	BV003CIAR4	T39N	R10E	2	0.09	H	NT	H	P+	H
CANADA THISTLE	BV005CIAR4	T41N	R7E	35	0.09	H	NT	H	P+	H
CANADA THISTLE	BV006CIAR4	T40N	R9E	30	0.09	PT-H	NT	PT-H	P+	H
CANADA THISTLE	DG002CIAR4	T44N	R10E	29	0.09	H	NT	H	P+	H
CANADA THISTLE	DG003CIAR4	T43N	R9E	27	0.09	H	NT	H	P+	H
CANADA THISTLE	DG004CIAR4	T43N	R9E	12	0.09	NT	NT	NT	P+	H
CANADA THISTLE	DG005CIAR4	T44N	R10E	30	0.09	PT-H	NT	PT-H	P+	H
CANADA THISTLE	DG006CIAR4	T43N	R9E	1	0.09	NT	NT	NT	P+	H
CANADA THISTLE	DG008CIAR4	T46N	R11E	6	0.09	PT-H	NT	PT-H	P+	H
CANADA THISTLE	DG009CIAR4	T46N	R11E	7	0.09	NT	NT	NT	P+	H
CANADA THISTLE	DG010CIAR4	T45N	R10E	21	0.09	PT-H	NT	PT-H	P+	H
CANADA THISTLE	DG013CIAR4	T47N	R11E	29	0.09	H	NT	H	P+	H
CANADA THISTLE	DG014CIAR4	T47N	R11E	31	0.09	PT-H	NT	PT-H	P+	H
CANADA THISTLE	DG015CIAR4	T43N	R9E	12	0.09	NT	NT	NT	P+	H
CANADA THISTLE	DG016CIAR4	T44N	R10E	29	0.08	H	NT	H	P+	H
CANADA THISTLE	DG017CIAR4	T44N	R10E	29	0.15	H	NT	H	LT	H
CANADA THISTLE	DG018CIAR4	T44N	R10E	29	0.09	PT-H	NT	PT-H	P+	H
CANADA THISTLE	DH011CIAR4	T47N	R8E	22	0.09	PT-H	NT	PT-H	P+	H
CANADA THISTLE	DH012CIAR4	T47N	R8E	21	0.09	NT	NT	NT	P+	H
CANADA THISTLE	DH013CIAR4	T47N	R8E	22	0.09	H	NT	H	P+	H
CANADA THISTLE	WM001CIAR4	T42N	R15E	28	0.1	H	NT	H	P+	H
CANADA THISTLE	WM002CIAR4	T44N	R15E	8	0.1	PT-H	NT	PT-H	P+	H
CANADA THISTLE	WM003CIAR4	T42N	R15E	4	0.1	H	NT	H	P+	H

SPECIES	ID_NUMBER	TOWN	RANGE	SECTION	ACRES	ALT2	ALT3	ALT4	ALT5	ALT6
CANADA THISTLE	WM004CIAR4	T42N	R15E	6	0.1	H	NT	H	P+	H
CANADA THISTLE	WM005CIAR4	T44N	R14E	25	0.17	PT-H	NT	PT-H	LT	H
CANADA THISTLE	WM006CIAR4	T43N	R15E	33	0.1	PT-H	NT	PT-H	P+	H
CANADA THISTLE	WM008CIAR4	T47N	R15E	3	0.09	H	NT	H	P+	H
CANADA THISTLE	WM009CIAR4	T47N	R15E	27	9.99	PT-H	NT	PT-H	LT	H
CANADA THISTLE	WM010CIAR4	T42N	R14E	25	0.1	H	NT	H	P+	H
CANADA THISTLE	WM011CIAR4	T41N	R14E	12	0.1	H	NT	H	P+	H
CANADA THISTLE	WM012CIAR4	T41N	R15E	31	0.1	H	NT	H	P+	H
CANADA THISTLE	WM013CIAR4	T40N	R15E	5	0.1	H	NT	H	P+	H
CRUPINA	BV001CRVU2	T40N	R10E	36	158.65	P	P	P	LT	LT
DALMATIAN TOADFLAX	BV001LIDA	T41N	R6E	29	0.09	H	NT	H	P+	H
DALMATIAN TOADFLAX	BV005LIDA	T42N	R5E	19	0.09	H	NT	H	P+	H
DALMATIAN TOADFLAX	BV006LIDA	T42N	R6E	28	850.82	PT-H	NT	PT-H	LT	LT
DALMATIAN TOADFLAX	DH001LIDA	T42N	R6E	1	0.08	H	NT	H	P+	H
DALMATIAN TOADFLAX	DH002LIDA	T42N	R6E	1	0.09	H	NT	H	P+	H
DALMATIAN TOADFLAX	DH003LIDA	T42N	R6E	1	0.08	H	NT	H	P+	H
DALMATIAN TOADFLAX	DH004LIDA	T45N	R6E	8	0.09	H	NT	H	P+	H
DALMATIAN TOADFLAX	DH005LIDA	T43N	R7E	17	0.09	H	NT	H	P+	H
DALMATIAN TOADFLAX	WM003LIDA	T46N	R14E	13	44.57	PT-H	NT	PT-H	LT	H
DALMATIAN TOADFLAX	WM004LIDA	T46N	R14E	13	0.08	H	NT	H	P+	H
DALMATIAN TOADFLAX	WM008LIDA	T47N	R15E	5	3.38	PT-H	NT	PT-H	LT	H
DALMATIAN TOADFLAX	WM010LIDA	T47N	R15E	5	2.99	PT-H	NT	PT-H	LT	H
DIFFUSE KNAPWEED	BV001CEDI3	T36N	R10E	12	0.09	P or H	P	P or H	P+	P+ or H
DIFFUSE KNAPWEED	BV002CEDI3	T39N	R9E	7	0.09	P or H	P	P or H	P+	P+ or H
DIFFUSE KNAPWEED	BV003CEDI3	T41N	R9E	28	0.15	P or H	P	P or H	P+	P+ or H
DIFFUSE KNAPWEED	BV004CEDI3	T40N	R9E	14	0.09	P or H	P	P or H	P+	P+ or H
DIFFUSE KNAPWEED	BV006CEDI	T40N	R9E	14	0.99	P	P	P	P+	P+ or H
DIFFUSE KNAPWEED	BV006CEDI3	T40N	R9E	14	0.09	P	P	P	P+	P+ or H

SPECIES	ID_NUMBER	TOWN	RANGE	SECTION	ACRES	ALT2	ALT3	ALT4	ALT5	ALT6
DIFFUSE KNAPWEED	DG004CEDI3	T46N	R11E	18	0.09	P	P	P	P+	P+
DIFFUSE KNAPWEED	DH001CEDI3	T45N	R6E	22	0.69	P or H	P	P or H	P+	P+ or H
DIFFUSE KNAPWEED	DH002CEDI3	T45N	R6E	27	0.09	P or H	P	P or H	P+	P+ or H
DIFFUSE KNAPWEED	DH003CEDI3	T44N	R6E	25	0.09	P or H	P	P or H	P+	P+ or H
DIFFUSE KNAPWEED	WM001CEDI3	T44N	R14E	2	0.09	P	P	P	P+	P+
DIFFUSE KNAPWEED	WM002CEDI3	T39N	R14E	36	1.22	P	P	P	P+	P+ or H
DYER'S WOAD	BV004ISTI	T39N	R10E	12	0.09	P	P	P	P+	P+ or H
DYER'S WOAD	BV005ISTI	T39N	R10E	16	0.09	P	P	P	P+	P+
DYER'S WOAD	BV006ISTI	T39N	R10E	26	0.09	P	P	P	P+	P+
DYER'S WOAD	BV007ISTI	T39N	R10E	23	0.09	P	P	P	P+	P+
DYER'S WOAD	BV008ISTI	T39N	R11E	18	0.09	P	P	P	P+	P+
DYER'S WOAD	BV009ISTI	T40N	R10E	27	0.09	P or H	P	P or H	P+	P+ or H
DYER'S WOAD	BV010ISTI	T40N	R10E	28	0.09	P or H	P	P or H	P+	P+ or H
DYER'S WOAD	BV011ISTI	T40N	R10E	27	0.09	P or H	P	P or H	P+	P+ or H
DYER'S WOAD	BV014ISTI	T39N	R10E	23	0.09	P or H	P	P or H	P+	P+ or H
DYER'S WOAD	BV015ISTI	T39N	R10E	16	0.09	P or H	P	P or H	P+	P+ or H
DYER'S WOAD	BV016ISTI	T39N	R10E	16	0.09	P	P	P	P+	P+
DYER'S WOAD	BV017ISTI	T40N	R10E	29	0.09	P	P	P	P+	P+
DYER'S WOAD	BV019ISTI	T40N	R10E	28	0.09	P	P	P	P+	P+
DYER'S WOAD	BV020ISTI	T37N	R10E	20	0.09	P	P	P	P+	P+ or H
DYER'S WOAD	DG001ISTI	T43N	R7E	23	0.99	P or H	P	P or H	P+	P+
DYER'S WOAD	DG007ISTI	T44N	R8E	18	0.09	P	P	P	P+	P+
DYER'S WOAD	DG008ISTI	T43N	R7E	10	0.09	P	P	P	P+	P+
DYER'S WOAD	DG009ISTI	T44N	R10E	15	0.09	P	P	P	P+	P+
DYER'S WOAD	DG013ISTI	T43N	R7E	27	0.09	P or H	P	P or H	P+	P+ or H
DYER'S WOAD	DG014ISTI	T43N	R7E	9	0.09	P	P	P	P+	P+
DYER'S WOAD	DG015ISTI	T44N	R8E	18	0.09	P or H	P	P or H	P+	P+ or H
DYER'S WOAD	DG018ISTI	T43N	R7E	12	0.09	P	P	P	P+	P+ or H

SPECIES	ID_NUMBER	TOWN	RANGE	SECTION	ACRES	ALT2	ALT3	ALT4	ALT5	ALT6
DYER'S WOAD	DG020ISTI	T47N	R11E	16	1.2	P	P	P	P+	P+ or H
DYER'S WOAD	DH001ISTI	T42N	R7E	5	0.09	P or H	P	P or H	P+	P+ or H
DYER'S WOAD	DH002ISTI	T42N	R7E	5	0.09	P or H	P	P or H	P+	P+ or H
DYER'S WOAD	DH003ISTI	T42N	R7E	5	0.09	P or H	P	P or H	P+	P+ or H
DYER'S WOAD	DH004ISTI	T48N	R7E	23	1.99	P or H	P	P or H	P+	P+ or H
DYER'S WOAD	DH005ISTI	T47N	R9E	13	0.09	P or H	P	P or H	P+	P+ or H
DYER'S WOAD	DH006ISTI	T47N	R9E	24	0.09	P	P	P	P+	P+
DYER'S WOAD	DH007ISTI	T47N	R9E	13	0.12	P or H	P	P or H	P+	P+ or H
DYER'S WOAD	DH008ISTI	T44N	R6E	25	0.07	P	P	P	P+	P+
DYER'S WOAD	DH009ISTI	T44N	R6E	25	0.41	P	P	P	P+	P+ or H
DYER'S WOAD	DH010ISTI	T44N	R7E	30	0.09	P	P	P	P+	P+ or H
DYER'S WOAD	DH011ISTI	T45N	R7E	21	0.09	P or H	P	P or H	P+	P+ or H
DYER'S WOAD	DH012ISTI	T44N	R7E	27	0.09	P or H	P	P or H	P+	P+ or H
DYER'S WOAD	DH013ISTI	T43N	R7E	7	5657.75	P or H	P	P or H	LT	LT
DYER'S WOAD	DH014ISTI	T44N	R7E	31	0.09	P	P	P	P+	P+
DYER'S WOAD	DH015ISTI	T43N	R7E	27	0.99	P or H	P	P or H	P+	P+ or H
DYER'S WOAD	DH016ISTI	T43N	R6E	32	0.09	P	P	P	P+	P+
DYER'S WOAD	DH018ISTI	T44N	R7E	22	0.09	P or H	P	P or H	P+	P+ or H
DYER'S WOAD	WM001ISTI	T46N	R15E	5	5.89	P or H	P	P or H	P+	P+ or H
DYER'S WOAD	WM002ISTI	T46N	R15E	5	12.65	P	P	P	P+	P+ or H
DYER'S WOAD	WM003ISTI	T47N	R15E	33	1.96	P or H	P	P or H	P+	P+ or H
DYER'S WOAD	WM004ISTI	T47N	R15E	32	12.27	P	P	P	P+	P+ or H
DYER'S WOAD	WM005ISTI	T47N	R15E	32	8.43	P	P	P	P+	P+ or H
DYER'S WOAD	WM006ISTI	T47N	R15E	20	0.05	P or H	P	P or H	P+	P+ or H
DYER'S WOAD	WM007ISTI	T47N	R15E	28	0.45	P	P	P	P+	P+ or H
DYER'S WOAD	WM008ISTI	T47N	R15E	32	6.97	P or H	P	P or H	P+	P+ or H
DYER'S WOAD	WM009ISTI	T47N	R16E	31	1.2	P	P	P	P+	P+ or H
DYER'S WOAD	WM010ISTI	T47N	R15E	26	0.82	P	P	P	P+	P+ or H

SPECIES	ID_NUMBER	TOWN	RANGE	SECTION	ACRES	ALT2	ALT3	ALT4	ALT5	ALT6
DYER'S WOAD	WM011ISTI	T47N	R15E	22	0.67	P or H	P	P or H	P+	P+ or H
DYER'S WOAD	WM012ISTI	T47N	R15E	27	0.38	P or H	P	P or H	P+	P+ or H
DYER'S WOAD	WM013ISTI	T47N	R15E	34	1.02	P or H	P	P or H	P+	P+ or H
DYER'S WOAD	WM014ISTI	T46N	R15E	2	1.02	P	P	P	P+	P+ or H
DYER'S WOAD	WM015ISTI	T47N	R15E	21	1.02	P	P	P	P+	P+ or H
DYER'S WOAD	WM016ISTI	T44N	R14E	13	0.46	P or H	P	P or H	P+	P+ or H
DYER'S WOAD	WM017ISTI	T47N	R16E	29	0.1	P or H	P	P or H	P+	P+ or H
DYER'S WOAD	WM018ISTI	T47N	R15E	36	1.13	P	P	P	P+	P+ or H
DYER'S WOAD	WM019ISTI	T47N	R15E	24	0.1	P	P	P	P+	P+
DYER'S WOAD	WM021ISTI	T46N	R15E	6	0.09	P or H	P	P or H	P+	P+ or H
DYER'S WOAD	WM022ISTI	T47N	R15E	32	0.09	P or H	P	P or H	P+	P+ or H
DYER'S WOAD	WM023ISTI	T47N	R15E	29	1.93	P or H	P	P or H	P+	P+ or H
DYER'S WOAD	WM024ISTI	T47N	R15E	2	0.1	P	P	P	P+	P+
DYER'S WOAD	WM025ISTI	T48N	T15E	3	0.09	P	P	P	P+	P+ or H
KLAMATHWEED	BV001HYPE	T37N	R8E	12	0.09	P	P	P	P+	P+ or H
KLAMATHWEED	BV002HYPE	T40N	R9E	14	0.09	P	P	P	P+	P+ or H
KLAMATHWEED	BV003HYPE	T39N	R10E	8	0.09	P	P	P	P+	P+
KLAMATHWEED	BV006HYPE	T41N	R9E	29	0.99	P	P	P	P+	P+ or H
KLAMATHWEED	DG006HYPE	T43N	R7E	36	0.09	P	P	P	P+	P+ or H
KLAMATHWEED	DG007HYPE	T42N	R8E	1	0.09	P	P	P	P+	P+
KLAMATHWEED	DG008HYPE	T42N	R8E	23	0.09	P	P	P	P+	P+
KLAMATHWEED	DH001HYPE	T44N	R6E	14	0.99	P	P	P	P+	P+ or H
KLAMATHWEED	DH002HYPE	T45N	R6E	34	0.09	P	P	P	P+	P+
MEDITERRANEAN SAGE	BV001SAAE	T40N	R9E	14	0.66	P or H	P	P or H	P+	P+ or H
MEDITERRANEAN SAGE	BV005SAAE	T41N	R8E	20	0.09	P	P	P	P+	P+ or H
MEDITERRANEAN SAGE	BV006SAAE	T40N	R8E	3	0.09	P	P	P	P+	P+
MEDITERRANEAN SAGE	BV007SAAE	T41N	R9E	28	0.99	P or H	P	P or H	P+	P+ or H
MEDITERRANEAN SAGE	DG006SAAE	T47N	R12E	15	0.09	P	P	P	P+	P+

SPECIES	ID_NUMBER	TOWN	RANGE	SECTION	ACRES	ALT2	ALT3	ALT4	ALT5	ALT6
MEDITERRANEAN SAGE	DG007SAAE	T47N	R12E	23	0.09	P	P	P	P+	P+
MEDITERRANEAN SAGE	DG008SAAE	T47N	R12E	23	0.09	P or H	P	P or H	P+	P+ or H
MEDITERRANEAN SAGE	DG009SAAE	T47N	R12E	22	0.09	P or H	P	P or H	P+	P+ or H
MEDITERRANEAN SAGE	DG010SAAE	T47N	R12E	27	0.09	P or H	P	P or H	P+	P+ or H
MEDITERRANEAN SAGE	DG011SAAE	T47N	R13E	6	0.09	P	P	P	P+	P+
MEDITERRANEAN SAGE	DG012SAAE	T47N	R12E	10	0.09	P	P	P	P+	P+ or H
MEDITERRANEAN SAGE	DG013SAAE	T47N	R12E	13	0.09	P	P	P	P+	P+
MEDITERRANEAN SAGE	DG014SAAE	T47N	R11E	34	0.09	P	P	P	P+	P+
MEDITERRANEAN SAGE	DG017SAAE	T44N	R8E	18	0.09	P or H	P	P or H	P+	P+ or H
MEDITERRANEAN SAGE	DG018SAAE	T41N	R9E	9	0.53	P	P	P	P+	P+ or H
MEDITERRANEAN SAGE	DG019SAAE	T41N	R9E	9	3.84	P	P	P	P+	P+ or H
MEDITERRANEAN SAGE	DG020SAAE	T41N	R8E	6	0.09	P	P	P	P+	P+ or H
MEDITERRANEAN SAGE	DG023SAAE	T47N	R13E	8	0.09	P	P	P	P+	P+
MEDITERRANEAN SAGE	DG024SAAE	T41N	R8E	2	0.99	P	P	P	P+	P+
MEDITERRANEAN SAGE	DH003SAAE	T45N	R6E	5	0.09	P or H	P	P or H	P+	P+ or H
MEDITERRANEAN SAGE	DH004SAAE	T46N	R6E	32	0.09	P or H	P	P or H	P+	P+ or H
MEDITERRANEAN SAGE	DH005SAAE	T46N	R6E	29	0.09	P	P	P	P+	P+
MEDITERRANEAN SAGE	DH007SAAE	T46N	R6E	27	0.09	P or H	P	P or H	P+	P+ or H
MEDITERRANEAN SAGE	DH008SAAE	T46N	R6E	33	0.09	P	P	P	P+	P+
MEDITERRANEAN SAGE	WM001SAAE	T45N	R15E	10	0.1	P or H	P	P or H	P+	P+ or H
MEDITERRANEAN SAGE	WM003SAAE	T41N	R14E	25	0.09	P or H	P	P or H	P+	P+ or H
MUSK THISTLE	BV001CANU4	T40N	R8E	26	0.09	P or H	P	P or H	P+	P+ or H
MUSK THISTLE	BV002CANU4	T40N	R8E	26	0.09	P or H	P	P or H	P+	P+ or H
MUSK THISTLE	BV003CANU4	T40N	R8E	26	0.09	P or H	P	P or H	P+	P+ or H
MUSK THISTLE	BV004CANU4	T40N	R8E	26	0.09	P	P	P	P+	P+ or H
MUSK THISTLE	BV006CANU4	T41N	R6E	30	0.09	P or H	P	P or H	P+	P+ or H
MUSK THISTLE	BV007CANU4	T41N	R5E	27	5.21	P or H	P	P or H	G or P+	G or H
MUSK THISTLE	BV010CANU4	T40N	R9E	16	0.09	P or H	P	P or H	P+	P+ or H

SPECIES	ID_NUMBER	TOWN	RANGE	SECTION	ACRES	ALT2	ALT3	ALT4	ALT5	ALT6
MUSK THISTLE	BV011CANU4	T40N	R8E	25	0.09	P	P	P	P+	P+ or H
MUSK THISTLE	DG003CANU4	T41N	R8E	5	2.36	P or H	P	P or H	P+	P+ or H
MUSK THISTLE	DG004CANU4	T41N	R8E	6	0.09	P	P	P	P+	P+
MUSK THISTLE	DG005CANU4	T43N	R8E	32	0.18	P	P	P	P+	P+ or H
MUSK THISTLE	DH004CANU4	T45N	R7E	15	0.84	P or H	P	P or H	P+	P+ or H
PLUMELESS THISTLE	DG001CAAC	T43N	R8E	6	0.09	P	P	P	P+	P+
SCOTCH THISTLE	BV001ONAC	T36N	R8E	19	0.09	P	P	P	P+	P+
SCOTCH THISTLE	BV002ONAC	T36N	R8E	19	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV003ONAC	T36N	R8E	19	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV004ONAC	T36N	R8E	19	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV005ONAC	T36N	R8E	19	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV006ONAC	T36N	R7E	24	0.09	P	P	P	P+	P+ or H
SCOTCH THISTLE	BV007ONAC	T36N	R7E	24	0.09	P	P	P	P+	P+
SCOTCH THISTLE	BV008ONAC	T36N	R7E	24	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV009ONAC	T36N	R7E	24	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV010ONAC	T36N	R7E	13	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV011ONAC	T36N	R7E	13	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV012ONAC	T36N	R7E	13	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV013ONAC	T36N	R8E	18	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV014ONAC	T36N	R8E	18	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV015ONAC	T36N	R8E	18	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV016ONAC	T36N	R8E	17	0.09	P	P	P	P+	P+
SCOTCH THISTLE	BV017ONAC	T36N	R8E	17	0.09	P	P	P	P+	P+
SCOTCH THISTLE	BV018ONAC	T36N	R8E	17	0.09	P	P	P	P+	P+
SCOTCH THISTLE	BV019ONAC	T36N	R8E	17	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV020ONAC	T36N	R8E	8	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV021ONAC	T36N	R8E	5	0.09	P	P	P	P+	P+
SCOTCH THISTLE	BV022ONAC	T36N	R8E	5	0.09	P	P	P	P+	P+

SPECIES	ID_NUMBER	TOWN	RANGE	SECTION	ACRES	ALT2	ALT3	ALT4	ALT5	ALT6
SCOTCH THISTLE	BV023ONAC	T36N	R8E	5	0.09	P	P	P	P+	P+
SCOTCH THISTLE	BV024ONAC	T36N	R8E	5	0.09	P	P	P	P+	P+
SCOTCH THISTLE	BV025ONAC	T36N	R8E	5	0.09	P	P	P	P+	P+
SCOTCH THISTLE	BV026ONAC	T36N	R8E	5	0.09	P	P	P	P+	P+
SCOTCH THISTLE	BV027ONAC	T36N	R8E	5	0.09	P	P	P	P+	P+
SCOTCH THISTLE	BV028ONAC	T36N	R8E	5	0.09	P	P	P	P+	P+
SCOTCH THISTLE	BV029ONAC	T36N	R8E	5	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV030ONAC	T37N	R8E	32	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV031ONAC	T37N	R8E	32	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV032ONAC	T37N	R8E	32	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV033ONAC	T37N	R8E	32	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV034ONAC	T36N	R8E	4	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV035ONAC	T36N	R8E	4	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV036ONAC	T36N	R8E	9	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV037ONAC	T36N	R8E	16	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV038ONAC	T36N	R8E	15	0.09	P	P	P	P+	P+
SCOTCH THISTLE	BV039ONAC	T36N	R8E	21	0.09	P	P	P	P+	P+
SCOTCH THISTLE	BV040ONAC	T36N	R8E	3	0.09	P	P	P	P+	P+ or H
SCOTCH THISTLE	BV041ONAC	T36N	R8E	3	0.09	P	P	P	P+	P+ or H
SCOTCH THISTLE	BV042ONAC	T36N	R8E	3	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV043ONAC	T37N	R8E	34	0.09	P	P	P	P+	P+
SCOTCH THISTLE	BV044ONAC	T36N	R8E	23	0.09	P	P	P	P+	P+ or H
SCOTCH THISTLE	BV045ONAC	T36N	R8E	23	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV046ONAC	T36N	R8E	13	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV047ONAC	T36N	R8E	1	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV048ONAC	T36N	R8E	1	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV049ONAC	T37N	R8E	33	0.09	P	P	P	P+	P+ or H
SCOTCH THISTLE	BV050ONAC	T37N	R8E	33	0.09	P or H	P	P or H	P+	P+ or H

SPECIES	ID_NUMBER	TOWN	RANGE	SECTION	ACRES	ALT2	ALT3	ALT4	ALT5	ALT6
SCOTCH THISTLE	BV051ONAC	T37N	R8E	23	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV052ONAC	T37N	R8E	13	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV053ONAC	T37N	R8E	13	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV054ONAC	T37N	R8E	12	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV056ONAC	T37N	R9E	6	0.09	P	P	P	P+	P+
SCOTCH THISTLE	BV057ONAC	T37N	R9E	6	0.09	P	P	P	P+	P+ or H
SCOTCH THISTLE	BV059ONAC	T37N	R9E	8	0.09	P	P	P	P+	P+ or H
SCOTCH THISTLE	BV060ONAC	T37N	R9E	8	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV062ONAC	T37N	R9E	30	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV063ONAC	T37N	R9E	33	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV064ONAC	T37N	R9E	33	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV065ONAC	T37N	R9E	32	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV066ONAC	T37N	R9E	32	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV067ONAC	T36N	R8E	2	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV068ONAC	T36N	R8E	11	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV070ONAC	T37N	R11E	18	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV071ONAC	T37N	R11E	31	0.01	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV072ONAC	T37N	R11E	30	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV073ONAC	T37N	R11E	30	0.09	P	P	P	P+	P+
SCOTCH THISTLE	BV074ONAC	T37N	R10E	24	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV075ONAC	T37N	R11E	7	0.01	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV076ONAC	T37N	R10E	12	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV077ONAC	T37N	R10E	12	0.09	P	P	P	P+	P+ or H
SCOTCH THISTLE	BV078ONAC	T37N	R10E	12	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV079ONAC	T37N	R10E	1	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV080ONAC	T37N	R10E	14	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV081ONAC	T37N	R10E	3	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV082ONAC	T37N	R10E	4	0.09	P or H	P	P or H	P+	P+ or H

SPECIES	ID_NUMBER	TOWN	RANGE	SECTION	ACRES	ALT2	ALT3	ALT4	ALT5	ALT6
SCOTCH THISTLE	BV084ONAC	T37N	R10E	4	0.09	P	P	P	P+	P+ or H
SCOTCH THISTLE	BV085ONAC	T37N	R10E	9	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV086ONAC	T37N	R10E	4	0.09	P	P	P	P+	P+
SCOTCH THISTLE	BV088ONAC	T37N	R10E	3	0.01	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV089ONAC	T37N	R10E	2	0.01	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV090ONAC	T37N	R10E	2	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV091ONAC	T37N	R10E	3	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV092ONAC	T38N	R10E	34	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV093ONAC	T37N	R10E	1	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV095ONAC	T38N	R10E	28	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV096ONAC	T38N	R10E	27	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV097ONAC	T38N	R10E	26	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV098ONAC	T38N	R10E	25	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV099ONAC	T38N	R8E	25	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV100ONAC	T38N	R8E	25	0.09	P	P	P	P+	P+
SCOTCH THISTLE	BV101ONAC	T38N	R8E	25	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV102ONAC	T38N	R9E	31	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV103ONAC	T37N	R9E	6	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV105ONAC	T37N	R8E	12	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV106ONAC	T37N	R8E	24	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV108ONAC	T37N	R8E	24	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV109ONAC	T38N	R8E	25	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV110ONAC	T38N	R8E	23	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV111ONAC	T38N	R8E	24	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV112ONAC	T39N	R9E	7	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV113ONAC	T39N	R9E	25	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV114ONAC	T38N	R10E	14	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV115ONAC	T38N	R11E	18	0.09	P or H	P	P or H	P+	P+ or H

SPECIES	ID_NUMBER	TOWN	RANGE	SECTION	ACRES	ALT2	ALT3	ALT4	ALT5	ALT6
SCOTCH THISTLE	BV116ONAC	T38N	R11E	18	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV117ONAC	T38N	R10E	10	0.14	P	P	P	P+	P+ or H
SCOTCH THISTLE	BV119ONAC	T39N	R10E	36	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV120ONAC	T39N	R10E	35	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV121ONAC	T39N	R10E	35	0.67	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV122ONAC	T39N	R10E	33	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV123ONAC	T39N	R10E	32	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV124ONAC	T39N	R10E	32	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV125ONAC	T39N	R10E	32	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV126ONAC	T39N	R10E	30	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV127ONAC	T39N	R10E	29	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV128ONAC	T39N	R10E	29	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV129ONAC	T39N	R10E	27	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV130ONAC	T39N	R10E	25	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV133ONAC	T39N	R10E	19	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV134ONAC	T39N	R10E	19	0.09	P	P	P	P+	P+ or H
SCOTCH THISTLE	BV135ONAC	T39N	R10E	22	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV136ONAC	T39N	R10E	23	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV137ONAC	T39N	R11E	18	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV138ONAC	T39N	R10E	16	0.08	P	P	P	P+	P+
SCOTCH THISTLE	BV139ONAC	T39N	R10E	16	0.08	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV140ONAC	T39N	R10E	17	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV142ONAC	T39N	R10E	8	0.09	P	P	P	P+	P+
SCOTCH THISTLE	BV143ONAC	T39N	R10E	9	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV144ONAC	T39N	R10E	11	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV145ONAC	T39N	R10E	11	0.09	P	P	P	P+	P+ or H
SCOTCH THISTLE	BV146ONAC	T39N	R10E	5	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV147ONAC	T39N	R11E	5	0.09	P or H	P	P or H	P+	P+ or H

SPECIES	ID_NUMBER	TOWN	RANGE	SECTION	ACRES	ALT2	ALT3	ALT4	ALT5	ALT6
SCOTCH THISTLE	BV148ONAC	T39N	R11E	3	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV149ONAC	T39N	R11E	12	0.01	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV150ONAC	T39N	R11E	20	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV152ONAC	T39N	R11E	20	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV154ONAC	T39N	R11E	29	0.04	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV155ONAC	T39N	R11E	29	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV156ONAC	T38N	R11E	4	0.09	P	P	P	P+	P+ or H
SCOTCH THISTLE	BV157ONAC	T39N	R12E	20	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV158ONAC	T40N	R11E	5	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV159ONAC	T39N	R11E	3	0.09	P	P	P	P+	P+ or H
SCOTCH THISTLE	BV161ONAC	T40N	R10E	32	0.14	P	P	P	P+	P+ or H
SCOTCH THISTLE	BV162ONAC	T40N	R10E	33	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV163ONAC	T40N	R10E	34	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV164ONAC	T40N	R10E	28	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV165ONAC	T40N	R10E	21	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV166ONAC	T40N	R10E	18	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV167ONAC	T41N	R9E	26	0.57	P	P	P	P+	P+ or H
SCOTCH THISTLE	BV168ONAC	T41N	R9E	30	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV169ONAC	T41N	R9E	28	0.07	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV170ONAC	T40N	R9E	4	0.08	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV171ONAC	T40N	R9E	28	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV172ONAC	T40N	R9E	31	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV173ONAC	T40N	R9E	33	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV174ONAC	T40N	R9E	33	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV176ONAC	T39N	R8E	1	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV177ONAC	T39N	R8E	1	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV178ONAC	T40N	R8E	26	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV179ONAC	T40N	R8E	26	0.09	P or H	P	P or H	P+	P+ or H

SPECIES	ID_NUMBER	TOWN	RANGE	SECTION	ACRES	ALT2	ALT3	ALT4	ALT5	ALT6
SCOTCH THISTLE	BV180ONAC	T40N	R8E	28	0.09	P	P	P	P+	P+ or H
SCOTCH THISTLE	BV181ONAC	T40N	R8E	23	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV185ONAC	T41N	R8E	27	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV186ONAC	T41N	R8E	27	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV187ONAC	T41N	R8E	28	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV188ONAC	T41N	R8E	28	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV190ONAC	T41N	R7E	28	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV191ONAC	T41N	R7E	31	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV192ONAC	T41N	R7E	32	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV193ONAC	T41N	R7E	35	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV194ONAC	T40N	R6E	11	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV195ONAC	T41N	R6E	28	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV200ONAC	T42N	R5E	20	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV201ONAC	T42N	R4E	25	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV203ONAC	T41N	R7E	14	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV210ONAC	T41N	R9E	7	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV211ONAC	T41N	R9E	17	0.74	P	P	P	P+	P+ or H
SCOTCH THISTLE	BV212ONAC	T36N	R8E	9	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV213ONAC	T36N	R7E	13	0.24	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV214ONAC	T37N	R8E	33	0.09	P	P	P	P+	P+ or H
SCOTCH THISTLE	BV215ONAC	T37N	R8E	12	0.09	P	P	P	P+	P+
SCOTCH THISTLE	BV216ONAC	T37N	R8E	1	0.09	P	P	P	P+	P+
SCOTCH THISTLE	BV217ONAC	T37N	R10E	9	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV219ONAC	T38N	R10E	4	0.09	P	P	P	P+	P+
SCOTCH THISTLE	BV221ONAC	T37N	R10E	2	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV223ONAC	T39N	R10E	11	0.09	P	P	P	P+	P+
SCOTCH THISTLE	BV224ONAC	T39N	R10E	16	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV225ONAC	T39N	R10E	22	0.09	P	P	P	P+	P+

SPECIES	ID_NUMBER	TOWN	RANGE	SECTION	ACRES	ALT2	ALT3	ALT4	ALT5	ALT6
SCOTCH THISTLE	BV226ONAC	T39N	R10E	14	0.09	P	P	P	P+	P+ or H
SCOTCH THISTLE	BV227ONAC	T39N	R10E	23	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV228ONAC	T39N	R10E	23	0.09	P	P	P	P+	P+
SCOTCH THISTLE	BV229ONAC	T39N	R10E	23	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV230ONAC	T39N	R10E	24	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV231ONAC	T39N	R10E	24	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV234ONAC	T39N	R10E	24	0.09	P	P	P	P+	P+ or H
SCOTCH THISTLE	BV235ONAC	T39N	R10E	25	0.09	P	P	P	P+	P+ or H
SCOTCH THISTLE	BV236ONAC	T39N	R10E	24	0.09	P	P	P	P+	P+
SCOTCH THISTLE	BV237ONAC	T39N	R10E	28	0.09	P	P	P	P+	P+
SCOTCH THISTLE	BV238ONAC	T39N	R10E	28	0.09	P	P	P	P+	P+
SCOTCH THISTLE	BV239ONAC	T39N	R10E	26	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV240ONAC	T39N	R10E	35	0.09	P	P	P	P+	P+
SCOTCH THISTLE	BV242ONAC	T39N	R10E	14	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV2430NAC	T39N	R10E	26	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV244ONAC	T39N	R10E	26	0.01	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV254ONAC	T39N	R11E	31	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV256ONAC	T39N	R11E	18	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV257ONAC	T40N	R10E	20	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV258ONAC	T40N	R10E	28	0.09	P	P	P	P+	P+
SCOTCH THISTLE	BV259ONAC	T40N	R9E	16	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV260ONAC	T40N	R9E	23	0.09	P	P	P	P+	P+ or H
SCOTCH THISTLE	BV261ONAC	T39N	R10E	3	0.09	P	P	P	P+	P+
SCOTCH THISTLE	BV265ONAC	T39N	R10E	23	0.01	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV267ONAC	T37N	R10E	13	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV269ONAC	T37N	R11E	29	0.09	P	P	P	P+	P+ or H
SCOTCH THISTLE	BV270ONAC	T38N	R10E	12	0.09	P	P	P	P+	P+
SCOTCH THISTLE	BV272ONAC	T37N	R8E	33	0.09	P or H	P	P or H	P+	P+ or H

SPECIES	ID_NUMBER	TOWN	RANGE	SECTION	ACRES	ALT2	ALT3	ALT4	ALT5	ALT6
SCOTCH THISTLE	BV273ONAC	T38N	R10E	2	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV278ONAC	T36N	R8E	1	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV280ONAC	T41N	R9E	17	0.08	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV281ONAC	T41N	R9E	16	0.09	P	P	P	P+	P+ or H
SCOTCH THISTLE	BV282ONAC	T41N	R9E	26	1.94	P	P	P	P+	P+ or H
SCOTCH THISTLE	BV284ONAC	T39N	R10E	8	16.3	P	P	P	G or P+	G or P+ or H
SCOTCH THISTLE	BV285ONAC	T39N	R12E	20	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV286ONAC	T37N	R11E	31	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV287ONAC	T38N	R10E	33	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV288ONAC	T40N	R9E	34	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV289ONAC	T40N	R7E	3	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV290ONAC	T41N	R9E	15	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV291ONAC	T41N	R9E	14	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV293ONAC	T41N	R9E	13	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV294ONAC	T37N	R10E	11	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	BV296ONAC	T39N	R11E	18	0.09	P	P	P	P+	P+
SCOTCH THISTLE	BV297ONAC	T36N	R9E	5	0.09	P	P	P	P+	P+
SCOTCH THISTLE	BV298ONAC	T36N	R8E	9	0.09	P	P	P	P+	P+
SCOTCH THISTLE	BV300ONAC	T37N	R8E	33	4.99	P	P	P	G or P+	G or P+ or H
SCOTCH THISTLE	BV301ONAC	T37N	R8E	8	0.09	P	P	P	P+	P+ or H
SCOTCH THISTLE	BV302ONAC	T40N	R8E	2	4.99	P	P	P	G or P+	G or H
SCOTCH THISTLE	BV303ONAC	T40N	R7E	5	0.09	P	P	P	P+	P+
SCOTCH THISTLE	BV304ONAC	T41N	R8E	32	2.99	P	P	P	P+	P+ or H
SCOTCH THISTLE	BV305ONAC	T36N	R8E	1	0.09	P	P	P	P+	P+
SCOTCH THISTLE	BV306ONAC	T36N	R8E	6	0.09	P	P	P	P+	P+
SCOTCH THISTLE	BV307ONAC	T36N	R8E	17	0.99	P	P	P	P+	P+ or H
SCOTCH THISTLE	BV309ONAC	T38N	R8E	25	0.99	P	P	P	P+	P+ or H

SPECIES	ID_NUMBER	TOWN	RANGE	SECTION	ACRES	ALT2	ALT3	ALT4	ALT5	ALT6
SCOTCH THISTLE	BV311ONAC	T41N	R9E	33	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	DG029ONAC	T43N	R8E	6	0.09	P	P	P	P+	P+ or H
SCOTCH THISTLE	DG031ONAC	T44N	R13E	30	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	DG032ONAC	T44N	R12E	35	0.09	P	P	P	P+	P+
SCOTCH THISTLE	DG033ONAC	T44N	R12E	35	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	DG034ONAC	T44N	R12E	35	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	DG035ONAC	T43N	R12E	2	0.01	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	DG036ONAC	T43N	R12E	2	0.09	P	P	P	P+	P+ or H
SCOTCH THISTLE	DG037ONAC	T43N	R12E	2	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	DG038ONAC	T43N	R13E	7	0.09	P	P	P	P+	P+ or H
SCOTCH THISTLE	DG039ONAC	T43N	R13E	7	0.09	P	P	P	P+	P+
SCOTCH THISTLE	DG040ONAC	T43N	R11E	22	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	DG041ONAC	T43N	R10E	33	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	DG042ONAC	T43N	R10E	29	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	DG043ONAC	T41N	R8E	5	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	DG044ONAC	T41N	R8E	11	0.08	P	P	P	P+	P+ or H
SCOTCH THISTLE	DG045ONAC	T41N	R8E	2	0.08	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	DG050ONAC	T42N	R9E	17	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	DG051ONAC	T42N	R9E	17	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	DG052ONAC	T42N	R9E	21	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	DG053ONAC	T42N	R9E	16	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	DG054ONAC	T43N	R9E	12	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	DG055ONAC	T43N	R7E	24	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	DG056ONAC	T43N	R7E	23	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	DG057ONAC	T43N	R7E	16	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	DG058ONAC	T43N	R7E	22	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	DG059ONAC	T43N	R7E	23	1.42	P or H	P	P or H	P+	P+
SCOTCH THISTLE	DG060ONAC	T43N	R10E	33	0.09	P or H	P	P or H	P+	P+ or H

SPECIES	ID_NUMBER	TOWN	RANGE	SECTION	ACRES	ALT2	ALT3	ALT4	ALT5	ALT6
SCOTCH THISTLE	DG061ONAC	T41N	R8E	11	0.09	P	P	P	P+	P+ or H
SCOTCH THISTLE	DG062ONAC	T41N	R8E	2	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	DG063ONAC	T47N	R13E	31	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	DG064ONAC	T47N	R13E	31	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	DG065ONAC	T47N	R13E	31	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	DG066ONAC	T47N	R13E	31	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	DG067ONAC	T47N	R13E	31	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	DG068ONAC	T47N	R12E	25	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	DG069ONAC	T47N	R12E	26	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	DG070ONAC	T47N	R12E	26	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	DG071ONAC	T47N	R12E	30	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	DG072ONAC	T47N	R11E	26	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	DG073ONAC	T47N	R11E	22	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	DG074ONAC	T47N	R11E	28	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	DG075ONAC	T43N	R8E	6	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	DG076ONAC	T44N	R11E	34	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	DH026ONAC	T47N	R6E	1	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	DH028ONAC	T47N	R6E	1	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	DH029ONAC	T45N	R7E	7	0.07	P	P	P	P+	P+ or H
SCOTCH THISTLE	DH030ONAC	T44N	R6E	2	0.8	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	DH031ONAC	T45N	R6E	33	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	DH033ONAC	T45N	R6E	22	0.26	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	DH034ONAC	T44N	R5E	6	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	DH035ONAC	T44N	R6E	10	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	DH036ONAC	T44N	R6E	16	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	DH037ONAC	T44N	R6E	20	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	DH038ONAC	T44N	R6E	19	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	DH039ONAC	T43N	R6E	1	0.09	P	P	P	P+	P+

SPECIES	ID_NUMBER	TOWN	RANGE	SECTION	ACRES	ALT2	ALT3	ALT4	ALT5	ALT6
SCOTCH THISTLE	DH040ONAC	T43N	R5E	12	0.2	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	DH041ONAC	T43N	R5E	1	0.07	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	DH042ONAC	T45N	R6E	34	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	DH043ONAC	T44N	R6E	15	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	WM001ONAC	T38N	R15E	21	0.08	P	P	P	P+	P+ or H
SCOTCH THISTLE	WM002ONAC	T43N	R15E	33	0.1	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	WM003ONAC	T43N	R14E	12	0.1	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	WM004ONAC	T45N	R15E	14	9.72	P or H	P	P or H	G or P+	G or H
SCOTCH THISTLE	WM006ONAC	T45N	R15E	4	0.06	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	WM007ONAC	T45N	R15E	4	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	WM008ONAC	T45N	R15E	9	0.1	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	WM011ONAC	T46N	R14E	34	0.09	P	P	P	P+	P+ or H
SCOTCH THISTLE	WM012ONAC	T46N	R14E	34	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	WM013ONAC	T46N	R14E	34	0.09	P	P	P	P+	P+ or H
SCOTCH THISTLE	WM014ONAC	T45N	R14E	11	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	WM015ONAC	T45N	R14E	11	0.45	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	WM016ONAC	T48N	R15E	34	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	WM017ONAC	T47N	R15E	27	0.1	P	P	P	P+	P+ or H
SCOTCH THISTLE	WM018ONAC	T44N	R14E	26	0.21	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	WM019ONAC	T44N	R14E	14	0.08	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	WM020ONAC	T43N	R14E	1	0.37	P	P	P	P+	P+ or H
SCOTCH THISTLE	WM021ONAC	T43N	R15E	28	0.06	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	WM022ONAC	T42N	R15E	2	0.14	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	WM023ONAC	T43N	R14E	2	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	WM0240NAC	T43N	R14E	26	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	WM025ONAC	T42N	R15E	2	0.1	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	WM026ONAC	T42N	R15E	29	0.08	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	WM027ONAC	T42N	R15E	22	0.1	P or H	P	P or H	P+	P+ or H

SPECIES	ID_NUMBER	TOWN	RANGE	SECTION	ACRES	ALT2	ALT3	ALT4	ALT5	ALT6
SCOTCH THISTLE	WM028ONAC	T39N	R16E	11	0.1	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	WM036ONAC	T39N	R14E	9	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	WM037ONAC	T39N	R14E	9	0.13	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	WM040ONAC	T43N	R14E	2	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	WM041ONAC	T45N	R15E	26	0.1	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	WM042ONAC	T45N	R15E	15	0.1	P	P	P	P+	P+
SCOTCH THISTLE	WM043ONAC	T39N	R15E	32	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	WM044ONAC	T38N	R15E	33	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	WM045ONAC	T48N	R15E	34	0.09	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	WM051ONAC	T45N	R14E	27	0.19	P or H	P	P or H	P+	P+ or H
SCOTCH THISTLE	WM052ONAC	T42N	R15E	26	0.1	P or H	P	P or H	P+	P+ or H
SPOTTED KNAPWEED	BV001CEMA4	T40N	R9E	12	0.09	P	P	P	P+	P+
SPOTTED KNAPWEED	BV002CEMA4	T40N	R9E	14	0.99	P	P	P	P+	P+ or H
SPOTTED KNAPWEED	DG007CEMA4	T42N	R9E	7	0.09	P	P	P	P+	P+ or H
SPOTTED KNAPWEED	DG010CEMA4	T43N	R8E	28	0.06	P or H	P	P or H	P+	P+ or H
SPOTTED KNAPWEED	DG011CEMA4	T43N	R7E	24	0.09	P or H	P	P or H	P+	P+ or H
SPOTTED KNAPWEED	DG012CEMA4	T43N	R7E	24	0.09	P or H	P	P or H	P+	P+ or H
SPOTTED KNAPWEED	DG013CEMA4	T43N	R9E	28	0.09	P or H	P	P or H	P+	P+ or H
SPOTTED KNAPWEED	DG014CEMA4	T42N	R9E	6	0.01	P or H	P	P or H	P+	P+ or H
SPOTTED KNAPWEED	DH006CEMA4	T45N	R6E	34	0.09	P or H	P	P or H	P+	P+ or H
SPOTTED KNAPWEED	DH007CEMA4	T43N	R7E	5	0.07	P or H	P	P or H	P+	P+ or H
SPOTTED KNAPWEED	DH008CEMA4	T44N	R6E	10	0.09	P or H	P	P or H	P+	P+ or H
SPOTTED KNAPWEED	DH009CEMA4	T43N	R7E	5	0.06	P or H	P	P or H	P+	P+ or H
SPOTTED KNAPWEED	DH010CEMA4	T43N	R7E	5	1.92	P or H	P	P or H	P+	P+ or H
SPOTTED KNAPWEED	DH011CEMA4	T44N	R6E	14	0.09	P	P	P	P+	P+
SQUARROSE KNAPWEED	BV001CESQ	T38N	R8E	36	0.09	P or H	P	P or H	P+	P+ or H
SQUARROSE KNAPWEED	DG002CESQ	T42N	R8E	3	0.09	P or H	P	P or H	P+	P+ or H
SQUARROSE KNAPWEED	DH002CESQ	T42N	R4E	13	0.09	P	P	P	P+	P+ or H

SPECIES	ID_NUMBER	TOWN	RANGE	SECTION	ACRES	ALT2	ALT3	ALT4	ALT5	ALT6
SQUARROSE KNAPWEED	DH003CESQ	T45N	R6E	5	0.09	P	P	P	P+	P+
SQUARROSE KNAPWEED	DH008CESQ	T44N	R6E	17	0.09	P	P	P	P+	P+ or H
TALL WHITETOP	DG001LELA2	T43N	R7E	27	0.09	H	NT	H	P+	H
TALL WHITETOP	WM001LELA2	T42N	R15E	29	0.1	H	NT	H	P+	H
YELLOW STARTHISTLE	DG003CESO3	T43N	R9E	12	0.05	P or H	P	P or H	P+	P+ or H
YELLOW STARTHISTLE	DH001CESO3	T45N	R6E	33	0.09	P	P	P	P+	P+
YELLOW STARTHISTLE	DH002CESO3	T45N	R5E	24	0.09	P or H	P	P or H	P+	P+ or H
YELLOW STARTHISTLE	DH003CESO3	T44N	R6E	25	0.09	P or H	P	P or H	P+	P+ or H
YELLOW STARTHISTLE	DH004CESO3	T44N	R6E	24	0.09	P or H	P	P or H	P+	P+ or H
YELLOW STARTHISTLE	DH005CESO3	T44N	R6E	14	0.09	P or H	P	P or H	P+	P+ or H
YELLOW STARTHISTLE	DH006CESO3	T45N	R6E	8	0.86	P or H	P	P or H	P+	P+ or H
YELLOW STARTHISTLE	DH007CESO	T44N	R6E	14	0.09	P	P	P	P+	P+

Appendix C:

Safety and Spill Management

SPILL PLAN

U.S.D.A. FOREST SERVICE
MODOC NATIONAL FOREST

OIL AND HAZARDOUS SUBSTANCE
POLLUTION CONTINGENCY PLAN

APRIL, 2006

PREPARED BY: _____
MATT DORGAN, CIVIL ENGINEER

RECOMMENDED BY: _____
JED PARKINSON, FOREST ENGINEER

APPROVED BY: _____ 5/3/06
STANLEY S. SYLVA, FOREST SUPERVISOR

Appendix C: Spill and Safety Management

Pesticide spill prevention and clean-up, as well as storage, transport, and disposal procedures are covered in detail in Forest Service Handbook (FSH) 2109.12 Pesticide Storage, Transportation, Spills, and Disposal. Any herbicide projects would follow the direction given in this handbook. It is available for review at U.S. Forest Service offices.

This Spill and Safety Management Appendix is in two parts:

Part 1 contains the Oil and Hazardous Substance Polluion Contingecy Plan for the Modoc National Forest.

Part 2 consists of samples of Job Hazardard Analysis (JHA) for activities associated with those proposals presented in the FEIS.

Required Equipment

The following equipment should be available with vehicles or pack animals used to transport pesticides and in the immediate vicinity of all spray operations. The list will be adjusted annually to reflect technology and needs identified during the development of the annual operating plans for noxious weed control.

- A shovel
- A broom (except backcountry operations)
- 10 pounds of absorbent material or the equivalent in absorbent pillows
- Large plastic garbage bags
- Rubber gloves
- Safety goggles
- Protective overalls
- Rubber boots
- Material Safety Data Sheets will be reviewed with all personnel involved in the handling of pesticides.

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Oil And Hazardous Substance Pollution Contingency Plan

Herbicide spills will be treated in accordance with the Forest Oil and Hazardous Substance Pollution Contingency Plan which is updated regularly. The following is from the last update of April 2006.

Introduction

The Modoc National Forest (MDF) Oil and Hazardous Substance Pollution Contingency Plan establishes response procedures for hazardous materials incidents occurring within the Modoc National Forest. It is meant to minimize exposure and damage to human health and the environment that may be caused by the release or threatened release of hazardous materials.

This plan should be used for incident preparedness, during a hazardous material incident, and as a guideline to determine the jurisdiction of clean up.

The watersheds of the Modoc National Forest contain drinking water sources, wildlife habitat, and commercial and recreational resources. To protect these resources, every effort should be made, especially at the project planning stage, to safely contain oil and hazardous substances away from surface or subsurface water. Clean up cost of these waters may be prohibitive if hazardous material releases are not contained as soon as possible.

Objectives

- Provide for safety and health of the public and Forest Service employees and contractors involved in a hazardous material incident response.
- Provide a system for notification and response to accidental discharges of oil and hazardous substances on or threatening National Forest System lands.
- Provide procedures for clean up, abatement, disposal and restoration of a release of oil or hazardous substances.
- Emphasize Pollution Prevention on National Forest lands.
- Incorporate the Incident Command System (ICS) to provide Modoc National Forest employees with a clear and concise chain of command in the event of an accidental discharge of oil and/or hazardous materials on National Forest lands.

Authority

Authority for oil and hazardous substance pollution contingency planning is contained in the following documents:

- CERCLA – the Comprehensive Environmental Response, Compensation and Liability Act
- SARA - Super Fund Amendments and re-authorization Act of 1986
- 40 CFR Part 300, National Oil and Hazardous Substances Pollution Contingency Plan
- 40 CFR Part 302, Designation, Reportable Quantities and Notification

- Cost Recovery from Potential Responsible Parties (PRP's) are authorized in 40 CFR 300.160 and 300.315

Definitions

Hazardous Material Emergency Oil Spill – Any release or threat of release of a hazardous substance or petroleum product that presents an imminent and substantial risk of injury to human health or to the environment.

Release – Any spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping or disposing into the environment, OR the abandonment or discarding of closed containers of oil or hazardous substances.

(Releases that do not constitute an immediate threat; occur entirely within a facility; are federally permitted; are a routine application of a product (i.e. pesticide, paint); are not considered to be an emergency and are not covered by this plan.)

HazCat – A program designed to assist in the identification of an unknown material. Teams are set up through the EPA (Environmental Protection Agency) and will respond to incidents where product identification is a problem.

Reportable Quantities (RQ) – A threshold amount of oil or hazardous substance which, when exceeded, must be reported to the Office of Emergency Services (OES), provided by the Sheriffs Office.

The threshold amount of released hazardous substance so tabulated in 40 CFR Part 302.

- Any release which violates or has the potential to violate water quality standards.
- Any release of oil which causes "a film or sheen which discolors water surface or adjoining shorelines, or causes a sludge or emulsion to be deposited beneath the surface of the water or adjoining shorelines".
- Any pesticide release, outside of approved plan applications.
- Any petroleum product in excess of 42 gallons.

Responsibilites

Forest Supervisor – In addition to the responsibilities delegated in FSM 7443, R-5 Supplement, the Forest Supervisor shall:

- Designate an Emergency Response Coordinator per FSM 2160.43, also known as the Forest Spill Coordinator
- Provide dispatch capabilities through the Modoc Interagency Command Center Manager.
- Provide line officer input as needed in the event of a large incident.

Public Affairs Officer (PAO) – Due to the sensitive nature of hazardous spills, the PAO will provide official news releases and public announcements.

Forest Spill Coordinator (Emergency Response Coordinator) – The Sierra Cascade Province Safety and Health Officer

- may be assigned as an Alternate, or contact any spill coordinators from Neighboring forests.
- Be assigned as Incident Commander or as resource specialist to the Incident commander.
- Determine if a release is a reportable quantity and contact OES and Forest Service personnel where required.
- Provide for emergency procurement through Sierra Cascade Province Acquisitions section. Have a working knowledge of Regional Contracts for the clean up of Hazardous Materials.
- Notify Law enforcement if a release is possibly intentionally dumped, from a drug lab or other illegal activity. Cost recovery may depend on criminal investigation and prosecution.
- Annually update the Forest Oil and Hazardous Substances Pollution Contingency Plan.
- Have a working knowledge of the EPA Region IX Contingency Plan, the National Contingency Plan, and related 40 CFR's for pollution prevention.
- Insure that Forest First Responders receive proper training.
- Maintain a cache of spill response materials.
- Sign Hazardous Waste Manifests when disposing spilled hazardous material.

Modoc Interagency Command Center (Forest Dispatcher)

- Assign an Incident Commander, incident name and MDF incident number.
- Notify Forest Spill Coordinator (Emergency Response Coordinator) of any release of oil or hazardous substances (see Contacts, pg. 7).
- Request an incident job code from the Forest Financial Officer.
- Make required notifications in the absence of the Forest Spill Coordinator.
- Provide normal dispatch services.

District Ranger

- Works directly or through local law enforcement agencies to warn the public of a possible hazard, when notified of such by the Forest Dispatcher or the Spill Coordinator.
- Furnish district resources to assist in emergency response and subsequent clean up and remediation.
- Coordinate with the Forest PAO for public announcements and news releases. Due to the sensitive nature of this subject, only the PAO will make official news releases and public announcements.

Hazardous Material Incident First Responders (Hazmat First Responders)

- Provide for the safety of the public and personnel on scene of a hazardous material incident.
- Deny entry to untrained or unprepared persons.
- Initiate action based on size and complexity of release. When possible and safe to do so, reduce the potential risk to human health and the environment by containing the release. Initiate the Report of Hazardous Material Release form and relay to the Forest Spill Coordinator.
- Direct on scene resources providing for safety first.

- Perform as Incident Commander as assigned or until relieved by the IC of the agency of jurisdiction.
- Maintain certification in OSHA Hazardous Waste Operations (hazwoper) First Responder.
- CLEAN UP AND REMEDIATION OF HAZARDOUS MATERIALS WILL NOT BE PERFORMED BY FOREST SERVICE PERSONNEL. Containment by placement of dikes, absorbent material or impervious materials may be attempted where risk to personnel is low.

Other Forest Personnel

The first employee to encounter a release of oil or hazardous substances and is aware of the significance, has the responsibility to report the release to Modoc Interagency Command Center. Personnel who encounter a release of an unknown substance shall treat it as hazardous. The primary objective of the first on scene is the protection of personnel and the public.

Jurisdiction

Release Location	Agency with Jurisdiction
Forest Service Land	Forest Service
State Highways & Rights-of-Way	California Highway Patrol
County Roads & Rights-of-Ways	Appropriate County Road Dept.
Railroads	Modoc Western, Goose Lake RR
In or Threatening Streams	CA Dept. of Fish and Game
Illegal Acts Dumps	Appropriate County Sheriff Dept.

Response Procedures

The source of a release of oil or hazardous substances will affect the Forest Service response:

When the release is from a Forest Service Force Account operation, the project leader has the responsibility to take action. All activities in the affected area should be suspended and the Forest Dispatcher notified of the release. The project leader has the role of Hazmat First Responder if so qualified. If not, the Forest Dispatcher will assign a First Responder.

When the release is from a Forest Service contractor or permittee, they have the responsibility to take appropriate action. However, failure to take appropriate action gives the Forest Service project leader (Timber Sale Administrator, COR, inspector, Permit Administrator, etc) authority to take over response actions. Usually, a level of cooperation is achieved with the contractor taking responsibility for clean up, and Forest Service Emergency crews responding to secure access to the incident. In all cases, the Forest Dispatcher and the Forest Spill Coordinator are to be notified to make appropriate determinations and upward reporting.

When the release is from a third party operation, the Forest Service will respond if the third party fails to take appropriate action. The Forest Dispatcher and the Forest Spill Coordinator need to be notified to determine if appropriate action is being taken and required reporting is made.

When the release is from a transportation related incident, the Forest Service will respond if the driver is unable or fails to take appropriate action. The Forest Dispatcher and the Forest Spill Coordinator need to be notified to assist the appropriate jurisdiction determine if appropriate action is being taken and required reporting is made.

When oil or hazardous substances are abandoned or dumped on Forest Service land, whether in sound containers or releasing directly to the environment, notify the Forest Dispatcher immediately. The Forest Dispatcher will assign an Incident Commander, the Forest Spill Coordinator and Law Enforcement.

Reporting Procedures

The nature and severity of a release of oil or hazardous substances will determine the extent of upward reporting. All releases are to be reported to the Forest Dispatcher or the Forest Spill Coordinator (who will contact the other). They will make all further required reports.

When any of the five criteria of Reportable Quantities are met, OES (Office of Emergency Services) for the state and the respective counties are to be notified by telephone. The Forest Service Environmental Engineer in the Regional Office should also be notified.

The Public Affairs Officer, the District Ranger and the Forest Supervisor should all be notified of any release, regardless of severity. The Forest leadership should not be surprised by a public inquiry about a recent release of which they were unaware.

Required Training

- Emergency Response Coordinator (Spill Coordinator) – OSHA 40 hr classroom training: 8 hr. annual refresher.
- First Responder, Hazardous Material Incident– OSHA Hazardous Waste Operations (Hazwoper) First Responder 24 hr classroom training; 8 hr. annual refresher.
- All Employees – Hazmat awareness.

Project Planning

All projects on the forest that propose to use petroleum products in excess of planning threshold quantity or hazardous substances in excess of reportable quantities are required to have a written Pollution, Prevention, Control and Countermeasures Plan (40 CFR Part 112).

Planning threshold quantity for petroleum products is cumulative 1320 gallons when considering all containers (full or not) 55 gallons capacity or larger. This includes and combines all grades of petroleum products: fuels in bulk storage, hydraulic fluid, waste oil, etc. One exception is a fuel tank used solely to power the motor vehicle that the tank is mounted on.

The Pollution, Prevention, Control and Countermeasures Plan must consider:

- Staging areas that employ secondary containment in defensible, non-sensitive areas.
- Reduction of quantities used at any one time and place.
- Planning to avoid crossing live water or sensitive areas when accessing project areas.
- Identify specialized equipment for proper safe handling of hazardous products.
- Maintaining a stock of absorbent or impervious materials to control accidental release.
- Have available communication and contacts in the event of a release.
- Maintaining MSDS's (Material Data Safety Sheets) and specialized PPE (Personal Protective Equipment) on hand for employees and emergency response personnel.

Available Resources

Contractors for emergency spill response and hazardous waste clean up:

- A/C Industrial Services, Chico, CA 530-343-5488 Reference contract # AG-91S8-C-06-0025/0002
- Tetra Tech, San Francisco, CA 415-543-4880 Reference contract # AG-91S8-C-06-0024/0003
- PARC Environmental Services, Fresno, CA 559-233-7156 Reference contract # AG-91S8-C-06-0026/0002
- NRC Environmental Services, Alameda, CA 510-749-1390 Reference contract # AG-91S8-C-06-0027/0002

The use of these Region 5 contracts are not mandatory, but are set up as a quick and convenient option for Forest Service use. Private parties are free to contact these companies as well. The Forest Spill Coordinator, Sierra Cascade Province Acquisitions and the Regional Environmental Engineer can all assist in using these contractors.

Any disposal of waste must be transported by a State Certified Hazardous Waste Hauler (such as these contractors), in a certified vehicle, to a certified facility. A manifest must be accurately filled out and signed by trained personnel, using the State EPA Hazardous Waste Generator Number, "CAL 000022954."

Emergency response spill kits are located at South Fork Compound warehouse and at the Big Valley Ranger Station. Spill kits are purposely limited in that local personnel are not trained to use more extensive spill kits. Spill kits typically include petroleum absorbing materials (pads and skimming booms), impervious plastic sheets, and sealable 55 gallon drums.

MSDS's (Material Safety Data Sheets) – MSDS's contain important information regarding the safe handling of a product and should be referenced whenever possible when responding to an incident. All Forest Service and related projects should have MSDS's available. They are also available on-line at http://msds.ehs.cornell.edu/msdssrch.asp and http://jrm.phys.ksu.edu/Safety/msds.html.

DOT (Department of Transportation) Orange Book – The North American Emergency Response Guidebook is widely available in Forest Service vehicles and offices. The Forest Dispatcher maintains a copy. The Orange Book provides quick reference for most common hazardous substances found in transportation.

CHEMTREC is the Chemical Transportation Emergency Center, a public service of the Manufacturing Chemicals Association. They provide valuable information 24/7 when chemicals are involved in fire, explosions or spills.

Cost Recovery

DOCUMENTATION CANOT BE OVERSTRESSED! The cost of an emergency response to an oil or hazardous substance incident and the related clean up and restoration is not routinely covered by forest funds. Whether the financial responsibility falls on the Forest Service, a contractor or permittee, or other third party, all costs will be scrutinized and will need to be well documented to be reimbursed. The Forest Dispatcher will request a reimbursable account from the Forest Financial Officer for all involved in the incident. Recoverable costs may include:

- Personnel time and overtime.
- Equipment use and mileage
- Per diem
- Supplies
- Damage to facilities
- Restoration of environmental damage

Contacts

Office of Emergency Services (County offices are reached by calling the Sheriff's Office)

- California State O.E.S. 800-852-7550 or 916-845-8911
- Modoc 233-4416
- Lassen 251-8013
- Siskiyou 842-8300

Forest Contacts

- Forest Spill Coordinator – Ron Rhodes 299-8427;
- Alternate Spill Coordinator – Matt Dorgan 233-8851; 233-8675
- SCP Safety & Health Officer – Mike Martinez 252-6437
- DG/WM Districts Ranger, Jim Irvin – 233-8812
- BV/DH Districts Ranger, Laurence Crabtree – 299-8410
- Public Affairs Officer, Laura Williams – 233-8713
- Forest Supervisor, Stan Sylva – 233-8700

Regional Office Contacts

- Environmental Engineer, Dennis Geiser – 707-562-8729
- Pesticide Use Coordinator, Dave Bakke – 707-562-8916

State of California

- CA Dept. of Fish and Game 257-5206
- CA highway Patrol 257-2191
- Cal Trans 225-3066

County Road Departments

- Modoc – 233-6403
- Lassen – 251-8116
- Siskiyou – 842-8250

Railroads

- Burlington Northern RR 800-832-5452; 541-880-5639; 541-891-7435
- Modoc Northern RR (parent company Utah Central) 667-2500
- Lake County RR 541-219-1948

Note:

- Burlington Northern runs Klamath Falls to Nubieber and south.
- Modoc Northern runs Klamath Falls to Alturas.
- Lake County runs Lakeview to Alturas.

CHEMTREC – 800-424-9300

MSDS sources - http://msds.ehs.cornell.edu/msdssrch.asp

http://jrm.phys.ksu.edu/Safety/msds.html.

Job Hazard Analysis

In addition the above Forest Service policy requires project supervisors to complete or review a Job Hazard Analysis for each project undertaken annually. The following examples are samples of Job Hazard Analysis for activities associated with noxious weed treatments. The examples attached are for field work, weed cutting, vehicle travel, and application of herbicides.These samples will be updated and modified to reflect the specific sites and treatments provided in the annual noxious weed treatment program of work.

FS-6700-7 (2/98)

U.S. Department of Agriculture Forest Service	1. WORK PROJECT/ACTIVITY Field Work	2. LOCATION Modoc National Forest	3. UNIT MDF
JOB HAZARD ANALYSIS (JHA) References-FSH 6709.11 and -12 (Instructions on Reverse)	4. NAME OF ANALYST Robert Haggard	5. JOB TITLE Public Services Staff Officer	6. DATE PREPARED 01/26/2006

7. TASKS/PROCEDURES	8. HAZARDS	9. ABATEMENT ACTIONS Engineering Controls * Substitution * Administrative Controls * PPE
COMMUNICATION	Safety, crew unity	Talk to each other. Let other crewmembers know when you see a hazard. Avoid working near known hazard trees. Yell "ROCK!" if you see one start to roll down the hill. Always know the wherabouts of fellow crewmembers. Supervisors or crew bosses will carry a radio and spare batteries. Be familiar with the communication plan and know your assigned frequency.
WALKING AND WORKING IN THE FIELD	Falling down, twisted ankles and knees, poor footing	Always watch your footing. Slow down and use extra caution around logs, rocks, and animal holes. Extremely steep slopes (>50%) can be hazardous under wet or dry conditions; consider an alternate route. Tree root holes are prevelant and should be flagged. Work boots, hiking boots, or sturdy shoes will be required. Open toed shoes such as; sandals, tennis shoes, and the like are prohibited.
	Falling objects	Wear your hardhat for protection from falling limbs and pinecones, and from tools and equipment carried by other crewmembers. Stay out of the woods during extremely high winds.
	Damage to eyes	Watch where you walk, especially around trees and brush with limbs sticking out. Exercise caution when clearing limbs. Advise wearing eye protection. Ultraviolet light from the sun can be damaging to the eyes; look for sunglasses that specify significant protection from UV-A and UV-B radiation.
	Bee and wasp stings	Watch for respiratory problems. Notify Communications and get person to a doctor immediately if there is trouble breathing. Gently scrape stinger off of one is present. Apply analgesic swab and a cold pack if possible, and watch for infection. Flag the location of any known nests and inform other crewmembers. Advise packing an inhaler and Benadryl or Epi-pen if you are prone to severe allergic reaction.
	Tools and Equipment	Supervisors have the responsibility to : 1) ensure that tools are not modified or used in any manner that increases the risk of injury, 2) ensure that tools remain in a safe condition through periodic inspection and repair. This includes tools furnished by Volunteers. 3) Monitor Volunteers performance periodically to ensure proper methods are followed. Gloves shall be worn while performing work tasks.
	Lifting and Bending	Ask for help if the load is too heavy. Do not try to lift or otherwise move material beyond abilities.
	Working with others	Avoid injury to yourself and others by maintaining awareness of fellow crew members; wear hardhats.
	Stings from contact with thistle plants and blisters from use of hand tools	Wear leather gloves to protect hands and long sleeved shirt to protect arms.
ENVIRONMENTAL HEALTH CONSIDERATIONS	Heat Stress	Remain constantly aware of the four basic factors that determine the degree of heat stress (air temperature, humidity, air movement, and heat radiation) relative to the surrounding work environmental heat load. Know the signs and symptoms of heat exhaustion, heat cramps, and heat stroke. Heat stroke is a true medical emergency requiring immediate emergency response action. NOTE: The severity of the effects of a given environmental heat stress is decreased by reducing the work load, increasing the frequency and/or duration of rest periods, and by introducing measures which will protect employees from hot environments. Maintain adequate water intake by drinking water periodically in small amounts throughout the day (flavoring water with citrus flavors or extracts enhances palatability). Some over hydration is strongly recommended. Curtail or suspend physical work when conditions are extremely severe
	Wind	Terminate all work during periods of high winds due to snag hazards.

	Dusty Conditions	Dust masks will be worn while working in dusty conditions along with eye protection
	Lightning	Although most common in the summer, thunder and lightning can occur anytime. If caught in a storm near a vehicle, return to the vehicle and stay inside while the storm is most active. Park vehicle in an open area away from trees. Turn off radios during the storm. Lightning is more likely to strike when radio transmission occurs. After the storm passes, turn forest radio on and check in with communications. If caught in a storm away from your vehicle, try to find some form of building or shelter. DO NOT seek shelter under large trees or open areas. Stay off ridge tops and mountain tops. Seek shelter in low lying areas such as a ditch or cave. High winds can snap off snags and healthy trees unexpectedly.

10. LINE OFFICER SIGNATURE	11. TITLE	12. DATE

Previous edition is obsolete

FS-6700-7 (2/98)

U.S. Department of Agriculture Forest Service		1. WORK PROJECT/ACTIVITY Weed Cutting	2. LOCATION Various	3. UNIT Modoc NF
JOB HAZARD ANALYSIS (JHA) References-FSH 6709.11 and -12 (Instructions on Reverse)		4. NAME OF ANALYST Robert Haggard	5. JOB TITLE Public Services Staff Officer	6. DATE PREPARED 01/26/2006
7. TASKS/PROCEDURES	8. HAZARDS	9. ABATEMENT ACTIONS Engineering Controls * Substitution * Administrative Controls * PPE		
Pre Use Inspection of weed trimmer	Missing & Loose Parts. Lack of Maintenance	Before running Trimmer. Check for missing , worn , and loose parts. Ensure guards are attached. Consult operator's manual for instruction. Inspect fuel lines and fuel tank. Do not repair unit without proper instructions. Follow Manufacturers Maintenance and servicing guidelines. Adjust handle and strap for comfort and balance. If unit is unsafe to operate tag it out of service in a position that will be immediately obvious to anyone attempting to operate.		
Operator	Lack of Training	Read the operators manual. Locate the safety decals on your unit. Make sure the decals are legible and that you understand and follow the instructions on them. You should be in good mental and physical health.		
Work site	Uneven and steep terrain. Ground squirrel holes. Bottles & Glass, Hidden Objects, Snags and Widow Makers. Bees & Snakes	Inspect the area before using the unit. Remove objects which the unit could throw or become entangled with. Remember where there are obstructions to be avoided. Mark or flag hazards. Remove dead or weaken branches and trees. Public and other workers must be warned, and children and animals must be prevented from coming within 50 feet while the trimmer is in use.		
Proper PPE	Flying Objects: Dust, glass, rocks, cans and wood. Hearing Loss	Wear safety glasses or goggles eye protection ANSI Standard Z87.1 compliance. Face shield maybe used only if safety glasses or goggles are worn underneath. Again the Face shield shall be ANSI Z87.1 compliance. Wear ear plugs or hearing protection headsets. Gloves must be worn. Long sleeves and long pants and sturdy boots. Dust Masks may be worn.		
Operations	Flying Objects, Cutting Head Hot Muffler Hot gear shaft	Never operate the cutting head above your knees. Always start the unit on the ground. shut down immediately if the unit starts to shake or vibrate. Keep feet and hands away from rotating cutting head. Do not operate one handed. Always hold the unit with your fingers and thumbs encircling the handles. Avoid touching muffler and gear shaft until the unit has time to cool.		
Fueling	Fire Spills	Fill unit from labeled fuel container only. Let unit cool before fueling. Never refuel running unit. Wear eye protection. Wipe any spilled fuel from unit and move at least 10 feet from fueling spot before starting. Do not smoke or bring flame or sparks near fueling area. Have firefighting extinguishing device near by.		
Workplace	Violence or Threat of Violence	The most effective way to ensure a safe workplace is to establish and maintain a healthy, professional environment which fosters mutual respect and encourages open communication. Recognize the warning signs of violence. Watch for physical signs. Threats or acts of violence must be acted upon immediately. Notify ECC immediately if Law Enforcement is needed.		
Emergency Evacuation Procedures	Serious Illness or Injury	First aids kits shall be available at each facilities and in each vehicle. Supervisors or Work Leader shall be trained in First Aid and CPR. Minor injuries should be treated by agency trained employees. Seriously injured or ill employee needing Advanced Life Support and transport, notify ECC by Radio Or 911 by telephone. render first aid to the sick and injured until local agency Medical First Responder takes over care of the employee. Notify your Supervisor ASAP. Complete the required paperwork.		
10. LINE OFFICER SIGNATURE	11. TITLE	12. DATE		

FS-6700-7 (2/98)

U.S. Department of Agriculture		1. WORK PROJECT/ACTIVITY	2. LOCATION	3. UNIT
Forest Service		Vehicle Travel	Modoc National Forest	MDF
JOB HAZARD ANALYSIS (JHA)		4. NAME OF ANALYST	5. JOB TITLE	6. DATE PREPARED
References-FSH 6709.11 and -12 (Instructions on Reverse)		Robert Haggard	Public Services Staff Officer	01/14/2006
7. TASKS/PROCEDURES	8. HAZARDS	9. ABATEMENT ACTIONS Engineering Controls * Substitution * Administrative Controls * PPE		
Operating vehicles - general	Break-downs; Flat tires; Exhaust leaks; Collisions; UFP's (Unidentified Flying Projectiles); Carbon monoxide poisoning;	a) Keep current on preventive maintenance checks. b) Walk around vehicle prior to leaving compound to check for flat tires, fluid leaks, etc. c) Daily vehicle condition check should also include: lights, windshield wipers, fluid levels, seat belts. d) Make sure the vehicle has a first aid kit and that all medications are current. e) Make sure vehicle is equipped with warning signs and/or flares and that the warning flashers work. f) Vehicle should have FS and CB radios that are in good working condition g) Vehicles carrying tools will have a safety cage in place. All hand tools must be equipped with safety features, (e.g.. blade guards), first aid kit and fire extinguisher must be securely mounted. h) Vehicle must be equipped with chock blocks. i) Check and maintain vehicle's exhaust system. j) All drivers will be training in defensive driving before operating the vehicle. k) Sign out with vehicle number, destination, estimated time of return - radio in if plans change. l) Make sure you have enough gas to get you there and back again.		
Travel on forest roads.	a) Collision with other vehicles; b)Collision with animals or objects; c)Running or Skidding off road; d)Icy and/or muddy roads; e) UFO's (flying objects kicked up by other vehicles e.g. rocks); f) Poor visibility; g) Backing; h) Clearing obstacles from roadway; i) Carbon monoxide poisoning. j) Vehicle wear/tear	a) Drive defensively, drive at safe speeds, use seat belts, watch ahead for oncoming traffic, use lights, pull over to right and stop if vehicles following want to pass. Call out mile locators if you have a CB. Adjust your speed so that you are able to stop in less than 1/2 your line of sight. b) Use care in tall brush and grass, clear debris from roadways rather than trying to drive over or around. c) Drive on the main roadway, avoid soft gravel shoulders, do not straddle a gravel berm or drive with wheels on berm, pull over and stop if you have to look at a map d) Slow down! Don't' drive on the on the road if there is potential for resource or vehicle damage. Use 4WD drive to get out of trouble, not into trouble Consider carrying and using chains if conditions warrant. Know how to put on chains. Ask about road conditions before traveling. e) Follow from a safe distance. Pull off road when oncoming vehicle is passing. f) Keep windows clean inside and out, keep dash clear. Maintain safe speeds, replace badly damaged or cracked windshields, make sure wipers are in good repair g) Try to park so that you don't have to back up to leave. Use mirrors and a spotter, if you don't have a spotter, get out to check behind your vehicle before backing. h) Cut trees into easily removable pieces, use proper lifting techniques. i) Keep vehicle well ventilated when idling/heating by opening a window at least 6 inches. j) When descending forest roads, use a lower gear to control your speed, rather than the brakes. Take care of the vehicle you drive.		
Parking	Run-away vehicle	Use chock blocks when parking, set parking brake, don't leave vehicle unattended when it is running.		
10. LINE OFFICER SIGNATURE		11. TITLE		12. DATE

FS-6700-7 (11/99)

U.S. Department of Agriculture Forest Service	1. WORK PROJECT/ACTIVITY Herbicide Weed Treatment	2. LOCATION Modoc National Forest	3. UNIT Modoc NF
JOB HAZARD ANALYSIS (JHA) References-FSH 6709.11 and -12 (Instructions on Reverse)	4. NAME OF ANALYST Robert Haggard	5. JOB TITLE Public Service Staff Officer	6. DATE PREPARED 1/26/2006

7. TASKS/PROCEDURES	8. HAZARDS	9. ABATEMENT ACTIONS Engineering Controls * Substitution * Administrative Controls * PPE
General herbicide use	Exposure/Contamination	Read the product label before each use and follow the directions
Transporting herbicides	Spill/contamination	Keep chemicals and related equipment in designated area of vehicle outside the passenger area. If bedliners are used only use those made of non-porous material. Carry herbicide containers inside a catch basin. Read the Material Safety Data Sheets for herbicide used.
Mixing herbicides	Exposure/spills	Wear face shield or goggles, chemical resistant rubber gloves, apron, long sleeves, pants, and chemical resistant rubber boots. Fill tank half way with water, add herbicide, then finish filling tank. Read Material Safety Data Sheets for specific herbicides. Use only recommended amounts. Close container immediately after use.
	Synergism	Be aware of the effects of mixing chemicals. Read labels.
Spraying herbicides	Exposure	Wear personal protective equipment: hard hat as basic safety equipment and to protect head from herbicide drift; non-vented goggles to protect eyes from drift; respirator to prevent inhalation of drift (if respirator doesn't fit properly it doesn't do any good); long sleeves and long chemical resistant gloves to protect arms and hands; long pants and unlined, chemical resistant boots. Use unlined equipment because liners can carry residue. Wear disposable or washable coverall as added protection against drift or spills. Remove coveralls before getting back in vehicle. Wash or dispose of after each use. Avoid walking through treated areas. Do not touch your face with gloves. Think about hands: do not touch your face or food until hands are washed. Treat chemicals with respect. Don't get complacent. Do not spray if temperature is over 90 degrees F because more vapors created. Do not spray if winds are above about 7 miles per hour.
	Trips/Falls	Take extra when walking with PPE on. Goggles and respirators can reduce your field of vision. Watch your footing. A backpack sprayer can throw off your balance. Watch your footing and balance.
Clean-up	Contamination	After emptying sprayer tank fill with water and spray as if it were a herbicide. Wash outside of sprayer with soap and water in the field. Wash all personal protective equipment in the field with soap and water then wash again with warm soapy water at the station. Return all equipment to proper storage area. Bathe or shower as soon as possible after spraying. Wash clothing separate from other laundry.
10. LINE OFFICER SIGNATURE	11. TITLE	12. DATE

Appendix D:

Best Management Practices

Appendix D: Best Management Practices (BMP's)

Best Management Practices were designed by the Forest Service in conjunction with the EPA and State of California to meet the Clean Water Act. During 1998-2000 BMP's were evaluated and updated within Region 5 of the USDA Forest Service. These recommended BMP's were certified by the EPA and approved by the State of California Water Resources Control Board as the most effective land management tools in meeting the Clean Water Act. Under the Memorandum of Agreement between Forest Service and the State of California, annually the Forest Service would evaluate the implementation and effectiveness of prescribed BMP's. This program is known as the Best Management Practice Evaluation Program (BMPEP). The results of this monitoring program would be reported annually to the State of California via the Regional Office of Region 5 USDA Forest Service.

The most recent report from this program, in 1998, analyzed over 2,300 randomly selected observations of BMP implementation and effectiveness (USDA Forest Service 1998). The assessment used 28 different monitoring procedures for different categories of BMPs. Key findings included:

"BMP implementation for individual evaluations ranged between 47 and 96% implemented. For all evaluations combined, implementation was found at 83% of the observation sites.

On-site effectiveness for individual evaluations ranged between 40 and 97%. For all evaluations combined, practices were rated as effective at 82% of the observation sites."

The 1989 Region 5 vegetation management EIS (USDA Forest Service 1989) required monitoring of water quality for herbicide treatments applied on national forests in California. Results of this monitoring are discussed in this FEIS, and data from many post-1989 herbicide monitoring projects are summarized in Appendix B.

This appendix lists Best Management Practices required for herbicide application in the USDA Forest Service, Pacific Southwest Region. These BMPs are further documented in "Water Quality Management for National Forest System Lands in California Best Management Practices (USDA Forest Service 2000). This document describes the pesticide (including herbicide) BMPs as follows, as part of a group with other BMPs for vegetation management:

The following are the BMPs for the control of non-point source pollution associated with pesticide use and prescribed forest and range management activities. Each BMP was formulated based on the administrative directives that guide and direct the Forest Service to plan and implement vegetation management activities on NFS land.

The line officer on each administrative unit is responsible for fully implementing the manuals, handbooks, and directives that require water quality protection and improvement during vegetation manipulation activities. The directives provide details on methods to incorporate water quality controls into each phase of the vegetation manipulation program.

Trained and qualified personnel would be available to assist the vegetation manipulation work force with technical assistance to identify beneficial uses, the most recent state-of-the-art water quality control methods and techniques, and conduct BMPEP.

BMP 1.8 Streamside Management Zone Designation

Objective: designate a zone along riparian areas, streams and wetlands that will minimize potential for adverse effects from adjacent management activities. Management activities within these zones are designed to improve riparian areas.

Explanation: As a preventive measure, factors such as stream class, channel aspect, channel stability, side slope are considered in determining the limitations on activities within the width of the SMZ. The SMZ will be a zone of closely managed activity. It is a zone, which acts as an effective filter and absorptive zone for sediment; maintains shade; protects aquatic and terrestrial riparian habitats; protects channels and stream banks; promotes floodplain stability.

Implementation: Identify the streamside management zone requirements during the environmental documentation process. Each Forest's LRMP identifies specific measures to protect these zones. As a minimum, forest requirement must be identified and implemented.

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

BMP 1.19 Stream course and Aquatic Protection

Objective:

To conduct management actions within these areas in a manner that maintains or improves riparian and aquatic values.

To provide unobstructed passage of storm flows.

To control sediment and other pollutants entering stream courses.

To restore the natural course of any stream as soon as practicable, where diversion of the stream has resulted from management activities.

Explanation: This management practice employs administrative, preventive and corrective measures to meet the objectives.

Implementation: The width of the SMZ and activities will be determined through the IDT process and will be consistent with Modoc National Forest Land and Resources Management Plan Standards and Guidelines.

BMP 5.7. Pesticide Use Planning Process

Objective: To introduce water quality and hydrologic considerations into the pesticide use planning process.

Explanation: The Pesticide Use Planning Process is the framework for incorporation of water quality protection requirements contained in BMPs 5-8 through 5-14 into project design and management. The project environmental document will incorporate these considerations in discussion of environmental effects and mitigation measures.

Implementation: The IDT will evaluate the project in terms of site response, social and environmental impacts and the intensity of monitoring needed.

The responsible line officer will prepare environmental documentation, Project Plan, and the Safety Plan. Project plans and safety plans will specify management direction.

Approval or for proposed pesticide projects will proceed according to direction established in region 5 supplement No. 2100-95-1 to 2150.

BMP 5.8. Pesticide Application According to Label Directions & Applicable Legal Requirements

Objective: To avoid water contamination by complying with all label instructions and restrictions for use.

Explanation: Directions found on the label of each pesticide are detailed and specific, and include legal requirements for use.

Implementation: Constraints identified on the label and other legal requirements of application must be incorporated into project plans and contracts.

For force account projects, responsibility for ensuring that label directions and other applicable legal requirements are followed will be the responsibility of the Forest Service project supervisor who will have a Qualified Applicator Certificate.

For contracted projects, it will be the responsibility of the contracting officer, or the COR to ensure that label directions and other applicable legal requirements are followed.

BMP 5.9. Pesticide Application Monitoring & Evaluation

Objective:

To determine whether pesticides have been applied safely, restricted to intended target areas, and have not resulted in unexpected non-target effects.

To document and provide early warning of possible hazardous conditions resulting from possible contamination of water or other non-target areas by pesticides.

To determine the extent, severity and possible duration of any potential hazard that might exist.

Explanation: This practice documents the accuracy of application, amount applied, and any water quality effects so as to reduce, or eliminate hazards to non-target species. Monitoring methods include spray cards, dye tracing (fluorometry), and direct measurement of particles in, or near water. Type of pesticide, type of equipment, application difficulty, public concern, beneficial

uses, monitoring difficulty, availability of laboratory analysis, and applicable Federal, State and local laws and regulations are all factors considered when developing the monitoring plan.

Implementation: The need for a monitoring plan will be identified during the pesticide use planning process as part of the project environmental evaluation and documentation.

The water quality-monitoring plan will specify: (See Appendix C)

- Who will be involved and their roles and responsibilities;
- What parameters will be monitored and analyzed;
- When and where monitoring will take place;
- What methodologies will be used for sampling and analysis, and the rationale behind each of the preceding specifications?

A water quality specialist and the project leader will evaluate and interpret the water quality monitoring results in terms of compliance with and adequacy of project specifications.

BMP 5.10. Pesticide Spill Contingency Planning

Objective: To reduce contamination of water by accidental pesticide spills.

Explanation: This is a preventative and corrective practice. The Pesticide Spill Contingency Plan prepared by each Forest consists of predetermined actions to be implemented in the event of a pesticide spill. The plan lists who will notify whom and how, time requirements for the notification, guidelines for spill containment, and who will be responsible for cleanup.

Site-specific planning will be included in the project safety plan.

Implementation: Pesticide spill contingency planning will be incorporated into the Project Safety Plan.

The site-specific environmental evaluation and resulting documentation will include public and other agency involvement in plan preparation. The plan will list the responsible authorities.

BMP 5.11. Cleaning and Disposal of Pesticide Containers and Equipment

Objective: To prevent water contamination resulting from cleaning, or disposal of pesticide containers.

Explanation: The cleaning and disposal of pesticide containers must be done in accordance with Federal, State, and local laws, regulations, and directives. Specific procedures for the cleaning and disposal of pesticide containers are documented in the Forest Service Pesticide Use Management and Coordination Handbook (FSH 2109.114), and State and local laws.

Implementation: The Forest, or district Pesticide Use Coordinator (Qualified Applicator) will approve proper rinsing procedures in accordance with State and local laws and regulations, and arrange for disposal of pesticide containers when Forest Service personnel apply the pesticide.

When a contractor applies the pesticide, the contractor will be responsible for proper container disposal in accordance with label directions and Federal, State, and local laws.

BMP 5.12. Streamside Wet Area Protection during Pesticide Spraying

Objective: To minimize the risk of pesticide inadvertently entering waters, or unintentionally altering the riparian area, SMZ, of wetland.

Explanation: When spraying pesticides for meeting non-riparian area land management objectives, an untreated strip of land and vegetation will be left alongside surface waters, wetlands, riparian areas, or SMZ. Strip width will be established by the IDT, and when county permits are required, in consultation with the county agricultural commissioner. When spraying pesticides for purposes of meeting within riparian area land management objectives localized buffers around target species will be established and only hand application will be used.

Factors considered in establishing buffer strip widths are beneficial water uses, adjacent land uses, rainfall, wind speed, wind direction, terrain, slope, soils and geology. The persistence, mobility, acute toxicity, bioaccumulation, and formulation of the pesticide are also considered. Equipment used, spray pattern, droplet size, and application height and past experience are other important factors.

Implementation: The IDT will identify the perennial and intermittent surface waters, wetlands, riparian areas, and SMZ from onsite observation, and map them during project planning.

When included as part of the environmental evaluation and documentation, the Project Work Plan, the protection of surface waters, wetlands, riparian areas, or the SMZ will be the responsibility of the project supervisor for force account projects, and the COR will be responsible on contracted projects.

The certified applicators must be briefed about the location of surface waters, wetlands, riparian areas, or SMZ. Buffer strip boundaries will be flagged, or otherwise marked when necessary to aid identification from the air.

BMP 5.13. Controlling Pesticide Drift during Spray Application

Objective: To minimize the risk of pesticide falling directly into water, or non-target areas.

Explanation: The spray application of pesticide is accomplished according to prescription which accounts for terrain, and specifies the following: spray exclusion areas, buffer areas, and factors such as formulation, equipment, droplet size, spray height, application pattern, flow rate, and the limiting factors of wind speed and direction, temperature, and relative humidity.

Implementation: The prescription will be prepared by an IDT working with the Forest or District Pesticide Use Coordinator during project planning.

For force account projects, the Forest Service project supervisor will be responsible for ensuring that the prescription is followed during application and for closing down application when specifications are exceeded.

These will also be the responsibility of the Contracting Officer, of the COR, on contracted projects.

BMP 7.6 Water Quality Monitoring

Objective: To collect representative water data to determine base line conditions for comparison to established water quality standards, which are related to beneficial uses for that particular watershed.

Explanation: Water quality monitoring is a mechanism, which evaluated the implementation and effectiveness of a management prescription in protecting water quality (beneficial uses identified in the environmental analysis). A water quality-monitoring plan will be part of an environmental document, a management plan, or a special use permit or it will be developed in response to other needs.

Implementation: A water quality-monitoring plan will be written, or reviewed by a hydrologist and will be implemented by the hydrologist or by other qualified personnel. The actual analysis of the data will be performed by the hydrologist, State certified laboratory, or other trained Forest personnel, or combination of these as appropriate.

Interpretation of the data and any reporting will be accomplished by the hydrologist, or other trained personnel. The EPA STORET system will be used for computer storage of all water quality data collected.

Appendix E: Herbicide Information

Introduction

This appendix provides specific information about the nature and effectiveness of the herbicides selected for use on the fourteen noxious weed species.

Herbicide treatment of infestations will use approved herbicides for the targeted weed species. Herbicides are part of a collective group of products called pesticides used to control vegetation. Herbicide will be applied directly to weed leaves and stems. A surfactant may be used to enable herbicide penetration of the plant cuticle, a thick, waxy layer present on leaves and stems of most plants.

All herbicides registered for use in the U.S. and California must have a label certifying that the Federal Environmental Protection Agency (EPA) and the California Department of Pesticide Regulation (DPR) have approved the herbicide for use. Product labels are legal documents whose language is determined and approved by the EPA during the pesticide registration process. All herbicides proposed for use are registered in the U.S. and California and have a label certifying that the EPA and the DPR have approved the herbicide for use on the targeted weed species.

The label contains information about the product, including its relative toxicity, potential hazard to humans and the environment, directions for use, storage and disposal, and first aid treatment in case of exposure. Product labels are legal documents whose language is determined and approved by the EPA during the pesticide registration process. These label directions provide for public and worker safety by requiring posting of treated areas, pre-designation of mixing, storage and filling sites, and transportation and handling practices in accordance with toxicity of each formulation.

The length of time each herbicide controls noxious weeds varies with the type of herbicide, environmental conditions, and target weed. Some herbicides control weeds for a short time period, while others can provide several years of control from one application. EPA approved herbicide labels include safe handling practices, application rates, and labels, susceptibility of weeds to different herbicides, Material Safety Data Sheets, guidelines, and Emergency Spill Response proposed for use on this project are contained in the project file at the Supervisor’s Office in Alturas, California.

Use of herbicides for noxious weed treatment involves application of products developed, labeled, and produced to treat weed species at certain stages of plant growth. All but one of the herbicides considered in this analysis are “selective” which means they control certain plant species while allowing other species to remain unaffected. Glyphosate is the only non-selective herbicide

considered. Several herbicides are considered because they vary in effectiveness on different invasive weeds. Herbicide treatment will include the use of the following herbicides: 2,4-D, clopyralid, dicamba, glyphosate, chlorsulfuron, and triclopyr as well as two mixtures (Mix 1: Dicamba + 2,4-D, Mix 2: Chlorsulfuron + 2, 4-D), applied at appropriate rates according to label directions determined by EPA and DPR requirements. Herbicide selection depends on weed species, level of infestation, location, other resource concerns (see Best Management Practices), and the applicability of herbicides. Herbicide selection considers, but is not limited to, the following criteria:

- Herbicide effectiveness on target weed species;
- Proximity to water or other sensitive areas;
- Soil characteristics;
- Potential unintended impacts to non-target species such as conifers or shrubs;
- Application method;
- Adjacent treatments (private or state land); and
- Timing of treatment
- Herbicides Targeted for Noxious Weeds Species

Herbicides in the Alternatives and targeted weed species are shown in Chapter 2, Tables 2-14 and 2-15.

The application rates in Chapter 2, Table 2-14 are based on the current label instructions for the specific plant and application. If the label instructions change the treatment will be adjusted accordingly.

General Herbicide Descriptions

Clopyralid

Clopyralid is a selective post-emergence herbicide controlling broadleaf species in the sunflower, legume, and smartweed family. This herbicide affects the target weed by mimicking the plant hormone auxin and causes uncontrolled plant growth and eventual death. It has a half-life in the soil of 20 days and is degraded primarily by microbial metabolism. Once applied to the ground, it rapidly disassociates and does not bind strongly with soil particles, which results in clopyralid having a high potential to contaminate ground or surface water. It may be used to treat the biennial thistles, Canada thistle, diffuse knapweed, Mediterranean sage, Russian knapweed, spotted knapweed, and yellow starthistle.

Dicamba

Dicamba is considered a general use herbicide for forestry, rangeland and rights-of-way uses. It is a selective herbicide used to control broadleaf weeds, brush, and vines and it affects target plants by regulating growth. About half of this product is broken down by microbial activity in 10 and 35 days

once applied. Dicamba is highly mobile in the soil and does have the potential to contaminate ground or surface water. This herbicide is very versatile in noxious and invasive weed control and has been proven successful in the treatment of biennial thistles, Canada thistle, Dyer's woad, leafy spurge, rush skeletonweed, spotted knapweed, sulfur cinquefoil, and yellow and Malta starthistles.

Glyphosate

Glyphosate is a broad-spectrum, nonselective herbicide used for the control of annual and perennial plants including grasses, sedges, broadleaf weeds, and woody plants. This herbicide is used on a variety of crops and its method of action is to inhibit amino acid and protein synthesis. It is moderately persistent in the soil and has an estimated half-life of 30 to 50 days. Glyphosate is strongly absorbed in most soils and normally does not leach out of the profile. Microbes are primarily responsible for the breakdown of this herbicide in the environment. Glyphosate has been successful in controlling Canada thistle, cheatgrass, leafy spurge, spotted knapweed, Dalmatian toadflax, and yellow as well as Malta Starthistles.

Triclopyr

Triclopyr is a growth-regulating herbicide for the control of woody and broadleaf perennial weeds. It has a half-life in the soil of 30 to 90 days, and degrades to carbon dioxide and organic matter through microbial action. Triclopyr has a moderate to low solubility in water and normally binds to clay and organic matter, so its potential to contaminate ground water is slight. Triclopyr is effective in the treatment Common crupina, Dyers woad, tall whitetop and yellow starthistle.

2,4-D

2,4-D is a selective herbicide that is used to control broadleaf weeds by interfering with the metabolism of the plant. It has a half-life in the soil of 10 days and normally is broken down through microbial activities. It is moderately to highly mobile in the soil, which restricts its use in and around high ground water tables or open water. This herbicide is one of the oldest, most studied, and extensively used herbicides across the United States for over 50 years, though it does not appear it was used to any extent in the project area. Most previous herbicide work was targeted for the control of grasses to increase reforestation success, so 2,4-D was not warranted. This herbicide is one of the most versatile in the control of noxious and invasive weeds and has been proven successful in the treatment of biennial thistles, Canada thistle, diffuse knapweed, Dyer's woad, leafy spurge, Mediterranean sage, oxeye daisy, rush skeletonweed, Russian knapweed, spotted knapweed, sulfur cinquefoil, Dalmatian toadflax, tall whitetop, and yellow and Malta starthistles.

On August 8, 2005, the Environmental Protection Agency (EPA) released its comprehensive assessment of 2,4-D under the Agency's reregistration program. EPA's decision document concluded that 2,4-D does not present risks of concern to human health when users follow 2,4-D product instructions as outlined in EPA's 2,4-D Reregistration Eligibility Decision (RED) document.

Chlorsulfuron

Chlorsulfuron controls many broadleaf weeds especially mustard spp., pigweed spp., and several thistles. Most perennial grasses are tolerant to chlorsulfuron making it a good herbicide choice for use in range and wildland settings dominated by perennial grasses. Chlorsulfuron has soil activity and provides effective residual control of several weed species. Little of this effect will occur utilizing the direct spray application called for in all alternatives. The average field half-life is 40 days, although persistence can be much longer on soils with a high pH (greater than 7.5). Chlorsulfuron is a member of the sulfonylurea chemical family. The mode of action is as an inhibitor of a key enzyme required for plant cell growth- acetolactate synthase. Chlorsulfuron is primarily used for post-emergent weed control and has rapid foliar and root absorption. The active ingredient application rate is very low compared to most growth regulators such as 2,4-D and dicamba.

Herbicide Mix 1: Dicamba + 2,4-D

The mixing of dicamba and 2,4-D into a single spray solution can increase herbicide efficacy on several noxious weeds including many thistle and knapweed species. This tank-mix is also commonly used in areas where multiple weed species with different herbicide susceptibility are growing together. The mixing of 2,4-D and dicamba does not change the chemical properties of either herbicide. When using this tank-mix, label restrictions for both dicamba and 2,4-D will be followed.

Herbicide Mix 2: Chlorsulfuron + 2,4-D

The mixing of chlorsulfuron with 2,4-D can increase herbicide efficacy on Scotch thistle and perennial pepperweed. This tank-mix is also commonly used in areas where multiple weed species with different herbicide susceptibility are growing together. For example, applying this tank mix to a roadside with perennial pepperweed, Canada thistle, and diffuse knapweed growing intermixed provides better control of all weed species compared to applying either herbicide individually. Mixing chlorsulfuron and 2,4-D also provides the benefit of a longer application timing for some thistle species. For example, 2,4-D only provides post-emergent control of yellow starthistle seedlings, and chlorsulfuron only provides pre-emergent control of yellow starthistle. When the two herbicides are mixed, the tank mix provides both pre- and early post-emergent control of yellow

starthistle. The mixing of chlorsulfuron and 2,4-D does not change the chemical properties of either herbicide. When using this tank-mix, label restrictions for both herbicides will be followed.

Herbicide Concentrations and Application Rates for Target Weed Species

Chapter 2, Table 2-14 displays the herbicide concentrations for each of the weed species to be treated with herbicides by alternative. The information in the table displays the review of noxious weed information and the information on the herbicides which are most effective and approved for use in California for the weeds identified for control on the Modoc National Forest.

Herbicide Fact Sheets

Appendix E in the DEIS contained Herbicide Fact Sheets from a series issued by the Forest Service, the Bureau of Land Management, and the Bonneville Power Administration for their workers and the general public. It provides information on forest and land management uses, environmental and human health effects, and safety precautions for the herbicides proposed for use on the Modoc National Forest to eradicate and known noxious weed infestations. Unless otherwise stated, the toxicity data presented in this fact sheet refer to the active ingredient. The fact sheets were prepared by Information Ventures, Inc. under U.S. Forest Service http://infoventures.com/e-hlth/ Copyright (c) 1994-2004, Information Ventures, Inc.

The fact sheets were included in the DEIS to provide an easy to read and understand information sheet about the herbicides not as the sole source of information utilized in the DEIS. The FEIS herbicide information is from a variety of sources including but not limited to product labels approved by EPA, SERA reports, individual worksheets developed for this analysis, and related information related to treatment of the 14 noxious weed species related to treatment methods from the USDA Forest Service, California Department of Agriculture, University of California, University of Montana, Pennsylvania State University and others.

Appendix F:

Human Risk Assessment

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Appendix F: Human Health Risk Assessment

Section 1 - Introduction

The purpose of this analysis is to assess the risks to human health of using six different herbicides for the control and eradication of noxious weeds on the Modoc National Forest. The herbicide active ingredients assessed are chlorsulfuron, clopyralid, 2,4-D, dicamba, glyphosate, and triclopyr. For a description of uses and formulations, refer to Appendix E – Herbicide Descriptions.

This 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 on the Modoc National Forest. 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 other forest workers, forest visitors, and 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 of the use of chemical herbicides was accomplished using the methodology of risk assessment generally accepted by the scientific community (National Research Council 1983, U.S. EPA 1986). In essence, this pesticide risk assessment consists of comparing doses that people may get from applying the pesticides (worker doses) or from being near an application site (public doses) with the U.S. Environmental Protection Agency's (U.S. EPA) established Reference Doses (RfD), a level of exposure considered protective of lifetime or chronic exposures.

Details regarding the specific methods used to prepare the Syracuse Environmental Research Associates, Inc. (SERA) human health risk assessments referenced are documented in SERA (2000b), while detailed explanations of specific methods for estimating occupational exposure are provided in SERA (1998b). Basically, the risk assessment has five major sections: an introduction (Section 1); an identification of the hazards associated with each herbicide and its commercial formulations (Section 2); an assessment of potential exposure to the product (Section 3); an assessment of the dose-response relationships (Section 4); and a characterization of the risks associated with plausible levels of exposure (Section 5).

Risk assessments are usually expressed with numbers; however, the numbers are far from exact. *Variability* and *uncertainty* may be dominant factors in any risk assessment, and these factors should

be expressed. Within the context of a risk assessment, the terms variability and uncertainty signify different conditions.

Variability reflects the knowledge of how things may change. Variability may take several forms. For this risk assessment, three types of variability are distinguished: *statistical, situational*, and *arbitrary*. *Statistical variability* reflects, at least, apparently random patterns in data. For example, various types of estimates used in this risk assessment involve relationships of certain physical properties to certain biological properties. In such cases, best or maximum likelihood estimates can be calculated as well as upper and lower confidence intervals that reflect the statistical variability in the relationships. *Situational variability* describes variations depending on known circumstances. For example, the application rate or the applied concentration of an herbicide will vary according to local conditions and goals. As discussed in the following section, the limits on this variability are known and there is some information to indicate what the variations are. In other words, situational variability is not random. *Arbitrary variability*, as the name implies, represents an attempt to describe changes that cannot be characterized statistically or by a given set of conditions that cannot be well defined. This type of variability dominates some spill scenarios involving either a spill of a chemical on to the surface of the skin or a spill of a chemical into water. In either case, exposure depends on the amount of chemical spilled and the area of skin or volume of water that is contaminated.

Variability reflects knowledge of or at least an explicit assumption about how things may change, while *uncertainty* reflects a lack of knowledge. For example, the focus of the human health dose-response assessment is an estimation of an “acceptable” or “no adverse effect” dose that will not be associated with adverse human health effects. For most chemicals, however, this estimation regarding human health must be based on data from experimental animal studies, which cover only a limited number of effects. Generally, judgment, not analytical methods, is the basis for the methods used to make the assessment. Although the judgments may reflect a consensus (i.e., be used by many groups in a reasonably consistent manner), the resulting estimations of risk cannot be proven analytically. In other words, the estimates regarding risk involve uncertainty. The primary functional distinction between variability and uncertainty is that variability is expressed quantitatively, while uncertainty is generally expressed qualitatively.

In considering different forms of variability, almost no risk estimate presented in this document is given as a single number. Usually, risk is expressed as a central estimate and a range, which is sometimes very large. 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. Most of the calculations are relatively simple; however, some of the calculations are

cumbersome. These calculations are contained in worksheets in the project file for this EIS, and are based on the worksheets contained in the various SERA risk assessments.

Additives, or adjuvants, to the formulations that might be used when herbicides are applied are not considered in detail in this risk assessment, with the exception of surfactants containing nonylphenol polyethoxylate as an active ingredient. Additives might involve surfactants and 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. 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.

Section 2 - Hazard Analysis

The hazards associated with using each of the herbicides were determined by a thorough review of available toxicological studies. These reviews are contained in other documents and are referenced here as needed. A considerable body of information has been compiled in a group of risk assessments completed by SERA (authored by Dr. Patrick Durkin, PhD) under contract to the Forest Service, as well as in a risk assessment contained in the programmatic Region 5 Final EIS *Vegetation Management for Reforestation* (USDA 1989) and in the programmatic *Herger Feinstein Quincy Library Group Forest Recovery Act Final SEIS* (USDA 2003b). Another source of information on toxicity is the background statements contained in Forest Service Agricultural Handbook No. 633 (USDA 1984). 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 documents. All of these documents are incorporated by reference into this risk assessment.

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. Where such information is available, information on actual human poisoning incidents and effects on human populations supplement these test results. For a background discussion of the various toxicological tests and endpoints, refer to USDA (1989, pages F-7 to F18).

A note specific to impurities and metabolites - virtually no chemical synthesis yields a totally pure product. Technical grade herbicides, as with other technical grade products, undoubtedly contain some impurities. The 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. As with contaminants, the potential effect of metabolites on 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 will 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.

Unless otherwise specifically referenced, all data and test results are from the references listed at the herbicide heading.

Chlorsulfuron (Reference: SERA, 2004a)

Acute and Chronic Exposures - Although no information is available on the toxicity of chlorsulfuron to humans, the toxicity of chlorsulfuron has been relatively well characterized in mammals. All of this information is contained in unpublished studies submitted to the U.S. EPA as part of the registration process for chlorsulfuron.

In experimental mammals, the acute oral LD_{50} for chlorsulfuron is greater than 5,000 milligrams per kilogram of body weight (mg/kg), which indicates a low order of oral toxicity. Acute exposure studies of chlorsulfuron and chlorsulfuron formulations give similar results, indicating that formulations of chlorsulfuron are not more toxic than chlorsulfuron alone.

Similar adverse effects are observed following both subchronic and chronic exposure to chlorsulfuron in tested mammals. The most common and sensitive signs of acute, subchronic, and chronic toxicity are weight loss and decreased body weight gain. The only other commonly noted effects are changes in various hematological parameters and general gross pathological changes to several organs. None of these changes, however, suggest a clear or specific target organ toxicity. While observations of weight loss and decreased weight gain suggest that chlorsulfuron could be associated with an underlying change in metabolism, studies specifically investigating the effects of chlorsulfuron on metabolism have not been conducted. The U.S. EPA used a 1-year feeding study in

rats, with a NOEL of 5 mg/kg/day, to derive an RfD for chlorsulfuron; body weight loss and decreased weight gain were used as the most sensitive effects.

Effects on the Skin and Eyes - Chlorsulfuron is classified as a moderate eye irritant, but as a non-irritant to the skin. The results of several acute dermal studies show that formulations containing up to 80% chlorsulfuron produced only mild skin irritation. Dermal application of chlorsulfuron to intact and abraded skin produced mild redness in rabbits that resolved within 4-6 days. Dermal application of chlorsulfuron did not produce skin irritation or a sensitization response in guinea pigs. Application to the eyes of rabbits produced mild irritant effects to the cornea and conjunctiva. Transient, mild corneal clouding and mild to no conjunctival swelling and discharge were observed in rabbits following a single application of 0.1 milliliter (mL) of a 75% formulation. No signs of irritation of the iris were observed. In another study, a single application to the eyes produced transient slight corneal clouding, conjunctivitis, and swelling of the iris. Eyes returned to normal within 4 days. Studies on the systemic toxicity of chlorsulfuron following dermal exposure have been conducted in rabbits. Dermal exposure to doses up to 3,400 mg/kg was not associated with any signs of significant systemic toxicity in rabbits based on standard acute bioassays with 14-day observation periods. The only signs of systemic toxicity reported in these studies were an initial weight loss and diarrhea.

Reproductive and Teratogenic Effects - Two gavage teratogenicity studies have been conducted in rabbits and rats and two dietary reproduction studies have been conducted in rats. Chlorsulfuron is not teratogenic, but is toxic to embryos at high exposure levels. An increase in the number of fetal resorptions and a decrease in fetal viability, indicating embryo toxicity, were observed in rabbits exposed to 75 mg/kg/day. Teratogenic effects were not observed in any dose group. Exposure of rats for three-generations to chlorsulfuron did not result in significant treatment-related effects. The only adverse effect on reproductive function reported was a slightly decreased fertility index in rats exposed to 125 mg/kg/day. The NOEL for reproductive effects in rats is 25 mg/kg/day. Other than weight loss, no significant maternal toxicity was reported in these studies. Thus, chlorsulfuron does not appear to have significant adverse effects on reproductive function.

Carcinogenicity and Mutagenicity - Chlorsulfuron has been tested for mutagenicity in a number of different test systems and has been assayed for carcinogenic activity in rats and mice. No evidence of carcinogenic activity was found in any of the chronic toxicity studies conducted on chlorsulfuron. Chlorsulfuron was classified as having ``no evidence of carcinogenicity'' based upon lack of evidence of carcinogenicity in rats and mice (U.S. EPA 2002e).

Results of *in vitro* mutagenicity studies in several *Salmonella typhimurium* bacteria strains and in Chinese hamster ovary cells show that chlorsulfuron is not mutagenic, either with or without metabolic activation. Negative results were also obtained from genotoxicity studies in rat liver cell cultures. In addition, *in vivo* studies in rats show that chlorsulfuron at exposure levels up to 250 mg/kg/day for 10 weeks does not produce dominant lethal mutations.

Other Toxic Endpoints – There is very little direct information on which to assess the immunotoxic potential of chlorsulfuron. Results of long-term exposure studies in dogs and mice show that chlorsulfuron may produce changes to immune system function. Increases in lymphocytes and eosinophils (a type of white blood cell that can increase with allergy and other infections) were observed in female dogs exposed for 6 months to 25 or 125 mg/kg/day chlorsulfuron. Effects were not seen at the 5 mg/kg/day dose or in male dogs at any dose. In mice, neutrophilic granulocytes (a type of white blood cell) were decreased and lymphocyte counts were increased in female mice exposed to 250, or 375 mg/kg/day chlorsulfuron for 3 months. These effects were not observed in female mice at lower doses or in male mice at any dose. While results of these studies suggest that exposure to chlorsulfuron may produce changes in immune system parameters, the observations in these studies do not provide conclusive evidence supporting the immunotoxic potential of chlorsulfuron.

Virtually any chemical, including chlorsulfuron, will cause signs of neurotoxicity in severely poisoned animals and thus can be classified as an indirect neurotoxicant. This is the case for chlorsulfuron in that exposure to acute high doses of chlorsulfuron produces lethargy and weakness. This does not, however, implicate chlorsulfuron as a direct neurotoxicant.

Chronic, lifespan, and multigenerational bioassays in mammals and acute and subchronic studies on aquatic organisms and wildlife did not reveal endocrine effects. Any endocrine related effects would have been detected in this definitive array of required tests (U.S. EPA, 2002f). Both weight loss and weight gain is observed in animals treated with chlorsulfuron, implying a change in metabolic status. However, there is no evidence to suggest that changes in weight are due to effects of chlorsulfuron on the endocrine system. Decreased pituitary and thyroid weights were observed in male dogs exposed to chlorsulfuron for 26 weeks. However, these changes were not considered to be treatment related. With the exception of a slight decrease in the fertility index in rats exposed to 125 mg/kg/day chlorsulfuron in a three-generation reproductive study, there is no evidence that chlorsulfuron produces adverse effects on the reproductive endocrine system. Thus, no evidence for chlorsulfuron producing direct effects on the endocrine system was found.

Inhalation Exposures – There is only one inhalation toxicity study of chlorsulfuron. Acute (4 hour) inhalation of chlorsulfuron at relatively high concentration levels (5.9 mg/L) in dust did not result in any systemic adverse effects to rats considered to be treatment related. While no systemic effects were noted from necropsy performed after exposure, microscopic changes to the mucus membrane in the nasal cavity, including atrophy of the secreting cells of the nasal gland and minor changes to the nasal cavity skin cells, were noted in some of the rats. These histological findings were consistent with chronic inflammation of the lining of the nose or with post-injury repair processes.

Impurities – No information has been encountered in the published or unpublished literature on impurities in chlorsulfuron.

Metabolites - The elimination of chlorsulfuron has been studied in rats, goats, dairy cows, and hens. In rats, chlorsulfuron exhibits first order elimination kinetics, with an estimated half-life of <6 hours. In all mammalian species studied, chlorsulfuron and its metabolites are extensively and rapidly cleared by a combination of excretion and metabolism. Most of the chlorsulfuron is excreted in urine or feces in the form of the unchanged compound. Due to its rapid elimination, metabolism of chlorsulfuron in animals is minimal. The major metabolite identified in the urine of rats is 2-chlorobenzenesulfonamide (a hydrolysis product), although other minor metabolites have also been identified in urine. Conjugation products, mainly N-glucuronides, have also been identified in the urine of goats. No studies investigating the toxicity of the chlorsulfuron metabolites produced by mammals were identified in the published literature or unpublished studies. There is no evidence that the metabolites of chlorsulfuron as identified in either the plant, or animal metabolism studies are of any toxicological significance (U.S. EPA, 2002f).

Inerts - The formulation of chlorsulfuron used by the Forest Service contains materials other than chlorsulfuron that are included as adjuvants to improve either efficacy or ease of handling and storage. The identity of these materials is confidential. The inerts were disclosed to the U.S. EPA and were reviewed in the preparation of SERA, 2004a. All that can be disclosed explicitly is that none of the additives are classified by the U.S. EPA as toxic.

Clopyralid (Reference: SERA, 1999, 2004b)

Acute and Chronic Exposures - Although no information is available on the toxicity of clopyralid to humans, the toxicity of clopyralid has been relatively well characterized in mammals. All of this information is contained in unpublished studies submitted to the U.S. EPA as part of the registration process for clopyralid.

Two different manufacturing processes may be used for clopyralid: the penta process and the electrochemical process. The limited available information indicates that technical grade clopyralid samples from the electrochemical process may be somewhat more toxic (median lethal dose (LD_{50}) values in the range of about 3000 mg/kg) than the penta process (LD_{50} > 5000 mg/kg). These differences, however, are not substantial and may be due to random variability.

The available data do not suggest that Transline would be more or less toxic than clopyralid following acute oral exposure. Carreon and New (1981, as referenced in SERA 2004b) reported an LD_{50} >5000 mg/kg for a formulation with no deaths at a dose level of 5000 mg/kg; lethargy was the only treatment-related effect.

Clopyralid also has a low order of chronic toxicity. On chronic or subchronic exposures, no effects have been observed in laboratory mammals at doses of 50 mg/kg/day or less. At doses of 100 mg/kg/day or greater, various effects have been observed in different species and different bioassays. These effects include weight loss, changes in the weight of the liver and kidney, thickening of epithelial tissue, irritation of the lungs, and decreases in red blood cell counts.

Up until 2001, U.S. EPA had used a chronic No Observed Adverse Effect Level (NOAEL) of 50 mg/kg/day to establish the RfD. This was based on a chronic exposure study in rats (Humiston et al, 1977, as referenced in SERA, 1999) that showed decreases in body weight in females at the next highest dose tested (150 mg/kg/day). In 2001, U.S. EPA changed the chronic NOAEL to 15 mg/kg/day (U.S. EPA, 2001), based on another chronic study in rats that also showed effects at 150 mg/kg/day (thickening of epithelial tissue), but a NOAEL of 15 mg/kg/day (Barna-Lloyd et al, 1986, as referenced in SERA, 1999). This second study did not have a 50 mg/kg/day dose level. This change is currently under discussion between the clopyralid registrant and the U.S. EPA. However, for this risk assessment, the value of 15 mg/kg/day will be used as the chronic NOAEL, for the establishment of the RfD.

Effects on the Skin and Eyes - After direct instillation into the eyes, both penta and electrochemical process clopyralid can cause persistent damage to the eyes. The damage is characterized as slight to marked redness, swelling of the conjunctiva, and discharge with reddening of the iris and moderate to marked opacity of the cornea.

Other than signs of transient redness of the skin shortly after application, there is no evidence to suggest that clopyralid is a potent skin irritant. Neither the penta process clopyralid nor electrochemical process clopyralid causes skin sensitization.

Studies on formulations comparable or equivalent to Transline have been conducted for dermal irritation and for ocular irritation. These studies indicate that the irritant effects of Transline are comparable to those of technical grade clopyralid.

The available toxicity studies suggest that dermal exposure to 2000 mg/kg clopyralid was not associated with any signs of systemic toxicity in rabbits based on standard acute/single application bioassays with 14-day observation periods. The available data suggest that the dermal absorption of clopyralid is poor. No systemic effects were reported by a dermal study in which New Zealand white rabbits were exposed to 2000 mg/kg clopyralid for 24 hours.

The systemic effects from dermal exposure to the formulation may be influenced by the presence of other adjuvants which may alter the rate at which the parent chemical moves through the skin. The available data do not suggest that the Transline formulation has greater potential for persistent systemic toxicity than clopyralid, although lethargy was observed following acute dermal exposure.

Reproductive and Teratogenic Effects - Two gavage teratogenicity studies have been conducted in rabbits, one gavage teratogenicity study has been conducted in rats, and four dietary reproduction studies have been conducted in rats. Other than a decrease in maternal body weight, which is consistent with the information on the subchronic and chronic toxicity of clopyralid, these studies report few signs of toxicity in dams or offspring. At doses that cause no signs of maternal toxicity - i.e., doses below about 100 mg/kg/day - no reproductive or teratogenic effects are apparent. The available data suggest that clopyralid does not produce developmental effects at doses that do not produce maternal toxicity. U.S. EPA has established a reproductive NOAEL of >1,500 mg/kg/day (U.S. EPA, 2002b).

Carcinogenicity and Mutagenicity - Several chronic bioassays have been conducted on clopyralid in mice, rats, and dogs and no evidence of carcinogenic activity has been detected. U.S. EPA has placed clopyralid in Group E (no evidence of carcinogenicity). In addition, clopyralid is inactive in several different standard bioassays of mutagenicity.

Although none of the bioassays have shown that clopyralid has carcinogenic potential, technical grade clopyralid does contain low levels of the impurities hexachlorobenzene and pentachlorobenzene. Hexachlorobenzene has shown carcinogenic activity in three mammalian species and has been classified as a potential human carcinogen by the U.S. EPA. Pentachlorobenzene is not classifiable as to human carcinogenicity based on lack of available human and animal data. The risk of cancer from these contaminants is considered qualitatively and quantitatively in this risk assessment.

Other Toxic Endpoints – Clopyralid can be classified as an indirect neurotoxicant but not as a direct neurotoxicant. At high acute doses that produce a broad spectrum of toxicological effects, clinical signs of clopyralid poisoning include neurotoxicity, indicated by ataxia, tremors, convulsions, and weakness. Similar effects at high doses have been seen in birds. These reports, however, do not implicate clopyralid as a direct neurotoxicant. No studies designed specifically to detect impairments in motor, sensory, or cognitive functions in animals or humans exposed to clopyralid have been reported in the open literature or in the studies submitted to the U.S. EPA to support the registration of clopyralid. In addition, none of the studies in the clopyralid database reported histopathologic changes in nervous tissue.

There is very little direct information on which to assess the immunotoxic potential of clopyralid. The only studies specifically related to the effects of clopyralid on immune function are skin sensitization studies. While these studies provide information about the potential for clopyralid to act as a skin sensitizer, they provide no information useful for directly assessing the immuno-suppressive potential of clopyralid. The toxicity of clopyralid has been examined in numerous acute, subchronic, and chronic bioassays. Although many of these studies did not focus on the immune system, changes in the immune system were not observed in any of the available studies.

Clopyralid has not been tested for activity as an agonist (activator) or antagonist of the major hormone systems (e.g., estrogen, androgen, thyroid hormone), nor have the levels of circulating hormones been measured following clopyralid exposures. Thus, all inferences concerning the potential effect of clopyralid on endocrine function must be based on inferences from standard toxicity studies. The available toxicity studies have not reported any histopathologic changes in endocrine tissues that have been examined as part of the standard battery of tests.

Inhalation Exposures - Two relatively detailed inhalation studies have been submitted to U.S. EPA in support of registration of clopyralid. At nominal concentrations of 1 mg/L or greater over 4-hour exposure periods, the only effects noted were labored breathing and red stains around the openings of the nasal cavity. After a two-week recovery period, there was discoloration of the lungs in rats exposed to nominal concentrations of 1.2 mg/L but not in rats exposed to nominal concentrations of 5.5 mg/L. Although the author did not attribute the changes in the lungs to clopyralid exposure, these changes are consistent with effects noted in a one-year dietary study in dogs. In this study, low-dose (100 mg/kg/day), mid-dose (320 mg/kg/day), and high-dose (1000 mg/kg/day) animals evidenced atypical nodules in the lungs. The study authors attributed these findings to the inhalation of food particles containing clopyralid with subsequent irritation of the lungs from direct clopyralid contact.

No occupational exposure criteria have been found for clopyralid. While any effects on the lungs are of substantial concern, such effects have not been seen at lower dietary dose levels in other species. The current RfD for clopyralid is based on a NOAEL of 15 mg/kg/day from a two-year rat feeding study. This NOAEL is a factor of 6 below the lowest dose associated with lung effects in dogs (100 mg/kg/day).

Impurities - Technical grade clopyralid contains hexachlorobenzene and pentachlorobenzene as contaminants. Nominal or average concentrations of hexachlorobenzene are less than 2.5 parts per million (ppm). Nominal or average concentrations of pentachlorobenzene are less than 0.3 ppm. The U.S. EPA has classified hexachlorobenzene as a probable human carcinogen for which the data are adequate to consider risk quantitatively.

Metabolites – Metabolism studies indicate that clopyralid is not extensively metabolized in mammals and birds, with 79-96% of the administered dose being excreted unchanged in the urine during the first 24 hours, and nearly complete elimination within 120 hours. This is similar to the pattern seen in plants that generally suggests that clopyralid is not extensively metabolized, although it may be conjugated to form a methyl ester. U.S. EPA does not consider any clopyralid metabolites to be of toxic significance (U.S. EPA, 1999b).

Inerts - The commercial formulation of clopyralid used by the Forest Service (Transline®) is formulated as the monoethanolamine salt – i.e., monoethanolamine is considered part of the active ingredient. Transline® also contains isopropyl alcohol and polyglycol as adjuvants.

No studies specifically mentioning Transline®, were located in the search of the studies submitted to U.S. EPA for product registration. Dow AgroSciences (2003, as referenced in SERA 2004b) provided clarification of this issue and identified the studies submitted to U.S. EPA that were accepted as relevant to Transline®. These studies do not indicate any substantial differences between Transline® and clopyralid. This is consistent with the publicly available information on the three inerts contained in Transline®, two of which are approved for use as food additives (monoethanolamine and isopropyl alcohol).

The other inert in Transline® is Polyglycol 26-2. This compound is classified by the U.S. EPA as a List 3 inert. In other words, there is insufficient information to categorize this compound as either hazardous (Lists 1 or 2) or non-toxic (List 4). Notwithstanding this classification, surfactants such as Polyglycol 26-2 are surface active agents that can disrupt cellular membranes and lead to a number of different adverse effects. In an *in vitro* study on energy production in sub-mitochondrial particles derived from a marine alga, Oakes and Pollak (1999) noted that Polyglycol 26-2 inhibited oxidative

function in the submitochondrial preparations at a concentration of about 0.01%. While this study clearly indicates that Polyglycol 26-2 will impact mitochondrial function *in vitro*, the implications for potential effects in humans at plausible levels of exposure are not apparent.

2,4-D (References: USDA 1984; USDA 1989; SERA 1998a; U.S. EPA 2000c, 2004a, 2005)

Acute and Chronic Exposures - 2,4-D has a low order of acute toxicity to mammals, with oral LD_{50} values ranging from approximately 69 mg a.e./kg (100 mg butyl ester/kg) in cattle to 1800 mg/kg (2000 mg sodium salt/kg) in rats. Although the mode of action of 2,4-D as a plant toxin is well understood, the mode of action of 2,4-D toxicity in mammals is not clear. After acute lethal exposure, the signs of toxicity in humans include convulsions, vomiting, congestion of various organs, and degenerative changes in nerve cells. In non-lethal but toxic oral exposure to 2,4-D, the signs and symptoms of toxicity in humans include irritation to mouth, throat, and gastrointestinal tract, vomiting, chest and abdominal pain, diarrhea, muscle twitches, tenderness, and stiffness. Similar signs of acute toxicity were observed in monkeys and pigs exposed to 2,4-D. With the possible exception of neurotoxicity (see below), none of these signs or symptoms suggests a highly specific mode of toxic action in mammals.

Following subchronic oral exposure at dose levels of 2,4-D above the threshold of saturation for renal clearance, the primary target organs are the eye (retinal degeneration, cataract formation), thyroid (increased thyroid weight, changes in thyroid hormones, and follicular cell enlargement), kidney (loss of absorptive capacity), adrenals (enlargement), and ovaries/testes (decrease in size and weight). These changes are also observed following exposure to the amine salts and esters of 2,4-D. At high concentrations *in vitro*, 2,4-D may affect cellular energy processes and interfere with other enzymes involved in cellular energy, calcium regulation, protein and DNA synthesis, and polyamine synthesis. It is plausible that the target organ specificity of 2,4-D is related to active transport processes in certain organs.

There are no substantial or systematic differences in toxicity between different formulations of 2,4-D (amine or esters), when expressed as acid equivalents. 2,4-D and its amine salts (diethanolamine, dimethylamine, isopropylamine, and triisopropanolamine) and esters (butoxyethyl ester, ethylhexyl ester, and isopropyl ester) are not acutely toxic via the oral route of exposure (Toxicity Category III).

The current chronic RfD listed on U.S. EPA's Integrated Risk Information System (IRIS) for 2,4-D is based on the study by Serota et al (1983b as referenced in SERA 1998a) using Fisher 344

rats. This is the RfD used in SERA 1998a. The RfD was last revised on May 5, 1988. In the subchronic dietary study by Serota et al. (1983b), rats were exposed to daily doses of 1, 5, 15, or 45 mg/kg bw/day 2,4-D for 90 days. The investigators observed dose-related increases in kidney weight (males and females) and thyroid weight (males only) as well as decreases in mean hemoglobin, percentage of red blood cells, red blood cell levels, and immature red blood cells levels (males only). The increase in thyroid weight was associated with an increase in the levels of the thyroid hormone thyroxine in the blood of male rats. In addition, levels of various enzymes associated with liver function were decreased rather than increased. The U.S. EPA considered the dose of 1 mg/kg/day the NOAEL, identifying the critical effects as “hematologic, hepatic, and renal toxicity”. Although the RfD record indicates that the effects on the thyroid and thyroid hormone levels were taken into consideration, the record also indicates that these effects “were not considered to be treatment related”.

In 2000, the U.S. EPA wrote a toxicology disciplinary chapter as part of the reregistration eligibility decision document for 2,4-D (U.S. EPA 2000c). There is no discussion of the 1983 subchronic study discussed above. In this 2000 document, a proposed chronic RfD is based on a 2-year combined chronic toxicity/carcinogenicity study in rats in which rats were fed 2,4-D acid in the diet at doses of 0, 5, 75, and 150 mg/kg/day. The NOAEL from this study is 5 mg/kg/day. The LOAEL of 75 mg/kg/day is based on decreased body-weight gain (females) and food consumption (females), alterations in hematology (decreased red blood cells (females), hemoglobin (females), platelets (both sexes)) and clinical chemistry parameters (increased creatinine (both sexes), alanine and aspartate aminotransferase (males), alkaline phosphatase (both sexes), decreased thyroid hormones (both sexes), glucose (females), cholesterol (both sexes), and triglycerides (females)), increased thyroid weights (both sexes at study termination), decreased testes and ovarian weights, and microscopic lesions in the lungs (females). At the high-dose level, there were microscopic lesions in the eyes, liver, adipose tissue, and lungs. There was no treatment-related increase in the incidence of any tumor.

There is no strong time-response relationship for 2,4-D. The similarities in doses associated with similar subchronic and chronic effects can be explained, in part, by the pharmacokinetics of 2,4-D. Like other phenoxy-herbicides, such as 2,4,5-T and Silvex, 2,4-D is absorbed rapidly, distributed within the body, bound to endogenous proteins, and rapidly eliminated. Thus, steady-state levels are reached relatively fast and there is little difference with regard to body burdens in subchronic and chronic studies. A point to be made however is that tests using dogs have shown that dogs have a limited capacity to eliminate organic acids, such as 2,4-D and triclopyr. Because of this, toxicity tests

involving dogs may not be representative of human toxic responses because of the longer residence times of 2,4-D in the dog.

Effects on the Skin and Eyes - 2,4-D is an organic acid. Like all organic acids, 2,4-D in aqueous solution can be highly irritating to the eyes and can also cause skin irritation. 2,4-D and its amine salts and esters are not acutely toxic via the dermal routes of exposure. 2,4-D and its amine salts and esters are not skin irritants and none is a skin sensitizer. The acid and amine salt forms of 2,4-D are considered severe eye irritants, but the ester forms are not eye irritants. More unusual, however, is the potential for an effect on the eyes through systemic absorption. In subchronic and chronic feeding studies in rats, degenerative changes in eyes (cataracts, retinal degeneration) were noted in several studies.

Carcinogenicity and Mutagenicity – 2,4-D is classified as a Group D chemical (not classifiable as to human carcinogenicity). Chronic toxicity tests in rats and mice did not indicate any significant increases in tumors. There are many epidemiology studies that examine the association between exposure to 2,4-D (and other phenoxy herbicides) and the development of various forms of cancer. These studies are the subject of several reviews sponsored or prepared by industries associated with the manufacture and/or distribution of 2,4-D as well as a 1996 review sponsored by the USDA.

In 1994, the Science Advisory Board of the U.S. EPA reviewed the agency's analysis of 2,4-D carcinogenicity and concluded that while there is some evidence that cancer may occur in excess in populations which are likely to be exposed to 2,4-D, the data are not sufficient to conclude that there is a cause and effect relationship between the exposure to 2,4-D and cancer.

The U.S. EPA (EPA/OPP Cancer Peer Review Committee) classified 2,4-D as a Category D chemical (i.e., not classifiable as to human carcinogenicity) in 1996. The U.S. EPA requested further histopathological examinations of rat brain tissues and mouse spleen tissues. These exams were submitted and reviewed and in March 1999, the US EPA decided that it would continue to classify 2,4-D as a Group D carcinogen. The U.S. EPA has twice recently reviewed epidemiological studies linking cancer to 2,4-D. In the first review, completed January 14, 2004, U.S. EPA concluded there is no additional evidence that would implicate 2,4-D as a cause of cancer. The second review of available epidemiological studies occurred in response to comments received during the public comment period for the 2,4-D RED. This report, dated December 8, 2004, found that none of the more recent epidemiological studies definitively linked human cancer cases to 2,4-D (US EPA 2005).

Much of the controversy concerning the potential carcinogenicity of 2,4-D involves exposure to Agent Orange, a mixture of 2,4-D, 2,4,5-T, and TCDD (dioxin) used as a herbicide during the

Vietnam war. In the early 1990's, the National Academy of Sciences' Institute of Medicine reviewed the available epidemiology data on the effects of exposure to Agent Orange and concluded "there is limited/suggestive evidence for *no* association between exposure to phenoxy-herbicides and brain tumors". In the current reregistration effort, U.S. EPA is developing another review of the risks of dioxin in 2,4-D and has submitted its findings to the National Academy of Sciences for review.

Reproductive and Teratogenic Effects – At relatively high doses associated with fetotoxicity or maternal toxicity, 2,4-D might induce fetal malformations. Developmental toxicity was observed in the rat, as evidenced by the increased incidence of skeletal malformations and variations observed at the same dose level that resulted in maternal toxicity, indicated by decreased body-weight gain.

One occupational exposure study reports an association between 2,4-D exposure and sperm damage; however, the data in the study do not support the association. At best, the study shows that the incidence of sperm anomalies in a group of pesticide applicators was higher than in a group of individuals who did not apply pesticides. Whether exposure to 2,4-D was the cause of the observed effects cannot be verified by the data presented in the study. Although some animal studies support an association between 2,4-D exposure and male reproductive impairment, reproductive effects seem to be much less sensitive endpoints than the effects on which the RfD derived by U.S. EPA is based.

Other Toxic Endpoints – In experimental animals, 2,4-D exposure is associated with myotonia: the development of tonic muscle spasms in which the muscle remains contracted for a prolonged period. This endpoint may reflect a neurotoxic rather than muscular effect because removing the nerve from the muscle results in a blockage of the myotonic response. Both 2,4-D sodium salt and 2,4-D butyl ester were shown to affect brain levels of neurotransmitters in rats. Rats, however, may be atypically sensitive to the neurotoxic effects of 2,4-D. In all species tested, only rats showed evidence of histopathological changes in the brain. Subchronic exposure to 2,4- D acid was associated with changes in neurological function. Specific nerve damage (destruction of the nerve's myelin sheath) was associated with exposure to the n-butyl ester of 2,4-D but not the amine salt. Clinical signs of neurotoxicity (ataxia, decreased motor activity, inability to relax muscles, prostration, impaired/loss of the righting reflex, and skin cold to the touch) were observed in pregnant rabbits following exposure to 2,4-D and its amine salts and esters. Neuropathology (retinal degeneration) was observed following 2,4-D exposure in several studies in female rats. A lack of coordination and slight gait abnormalities (forepaw flexing or knuckling) were observed following acute dosing and increased forelimb grip strength was observed following chronic exposure to 2,4-D at dose levels that exceeded the threshold of saturation of renal clearance.

There is some evidence that certain forms of 2,4-D may cause immunological effects; however, most of the studies involve exposure to the n-butyl ester of 2,4-D, and it is not clear whether the observed responses are attributable to the 2,4-D part of the molecule or the formation of n-butanol. At acutely toxic levels, the n-butyl ester was shown to inhibit immune function in mice, assayed as antibody production against sheep red blood cells. Subtoxic doses, however, had no effect. Thus, the suppression of antibody production may be secondary to other toxic effects.

2,4-D affects thyroid hormone regulation following oral exposure, and there is a concern for endocrine disruption. Effects on the gonads in rats and dogs are seen following exposure to 2,4-D and/or its amine salts and esters. Although there are data on thyroid hormone levels in the adult animal, there are no data with respect to thyroid hormones in the young; therefore, there is no information on whether the young are more sensitive with respect to this endpoint. There is no developmental neurotoxicity (DNT) study available on 2,4-D, and U.S. EPA has called for a DNT study in the recent reregistration effort. There have been no studies on 2,4-D that specifically assess its endocrine disruption potential, and there are no data on other hormonal effects. As already stated, thyroid effects have been observed in the rat following subchronic and chronic exposure to 2,4-D and its amine salts and esters. Additionally, there is some concern for immunotoxicity following exposure to 2,4-D. There are clear NOAELs for each of the above-mentioned effects, which occur only at high-dose levels; above the doses selected for overall risk assessment. Therefore, there are no residual uncertainties with regard to these effects. However, U.S. EPA concluded that a two-generation reproduction study using current protocols is required to address the concern for thyroid effects (comparative assessment between the young and adult animals) and immunotoxicity, as well as a more thorough assessment of the gonads and reproductive/developmental endpoints. Because of these data gaps, U.S. EPA in its current reregistration documents, calls for an additional 10X safety factor for database uncertainty when developing the acute and chronic RfDs.

Inhalation Exposures – The acute toxicity data indicate that 2,4-D or its amine or ester formulations are not highly acutely toxic via the inhalation route of exposure. The rat LC_{50} value for 2,4-D acid is >1.79 mg/L (Toxicity Category 3) while the ester and amine formulations all exceeded 3.5 mg/L (Toxicity Category 4). Clinical signs of toxicity observed during inhalation exposure were decreased activity and closed eyes. Signs observed at the end of and during the week after inhalation exposure were salivation, tearing from the eyes, nasal discharge, labored breathing, dried red or brown material around eyes and nose, matted fur, and staining of the fur in the anogenital region. There were no significant findings *post mortem*.

Impurities - There is little published information on the impurities in commercial formulations of 2,4-D. Hansen et al. (1971, as referenced in SERA 1998a) reported that a commercial sample of 2,4-D contained low concentrations of monochlorophenoxyacetic acid (0.1%), 2,6-dichlorophenoxyacetic acid (2.3%), 2,4,6-trichlorophenoxyacetic acid (0.2%), and bis(2,4-dichlorophenoxy)-acetic acid (0.7%). Because the toxicity studies on 2,4-D used in SERA 1998 were conducted with technical grade 2,4-D, it is likely that the toxicity of the minor impurities is encompassed by the studies used as the basis for this risk assessment.

One concern regarding the use of 2,4-D is the possibility of contamination with chlorinated dioxins, such as 2,3,7,8-TCDD. Agent Orange, which is a mixture of 2,4-D and 2,4,5-T, was used during the Vietnam War, and it did contain 2,3,7,8-TCDD. Moreover, commercial formulations of 2,4,5-T have been known to contain 2,3,7,8-TCDD. 2,4-D formulations, however, were shown not to contain 2,3,7,8-TCDD. Thus, it appears that 2,3,7,8-TCDD contamination in commercial preparations of herbicides containing 2,4-D is attributable to the contamination of 2,4,5-T with 2,3,7,8-TCDD rather than the presence of 2,3,7,8-TCDD in 2,4-D. As stated, U.S. EPA is currently developing a new review of risks presented by dioxin in 2,4-D.

Some commercial samples of 2,4-D amine have been shown to contain polychlorinated dibenzo-p-dioxins, chiefly di-, tri-, and non-2,3,7,8-tetrachlorinated isomers. Most samples contained <1 µg/L, and the highest concentration of any dioxin in the samples of 2,4-D amine was 0.32 mg/L. All but one of the 2,4-D esters, however, were found to contain dioxin residues, and the levels were much higher, ranging from 0.1 to 23 mg/L.

Metabolites -The metabolism and excretion of 2,4-D have been investigated in a number of species including humans. In general, 2,4-D undergoes limited metabolism primarily involving minor conjugation of the parent acid that is then excreted in the urine. No detectable metabolites of 2,4-D have been reported in the rat; i.e., only the parent acid is found in rat urine. In addition to 2,4-D itself, 2,4-D conjugates have been found in the urine of dogs, humans, mice, and hamsters following oral exposure.

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 RfD for 2,4-D that is used in this risk assessment (refer to Section 4). 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.

Inerts – EPA reviews have not identified any inerts on EPA list 1 or 2 in the 2,4-D amine formulation (Weedar 64). The Weedone 638 label mentions petroleum distillates as being in the formulation. The current material safety data sheet (MSDS) also mentions two inerts: propylene glycol and titanium oxide (both on EPA list 4B). Heavy aromatic naptha ("other petroleum hydrocarbons") was identified in a 1988 letter from the USDA Forest Service Washington office to the Regions as the carrier for Weedone 638. Information from a Rhone-Poulenc 1995 MSDS (as described in NCAP, 2000) lists the following inerts for the Weedone 638 formulation of 2,4-D: methanol (CAS 67-56-1, EPA inert list 3), butoxyethanol (111-76-2, list 2), xylene (1330-20-7, list 2), and naphthalene (91-20-3, list 3).

EPA considers xylene to be a potentially toxic inert ingredient, with an oral RfD of 2 mg/kg/day, and is considered fetotoxic and teratogenic in mice at high doses, but EPA stated that the calculated RfD should be protective of these effects. EPA has not reached a conclusion on the carcinogenicity of xylene (USDA, 1997). In USDA, 1997, a human health risk assessment analyzed the risk of using xylene (an inert in two pesticides analyzed in that assessment). The conclusion from that assessment was that the proposed use of pesticides containing xylene did not represent a risk to either the public or the workers. Assuming that xylene makes up about 10% of the Weedone 638 formulation, and knowing that the RfD for xylene is 200 times higher than the value for 2,4-D, it would be unlikely that the RfD for xylene would be exceeded in the scenarios analyzed in this risk assessment. The lack of knowing the actual percentage of xylene in Weedone 638, as well as the lack of consensus on the carcinogenic potential of xylene adds some uncertainty to this risk assessment.

Butoxyethanol (or EGBE) has been assessed for human health risk as an impurity in the Garlon 4 formulation of triclopyr (Borrecco and Neisess, 1991). In that risk assessment, the addition of butoxyethanol did not substantially increase the risk to human health over the risk of using the active ingredient of triclopyr. The amount of butoxyethanol in Garlon 4 is listed as 0.3% in that assessment. As the actual amount of butoxyethanol in Weedone 638 is not known, there is some uncertainty in this risk assessment, however the toxicity of EGBE is a factor of 20 times lower than 2,4-D, and assuming that EGBE makes up less than 1% of Weedone 638, it is unlikely that the addition of EGBE represents a significantly increased hazard over the use of 2,4-D itself.

Dicamba (References: USDA 1984; USDA 1989; SERA 2004c)

Acute and Chronic Exposures – Dicamba is relatively nontoxic by oral administration, with single-dose LD_{50} values ranging from approximately 750 to 3,000 mg/kg in rats. Signs of neurotoxicity (e.g., decreased activity, ataxia, loss of coordination) were the main systemic effects in the LD_{50} assays, although gross pathologic changes (e.g., in liver, kidneys and lungs) have been noted in animals that died.

There are no clear indications that the dimethylamine (DMA) salt (e.g., Banvel®), sodium salt or methyl ester derivatives differ significantly from the toxicity of dicamba, or that the toxicity of these forms differs significantly between species or sexes. No information was located on the acute toxicity of the diglycolamine (DGA) salt (e.g., Vanquish®). The similar ranges of oral LD_{50} values for the different forms of dicamba are consistent with pharmacokinetic and chemical evidence for toxicological equivalence, i.e., data showing that dicamba rapidly dissociates in aqueous environments regardless of its form as free acid or salt. Intraperitoneal injections appear to be much more hazardous than oral (or inhalation or dermal) exposure, suggesting that the low acute toxicity by normal exposure routes might be due in part to the kinetics of absorption.

A large number of standard subchronic and chronic toxicity studies have been conducted on dicamba with reported NOAELs ranging from about 50 to 500 mg/kg/day depending on the endpoints assayed and species tested.

Effects on the Skin and Eyes - Mild and transient skin irritation occurred at the application site in some of the studies of the DMA and sodium salts after a dermal dose of 5,050 mg/kg. The local eye, nasal and skin effects observed in the acute inhalation and dermal studies are consistent with results of skin and eye irritation assays. Eye exposure is classified as being mildly to moderately irritating. Dermal exposure to dicamba appears to present no substantial acute toxicity. No mortality, clinical signs of toxicity and/or effects on body weight gain were observed in rats and rabbits dermally exposed to dicamba, the DMA or sodium salts or the methyl ester in single applications of 1,000-5,050 mg/kg (highest tested dose levels). Mild and transient skin irritation occurred at the application site in some of the studies of the DMA and sodium salts.

Subchronic dermal toxicity was studied in rabbits exposed to the DMA, DGA and isopropanolamine (IPA) salts of dicamba. Skin irritation was induced by the DMA salt tested as Banvel®. There were no compound-related changes in behavior and appearance, body weight, hematology, blood chemistry, urinalysis indices, or organ weights in either study. Comprehensive histological examinations were performed that only showed change in the skin at the application site that was consistent with the dermal irritation. In contrast to Banvel®, repeated dermal exposures to the

DGA salt or IPA salt caused no skin irritation in rabbits. There were no clinical signs of toxicity or effects on body weight, hematology, blood chemistry, urinalysis indices, organ weights, or histology in these studies.

Carcinogenicity and Mutagenicity – There are no epidemiology studies or case reports that demonstrate or suggest that exposure to dicamba leads to cancer in humans.

Reproductive and Teratogenic Effects – Dicamba has been tested for its ability to cause birth defects (i.e., teratogenicity) as well as its ability to cause reproductive and developmental impairment. Rabbits were more sensitive to dicamba than rats, with a NOAEL of 3 mg/kg/day for both maternal toxicity and reproductive effects. The reproductive NOAEL in rats was 400 mg/kg/day, a dose that caused signs of toxicity in dams. The 3 mg/kg/day NOAEL in rabbits is the basis of the U.S. EPA RfD on dicamba. Another type of reproduction study involves exposing more than one generation of the test animal to the compound. Three such studies, all in rats, have been conducted on dicamba. The 500 ppm dietary NOAEL determined in these studies was used by the U.S. EPA Office of Pesticide Programs (OPP) in setting the chronic RfD used in setting pesticide tolerances for dicamba.

Other Toxic Endpoints – One study was located that specifically addresses the potential toxic effects of repeated exposures to dicamba in humans. These investigators noted an increased incidence of acetylcholinesterase inhibition in farm workers using herbicides, including dicamba, and found that 3,6-dichloro-2-methoxy benzoic acid, the major component in dicamba, causes inhibition of both plasma and red blood cell cholinesterase *in vitro*, using red cells and plasma from human blood samples.

Neurobehavioral effects of lower dose levels of dicamba were comprehensively evaluated in rats using Functional Observational Battery (FOB) and open-field locomotor activity tests following acute or subchronic exposure. Similar effects were observed in both studies, including body tone rigidity in response to handling and touch, abnormal righting reflex, and impaired gait. Other effects included increased salivation and impaired respiration, flattened and/or raised posture, decreased rearing frequency, increased tail flick latency, decreased forelimb grip strength, hypoalertness and decreased locomotor activity in the acute study, and increased latency to first step in the subchronic study. No NOAEL was identified in the single dose study, indicating that the acute neurotoxicity LOAEL is 300 mg/kg. The subchronic study identified a neurotoxicity NOAEL of 472 mg/kg/day and LOAEL of 768 mg/kg/day.

Clinical signs of neurotoxicity, including ataxia, body stiffening and decreased motor activity, occurred in maternal rats treated with 400 mg/kg/day by gavage on days 0-19 of gestation, and rabbits

administered ≥150 mg/kg/day by capsule on gestation days 6-18. These LOAELs, like the 300 mg/kg LOAEL in the single dose rat study, are lower than the subchronic neurotoxicity NOAEL of 472 mg/kg/day in rats. The lower neurotoxicity LOAELs in the acute and developmental studies is likely related to the bolus methods of oral exposure (gavage or capsule) compared to diet in the subchronic study.

There is very little direct information on which to assess the immunotoxic potential of dicamba. The only studies specifically related to the effects of dicamba on immune function are skin sensitization studies. Nonetheless, the toxicity of dicamba has been examined in numerous acute, subchronic, and chronic bioassays. Although many of these studies did not focus on the immune system, changes in the immune system (which could potentially be manifest as increased susceptibility to infection compared to controls) were not observed in any of the available long-term animal studies. Typical subchronic or chronic animal bioassays conduct morphological assessments of the major lymphoid tissues, including bone marrow, major lymph nodes, spleen and thymus (thymus weight is usually measured as well), and white blood cell counts. These assessments can detect signs of inflammation or injury indicative of a direct toxic effect of the chemical on the lymphoid tissue. Changes in cellular physical and chemical properties of lymphoid tissue and blood, indicative of a possible immune system stimulation or suppression, can also be detected. None of these effects have been noted in any of the longer term toxicity studies.

Dicamba has not been tested for activity as a stimulator or antagonist of the major hormone systems (e.g., estrogen, androgen, thyroid hormone), nor have the levels of these circulating hormones been measured following dicamba exposures. Thus, any judgments concerning the potential effect of dicamba on endocrine function must be based on inferences from standard toxicity studies. The major endocrine glands in the body include the adrenal, hypothalamus, pancreas, parathyroid, pituitary, thyroid, ovary, and testis. None of the longer term or short-term toxicity studies reports effects in any of these organs.

Inhalation Exposures – Inhalation exposure to dicamba appears to present no substantial acute toxicity. Subchronic inhalation toxicity was evaluated in rats that were exposed to an aerosol of dicamba DMA salt as Banvel® 4S for 6 hours/day, 5 days/week for 2 weeks. Histopathological changes in the lungs occurred at ≥0.202 mg/L. The lung pathology in all exposure groups indicates that the LOAEL is 0.202 mg/L and a NOAEL cannot be identified.

Impurities - Information on impurities in technical grade dicamba have been disclosed to the U.S. EPA and this information was obtained and reviewed as part of the development of SERA 2004c. Because this information is classified as confidential business information, detail of the

information submitted to U.S. EPA cannot be disclosed in this risk assessment. If toxic impurities are present in technical dicamba, they are likely to be encompassed by the available toxicity studies using technical grade dicamba.

Some published information is available on the impurities in dicamba. A pharmacokinetics study indicates that the main impurity is 3,5-dichloro-2-methoxy benzoic acid. In a worker exposure study analysis of technical grade dicamba contained the major (3,6-dichloro) and minor (3,5-dichloro) isomers.

There is some indication that the impurities in dicamba may be more toxic than dicamba itself. Edson and Sanderson (1965, as referenced in SERA 2004c) note that "pure" dicamba was less toxic than technical grade dicamba to female rats. Nonetheless, all of the toxicology studies on dicamba involve technical grade dicamba, which is presumed to be the same as or comparable to the active ingredient in the formulations used by the Forest Service. Thus, if toxic impurities are present in technical dicamba, they are likely to be encompassed by the available toxicity studies using technical grade dicamba.

Metabolites - Following gavage or subcutaneous exposure, approximately 93% and 96% of the administered ^{14}C-dicamba, respectively, was excreted unmetabolized in the urine within 24 hours of dosing. With dietary exposure, urinary and fecal excretion approached 96% and 4% of the rate of intake. Dicamba was excreted unchanged in the urine. Similarly, following a single oral dose of 100 mg/kg of radiocarbon-labeled dicamba in rats, mice, rabbits and dogs, 67-83% of the radioactivity was eliminated in the urine as parent compound within 48 hours. About 1% of the administered dose was metabolized to 3,6-dichlorosalicylic acid (3,6-DCSA) and another 1% to an unidentified metabolite.

The pharmacokinetics of radiocarbon-labeled dicamba were compared in rats following a single gavage dose as the free acid or its dimethylamine, isopropylamine or diglycolamine salt in normal saline. Evaluation for 24 hours following dosing showed that there were no statistically significant differences between dicamba and the three amine salt forms. Parent dicamba was the major excreted compound, accounting for 92-94% of the urinary radiocarbon and 75-80% of the fecal radiocarbon. 3,6-DCSA was a minor metabolite (≈0.5 - 0.6% and ≈3-4% of the urinary and fecal radiocarbon, respectively), and unidentified metabolites accounted for <1 % of the urinary radiocarbon. The results of this study indicate that dicamba rapidly dissociated *in vivo* regardless of its form as free acid or an amine salt.

Inerts - The identity of inerts in both Banvel® and Vanquish® has been disclosed to the U.S. EPA and this information has been reviewed as part of the development of SERA 2004c. This information, however, is protected under Section 10 of FIFRA. Other than to state that no apparently hazardous materials have been identified, which is consistent with the MSDS for both Banvel® and Vanquish®, the information on the inerts in these formulations cannot be detailed.

The potential toxicological significance of inerts in Banvel® can be inferred from a comparison of the toxicity data on Banvel® with corresponding toxicity data on dicamba. The acute oral LD_{50} value for Banvel® in rats is 1,028-2,629 mg/kg and the corresponding value for the DMA salt of dicamba is 1,707-2,900 mg/kg. The dermal LD_{50} values for both Banvel® and the DMA salt of dicamba are >2,000 mg/kg and the inhalation LC_{50} value for both Banvel®l and the DMA salt of dicamba are >200 mg/L. Thus, in terms of acute lethal potency, no substantial differences are apparent between the active ingredient in Banvel® (the DMA salt of dicamba) and the Banvel® formulation. However, Banvel® causes severe skin irritation but the DMA salt of dicamba caused no irritation or only slight irritation.

For Vanquish®, commercial searches of the studies available in the FIFRA confidential business information (CBI) files as well as supplemental searches that were kindly provided by the U.S. EPA Office of Pesticide Programs did not identify specific mammalian toxicity studies using Vanquish®. Some data are available comparing the toxicity of the IPA salt, the active ingredient in Vanquish® to other forms of dicamba in birds. The LD_{50} value of a formulation of the IPA salt of dicamba in bobwhite quail is 1,373 mg/kg and the corresponding value for dicamba is 216 mg/kg.

Glyphosate (References: USDA, 1984; USDA, 1989; SERA, 2003a)

Acute and Chronic Exposures - The toxicity of glyphosate is relatively well characterized in both experimental mammals and humans, although the mechanism of action is not clear. The acute toxicity of glyphosate is relatively low, with oral LD_{50} values in rats and mice ranging from approximately 2,000 to 6,000 mg/kg. Most of the human experience with glyphosate involves the consumption of large quantities of glyphosate during attempted suicides. The signs of toxicity are generally consistent with massive mucosal irritation and tissue degeneration. In addition, glyphosate may interfere with normal metabolic biochemical functions.

The chronic toxicity of glyphosate has been well characterized in laboratory mammals. One of the more consistent signs of subchronic or chronic exposure to glyphosate is loss of body weight. This effect has been noted in mice, rats, and rabbits. Other signs of toxicity seem general and non-specific. A few studies report changes in liver weight, blood chemistry that would suggest mild liver

toxicity, or liver pathology. Changes in pituitary weight have also been observed. Signs of kidney toxicity, which might be expected based on the acute toxicity of glyphosate, have not been reported consistently and are not severe. As summarized by the National Toxicology Program (NTP) (1992, as referenced in SERA, 2003a), various hematological changes have been observed but are not considered severe and are attributed to mild dehydration.

Effects on the Skin and Eyes - Glyphosate formulations used by the Forest Service are classified as either non-irritating or only slightly irritating to the skin and eyes in standard assays required for product registration. Based on several eye and skin irritation studies submitted to the U.S. EPA as part of the registration process, the U.S. EPA classifies glyphosate as mildly irritating to the eyes (Category III) and slightly irritating to the skin (Category IV). The free acid of glyphosate is severely irritating to the eyes but the isopropylamine (IPA) salt of glyphosate, the form that is in all formulations used by the USDA Forest Service, is nonirritating to the skin and eyes. Although glyphosate is an irritant, there are no data indicating that the compound causes sensitization in animals or humans. POEA and other surfactants used in glyphosate formulations may be severely irritating to the eyes, skin, and other mucosal surfaces, such as the gastrointestinal tract and the lungs.

Carcinogenicity and Mutagenicity – Based on standard animal bioassays for carcinogenic activity *in vivo*, there is no basis for asserting that glyphosate is likely to pose a substantial risk. The Reregistration Eligibility Decision (RED) document on glyphosate indicates that glyphosate is classified as Group E: Evidence of non-carcinogenicity for humans. Tumors have been observed in some of the earlier chronic toxicity studies. U.S. EPA determined that the studies conducted before 1990 were insufficient for evaluating the potential carcinogenicity of glyphosate because the observed responses were equivocal or the dose levels were inappropriate (i.e., the highest dose used was not the maximum tolerated dose). A recent epidemiology study in Sweden (Hardell and Erikkson, 1999, as referenced in SERA 2003a) reported an increased cancer risk of non-Hodgkin lymphoma (NHL) in individuals in Sweden who have a history of exposure to glyphosate. The increased risk was not statistically significant. A review of the Hardell and Erikkson study was done by U.S. EPA, which concluded that the study does not change their risk assessment for the current uses of glyphosate.

According to the U.S. EPA classification of carcinogens and their assessment of the available data, glyphosate is not carcinogenic to humans. Given the marginal mutagenic activity of glyphosate and the failure of several chronic feeding studies to demonstrate a dose-response relationship for carcinogenicity and the limitations in the available epidemiology study, the Group E classification given by the U.S. EPA appears to be reasonable. As with any compound that has been studied for a long period of time and tested in a large number of different systems, some equivocal evidence of

carcinogenic potential is apparent and may remain a cause of concern, at least in terms of risk perception. While these concerns are understandable, there is no compelling basis for challenging the position taken by the U.S. EPA and no quantitative risk assessment for cancer is conducted as part of the current analysis.

A formulation of glyphosate, Roundup®, has been shown to cause an increase in chromosomal aberrations in a plant (*Allium* spp.) associated with cell abnormalities in spindle fiber, DNA adduct formation in mice, and single strand breaks in mice. None of the *in vivo* studies using mammalian species or mammalian cell lines have reported mutagenic activity. Two studies (Vyse and Vigfusson 1979, Vigfusson and Vyse 1980, as referenced in SERA, 2003a) report a significant increase in sister chromatid exchanges in human white blood cells *in vitro*. The authors of these studies conclude from their results that glyphosate is, at most, slightly mutagenic. In addition, some positive assays in the fruit fly have been reported as well as positive results in white blood cell cultures. Based on the weight of evidence of all available studies, U.S. EPA concluded that glyphosate is not mutagenic.

Reproductive and Teratogenic Effects - Glyphosate has been subject to multi-generation reproduction studies as well as teratology studies. There is no indication from these studies that glyphosate induces teratogenic effects (i.e., birth defects) in soft tissues at doses up to 3,500 mg/kg/day. The only abnormal development was delayed bone development (ossification). In the teratology studies, the observed signs of toxicity - respiratory and gastrointestinal effects - were similar to those observed in acute toxicity studies and occurred at dose levels that were also comparable. In a multi-generation reproduction study in rats, effects to the kidney were observed in male pups at 30 mg/kg/day but not at 10 mg/kg/day. This effect is consistent with the acute toxicity of glyphosate rather than a specific reproductive effect. In a subsequent study, no such effects were observed at doses up to 1,500 mg/kg/day. In the glyphosate RED (U.S. EPA, 1993), U.S. EPA concluded that the lack of renal effects in the second study indicated that the effects seen in the first study were not glyphosate-related. Previous to this, the U.S. EPA had based the RfD for glyphosate on the 10 mg/kg/day NOAEL for this effect. Based on this re-interpretation of results, the NOEL for developmental effects was set at 500 mg/kg/day. The multi-generation reproduction studies found no effect on reproductive capacity. In another study using rabbits, developmental toxicity was not observed at maternal doses up to 350 mg/kg/day, but maternal effects were seen at this dose. The maternal NOEL in this study was 175 mg/kg/day; this is the value U.S. EPA has used to establish the current RfD.

The only other specific and consistent effect of glyphosate involves effects on the testicles. In an NTP study, relative testicular weights in mice were increased. In rats, there was a 20% decrease in

sperm counts at the two highest dose levels, 1,678 and 3,398 mg/kg/day. Given the absence of specific testicular pathology in either species, the NTP concluded that there was no evidence of adverse effects on the reproductive system of rats or mice. This finding is consistent with the bulk of other animal studies, in which no adverse effects on the testes are reported, although an increase in testicular weight - relative and absolute - was observed in mice at 3,465–7,220 mg/kg/day. A study by Yousef et al., (1995, as referenced in SERA 2003a) suggests that more serious effects are plausible. Substantial decreases in libido, ejaculate volume, sperm concentrations, semen initial fructose and semen concentration, as well as increases in abnormal and dead sperm were observed in rabbits. In contrast, in multi-generation reproduction studies, no effects on reproductive performance have been observed at dietary levels equivalent to doses of 1,500 mg/kg/day. The basis for the inconsistency between the Yousef et al., 1995 study and all other studies that have assessed the reproductive effects of glyphosate cannot be identified unequivocally. As discussed in Williams, et al, 2000, the authors describe the Yousef study as having serious deficiencies in design, conduct, and reporting, such that "the data from [the Yousef] study cannot be used to support any meaningful conclusions". In addition, the method of administration of the glyphosate in the Yousef study is not representative of likely human exposures. In a subsequent study, Yousef also demonstrated a reduction in sperm motility after direct exposure of sperm to glyphosate. The mechanism of this effect is not clear, but may nay be related to the ability of glyphosate to inhibit cellular energy production.

Numerous epidemiological studies have examined relationships between pesticide exposures or assumed pesticide exposures in agricultural workers and reproductive outcomes. Very few studies, however, have attempted to characterize exposures, either qualitatively or quantitatively, to specific pesticides. Of those studies that have specifically addressed potential risks from glyphosate exposures, adverse reproductive effects have not been associated with glyphosate exposure.

Other Toxic Endpoints – No neurotoxic effects have been seen in any *in vivo* or *in vitro* studies. Glyphosate has been specifically tested for neurotoxicity in rats after both acute and chronic exposures and in hens. In all three assays, glyphosate was negative for signs of neurotoxicity. U.S. EPA has determined that there is no evidence of neurotoxicity in any of the exposure studies conducted (U.S. EPA, 2000b). Large-scale controlled epidemiological studies of glyphosate exposure and neurological outcomes have not been reported. A small clinical investigation found no evidence for neurological effects among forest workers who mixed and sprayed Roundup during a workweek. The clinical case literature of acute glyphosate intoxication is reasonably extensive and does not provide evidence for glyphosate being an acute neurotoxicant in humans. Several long-term experimental studies examined various endpoints of neurotoxicity (brain morphology) in dogs, mice,

or rats and did not find evidence of neurotoxicity. An acute study found no effect of glyphosate exposure on nervous system reflexes in dogs. Studies conducted in various bird species did not find evidence for neurological effects. One study reported a case of Parkinsonism in an adult male who was exposed to glyphosate (Barbosa et al 2001 as referenced in SERA 2003a). This study stands in contrast to the abundant case literature that suggests glyphosate is not a neurotoxicant in humans. Any direct connection between glyphosate exposure and onset of Parkinsonism from this one study cannot be established, as the effects could be coincidental. There appears to be no evidence for glyphosate being a neurotoxicant in humans or other species.

Schiffman et al. (1995, as referenced in SERA 2003a) conducted a study of the effects of glyphosate on taste response in gerbils. This study appears to be the only reported investigation of the effects of glyphosate on sensory mechanisms. Glyphosate (1 or 10 micromolar concentration (mM)) applied to the tongue of anesthetized gerbils decreased taste receptor response to table salt, sugars, and acids. These tests on glyphosate involved exposure periods of one minute and were conducted along with tests on ten other pesticides, with one-minute rinses between each agent. The mechanism of this effect on the taste response has not been investigated and the implications in terms of dietary preferences in the field cannot be assessed. The effect could have been produced by a general biochemical alteration in the epithelial cells of the tongue, including the specialized cells that detect taste (glyphosate has been shown to produce injury to the oral cavity), by chemical injury to the tongue, or by a direct neurotoxic effect on the sensory nerve endings. Thus, effects reported in Schiffman et al. (1995) cannot be classified clearly as a glyphosate-induced neurologic effect.

Based on results from the available studies in humans and experimental studies in rodents, glyphosate does not appear to be an immunotoxicant in humans or other animals. This conclusion is supported not only by an extensive set of standard mammalian bioassays on toxicity but also by an *in vivo* assay specifically designed to detect humoral immune response and an *in vitro* assay specifically designed to detect cell-mediated immune response.

Epidemiological studies and clinical cases have not found evidence for allergic reactions or sensitization to dermal exposures to glyphosate formulations. Two human experimental studies provide evidence that Roundup® is not a dermal allergen or sensitizing agent. Tests conducted in guinea pigs provide further support for glyphosate not being a dermal sensitizing agent. Several long-term experimental studies have examined the effects of exposure to glyphosate on lymphoid tissue morphology and blood leukocyte counts; treatment-related effects were not observed.

Three specific tests on the potential effects of glyphosate on the endocrine system have been conducted and all of these tests reported no effects. That glyphosate is not an endocrine disruptor is

reinforced by epidemiological studies that have examined relationships between occupational farm exposures to glyphosate formulations and risk of spontaneous miscarriage, fecundity, sperm quality, and serum reproductive hormone concentrations. The studies have not found positive associations between exposure to glyphosate formulations and any reproductive or endocrine outcomes. The clinical case literature does not provide evidence for glyphosate being an endocrine active agent. Several long-term experimental studies have examined the effects of exposure to glyphosate on endocrine organ morphology, reproductive organ morphology, and reproductive function; treatment-related effects were not observed.

Notwithstanding the negative results on endocrine function, the current RfD for glyphosate is based on reproductive effects. In addition, glyphosate has not undergone an extensive evaluation for its potential to interact or interfere with the estrogen, androgen, or thyroid hormone systems (i.e., assessments on hormone availability, hormone receptor binding or post-receptor processing (EDSTAC 1998, as referenced in SERA 2003a)). Thus, the assessment of the potential endocrine effects of glyphosate cannot be overly interpreted.

Inhalation Exposures – Because of the low volatility rate for glyphosate and the available inhalation toxicity studies on a number of glyphosate formulations, the U.S. EPA waived the requirement of an acute inhalation study for technical grade glyphosate in the re-registration of glyphosate. The acute inhalation LC_{50} value of the isopropylamine salt of glyphosate is >6.37 mg/L – i.e., no mortality in any of five rats of each sex exposed to this concentration for four hours (Mcguirk 1999a, as referenced in SERA 2003a). The short-term (typically 4 hours) inhalation LC_{50} values for various glyphosate formulations range from >1.3 mg/L to >7.3 mg/L. The lowest LC_{50} value that is not designated with a greater than (>) symbol is 2.6 mg/L, the reported LC_{50} value for several glyphosate formulations (refer to SERA 2003a).

Impurities - Glyphosate contains small amounts of a nitrosamine, N-nitrosoglyphosate (NNG). Certain groups of nitrosoamines have served as model compounds in some of the classical studies on chemical carcinogenicity. While there is a general concern for the carcinogenic potential of nitroso compounds, the contribution of specific nitroso compounds to carcinogenic risk is difficult to quantify. Monsanto has conducted an apparently extensive series of tests on NNG. A summary of the studies stated that NNG is relatively non-toxic, is rapidly excreted without undergoing any chemical change, does not bioaccumulate, is not mutagenic, and does not cause birth defects or cancer in laboratory test species.

Metabolites – Glyphosate is metabolized to a minor extent in animals, to aminomethylphosphonate (AMPA). In mammals, only very small amounts of AMPA, less than 1% of the absorbed dose, are formed. In addition, AMPA is formed in environmental media such as water and soil as a breakdown product of glyphosate. The approach of examining the potential importance of the metabolism of a chemical agent by a mammal is common in the risk assessment of xenobiotics, which generally involve the formation of one or more mammalian metabolites, some of which may be more toxic than the parent compound. Usually, the parent compound is selected as the agent of concern because the toxicology studies and monitoring studies provide information about the agent. Thus, the dose measure for the risk assessment is most clearly expressed in terms of the parent compound. In cases where a toxic metabolite is known to be handled differently by humans, this simple approach may be modified. There is no indication that such a modification is necessary for glyphosate. Thus, in terms of assessing direct exposures to technical grade glyphosate, the inherent exposures to AMPA as a metabolite are encompassed by the existing toxicity data on glyphosate.

This approach does not, however, encompass concern for exposures to AMPA as an environmental metabolite. 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 this risk assessment, AMPA is not quantitatively considered in the dose-response and exposure assessments.

Inerts – Certain formulations of glyphosate (Roundup® for example) contain a polyethoxylated tallow amine (POEA) surfactant at levels of ~15% (150 g/L) or contain a phosphate ester neutralized POEA surfactant (for example, Roundup Pro®) at a level of ~14.5%. There is some uncertainty in the interpretation of the toxicity data on Roundup® concerning the potential significance of these POEA surfactants, however the available toxicity information on Roundup® are adequate for the identification of toxic thresholds. It appears from an assessment of the data that POEA is less acutely toxic to mammals than glyphosate or Roundup®.

There is little information available on the subchronic or chronic toxicity of POEA. In a developmental toxicity test in rats, Farmer et al (2000b as referenced in SERA 2003a), exposed rats to glyphosate (0, 300, 1,000, or 3,500 mg/kg/day) and both the POEA (0, 15, 100, 300 mg/kg/day) and the phosphate ester neutralized POEA surfactant (0, 15, 50, 150 mg/kg/day) on days 6-15 of gestation. For glyphosate, severe maternal poisoning was observed at 3,500 mg/kg/day and this was associated with reduced fetal body weights and hardening of the cartilage around the sternum, as well

as fetal death. The NOAEL for both maternal and fetal toxicity was 1,000 mg glyphosate/kg/day. The surfactants also caused mortality in dams at the highest doses tested: 300 mg/kg/day for POEA and 150 mg/kg/day for neutralized POEA. In addition, a dose of 100 mg POEA/kg/day caused mild clinical signs of toxicity and decreased food consumption in dams. No fetotoxic effects were reported at any dose level. Thus, in repeated dosing, the NOAEL for glyphosate of 1,000 mg/kg/day was substantially higher than the NOAEL for either POEA (15 mg/kg/day) or neutralized POEA (50 mg/kg/day).

POEA contains the contaminant 1,4-dioxane, which has been classified by U.S. EPA as a probable human carcinogen, Class B2: Probable human carcinogen, and has been given a cancer potency factor (referred to by U.S. EPA as a slope factor) of 0.011 $(mg/kg/day)^{-1}$. Borrecco and Neisess (1991) derived toxicity-based criteria for 1,4-dioxane and used the information to calculate margins of safety for exposure to 1,4-dioxane. At the time of that analysis it was assumed that dioxane is present in Roundup® at a level of approximately 0.03% or 300 mg/L (300 ppm). This is about a factor of 0.00084 less than the level of glyphosate in Roundup®. This is likely an over-estimate of the concentration of dioxane, based on information from the manufacturer (*ibid*).

From Borrecco and Neisess, (1991), the risks of cancer from the exposure to 1,4-dioxane were considered negligible for occupationally exposed individuals, based on an acceptable standard of 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). As the risks from 1,4-dioxane are considered in Borrecco and Neisess, (1991), and risks are considered acceptable, given the conservative assumptions of exposure, it will not be further analyzed or discussed in this Risk Assessment. Based on the analysis in Borrecco and Neisess (1991) and according to the available toxicity data, dioxane does not present unique toxic effects; therefore, its toxicity is likely to be encompassed by the available toxicity data on Roundup®. Dioxane does not present cancer risks to workers at levels considered unacceptable.

Another potential impurity in the POEA surfactant is un-reacted ethylene oxide. Ethylene oxide may be present in any ethoxylated surfactant as a residue of the manufacturing process. Ethylene oxide is a potential carcinogen. Refer to the discussion in Appendix 2 of USDA (2003a) for a discussion of the cancer risk of ethylene oxide in surfactants. The low amount of ethylene oxide in such surfactants, combined with the physical properties of ethylene oxide, make cancer risks low.

Since the late 1990's, patent protection for glyphosate expired, resulting in a strong increase in the number of commercial formulations available for purchase. Most of the hazard analyses done to date have involved Roundup ®, Rodeo®, or Accord® formulations. Inerts in the Roundup® formulation other than the surfactant discussed above, are isopropylamine (0.5%), related organic acids of glyphosate (1.5%), and water (41.6%). The only listed inert ingredient in Rodeo® and Accord® is water (46% to 58%), although it is likely that small amounts of isopropylamine and related organic acids of glyphosate also are present.

Triclopyr (References: USDA, 1984; USDA, 1989; SERA 2002, 2003b; U.S. EPA, 1998b)

Acute and Chronic Exposures - Triclopyr has a low order of acute lethal potency. Oral LD_{50} values range from 600 to 1,000 mg/kg. The signs and symptoms of acute oral intoxication generally include lethargy, impaired coordination, weakness, labored respiration, and tremors. Anorexia and diarrhea have also been observed in rodents and domestic animals. Similar signs and symptoms are associated with triclopyr acid, triclopyr butoxyethylester (BEE), and triclopyr triethylamine salt (TEA). The few available studies regarding histopathology and clinical chemistry data on triclopyr suggest that the liver and kidney are the primary target organs in acute intoxication.

The kidney appears to be the most sensitive target organ for triclopyr, and the dog was initially thought to be the most sensitive species. The lowest effect level for triclopyr is 2.5 mg/kg/day in the dog. In this study, this dose was associated with decreased urinary excretion, determined by means of a phenolsulfonphthalein (PSP) dye excretion test, as well as reduced absolute and relative kidney weights. The inhibition of PSP excretion in the dog could be attributed to competition between triclopyr and PSP for elimination via anion transport. U.S. EPA does not consider PSP excretion appropriate for establishing a NOEL. In the absence of other toxic effects, the 2.5 mg/kg/day dose in the dog study was classified as a NOEL by U.S. EPA. This determination formed the basis of U.S. EPA's provisional acceptable daily intake of 0.025 mg/kg/day. In a follow-up study, the dose of 2.5 mg/kg/day was associated with a statistically significant increase in serum urea nitrogen and creatinine in male dogs. These effects were also evident but more pronounced at 5 mg/kg/day. The NOEL for this effect was 0.5 mg/kg/day. This resulted in the lowering of the provisional U.S. EPA/OPP RfD to 0.005 mg/kg/day using the 0.5 mg/kg/day dose group as the NOEL for effects on kidney function. However, in the 1998 triclopyr RED (U.S. EPA, 1998b), U.S. EPA determined that these two studies, while showing statistically significant results, did not represent a toxic response to triclopyr, but rather a physiologic response of the dog, based on the dog's limited ability to excrete

organic acids at higher plasma concentrations. They used the lack of histopathological changes in the kidneys as support for this decision.

In rodents, kidney effects - hematological and histopathological changes and increased kidney weight - have been observed after subchronic exposure to triclopyr doses as low as 7 mg/kg/day for 90 days. The highest NOEL below the 7 mg/kg/day AEL for kidney effects in rodents is 5 mg/kg/day for 90 days. This result is supported by additional NOAELs of 5 mg/kg/day for exposure periods ranging from 90 days to 2 years. All of these NOAELs are based on the lack of tissue pathology in the kidney rather than tests of kidney function. In 1998, U.S. EPA determined that the RfD would be based upon the NOEL of 5 mg/kg/day, from a two-generation reproduction study (U.S. EPA, 1998b).

The other general systemic toxic effects of triclopyr are un-remarkable. At high doses, signs of liver damage may be apparent as well as decreases in food consumption, growth rate, and gross body weight.

Effects on the Skin and Eyes - Exposure to triclopyr formulations may cause irritation to the skin and eyes. Technical grade triclopyr is classified as only slightly irritating (Category IV). Triclopyr TEA is not a primary skin irritant but has been shown to cause delayed contact sensitization in some studies. Triclopyr BEE has also been shown to cause delayed contact hypersensitivity. Triclopyr BEE causes more severe skin irritation than triclopyr acid or TEA. This may be due to the more rapid absorption of triclopyr BEE.

Ocular exposure appears to follow a different pattern with triclopyr TEA being much more irritating than triclopyr acid or triclopyr BEE.

Triclopyr is poorly absorbed by the skin, and very high doses (>2,000 mg/kg) applied to the skin have not caused death or other signs of toxicity, except weight loss. This result suggests that triclopyr, like many herbicides, is less readily absorbed after dermal exposure than after oral exposure.

There have been repeated dosing studies on triclopyr. Three of these studies involve applications of Garlon® 4 – i.e., triclopyr BEE. The only study reporting systemic toxic effects involved rats that received dermal doses of 24, 240, and 480 mg a.i./kg/day, 5 days per week for 3 weeks. A significant decrease in food intake and growth was observed in males at all dose levels and a significant decrease in food efficiency was observed in males at all dose levels and in females at the highest dose. Based on a review of these and other studies, the U.S. EPA/OPP classified the dermal NOAEL for multiple exposures to triclopyr as greater than 1,000 mg/kg.

Reproductive and Teratogenic Effects - Triclopyr has been subject to several teratogenicity studies, and two multi-generation reproduction studies. At sufficiently high doses, triclopyr can cause adverse reproductive effects as well as birth defects. A consistent pattern with triclopyr, however, is that adverse reproductive effects as well as teratogenic effects occur only at doses that are maternally toxic. At doses that do not cause maternal toxicity, there is no apparent concern for either reproductive or teratogenic effects.

The most significant study is the two-generation reproduction study by Vedula et al. (1995 as referenced in SERA 2003b). This study is the basis of the current RfD on triclopyr. In this study, male and female rats were exposed to triclopyr in the diet at concentrations resulting in doses of 0, 5, 25, or 250 mg/kg/day, except that the first generation males in the high dose group were exposed only to concentrations resulting in a daily dose of 100 mg/kg/day. The 5 mg/kg/day dose groups evidenced no adverse effects in parents or offspring. At 25 mg/kg/day, kidney effects were noted only in adult animals. At 250 mg/kg/day, parental effects included decreased food consumption and body weights as well as histopathologic changes in the liver and kidney. Fetotoxic effects – decreased pup survival and litter sizes – were noted only at 250 mg/kg/day. This dose also resulted in decreased parental fertility. Because no effects were observed at this dose on spermatogenesis or the testes, the decreased fertility was attributed to effects on the female rats.

At substantially higher doses – i.e., greater than or equal to 100 mg/kg/day, triclopyr has been shown to result in birth defects. Most of the abnormalities have been indicative of delayed growth and have been associated with maternal toxicity. Based on several studies with triclopyr BEE and triclopyr TEA, these two forms of triclopyr appear to be equally toxic, consistent with the basic position adopted by U.S. EPA.

Carcinogenicity and Mutagenicity - In 1995, U.S. EPA's Carcinogenicity Peer Review Committee (CPRC) classified triclopyr as a Group D chemical (not classifiable as to human carcinogenicity). This decision was based on increases in mammary tumors in female mice and rats and adrenal tumors in male rats. The CPRC felt that the evidence was marginal (not entirely negative, but yet not convincing), and when combined with lack of genotoxicty and mutagenicity and lack of carcinogenicity of structural analogs, supported the Group D classification. The decision by U.S. EPA to classify triclopyr as Group D is accompanied automatically by a decision not to derive a cancer potency factor for triclopyr and hence, in terms of a risk assessment, the potential carcinogenicity of triclopyr is not considered quantitatively.

There is concern however, since triclopyr has been shown to cause the same type of tumors in two species. In addition, while all cancers are a public health concern, the particular tumor type noted

in rats and mice (breast cancer) is a common and important form of cancer in humans. Nonetheless, it is worth noting that none of the dose groups in either rats or mice evidenced a statistically significant pair-wise increase in breast tumors. In other words, the magnitude of the response was not substantial. The other important factor considered by U.S. EPA is the apparent lack of mutagenic activity of triclopyr. Only one study indicated any form of mutagenic activity and the other standard assays for genotoxicity were negative. This is an important point because even if the U.S. EPA had decided to classify triclopyr as a carcinogen, it is plausible that a threshold dose-response assessment would be conducted. In the current risk assessment, a threshold-based approach is used for standard toxicity and this approach is based on the most sensitive endpoint – effects on the kidney.

Other Toxic Endpoints - There is no evidence for triclopyr being a direct neurotoxicant in humans or other species. Studies designed specifically to detect impairments in motor, sensory, or cognitive functions in mammals or other species exposed sub-chronically or chronically to triclopyr have not been reported. This is not surprising, since the undertaking of such studies on a substance for which the clinical and experimental toxicology experience provide no reason to suspect a neurotoxicity potential, would be highly unusual. Experiments conducted in fish suggest possible effects of triclopyr on behavior when exposures are at or near lethal levels. As is the case with mammals, these studies provide no evidence that triclopyr is a direct neurotoxicant.

Acute toxicity studies conducted in various mammalian species have observed lethargy, impaired coordination, weakness, labored respiration, and tremors in animals exposed to lethal or near-lethal dose levels of triclopyr. Direct neurotoxic activity is expected in longer-term experimental studies in which exposures were well below lethal levels. However, studies conducted in rodents, dogs, monkeys, birds, and amphibians have not provided evidence of direct neurotoxicity, even at the maximum tolerated dose. Neurological endpoints evaluated in these studies may have been limited to brain morphology and observation of the animals for gross abnormalities in movement or balance. Nevertheless, these studies suggest that the acute neurological effects of triclopyr observed at near lethal doses may indeed be secondary to cardiovascular trauma from treatment-induced injuries to other organs, possibly kidney and liver. Studies designed specifically to detect impairments in motor, sensory, or cognitive functions in mammals exposed sub-chronically or chronically to triclopyr have not been reported. Two studies found evidence for possible neurological effects of triclopyr in fish. The effects observed included lethargy, hypersensitivity to light stimuli, and avoidance behavior but were only observed at lethal or near-lethal exposure levels. In the absence of any signs of direct neurotoxicity in other species, these observations are consistent with indirect neurological effects secondary to general poisoning.

There is very little direct information on which to assess the immunotoxic potential of triclopyr. The only studies specifically related to the immune effects of triclopyr are skin sensitization studies conducted on triclopyr BEE and the triclopyr TEA salt. For both of these forms of triclopyr, skin sensitization was observed following standard protocols accepted by the U.S. EPA (1998, as referenced in SERA, 2003b). While these studies provide support for asserting that triclopyr may cause skin sensitization, they provide no information useful for directly assessing immune suppressive potential of triclopyr. The toxicology of triclopyr has been examined in subchronic, chronic, and multi-generation studies in rodents and in subchronic studies in dogs. In these reviews of the toxicity of triclopyr, morphologic abnormalities in lymphoid tissues have not been reported.

Triclopyr has not undergone evaluation for its potential to interact or interfere with the estrogen, androgen, or thyroid hormone systems (i.e., assessments on hormone availability, hormone receptor binding, or post-receptor processing). However, extensive testing in experimental animals provides reasonably strong evidence that triclopyr is not an endocrine disruptor. No epidemiological studies of health outcomes of triclopyr have been reported, and there is no clinical case literature on human triclopyr intoxication. Several long-term experimental studies in dogs, rats, and mice have examined the effects of exposure to triclopyr on endocrine organ morphology, reproductive organ morphology, and reproductive function; treatment-related effects on these endpoints were not observed.

Inhalation Exposures – There is very little information regarding the inhalation toxicity of triclopyr. Three studies on the inhalation toxicity of triclopyr have been reviewed involving technical grade triclopyr as well as triclopyr BEE and triclopyr TEA. No mortality was observed in any animals. The only study not summarized in U.S. EPA (1998) is the recent report by Carter (2000, as referenced in SERA 2003b) on technical grade triclopyr. The results of this study – i.e., an LC_{50} of greater than 2.56 mg/L – is essentially equivalent to the reported LD_{50} value of 2.6 mg/L for triclopyr TEA. Based on these results, the U.S. EPA classified inhalation exposures to not be of toxicological concern.

Metabolites - Triclopyr is not extensively metabolized in humans or experimental mammals. In a study involving rats, >90% of the administered dose of triclopyr acid was recovered in the urine as un-metabolized triclopyr. The remainder was identified as the metabolite 3,5,6-trichloro-2-pyridinol (TCP) and possible conjugates. TCP acute and chronic toxicity is similar to triclopyr. TCP has an acute NOEL of 25 mg/kg/day (compared to 30 mg/kg/day for triclopyr) and a chronic NOEL of 3 mg/kg/day, from a 1-year dog study (compared to a NOEL of 5 mg/kg/day for triclopyr). TCP is also the major metabolite of the insecticide chlorpyrifos. Because of the toxicity of TCP, it will be considered in this risk assessment, specifically in Section 5 (Cumulative Effects).

Inerts – Garlon® 3A contains the triethylamine salt of triclopyr (44.4%) as well as emulsifiers, surfactants, and ethanol. Garlon® 4 contains the butoxyethyl ester (BEE) of triclopyr (61.6%) as well as inerts (38.4%) that include deodorized kerosene.

As reviewed by U.S. EPA, triclopyr TEA dissociates extremely rapidly to triclopyr acid and triethanolamine and triclopyr BEE hydrolyzes to triclopyr acid and 2-butoxyethanol. Relatively little information is available on the toxicity of triethanolamine. This compound is classified as a list 3 inert by U.S. EPA. The List 3 classification reflects the limited toxicity data on triethanolamine and indicates that U.S. EPA was not able to classify this compound as toxic (List 1), potentially toxic (List 2), or essentially non-toxic (Lists 4a or 4b). There is an extensive database on the toxicity of 2-butoxyethanol. The acute oral maximum residue level (MRL) for 2-butoxyethanol is 0.4 mg/kg/day and the intermediate MRL for 2-butoxyethanol is 0.07 mg/kg/day. The acute MRL for 2-butoxyethanol is on the same order as the acute RfD for triclopyr (1 mg/kg/day) and the intermediate MRL for 2-butoxyethanol is similar to the intermediate and chronic RfD for triclopyr (0.05 mg/kg/day). In terms of a practical impact on the risk assessment, the most relevant factor is that both triethanolamine and 2-butoxyethanol will mineralize very rapidly in the environment – i.e., be completely degraded to CO_2. This is not the case for triclopyr or TCP, a metabolite of triclopyr. Thus, the uncertainties associated with the toxicity of triethanolamine and the comparable toxicity of 2-butoxyethanol to triclopyr have relatively little impact on this risk assessment. Because triclopyr and the TCP metabolite of triclopyr persist in the environment much longer than triethanolamine or 2-butoxyethanol, it is triclopyr and the TCP metabolite that are the major quantitative focus of the risk assessment. This approach is identical to the position taken by U.S. EPA.

The toxicity of ethanol is extremely well characterized in humans, and the hazards of exposure include intoxication from acute exposure as well as liver cirrhosis and fetal alcohol syndrome. For chronic exposure, the alcohol contained in Garlon® 3A will not be of toxicological significance because of the rapid breakdown of alcohol in the environment and the relatively high levels of alcohol associated with chronic alcohol poisoning. Similarly, alcohol is not likely to pose an acute toxic hazard. Each milliliter (mL) of Garlon® 3A contains 0.01 mL of ethanol. Therefore, 1,480 mL, or approximately 1.5 liters (L), of Garlon® 3A must be consumed to equal the amount of alcohol contained in 1 ounce of an alcoholic beverage. The same amount of Garlon® 3A contains approximately a lethal dose for triclopyr in humans. Thus, compared with the active ingredient, which is triclopyr, the amount of ethanol in Garlon® 3A is not toxicologically significant in terms of potential toxicity.

The acute toxicity of Garlon® 3A is substantially less than the acute toxicity of triclopyr. The acute oral LD_{50} of triclopyr to rats is approximately 713 mg/kg. The corresponding values for Garlon® 3A range from approximately 2,140 to 2,830 mg/kg or from approximately 1,540 to 2,040 mg a.e./kg. This suggests that components in Garlon® 3A antagonize the acute toxicity of triclopyr.

Like Garlon® 3A, Garlon® 4 causes substantially less acute toxicity in mammals than does triclopyr (oral LD_{50} values in rats = 2,140-2,460 mg/kg (1,540-1,770 mg a.e./kg)). U.S. EPA classifies deodorized kerosene as a List 3 Inert. The toxicity of kerosene was reviewed recently by the Agency for Toxic Substances and Disease Registry (ATSDR). At sufficiently high doses, kerosene can cause many gastrointestinal, central nervous system (CNS), and renal effects. The acute lethal dose of kerosene for humans ranges from approximately 2,000 to 12,000 mg/kg; the acute oral LD_{50} values in experimental mammals range from approximately 16,000 to 23,000 mg/kg. In experimental mammals, acute oral LD_{50} values for triclopyr range from approximately 600 to 1,000 mg/kg. Thus, the acute lethal potency of kerosene is approximately 16 times less than the acute lethal potency of triclopyr. Given the relative potency of kerosene, the acute effects associated with exposure to Garlon® 4 are probably attributable to triclopyr and not to kerosene.

In contrast, the material safety data sheet for Garlon® 4 specifies that inhalation exposure to its vapors may cause central nervous system (CNS) depression attributable to kerosene. CNS depression is consistent with inhalation exposure to kerosene. No monitoring data are available regarding kerosene levels during the application of Garlon® 4. One study monitored triclopyr in air at levels ranging from approximately 5 to 15 $\mu g/m^3$, based on the personal breathing zone air of workers involved in backpack sprays. If kerosene in Garlon® 4 is present at a concentration of ≤20%, the corresponding concentration of kerosene in the air would range from approximately 1 to 3 $\mu g/m^3$. The NOAEL for neurological effects in experimental mammals after exposure to kerosene, which ranged from 14 days to 1 year, is approximately 100 mg/m^3; the NIOSH TLV for petroleum distillates is 350 mg/m^3. Thus, plausible levels of exposure to kerosene during applications of Garlon® 4 are approximately 30,000-100,000 below the NOEL for kerosene in experimental mammals and a factor of 120,000-350,000 below the TLV for petroleum distillates. Although some components of kerosene are known to be carcinogenic to humans (e.g., benzene) kerosene is not classified as a carcinogen, and quantitative risk assessments have not been conducted on kerosene. Exposure to Garlon® 4 may present a hazard, based on the toxicity of triclopyr. Relative to those concerns, the presence of kerosene in Garlon® 4 is not toxicologically significant.

Nonylphenol Polyethoxylate (References: USDA, 2003a)

Introduction: The primary active ingredient in many of the non-ionic surfactants used by the Forest Service is a component known as nonylphenol polyethoxylate (NPE). NPE is found in these commercial surfactants at rates varying from 20 to 80%. NPE is formed through the combination of ethylene oxide with nonylphenol, and may contain small amounts of un-reacted nonylphenol. Nonylphenol (NP) is a material recognized as hazardous by the U.S. EPA (currently on U.S. EPA's inerts list 2). Both NP and NPE exhibit estrogen-like properties, although they are much weaker than the natural estrogen estradiol. Because of the potential for exposure to nonylphenol, as well as the demonstrated estrogenicity of these compounds, a comprehensive consideration of NPE is warranted.

In the production of NPE, various numbers of ethoxylate groups are attached to a nonylphenol (NP) molecule, through a reaction of NP with ethylene oxide. The properties of the particular NPE depend upon the number of ethoxylate groups that are attached, and this number can vary from just a few, up to about a hundred. The most common NPE used in surfactants for pesticide is a mixture that has, as a majority, 8-10 ethoxylate groups attached.[1] But it is important to understand that there is a bell-shaped distribution curve around 9 ethoxylate groups in such a mixture, and that other longer and shorter-chain NPEs also exist in the mixture. An average of 8-10 ethoxylate groups makes these surfactants highly water-soluble.

Acute and Chronic Exposures: - Various NPEs have been acutely tested in rats, rabbits, mice, and guinea pigs. NP4E, NP5E, NP6E and NP9E are classified as slightly toxic to practically non-toxic to mammals and are placed in EPA toxicity category III or IV (tested LD_{50} values ranging from 620 to 7,400 mg/kg). In comparison with these NPEs, the acute toxicity of NP is somewhat higher (tested LD_{50} values in rats ranging from 580 to 1,620 mg/kg).

Based on subchronic and chronic testing, it appears that the liver and kidney are the organs most likely to be affected by exposures to NPE and NP. In 90-day subchronic studies in rats and dogs, exposure to NP9E resulted in slight reductions of polysaccharide in the liver, increased relative liver, kidney, or spleen weight, and decreased weight gain; in rats the NOELs range from about 10-20 mg/kg/day. In 90-day subchronic studies in rats, the oral toxicity of NP6E resulted in a male rat NOEL of 40 mg/kg/day based on increased liver to body weight ratios at 200 mg/kg/day; in females this effect was noted at 1,000 mg/kg/day. In a 90-day subchronic test with beagles, the NOEL for

[1] In this risk assessment, the average number of ethoxylate groups and the NPE will be combined into a standard shorthand. For example NP9E will represent a nonylphenol polyethoxylate with an average of 9 ethoxylate groups. Unless otherwise stated, NP9E will represent the average surfactant ingredient, even though these surfactants may contain an average of 8 to 10 ethoxylate groups.

NP4E and NP6E was 40 mg/kg/day; emesis was evident at 200 mg/kg/day, with relative liver weight being affected at highest dose (1,000 mg/kg/day). In a 2-year chronic exposure test of NP9E in dogs, there was an increase in relative liver weight at a dose of 88 mg/kg/day, with a NOEL of 28 mg/kg/day.

In a 90-day subchronic study, rats exposed to NP in feed had a NOAEL of 650 ppm (50 mg/kg/day) based on small decreases in body weight and food consumption.

NP and NPE have been determined to be weakly estrogenic in both *in vitro* and *in vivo* tests involving aquatic and terrestrial organisms. Non-reproductive effects appear to be the more sensitive endpoint. The NOAEL for chronic effects is assumed to be 10 mg/kg/day based on kidney effects in rats.

Effects on the Skin and Eyes -. NP9E is considered minimally to severely irritating to rabbit skin; acute dermal LD_{50} of 2,830 mg/kg. Acute dermal LD_{50} of NP5E in rabbits is greater than 2,000 mg/kg; with NP6E in rabbits, the acute dermal LD_{50} exceeds 3,000 mg/kg. Both NP5E and NP6E are considered at most, slightly toxic to rabbits via dermal exposure. NP5E and NP6E are skin irritants in rabbits; NP6E is not a skin sensitizer in guinea pigs. Dermal acute toxicity assessment of NP in rabbits gives LD_{50} values > 2,000 mg/kg. NP is considered moderately to severely irritating to rabbit skin.

NP9E is considered moderately to severely irritating to rabbit eyes. The ocular irritation potential of NP6E was evaluated in a Draize test using rabbits; the eyes were not rinsed. NP5E and NP6E are considered severe ocular irritants. NP is considered moderately to severely irritating to rabbit eyes.

Exposure data for NP9E in humans is limited to its use as a component of spermicides and in cosmetics and cleaning products. Incidents of vaginal irritation, irritation of the urinary tract, and allergic contact dermatitis have been reported. Contact dermatitis and contact photosensitivity has been reported in humans following exposure to NP6E, NP10E, and NP12E in consumer products NP2E and NP4E were evaluated as a skin sensitizer on humans; there was no sensitization with a 5% solution of NP2E, but sensitization was seen with NP2E at 10% dilution and NP4E at 10% dilution.

In one study on rats, NP9E was administered dermally to females during gestational days 6-15 at doses of 0, 50, or 500 mg/kg/day. There were no dose-related reproductive or teratogenic effects following this dermal exposure, although there was a decrease in feeding in dams exposed to the highest dose.

Reproductive and Teratogenic Effects - NP and NPE have been determined to be weakly estrogenic in both *in vitro* and *in vivo* tests involving aquatic and terrestrial organisms. In comparison

to the natural estrogen 17-beta-estradiol, NP is approximately 1,000 - 100,000 times weaker in eliciting estrogenic responses. NP9E is less potent than NP, by 1 to 3 orders of magnitude. In general, estrogenic effects appear to decrease with increasing ethoxylate number.

NP increased uterine weight in immature or ovariectomized rats (the ovaries are removed) and in mice following oral administration of 75 mg/kg/day and above and following subcutaneous and intraperitoneal administration, with a NOAEL of 37.5 mg/kg/day. With NP4E and NP9E, no evidence of estrogenic activity was observed in rats *in vivo* as evidenced by a lack of the stimulation of uterine growth following oral exposure of ovariectomized females at doses up to 1000 mg/kg/day for 3 or 4 days. *In vivo* tests in mammals have shown that high chronic dietary levels of NPE need to be administered to show any estrogenic effects (on the order of hundreds or thousands of ppm).

Because of the demonstrated estrogenicity of NP, there have been many studies completed concerning potential reproductive effects of exposure. There are relatively few reproductive tests completed concerning NP9E or other NPEs.

In a multi-generation reproduction study in rats, a 200-ppm daily dose of NP (the lowest dose tested) in the diet (12-18 mg/kg/day in males; 16-21 mg/kg/day in non-lactating females, 27-30 mg/kg/day in lactating females) was the LOEL based on kidney effects (Chapin et al 1999, as referenced in USDA 2003a). No developmental effects were seen at any exposure level, however a range of effects on endocrine-regulated endpoints were observed at 650 and 2,000 ppm in females (increased estrous cycle length, accelerated vaginal opening, increase in relative weights of uterus and vagina). There were no consistent detectable effects on male reproductive parameters (*ibid*). A reproductive NOEL of 200 ppm (~12-40 mg/kg/day) was determined. The authors conclude that NP at low doses would appear to pose a greater hazard to the kidneys than to the reproductive system of male or female rats (*ibid*).

In a multi-generation study in rats where they were continuously exposed to NP via oral gavage at doses of 0, 2, 10, and 50 mg/kg/day, the authors concluded that the reproductive NOAEL for all three generations would be 10 mg/kg/day (Nagao et al, 2001, as referenced in USDA 2003a). In this study, the F0 generation (6 week-old males and 13 week old females at the beginning of the test) showed no dose-related reproductive effects after exposure to NP at any dose. However effects were seen at the 50 mg/kg/day dose in the F1 generation. Although there were no treatment related effects on mating ability or fertility, there were effects to hormone levels in the F1 males and females at the highest dose, although the authors caution against assuming this is treatment related due to inconsistent changes in various related hormones and an absence of effect to the thyroid. There was

also a significant decrease in both absolute and relative ovary weight and an acceleration of vaginal opening. There was a significant decrease in the number of implants and live pups born to F1 females in the highest dose group. Histopathologic examination found no treatment related effects to the testes, and spermatogenesis was normal; there was no effect on male fertility in any generation at any dose, which agrees with the findings in Chapin et al 1999.

De Jager et al 1999 (as referenced in USDA 2003a) provided oral doses of NP to female rats during gestation through weaning and to the male offspring from point of weaning through mating to determine both maternal effects and effects to male reproduction. There were no offspring born to the highest dose group (400 mg/kg/day). There were adverse effects to body and testicular mass and decreased seminiferous tubule diameter at 100 and 250 mg/kg/day dose levels (NOEL < 100 mg/kg/day). There were no significant effects to sperm count, or testis/body weight ratio at 100 mg/kg/day. In Nagao et al 2000 (as referenced in USDA 2003a), after subcutaneous injection of 500 mg/kg/day on post-natal days 1-5, rats were evaluated for reproductive function after puberty. There were effects to reproductive function in females, assumed to be the result of effects to the estrous cycle and histopathological alterations to the ovaries and uterus. In males, there was a decrease in germ cells in the seminiferous tubules, and an increase in degenerated germ cells was noted in the epididymides (*ibid*). There were no effects to sperm motility or plasma testosterone (*ibid*).

NP9E was injected (intraperitoneal) into 9-10 week old male mice at doses of 20, 40, 50, 60 mg/kg/day for 5 days along with a positive and negative control to study the effects on sperm (Johnson 1999, as referenced in USDA 2003a). Evaluations were completed 35 days after injections were completed. The authors concluded that NP9E did not increase the frequency of morphologically abnormal sperm (NOEL > 60 mg/kg.day). No reproductive or developmental effects were observed following oral exposure during gestation to 600 mg/kg/day NP10E in mice. In another study, NP10E was administered subcutaneously to 7-week old female rats at dose levels of 2 and 20 mg/kg/day for 15 weeks (Aso et al 1999a, as referenced in USDA 2003a). There were no effects to reproductive ability and no effects to fetuses (external, skeletal or visceral effects). The same authors conducted another study in which NP10E was administered subcutaneously to female rats at dose levels of 5, 20, and 80 mg/kg/day from date of offspring birth through day 21 after birth to explore the effects on offspring from lactation exposure. There were no effects to physical development or reproductive ability, however there were growth effects at the highest dose. The authors consider 20 mg/kg/day to be the NOEL, based on growth effects to both the dams and offspring.

Oral exposure in rats to NP9E on gestation days 6-15 indicated teratogenic NOEL at 50 mg/kg/day based on litter size decrease, pre-implantation loss, and skeletal anomalies seen in fetuses

after maternal exposures to 250 and 500 mg/kg/day. These doses of 250 and 500 mg/kg/day were also maternally toxic, based on decreases in maternal weight gain.

The relationship between birth defects and use of NP9E as a spermicide was examined in an epidemiological study involving 462 women (426 of whom had used spermicides containing NP9E or OP9E in the first four months of pregnancy). Limb reduction deformities, neoplasms, Down's syndrome, and hypospadias (birth defect of the penis) did not occur in excess in children whose mothers were exposed to spermicides (Shapiro et al 1982, as referenced in USDA 2003a). Although this provides no quantitative information, it is useful in that it is a study involving human health.

Carcinogenicity and Mutagenicity - NP9E was not mutagenic in the Ames test (either with or without metabolic activation) or on the unscheduled DNA synthesis assay (adult rat liver cells). NP9E did not induce malignant transformations (*in vitro*) in rat liver cells. In one study NP9E did induce malignant transformations in BALB/3T3 cells, but this was not duplicated in another study. NP10E was not mutagenic in the Ames test (either with or without activation). NP4E showed no evidence of genotoxicity in tests of reverse mutation in bacteria or in unscheduled DNA repair studies in rat primary liver cells. NP4E did not induce micronuclei in the bone marrow cells of mice following intraperitoneal injection. NP did not show any initiating activity for BALB/3T3 cell transformation, implying that NP did not cause any genetic alteration that was inherited by daughter cells. In another study, NP did cause transformation of pre-treated BALB/3T3 cells in the promotion phase, but not in the initiation phase, indicating that NP may cause the enhancement of carcinogenesis *in vivo* (Sakai 2001, as referenced in USDA 2003a). NP was consistently negative in bacterial tests of mutagenicity, although it induced DNA damage in human sperm, lymphocytes, and MCF-7 breast cancer cells exposed *in vitro*.

No evidence of carcinogenicity was reported in 2-year chronic oral toxicity studies of NP9E with rats and dogs. Intravaginal dosages of NP9E in rats, up to 20 times the rates recommended for use in humans as a spermicide, for 2 years, indicated no carcinogenicity.

No chronic toxicity studies with NP were found with the exception of the two multi-generation studies discussed above (Chapin et al 1999; Nagao et al 2001). There was no indication of carcinogenesis in either of these two studies. As paraphrased from European Union 2002 (as referenced in USDA, 2003a), carcinogenicity of NP has not been directly studied, however, some information on the carcinogenic potential can be derived from other data. On the basis of information currently available it is unlikely that NP is mutagenic, so concerns for cancer caused by a genotoxic mechanism are low. Considering the potential for carcinogenicity by a non-genotoxic mechanism, no

evidence of sustained cell proliferation or hyperplasia was seen in the standard repeated exposure toxicity studies. Overall, there are low concerns for carcinogenicity by a non-genotoxic mechanism.

Other Toxic Endpoints - Some xenoestrogenic chemicals may also have an effect on the immune system; estradiol and diethylstilbestrol have shown both types of effects. In one study using female mice, the mice were injected with 0.2 ml of 0.2% NP9E daily (approximately 130 mg/kg/day) for 24 days followed by a challenge with sheep red blood cells. There were no effects to white blood cell counts, primary and secondary anti-SRBC titers, and serum immunoglobulin M (IgM) and serum immunoglobulin G (IgG) concentrations.

Indirect observations of potential immunotoxicity can be developed from *in vivo* studies that conduct histopathological examinations of body tissues that are part of the immune system such as the lymphoid tissues (lymphocytes), thymus, spleen, bone marrow, and lymph nodes (SERA 2002). In Nagao et al, 2001, after continuous exposure to NP (oral gavage) at 50 mg/kg/day in rats, there was a decrease in both relative and absolute thymus weight, but no histopathologic alterations observed in this organ; these effects were not seen at the next lower dose of 10 mg/kg. In the same study, after exposure of males to 250 mg/kg/day over several months, reduced thymus was observed in most of the males, and upon histopathologic examination, there was atrophy with pyknosis (reduction in the nucleus) and a reduction in lymphocyte number. Based on this observation, it was felt that the reduced thymus weights seen at 50 mg/kg were likely related to the exposure to NP (*ibid*).

In a subchronic study in rats exposed to NP, there was no effect to spleen weight, and histopathological examinations of sternum bone marrow, the spleen, mandibular and mesenteric lymph nodes, and the thymus reveled no treatment related changes after a 90-day exposure to NP in male and female rats up to 129 (males) and 149 mg/kg/day (females) (Cunny et al 1997, as referenced in USDA 2003a). In the multigeneration study by Chapin et al 1999, there were no effects to the spleen, in terms of relative weight, in any generation at any NP dose tested (up to 2,000 ppm).

There are few studies that look at neurological effects of exposure to NP9E or the other NPEs. After subcutaneous injection of NP10E in the female rats at 2 and 20 mg/kg/day for 15 weeks, effects to offspring that were conceived and delivered during the maternal exposure period showed no effects in several behavior tests (open field test, water maze test), nor showed any effects in several reflex response assessments (righting on surface, negative geotaxis, corneal or pinna reflex).

There are several *in vivo* studies that look at the neurological effects of exposure to NP. In a recent multigenerational study by Flynn et al. (2002 as referenced in USDA 2003a), rats were exposed to NP in the diet at rates of 0, 25, 200, 750 ppm (equivalent to 0, 2, 16, 60 mg/kg/day) over

two generations (F_0, F_1). Females in each of three generations (F_0, F_1, F_2) were tested at several points during their lives using a water maze test. The study showed that two generations of dietary exposure to NP did not significantly alter the water maze performance in young adult or middle-aged female rats. This suggests that chronic dietary exposure to NP does not cause gross alterations in spatial learning and memory in female rats.

In Nagao et al 2001, performance in behavioral tests (open field activity, water maze, and running wheel activity) was assessed, as was the development of neural reflexes (righting response, cliff-drop aversion response, negative geotaxis) in developing pups. There were no significant effects seen in any of these parameters in the F_1 or F_2 generations after lifetime exposures to up to 50 mg/kg/day NP via oral gavage. There was an increase in salivation in F_0 males at 50 mg/kg.

Pregnant rats were exposed to NP in the diet at 0, 25, 500, and 2,000 ppm and after weaning, their offspring were exposed to the same diet until postnatal day 77. At several points during the growth of the offspring, behavioral tests were conducted to assess effects of NP exposure. There were no consistent NP-related effects in open-field activity, running wheel activity, play behavior, or intake of a saccharin-flavored solution. Intake of a sodium-flavored solution as well as water intake was increased at the 2,000 ppm level in offspring. The authors note that increased sodium solution intake has been seen in experiments after developmental exposure to other estrogenic compounds (such as genistein and estradiol), indicating that this may be an estrogenic response. Male rats exposed to NP during development and weaning (through maternal dosing), and after weaning (oral gavage) showed no signs of behavioral abnormalities when exposed to NP up to 250 mg/kg/day through post natal day 70.

Indirect observations of potential neurotoxicity can be developed from *in vivo* studies that conduct histopathological examinations of body tissues that are part of the nervous system such as the spinal cord, the brain, peripheral nerves (such as the sciatic nerve) (SERA 2002). In the study by Cunny et al, 1997, there were no effects seen to the brain or brainstem in terms of absolute weight or based upon microscopic examination of the tissues after subchronic 90-day exposures to NP up to 149 mg/kg/day in male or female rats.

Impurities – To some extent, concern for impurities in technical grade NPE is reduced by the fact that the existing toxicity studies on NPE 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 potential carcinogen in an otherwise non-carcinogenic mixture may represent a carcinogenic risk. This is the situation with NPE. NPE may contain ethylene oxide and 1,4-dioxane as impurities. U.S. EPA considers ethylene oxide to be a probable human carcinogen for which the data are adequate to consider risk quantitatively.

Ethylene oxide has been found in NP9E at low levels, <3.6 to 12.2 mg/L (ppm), in the unreacted form as a residual from the manufacturing process. Depending upon processing methods, this can be reduced essentially to zero. Ethylene oxide is used in the production of many chemicals, including ethoxylates, and used as a hospital sterilant, but most use is for the production of ethylene glycol. Ethylene oxide is likely present in many products that contain ethoxylates, such as surfactants containing linear alcohol ethoxylates. Unreacted levels of ethylene oxide in these products should reduce with time due to reaction, storage, further pumping, and other processing.

Ethylene oxide has been described as a probable human carcinogen with sufficient evidence in experimental animals to support a finding as a carcinogen; it is also a mutagen (refer to USDA, 2003a, Appendix 2). Ethylene oxide has a high vapor pressure and high water solubility, and at normal room temperature and pressure is a gas. Because of its high vapor pressure and high water solubility it is not expected to bio-accumulate or accumulate in soil or sediment. Metabolism of ethylene oxide in larger mammals is primarily through hydrolysis to ethylene glycol, which in turn is converted to oxalic acid, formic acid, and CO_2. While a detailed review of ethylene oxide is beyond the scope of this risk assessment, adequate information is available on ethylene oxide to quantify the carcinogenic risk associated with the use of NP9E. This discussion of risk is contained in USDA (2003a, Appendix 2). Based on conservative assumptions concerning exposure, the carcinogenic risks to workers from ethylene oxide are at acceptable levels. Ethylene oxide will not be discussed further in this risk assessment.

1,4-dioxane has also been found as an impurity in NP9E at low levels (<4.5 to 5.9 ppm). 1,4-dioxane has also been classified as a carcinogen. Borrecco and Neisess 1991 conducted a risk assessment of the impurity 1,4-dioxane in the surfactant in Roundup® formulations of glyphosate. In that risk assessment, they assumed a concentration of 1,4-dioxane at 0.03% in the Roundup® formulation, which is about two orders of magnitude greater concentration than found in NP9E. Borrecco and Neisess used a systemic NOEL of 9.6 mg/kg/day and a cancer potency value of 0.0076 mg/kg/day. With the higher percentage of 1,4-dioxane assumed in Roundup®, they concluded that the risk of acute, chronic, or reproductive effects would be acceptably low, even at maximum labeled rates for Roundup®. They included a cancer risk assessment written by Heydens 1989, which looked at the increased risk of cancer caused by the use of surfactants that contained 1,4-dioxane as a

contaminant. Heydens, using a cancer potency value of 0.0076 mg/kg/day, and a 300 ppm contamination rate, determined that the risk of cancer from 1,4-dioxane was well below the 1 in 1 million threshold considered acceptable. Heydens concluded that the carcinogenic risk from exposure to 1,4-dioxane is negligible for occupationally exposed individuals. As these two documents have adequately considered the risk of 1,4-dioxane, this impurity will not be considered further in this risk assessment.

It is important to note that chronic studies involving NP9E have not determined cancer to be an endpoint in mammals.

Metabolites – Based on one study of NP9E, it appears to be rapidly metabolized and excreted (Walter et al 1988, as referenced in USDA 2003a). After injection of NP9E into female rats, bile and urine were monitored for metabolites. The NP9E was completely metabolized by the rats and these metabolites were primarily excreted in feces and secondarily in urine (all radioactivity being excreted within 48 hours after injection). Analysis of urinary metabolites 24 hours after an intravenous dose indicated the presence of highly polar neutral and acidic species.

Doerge et al 2002 (as referenced in USDA 2003a) analyzed for NP metabolites in rats after feeding over 2 generations at levels of 1.5, 12, and 45 mg/kg/day. Glucuronides were identified as the primary metabolite, with lesser amounts of NP-aglycone and NP-catechol. Glucuronides are not active as an estrogen receptor (nor as anti-estrogens, androgens, or anti-androgens) while the NP-aglycone and NP-catechol are expected to continue to act as estrogen mimics. After a 50 mg/kg oral dose, there was rapid absorption and elimination of NP in both males and females (elimination halftimes of 3.1 to 4.0 hours). In a human exposure experiment to NP, radio-labeled NP was injected intravenously (14 μg/kg) or given orally (66 μg/kg) to two human volunteers to study metabolism and excretion. Elimination from the blood was rapid, with no detectable residue after 10 hours through either method of exposure. Only a relatively small percentage of NP or glucuronide or sulphate conjugates were detectable in the urine or feces (approximately 10% of the dose), suggesting further metabolism to compounds unidentified in this study or storage in tissues, likely lipids.

Inerts – NP9E-based surfactants also commonly include an alcohol (such as butyl or isopropyl alcohol), making up about 10% of the mixture; a silicone defoamer (about 1% of the mixture); and water. The NP9E makes up the majority of the formulation, often around 80% of the formulation. Most of these inert ingredients are on U.S. EPA list 4B (considered safe in pesticide formulations).

Section 3 – Exposure Assessment

Workers

Pesticide applicators are likely to be the individuals who are most 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.

The USDA Forest Service has generally used an absorption-based model for worker exposure modeling, in which the amount of chemical absorbed is estimated from the amount of chemical handled. Absorption based models have been used by the USDA Forest Service because of two common observations from field studies. First, most studies that attempt to differentiate occupational exposure by route of exposure indicate that dermal exposure is the dominant route of exposure for pesticide workers. Second, most studies of pesticide exposure that monitored both dermal deposition and chemical absorption or some other method of bio-monitoring noted a very poor correlation between the two values (e.g., Cowell et al. 1991, Franklin et al. 1981, Lavy et al. 1982, all as referenced in SERA 2000b). In this exposure assessment for workers, the primary goal is to estimate absorbed dose so that the absorbed dose estimate can be compared with available information on the dose-response relationships for the chemical of concern.

Initially, risk assessments for the USDA 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). In 1998, 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). 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. Although pesticide application involves many different job activities, exposure rates can be defined for three categories: directed foliar applications (including cut surface, streamline, and direct sprays) involving the use of backpacks or similar devices,

broadcast hydraulic spray applications, and broadcast aerial applications. While these may be viewed as crude groupings, the variability in the available data does not seem to justify further segmenting the job classifications - e.g., hack-and-squirt, injection bar.

See Tables F3-3a to F3-3i for the results of worker exposure calculations. (Actual calculations are displayed on worksheets contained in the project file and are based on the referenced SERA risk assessments and USDA (2003a).

General Exposures - As described in SERA (2000b), worker exposure rates are expressed in units of milligrams (mg) of absorbed dose per kilogram (kg) of body weight per pound of chemical handled (mg/kg/lb applied). The exposure rates used in this risk assessment are based on worker exposure studies on nine different pesticides with molecular weights ranging from 169 to 416 and the base-10 log of the octanol water coefficient (log K_{ow}) values at pH 7 ranging from –2.90 to 6.50 (SERA 1998b, Table 1). The estimated exposure rates (Table F3-1) are based on estimated absorbed doses in workers as well as the amounts of the chemical handled by the workers (SERA 1998b, Table 5). Exposure rates are shown as milligrams of chemical per kilogram of body weight per pound of active ingredient (ai) applied. The molecular weight and log K_{ow} of the six herbicides considered in this risk assessment are within the range of pesticides studied in SERA (1998b). Although the molecular weight of NP9E is outside this range, the values derived in SERA (1998b), should be conservative for this use, because larger molecules would tend to be absorbed at lower rates. As described in SERA (2000b), the ranges of estimated occupational exposure rates vary substantially among individuals and groups, (i.e., by a factor of 50 for backpack applicators and a factor of 100 for mechanical ground sprayers). It seems that much of the variability can be attributed to the hygienic measures taken by individual workers (i.e., how careful the workers are to avoid unnecessary exposures).

Table F3-1: Estimated Exposure Rates from Herbicides used to Treat Noxious Weed

Job Category	Typical (mg/kg/lb ai)	Lower (mg/kg/lb ai)	Upper (mg/kg/lb ai)
Ground Application	0.003	0.0003	0.01
Hydraulic Sprayer	0.0002	0.00001	0.0009

Source: SERA, 1998b, Table 5.

The estimated number of acres treated per hour for ground applications is taken from recent experiences in the Pacific Southwest Region. It is estimated that hydraulic ground spray workers will typically treat 2 to 6 acres per hour. Although this rate of treatment is substantially lower than the typical rates used in herbicide ground broadcast applications in other risk assessments, these lower

values are better estimates of plausible treatment rates for these herbicides given the types of equipment that will be used and the areas that will be treated.

The number of hours worked per day is expressed as a range, the lower end of which is based on an 8-hour workday with 1 hour at each end of the workday spent in activities that do not involve herbicide exposure. The upper end of the range, 8 hours per day, is based on an extended (10-hour) workday, allowing for 1 hour at each end of the workday to be spent in activities that do not involve herbicide exposure. It is recognized that the use of 6 hours as the lower range of time spent per day applying herbicides is not a true lower limit. It is conceivable and perhaps common for workers to spend much less time in the actual application of a herbicide if they are engaged in other activities. Thus, using 6 hours can be regarded as conservative. In the absence of any published or otherwise documented work practice statistics to support the use of a lower limit, this conservative approach is used.

The range of acres treated per hour and hours worked per day is used to calculate a range for the number of acres treated per day. For this calculation as well as others in this section involving the multiplication of ranges, the lower end of the resulting range is the product of the lower end of one range and the lower end of the other range. Similarly, the upper end of the resulting range is the product of the upper end of one range and the upper end of the other range. This approach is taken to encompass as broadly as possible the range of potential exposures. The central estimate of the acres treated per day is taken as the arithmetic average of the range. Because of the relatively narrow limits of the ranges for backpack and boom spray workers, the use of the arithmetic mean rather than some other measure of central tendency, like the geometric mean, has no marked effect on the risk assessment.

The range of application rates and the typical application rate are based on experience in the Pacific Southwest Region or, for those herbicides without much previous use in this Region, the rate is based on local recommendations (See Table F3-2). (Rates are expressed as either acid equivalents (ae) or active ingredient (ai).) Similarly, the typical dilution rates and ranges of dilution rates are largely based on Pacific Southwest Region experience. The typical dilution rate is 25 gallons per acre of herbicide mixture applied, with the lowest dilution being 20 gallons per acre, and the highest being 35 gallons per acre. For hexachlorobenzene, the application rate is based on the application rate for clopyralid and the percentage of hexachlorobenzene in clopyralid.

Table F3-2: Herbicide and Nonylphenol Polyethoxylate Application Rates to be used to Treat Noxious Weeds (Including the Incidental Rate of Application of the Impurity Hexachlorobenzene)

Herbicide	Application Rate Typical (lb/ac)	Application Rate Lowest (lb/ac)	Application 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 (both BEE and TEA)	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

The central estimate of the amount handled per day is calculated as the product of the central estimates of the acres treated per day and the application rate. The ranges for the amounts handled per day are calculated as the product of the range of acres treated per day and the range of application rates. Similarly, the central estimate of the daily-absorbed dose is calculated as the product of the central estimate of the exposure rate and the central estimate of the amount handled per day. The ranges of the daily-absorbed dose are calculated as the range of exposure rates and the ranges for the amounts handled per day. The lower and upper limits are similarly calculated using the lower and upper ranges of the amount handled, acres treated per day, and worker exposure rate.

Accidental Exposures - Typical occupational exposures may involve multiple routes of exposure (i.e., 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 on 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.

The available literature does not include quantitative methods for characterizing exposure or responses associated with splashing a solution of a chemical into the eyes; furthermore, there appear to be no reasonable approaches to modeling this type of exposure scenario quantitatively. Consequently, accidental exposure scenarios of this type are considered qualitatively in the risk characterization.

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.

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 will be immersed in a solution of an herbicide for any period of time. 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.

For both scenarios (the hand immersion and the contaminated glove), the assumption of zero-order absorption kinetics is appropriate. Following the general recommendations of U.S. EPA (1992, as referenced in SERA 2000b), Fick's first law is used to estimate dermal exposure.

Exposure scenarios involving chemical spills on to 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. The absorbed dose is then calculated as the product of the amount of the chemical on the surface of the skin (i.e., the amount of liquid per unit surface area multiplied by the surface area of the skin over which the spill occurs and the concentration of the chemical in the liquid) the first-order absorption rate, and the duration of exposure. For both scenarios, it is assumed that the contaminated skin is effectively cleaned after 1 hour. As with the exposure assessments based on Fick's first law, this product (mg of absorbed dose) is divided by bodyweight (kg) to yield an estimated dose in units of mg chemical/kg body weight. The specific equation used in these exposure assessments is taken from SERA (2000b).

Table F3-3a: Summary of Worker Exposure Scenarios – Chlorsulfuron

Scenario	Typical Dose (mg/kg/day)	Lower Range (mg/kg/day)	Upper Range (mg/kg/day)
General Exposure (dose in mg/kg/day)			
Backpack application	0.00028	1.3 E-5	0.0025
Boom Spray	0.00026	4.2 E-6	0.0027
Accidental/Incidental Exposures (dose in mg/kg/event)			
Immersion of hands, 1 minute	1.1 E-7	1.9 E-8	5.1 E-7

Contaminated Gloves, 1 hour	6.4 E-6	1.1 E-6	3.1 E-5
Spill on hands,1 hour	4.0 E-6	4.0 E-7	3.2 E-5
Spill on lower legs,1 hour	9.8 E-6	9.9 E-7	7.9 E-5

Table F3-3b: Summary of Worker Exposure Scenarios – Clopyralid

Scenario	Typical Dose (mg/kg/day)	Lower Range (mg/kg/day)	Upper Range (mg/kg/day)
General Exposure (dose in mg/kg/day)			
Backpack application	0.0015	4.7 E-5	0.010
Boom Spray	0.0014	1.6 E-5	0.011
Accidental/Incidental Exposures (dose in mg/kg/event)			
Immersion of hands, 1 minute	4.1 E-7	3.9 E-8	1.9 E-6
Contaminated Gloves, 1 hour	2.4 E-5	2.3 E-6	0.00012
Spill on hands,1 hour	7.3 E-5	5.5 E-6	0.00045
Spill on lower legs,1 hour	0.00018	1.4 E-5	0.0011

Table F3-3c: Summary of Worker Exposure Scenarios – 2,4-D

Scenario	Typical Dose (mg/kg/day)	Lower Range (mg/kg/day)	Upper Range (mg/kg/day)
General Exposure (dose in mg/kg/day)			
Backpack application	0.0090	0.00018	0.080
Boom Spray	0.0084	6.0 E-5	0.086
Accidental/Incidental Exposures (dose in mg/kg/event)			
Immersion of hands, 1 minute	3.5 E-5	3.4 E-6	0.00014
Contaminated Gloves, 1 hour	0.0021	0.00020	0.0084
Spill on hands, 1 hour	0.00083	6.4 E-5	0.0041
Spill on lower legs, 1 hour	0.0020	0.00016	0.010

Table F3-3d: Summary of Worker Exposure Scenarios – Dicamba

Scenario	Typical Dose (mg/kg/day)	Lower Range (mg/kg/day)	Upper Range (mg/kg/day)
General Exposure (dose in mg/kg/day)			
Backpack application	0.0060	9.0 E-5	0.080
Boom Spray	0.0056	3.0 E-5	0.086
Accidental/Incidental Exposures (dose in mg/kg/event)			
Immersion of hands, 1 minute	3.2 E-5	2.4 E-6	0.00018
Contaminated Gloves, 1 hour	0.0019	0.00014	0.011
Spill on hands, 1 hour	0.00060	3.7 E-5	0.0045
Spill on lower legs, 1 hour	0.0015	9.2 E-5	0.011

Table F3-3e: Summary of Worker Exposure Scenarios – Glyphosate

Scenario	Typical Dose (mg/kg/day)	Lower Range (mg/kg/day)	Upper Range (mg/kg/day)
General Exposure (dose in mg/kg/day)			
Backpack application	0.015	0.00027	0.15
Boom Spray	0.014	9.0 E-5	0.16
Accidental/Incidental Exposures (dose in mg/kg/event)			
Immersion of hands, 1 minute	3.6 E-6	1.9 E-7	2.8 E-5
Contaminated Gloves,1 hour	0.00022	1.2 E-5	0.0017
Spill on hands, 1 hour	0.00047	3.2 E-5	0.0021
Spill on lower legs, 1 hour	0.0012	8.0 E-5	0.0052

Table F3-3f: Summary of Worker Exposure Scenarios – Triclopyr TEA

Scenario	Typical Dose (mg/kg/day)	Lower Range (mg/kg/day)	Upper Range (mg/kg/day)
General Exposure (dose in mg/kg/day)			
Backpack application	0.0060	0.00018	0.060
Boom Spray	0.0056	6.0 E-5	0.065
Accidental/Incidental Exposures (dose in mg/kg/event)			
Immersion of hands, 1 minute	2.3 E-5	3.7 E-6	9.7 E-5
Contaminated Gloves, 1 hour	0.0014	0.00022	0.0058
Spill on hands, 1 hour	0.0064	0.00080	0.035
Spill on lower legs, 1 hour	0.016	0.0020	0.085

Table F3-3g: Summary of Worker Exposure Scenarios – Triclopyr BEE

Scenario	Typical Dose (mg/kg/day)	Lower Range (mg/kg/day)	Upper Range (mg/kg/day)
General Exposure (dose in mg/kg/day)			
Backpack application	0.0060	0.00018	0.060
Boom Spray	0.0056	6.0 E-5	0.065
Accidental/Incidental Exposures (dose in mg/kg/event)			
Immersion of hands, 1 minute	0.0079	0.0015	0.027
Contaminated Gloves, 1 hour	0.47	0.090	1.6
Spill on hands, 1 hour	0.018	4.4 E-5	0.057
Spill on lower legs, 1 hour	0.046	0.00011	0.14

Table F3-3h: Summary of Worker Exposure Scenarios – NPE

Scenario	Typical Dose (mg/kg/day)	Lower Range (mg/kg/day)	Upper Range (mg/kg/day)
General Exposure (dose in mg/kg/day)			
Backpack application	0.010	0.00048	0.093
Boom Spray	0.0093	0.00016	0.10
Accidental/Incidental Exposures (dose in mg/kg/event)			
Immersion of hands, 1 minute	0.00017	6.2 E-5	.00044
Contaminated Gloves, 1 hour	0.010	0.0037	0.026
Spill on hands, 1 hour	5.4 E-5	7.7 E-6	0.00069
Spill on lower legs, 1 hour	0.00013	1.9 E-5	0.0017

Table F3-3i: Summary of Worker Exposure Scenarios – Hexachlorobenzene

Scenario	Typical Dose (mg/kg/day)	Lower Range (mg/kg/day)	Upper Range (mg/kg/day)
General Exposure (dose in mg/kg/day)			
Backpack application	3.8 E-9	1.2 E-10	2.5 E-8
Boom Spray	3.5 E-9	3.9 E-11	2.7 E-8
Accidental/Incidental Exposures (dose in mg/kg/event)			
Immersion of hands, 1 minute	4.7 E-7	5.3 E-8	1.8 E-6
Contaminated Gloves, 1 hour	2.8 E-5	3.2 E-6	0.00011
Spill on hands, 1 hour	6.3 E-9	5.0 E-10	3.4 E-8
Spill on lower legs, 1 hour	1.5 E-8	1.2 E-9	8.3 E-8

General Public

Under normal conditions, members of the general public should not be exposed to substantial levels of any of these herbicides. 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. See Tables F3-5a to F3-5i for a summary of the general public exposure scenarios.

Direct Spray -- Direct sprays involving ground applications are modeled in a manner similar to accidental spills for workers. In other words, it is assumed that the individual is sprayed with a solution containing the compound and that an amount of the compound remains on the skin and is absorbed by first-order kinetics. As with the similar worker exposure scenarios, the first-order absorption kinetics are estimated from the empirical relationship of first-order absorption rate coefficients to molecular weight and octanol-water partition coefficients (SERA 2000b).

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.

Dermal Exposure from Contaminated Vegetation -- In this 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 the estimation methods of Durkin et al. (1995, as referenced in SERA 2000b) are used. Other estimates used in this exposure scenario involve estimates of body weight, skin surface area, and first-order dermal absorption rates.

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

The acute exposure scenario assumes that a young child (2- to 3-years old) consumes 1 L of contaminated water (a range of 0.6 to 1.5L) shortly after an accidental spill of 200 gallons of a field solution into a pond that has an average depth of 1 m and a surface area of 1000 m^2 or about one-quarter acre. Because this scenario is based on the assumption that exposure occurs shortly after the spill, no dissipation or degradation of the herbicide is considered. This is an extremely conservative scenario dominated by arbitrary variability. The actual concentrations in the water would depend heavily on the amount of compound spilled, the size of the water body into which it is spilled, the time at which water consumption occurs relative to the time of the spill, and the amount of contaminated water that is consumed. It is also unlikely that ponds would be the waterbody receiving any herbicides in this project. Flowing streams are the more likely recipients, so dilution would occur. For these reasons, a second scenario is developed in which a stream is contaminated through drift, runoff, or percolation and a child consumes water from that stream. For the level of herbicide in this stream, an assumption of the short-term water contamination rate is developed (Table F3-4a).

The scenario for chronic exposure to these herbicides from contaminated water assumes that an adult (70 kg male) consumes contaminated ambient water for a lifetime. There are some monitoring studies available on many of these herbicides that allow for an estimation of expected concentrations in ambient water associated with ground applications of the compound over a wide area (glyphosate, hexazinone, and triclopyr). For the others, such monitoring data does not exist. For those herbicides without monitoring data, for this component of the exposure assessment, 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 hydro-geological conditions (Knisel et al. 1992, as

referenced in SERA 2001b). SERA (2001b) illustrated the general application of the GLEAMS model to estimating concentrations in ambient water. The results of the GLEAMS modeling runs are displayed in the respective SERA risk assessments.

The specific estimates of longer-term concentrations of these herbicides in water that are used in this risk assessment are summarized in Table F3-4b. These estimates are expressed as the water contamination rates (WCR) in mg/L (ppm) per pound of active ingredient or acid equivalent applied. The values in Tables F3-4a and F3-4b must be multiplied by the rates of application in Table F3-2 (with the exception of NPE, which already encompasses a range of application rates). It is important to note that water monitoring conducted in the Pacific Southwest Region since 1991, involving glyphosate and triclopyr has not shown levels of water contamination as high as these for normal (i.e., not accidental) applications (USDA 2001). This indicates that, at least for these two herbicides, the assumptions in this risk assessment provide for a conservative (i.e. protective) assessment of risk.

Table F3-4a: 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 F3-4b: 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

Oral Exposure from Contaminated Fish - 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 bio-concentration. Generally, bio-concentration is measured as the ratio of the concentration in the

organism to the concentration in the water. For example, if the concentration in the organism is 5 mg/kg and the concentration in the water is 1 mg/L, the bio-concentration factor (BCF) is 5 L/kg. As with most absorption processes, bio-concentration depends initially on the duration of exposure but eventually reaches steady state. Details regarding the relationship of bio-concentration factor to standard pharmacokinetic principles are provided in Calabrese and Baldwin (1993, as referenced in SERA 2000b).

Most of the herbicides in this risk assessment have BCF values for fish of 1 or less. There are three with BCF values greater than 1: chlorsulfuron (1-12), 2,4-D (40), and hexachlorobenzene (10,000). These values are generally determined from a standardized test that is required as part of the registration process.

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 of 200 gallons of a field solution into a pond that has an average depth of 1 meter and a surface area of 1000 m^2 or about one-quarter acre. 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 (U.S. EPA 1996, as referenced in SERA 2000b), separate exposure estimates are made for these two groups. The chronic exposure scenario is constructed in a similar way.

Oral Exposure from Contaminated Vegetation - Under normal circumstances and in most types of applications, it is extremely unlikely that humans will 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 basketweaving 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. In both scenarios, the concentration of herbicide on contaminated

vegetation is estimated using the empirical relationships between application rate and concentration on vegetation developed by Hoerger and Kenaga (1972, as referenced in SERA 2000b) as modified by Fletcher et al (1994, as referenced in SERA 2003a). 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.

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 is the BCF in vegetation, established as 19 (ATSDR 1998, as referenced in SERA 1999c).

Although the duration of exposure of 90 days may appear to be somewhat arbitrarily chosen, it is intended to represent the consumption of contaminated vegetation that might be available over one season. Longer durations could be used for certain kinds of vegetation but would lower the estimated dose (i.e., would result in a less conservative exposure assessment). The central estimate of dose for the longer-term exposure period is taken as the time-weighted average of the initial concentration and concentration after 90 days. For the acute exposure scenario, it is assumed that a woman consumes 1 lb (0.4536 kg) of contaminated fruit. Based on statistics summarized in U.S. EPA (1996, as referenced in SERA 2000b), this consumption rate is approximately the mid-range between the mean and upper 95% confidence interval for the total vegetable intake for a 64 kg woman. The longer-term exposure scenario is constructed in a similar way, except that the estimated exposures include the range of vegetable consumption (U.S. EPA 1996, as referenced in SERA 2000b) as well as the range of concentrations on vegetation and the range of application rates for the herbicides.

Table F3-5a: Summary of Public Exposure Scenarios – Chlorsulfuron

Scenario	Typical Dose (mg/kg/day)	Lower Range (mg/kg/day)	Upper Range (mg/kg/day)
Acute/Accidental Exposures (dose in mg/kg/day)			
Direct Spray, entire body, child	0.00015	1.5 E-5	0.0012
Direct Spray, lower legs, woman	1.5 E-5	1.5 E-6	0.00012
Dermal Exposure, contaminated vegetation	1.6 E-5	2.3 E-6	0.00011
Contaminated Fruit	0.00055	0.00041	0.012
Contaminated Water, spill, child	0.013	0.0042	0.032
Contaminated Water, stream, child	0.00035	1.6 E-5	0.0014
Consumption of Fish, general public	0.00039	0.00020	0.00063
Consumption of Fish, subsistence populations	0.0019	0.0010	0.0031
Chronic/Longer Term Exposures (dose in mg/kg/day)			
Contaminated Fruit	0.00023	0.00017	0.0049
Consumption of Water	8.1 E-7	7.0 E-8	1.9 E-6
Consumption of Fish, general public	6.0 E-9	7.5 E-10	1.2 E-8
Consumption of Fish, subsistence population	4.9 E-8	6.1 E-9	9.8 E-8

Table F3-5b: Summary of Public Exposure Scenarios – Clopyralid

Scenario	Typical Dose (mg/kg/day)	Lower Range (mg/kg/day)	Upper Range (mg/kg/day)
Acute/Accidental Exposures (dose in mg/kg/day)			
Direct Spray, entire body, child	0.0027	0.00021	0.017
Direct Spray, lower legs, woman	0.00027	2.1 E-5	0.0017
Dermal Exposure, contaminated vegetation	0.00035	3.6 E-5	0.0017
Contaminated Fruit	0.0029	0.0015	0.047
Contaminated Water, spill, child	0.068	0.015	0.13
Contaminated Water, stream, child	0.00038	3.0 E-5	0.0020
Consumption of Fish, general public	0.0020	0.00075	0.0026
Consumption of Fish, subsistence populations	0.010	0.0037	0.012
Chronic/Longer Term Exposures (dose in mg/kg/day)			
Contaminated Fruit	0.0012	0.00049	0.025
Consumption of Water	5.0 E-5	2.6 E-6	0.00011
Consumption of Fish, general public	2.5 E-7	1.9 E-8	4.6 E-7
Consumption of Fish, subsistence population	2.0 E-6	1.5 E-7	3.7 E-6

Table F3-5c: Summary of Public Exposure Scenarios – 2,4-D

Scenario	Typical Dose (mg/kg/day)	Lower Range (mg/kg/day)	Upper Range (mg/kg/day)
Acute/Accidental Exposures (dose in mg/kg/day)			
Direct Spray, entire body, child	0.031	0.0024	0.16
Direct Spray, lower legs, woman	0.0032	0.00024	0.016
Dermal Exposure, contaminated vegetation	0.0046	0.00046	0.018
Contaminated Fruit	0.018	0.0059	0.37
Contaminated Water, spill, child	0.41	0.059	1.02
Contaminated Water, stream, child	0.017	0.0030	0.095
Consumption of Fish, general public	0.49	0.12	0.82
Consumption of Fish, subsistence populations	2.4	0.57	4.0
Chronic/Longer Term Exposures (dose in mg/kg/day)			
Contaminated Fruit	0.0039	0.0013	0.083
Consumption of Water	8.6 E-5	1.0 E-5	0.00027
Consumption of Fish, general public	1.7 E-5	2.9 E-6	4.6 E-5
Consumption of Fish, subsistence population	0.00014	2.3 E-5	0.00037

Table F3-5d: Summary of Public Exposure Scenarios – Dicamba

Scenario	Typical Dose (mg/kg/day)	Lower Range (mg/kg/day)	Upper Range (mg/kg/day)
Acute/Accidental Exposures (dose in mg/kg/day)			
Direct Spray, entire body, child	0.023	0.0014	0.17
Direct Spray, lower legs, woman	0.0023	0.00014	0.017
Dermal Exposure, contaminated vegetation	0.0032	0.00025	0.020
Contaminated Fruit	0.012	0.0029	0.37
Contaminated Water, spill, child	0.27	0.030	1.02
Contaminated Water, stream, child	2.3 E-4	6.9 E-7	0.0023
Consumption of Fish, general public	0.0054	0.00097	0.014
Consumption of Fish, subsistence populations	0.026	0.0047	0.066
Chronic/Longer Term Exposures (dose in mg/kg/day)			
Contaminated Fruit	0.0017	0.00042	0.054
Consumption of Water	2.9 E-7	2.5 E-8	2.1 E-6
Consumption of Fish, general public	9.4 E-10	1.2 E-10	5.7 E-9
Consumption of Fish, subsistence population	7.6 E-9	9.6 E-10	4.6 E-8

Table F3-5e: Summary of Public Exposure Scenarios – Glyphosate

Scenario	Typical Dose (mg/kg/day)	Lower Range (mg/kg/day)	Upper Range (mg/kg/day)
Acute/Accidental Exposures (dose in mg/kg/day)			
Direct Spray, entire body, child	0.018	0.0012	0.080
Direct Spray, lower legs, woman	0.0018	0.00012	0.0080
Dermal Exposure, contaminated vegetation	0.0028	0.00024	0.010
Contaminated Fruit	0.029	0.0088	0.7
Contaminated Water, spill, child	0.68	0.090	1.9
Contaminated Water, stream, child	0.0038	3.4 E-5	0.17
Consumption of Fish, general public	0.0078	0.0017	0.014
Consumption of Fish, subsistence populations	0.038	0.0082	0.070
Chronic/Longer Term Exposures (dose in mg/kg/day)			
Contaminated Fruit	0.016	0.0048	0.38
Consumption of Water	7.1 E-5	1.5 E-6	0.0010
Consumption of Fish, general public	1.4 E-7	4.1 E-9	1.6 E-6
Consumption of Fish, subsistence population	1.1 E-6	3.3 E-8	1.3 E-5

Table F3-5f: Summary of Public Exposure Scenarios – Triclopyr TEA

Scenario	Typical Dose (mg/kg/day)	Lower Range (mg/kg/day)	Upper Range (mg/kg/day)
Acute/Accidental Exposures (dose in mg/kg/day)			
Direct Spray, entire body, child	0.24	0.030	1.3
Direct Spray, lower legs, woman	0.024	0.0030	0.13
Dermal Exposure, contaminated vegetation	0.030	0.0055	0.10
Contaminated Fruit	0.0031	0.0016	0.052
Contaminated Water, spill, child	0.27	0.059	0.77
Contaminated Water, stream, child	0.0068	2.3 E-5	0.068
Consumption of Fish, general public	0.00049	0.00017	0.00092
Consumption of Fish, subsistence populations	0.0024	0.00085	0.0045
Chronic/Longer Term Exposures (dose in mg/kg/day)			
Contaminated Fruit	0.0015	0.00058	0.034
Consumption of Water	0.00086	8.0 E-5	0.0026
Consumption of Fish, general public	2.6 E-7	3.4 E-8	6.4 E-7
Consumption of Fish, subsistence population	2.1 E-6	2.8 E-7	5.2 E-6

Table F3-5g: Summary of Public Exposure Scenarios – Triclopyr BEE

Scenario	Typical Dose (mg/kg/day)	Lower Range (mg/kg/day)	Upper Range (mg/kg/day)
Acute/Accidental Exposures (dose in mg/kg/day)			
Direct Spray, entire body, child	0.70	0.0017	2.2
Direct Spray, lower legs, woman	0.070	0.00017	0.22
Dermal Exposure, contaminated vegetation	0.066	0.00032	0.13
Contaminated Fruit	0.0031	0.0016	0.052
Contaminated Water, spill, child	0.27	0.059	0.77
Contaminated Water, stream, child	0.0068	2.3 E-5	0.068
Consumption of Fish, general public	0.00049	0.00017	0.00092
Consumption of Fish, subsistence populations	0.0024	0.00085	0.0045
Chronic/Longer Term Exposures (dose in mg/kg/day)			
Contaminated Fruit	0.0015	0.00058	0.034
Consumption of Water	0.00086	8.0 E-5	0.0026
Consumption of Fish, general public	2.6 E-7	3.4 E-8	6.4 E-7
Consumption of Fish, subsistence population	2.1 E-6	2.8 E-7	5.2 E-6

Table F3-5h: Summary of Public Exposure Scenarios – Nonylphenol Polyethoxylate

Scenario	Typical Dose (mg/kg/day)	Lower Range (mg/kg/day)	Upper Range (mg/kg/day)
Acute/Accidental Exposures (dose in mg/kg/day)			
Direct Spray, entire body, child	0.0020	0.00029	0.026
Direct Spray, lower legs, woman	0.00020	2.9 E-5	0.0026
Dermal Exposure, contaminated vegetation	0.00031	3.5 E-5	0.0057
Contaminated Fruit	0.020	0.016	0.44
Contaminated Water, spill, child	0.46	0.28	0.68
Contaminated Water, stream, child	0.00094	0.00014	.0035
Consumption of Fish, general public	0.014	0.014	0.014
Consumption of Fish, subsistence populations	0.067	0.067	0.067
Chronic/Longer Term Exposures (dose in mg/kg/day)			
Contaminated Fruit	0.00032	0.00025	0.0070
Consumption of Water	0.00020	2.0 E-7	0.00048
Consumption of Fish, general public	1.0 E-6	1.4 E-9	2.0 E-6
Consumption of Fish, subsistence population	8.1 E-6	1.2 E-8	1.6 E-5

Table F3-5i: Summary of Public Exposure Scenarios – Hexachlorobenzene

Scenario	Typical Dose (mg/kg/day)	Lower Range (mg/kg/day)	Upper Range (mg/kg/day)
Acute/Accidental Exposures (dose in mg/kg/day)			
Direct Spray, entire body, child	2.4 E-7	1.9 E-8	1.3 E-6
Direct Spray, lower legs, woman	2.4 E-8	1.9 E-9	1.3 E-7
Dermal Exposure, contaminated vegetation	7.5 E-9	9.5 E-10	1.6 E-8
Contaminated Fruit	1.3 E-8	7.0 E-9	9.9 E-8
Contaminated Water, spill, child	1.7 E-7	3.8 E-8	3.2 E-7
Contaminated Water, stream, child	4.2 E-9	1.5 E-11	2.1 E-8
Consumption of Fish, general public	1.0 E-5	3.8 E-6	1.3 E-5
Consumption of Fish, subsistence populations	5.0 E-5	1.8 E-5	6.2 E-5
Chronic/Longer Term Exposures (dose in mg/kg/day)			
Contaminated Fruit	5.2 E-10	6.2 E-11	4.6 E-9
Consumption of Water	8.9 E-12	2.0 E-13	2.1 E-11
Consumption of Fish, general public	8.9 E-10	2.8 E-11	1.8 E-9
Consumption of Fish, subsistence population	7.2 E-9	2.3 E-10	1.4 E-8

Section 4 – Dose Response Assessment

Chlorsulfuron

The U.S. EPA derived a chronic RfD for chlorsulfuron of 0.05 mg/kg/day. This RfD is currently listed on the U.S. EPA IRIS web site. This RfD is based on a two-year rat feeding study. The rats were given chlorsulfuron in the diet at concentrations of 100, 500 and 2,500 ppm for two years. Treatment related adverse effects of decreases in mean body weights and weight in male rats occurred at the 500 ppm and 2,500 ppm dose level. No frank signs of toxicity were seen at the 100 ppm or higher dose levels. Dose related effects on various hematological parameters were observed in males; however, these effects were observed during the first year. The investigators indicated that although the findings suggest the presence of reticulocytosis, reticulocyte counts were not measured. Consequently, the investigators concluded that in the absence of clarifying data, the biological

significance of these hematological effects is unclear. No other behavioral, nutritional, clinical, hematological, gross, or histopathological abnormalities were observed. In deriving the RfD, the U.S EPA accepted the 100 ppm dose as a NOAEL and estimated the daily intake as 5 mg/kg/day and used an uncertainty factor of 100.

The U.S. EPA Office of Pesticide Programs has recently proposed a lower chronic RfD of 0.02 mg/kg/day, which appears to be based on the identical study used by U.S. EPA in deriving the RfD of 0.05 mg/kg/day. The difference in the two RfDs is accounted for by an additional uncertainty factor required under the FQPA. Citing a three-generation reproduction study in which effects "...considered of questionable toxicological significance..." were noted at 125 mg/kg/day, the U.S. EPA selected an FQPA uncertainty factor of 3. Thus, the chronic NOAEL of 5 mg/kg/day was divided by 300 – factors of 10 for extrapolating from animals to humans, 10 for extrapolating to sensitive individuals within the human population, and 3 for accounting for differences in children as required by FQPA. This value was rounded to one significant decimal to yield the RfD of 0.02 mg/kg/day. For this risk assessment, the lower and more recent RfD of 0.02 mg/kg/day will be used to characterize all risks involving chronic or longer-term exposures.

The NOAEL of 5 mg/kg/day for chronic toxic effects is below the NOAEL of 25 mg/kg/day for reproductive effects. Thus, doses at or below the RfD will be below the level of concern for reproductive effects.

The U.S. EPA did not explicitly derive an acute/single dose RfD for chlorsulfuron. Nonetheless, for several short-term exposure scenarios the U.S. EPA recommends that an acute RfD be 0.25 mg/kg/day. This acute RfD appears to be based on a developmental study in rabbits with decreased body weight gains at 200 mg/kg/day. As with the chronic RfD, the NOAEL of 75 mg/kg/day was divided by an uncertainty factor of 300. Consistent with U.S. EPA, this risk assessment will use the short term RfD of 0.25 mg/kg/day to characterize all risks acute or short-term exposures.

Chlorsulfuron is listed by the state of California on its Groundwater Protection List.

Clopyralid

Up until 2001, U.S. EPA had established a provisional RfD of 0.5 mg/kg/day. This RfD was based on a two-year rat feeding study in which groups of male and female rats were administered clopyralid in the diet for 2 years at concentrations that resulted in daily doses of 0 (control), 5, 15, 50 or 150 mg/kg/day. No gross signs of toxicity, changes in organ or body weight, or histopathologic effects attributable to treatment were seen at doses of 50 mg/kg/day or lower. At 150 mg/kg/day, the only effect noted was a decrease in the body weight of the female rats. Thus, the U.S. EPA designated

the dose of 50 mg/kg/day as a NOAEL and used an uncertainty factor of 100 (10 for species-to-species extrapolation and 10 for sensitive subgroups in the human population) to derive the RfD of 0.5 mg/kg/day. In 2001, U.S EPA changed the chronic NOAEL to 15 mg/kg/day, based on a study in rats showing effects at 150 mg/kg/day. This change is currently under discussion between the clopyralid registrant and the U.S. EPA, however, for this risk assessment, the value of 15 mg/kg/day will be used as the chronic NOAEL, resulting in a chronic RfD of 0.15 mg/kg/day.

Based on these data, the critical effect - i.e., the adverse effect that will occur at the lowest dose level - is somewhat ambiguous. At a factor of 3 to 10 above the chronic NOAEL, effects have been reported on body weight, liver weight, and the gastric epithelium. Decreases in body weight and changes in organ weight are commonly observed in chronic toxicity studies and can indicate either an adaptive or toxic response. Changes in epithelial tissue are less commonly observed and the toxicological significance of this effect is unclear.

U.S. EPA has established an acute oral RfD of 0.75 mg/kg, based on a maternal NOEL of 75 mg/kg/day in rats in a developmental toxicity test (U.S. EPA, 2001). This value can be used as an indicator of short-term risk.

There are no drinking water standards established for clopyralid, either by U.S. EPA or CalEPA.

Although the two chlorinated benzenes should be regarded as much more potent toxicologically than clopyralid, the chlorinated benzenes do not appear to be present in a significant quantity with respect to systemic toxicity. In addition, all of the toxicity studies on clopyralid used the technical grade clopyralid and thus encompass the likely toxic contribution of the chlorinated benzene contaminants.

2,4-D

In 1988, the U.S. EPA derived a chronic RfD of 0.01 mg/kg/day for 2,4-D. The RfD is based on a NOAEL of 1 mg/kg/day using an uncertainty factor of 100 to account for species to species extrapolation and sensitive individuals in the human population. Since this RfD was developed, a significant amount of new information was made available and is under review by the U.S. EPA as part of the re-registration process for 2,4-D. The re-registration review has focused on different studies to establish both an acute and chronic RfD. The chronic RfD is based on a 2-year chronic toxicity study in rats with a NOAEL of 5 mg/kg/day. There are two acute RfDs developed, one for females of childbearing age, and one for the population as a whole. The acute RfD for women is based on a developmental toxicity study in rats that found skeletal abnormalities at the 75 mg/kg/day dose, while the next lowest dose of 25 mg/kg/day was the NOAEL. The acute RfD for the general

population is based on an acute neurotoxicity study in rats that had a NOAEL of 67 mg/kg/day. As discussed in the hazard identification, the potential effects of 2,4-D on the developing nervous system as well as the endocrine system were considered to be data gaps in the toxicity database for 2,4-D. Because of this, the U.S. EPA recommends an additional 10X uncertainty factor (for a total of 1000) in deriving the RfDs. The RfD that will be used for acute exposure scenarios involving women will be 0.025 mg/kg/day; for the general population, the acute RfD will be 0.067 mg/kg/day. The chronic RfD that will be used is 0.005 mg/kg/day.

2,4-D is considered a restricted-use pesticide within the state of California.

The U.S. EPA Office of Water has established a lifetime health advisory level (HA) of 0.07 mg/L (70 ppb) and a 10-day HA of 0.30 mg/L for 2,4-D in drinking water (U.S. EPA, 2004b). The lifetime HA is an estimate of acceptable drinking water levels for a contaminant at which adverse health effects would not be expected to occur, even over a lifetime of exposure. The 10-day HA is designed to be protective of a child consuming 1 liter of water a day. These are not legally enforceable Federal standards, but serve as technical guidance to assist others. In addition, a Maximum Contaminant Level (MCL) of 0.07 mg/L has been set by U.S. EPA. This is an enforceable standard for drinking water quality. The state of California has also established a Public Health Goal (PHG) of 0.07 mg/L (70 ppb), based on a similar analysis as U.S. EPA (CalEPA, 1997a). The PHG describes a level of contamination at which adverse health effects would not be expected to occur, even over a lifetime of exposure. The dimethylamine salt formulation of 2,4-D is listed by the state of California on its Groundwater Protection List.

An assessment of the dose/duration/severity data on 2,4-D suggests no apparent or, at least, no strong relationship between exposure duration and the severity of effects at a given dose. In other words, adverse effects, if they are to develop, will develop relatively fast and will not become more severe as the duration of exposure continues. This assessment is confirmed by categorical regression analysis in which the duration of exposure is statistically insignificant. The weak duration-response relationship for 2,4-D may be explained, in part, by the pharmacokinetics of 2,4-D. For compounds like 2,4-D that are eliminated rapidly, the time to approximate steady state is relatively brief. Although somewhat speculative, this explanation suggests that 2,4-D does not exert cumulative toxic damage (i.e., at low levels of exposure, the rate of injury is less than the rate of repair).

A qualitative summary of the dose-severity relationship based on these data is presented in the table below. The animal doses are presented as ranges. The column labeled “estimated human dose” is the animal dose divided by 10 (i.e., the uncertainty factor used for species to species extrapolation

in deriving RfDs). The column giving estimated human doses in the table does not incorporate an additional uncertainty factor for sensitive subgroups or for data uncertainty, which is incorporated into the RfD. The purpose of the table is to provide dose estimates associated with effects of varying severity. Effects like these in sensitive subgroups exposed to 2,4-D cannot be quantified from the available data.

Table F4-1: Dose-severity relationships used for 2,4-D risk characterization

Animal Dose (mg ae/kg/day)	Estimated Human Dose (mg ae/kg/day)	Plausible Effect
100 to 1,000	10 to 100	Frank neurological and/or reproductive effects, including teratogenic, are likely. Upper limit of the range will be lethal without prompt and effective medical intervention.
10 to 100	1 to 10	For chronic exposures - Subclinical signs of neurologic toxicity are likely and mild signs of toxicity are plausible. Degenerative or other pathological changes to several organs are likely. Upper limit of the range may be lethal. For acute exposures – Risk of prenatal effects (reduced ossification, resorptions), possible neurological (behavioral) effects; body weight loss.
1 to 10	0.1 to 1	For chronic exposures - A slight increase in thyroid weight and/or decrease in testicular weight may be noted. Possible decrease in whole body weight gain. Subclinical signs of neurologic toxicity are possible. Subclinical pathology to the kidney and liver. For acute exposures – No effects are likely,
<0.1 to 1	<0.01 to 0.1	For chronic exposures – No effects are likely For acute exposures – No effects are likely

Source: Table derived from SERA 1998a and U.S. EPA 2000c

Dicamba

The most recent chronic U.S. EPA RfD for dicamba is 0.045 mg/kg/day. This RfD was derived by the U.S. EPA/OPP in the re-evaluation of pesticide tolerances for dicamba required by the Food Quality Protection Act (FQPA). The RfD is based on the two-generation reproduction study in rats by Masters (1993, as referenced in SERA 2004c). The dietary NOAEL in this study was 500 ppm, corresponding to daily doses of in the range of 35-44 mg/kg/day. The dietary LOAEL, based on significantly decreased pup growth, was 1,500 ppm, corresponding to daily doses of 105-135 mg/kg/day. The RfD of 0.045 mg/kg/day proposed by U.S. EPA/OPP appears to be based on a rounding of the NOAEL to 45 mg/kg/day and the use of an uncertainty factor of 1000, 10 for species to species extrapolation, 10 for sensitive subgroups, and 10 as an FQPA uncertainty factor for the protection of children. It should be noted that FQPA requires the U.S. EPA to use an additional uncertainty factor of 10 to encompass concerns for exposures involving children unless the available toxicity data indicate that such an uncertainty factor is unnecessary. In an earlier version of the RfD development, the U.S. EPA/OPP had used an uncertainty factor of 300. It is unclear why the

uncertainty factor was increased to 1000 but this factor will be maintained for consistency with the U.S. EPA/OPP risk assessment and because it is more protective than the uncertainty factor of 300.

Prior to the RfD derived by U.S. EPA/OPP, the U.S. EPA had recommended a somewhat lower chronic RfD of 0.03 mg/kg/day. This RfD was based on a NOAEL of 3 mg/kg/day in a teratology study in rabbits (Goldenthal et al. 1978, as referenced in SERA 2004c). In a re-evaluation of the data, the U.S. EPA/OPP determined that the Goldenthal et al. (1978) study was not scientifically adequate and should not be the basis of the chronic RfD. Deficiencies of the study include the use of unhealthy rabbits, lack of clinical signs and individual necropsy data, inadequate number of pregnancies, lack of analytical data on dosing solutions, and the conduct of the study prior to GLP regulations. This re-evaluation of the study by Goldenthal et al. (1978) is supported by a more recent teratology study in rabbits by Hoberman (1992 as referenced in SERA 2004c). Hoberman (1992) failed to note any effects in dams or pups at a dose of 30 mg/kg/day. At 150 mg/kg/day, there were signs of maternal toxicity as well as an increase in the number of spontaneous abortions.

For this risk assessment, the most recent RfD – i.e., 0.045 mg/kg/day derived by the Office of Pesticides – will be used to characterize risk. Given the reasonable and well-documented concerns with the earlier teratology studies as well as the appropriate application of the FQPA uncertainty factors in the more recent RfD, the use of the more recent chronic RfD seems justified over the earlier and somewhat lower RfD.

For characterizing the risks for acute exposure scenarios, 1-day dietary RfD of 0.10 mg/kg/day, derived by U.S. EPA/OPP, is used. This acute RfD is based on a neurotoxicity study, which involved single-dose gavage exposures to rats at doses of 300, 600 or 1200 mg/kg. At the lowest dose tested, 300 mg/kg/day, a number of gross signs of neurotoxicity, including impaired gait and decreased forelimb grip strength, were apparent within 2.5 hours after dosing. Most effects were transient but decreased forelimb grip strength persisted for 7 days. Thus, 300 mg/kg/day was classified as an LOAEL. The RfD was derived by dividing the LOAEL by an uncertainty factor of 3000: 10 for species to species, 10 for sensitive subgroups, 10 for the use of a LOAEL, 3 for FQPA considerations. The use of the 300 mg/kg/day with an uncertainty factor of 10 for using the LOAEL functionally estimates the NOAEL at 30 mg/kg/day. Because the neurotoxicity study involved adult animals rather than neonate or young animals, the application of the FQPA uncertainty factor is clearly appropriate.

Dicamba is considered a restricted-use pesticide within the state of California.

The U.S. EPA Office of Drinking Water used the 3 mg/kg/day NOAEL from the teratology study to derive a 10-day health advisory for drinking water of 0.3 mg/L using an uncertainty factor of

100. This 10-day health advisory was also recommended for 1-day exposures. Thus, this is analogous to a 1-day RfD of 0.03 mg/kg/day, identical to the chronic NOAEL.

While the 1-day RfD of 0.03 mg/kg based on the Office Drinking Water 1-day health advisory is somewhat more conservative than the acute RfD of 0.10 mg/kg derived by U.S. EPA/OPP, the 1-day RfD derived by U.S. EPA/OPP is based on a single dose exposure and more clearly applies to several of the acute exposure scenarios developed in this risk assessment. Consequently, the 1-day RfD of 0.10 mg/kg is used to characterize the risks of short-term exposures.

Glyphosate

The U.S. EPA Office of Pesticide Programs has established a provisional RfD of 2 mg/kg/day for glyphosate (U.S. EPA, 2000b). This is based on the maternal NOAEL of 175 mg/kg/day from a rabbit developmental study and an uncertainty factor of 100 (10 for sensitive individuals and 10 for species to species extrapolation). The RfD of 2 mg/kg/day is a rounding of the 1.75 mg/kg/day value to one significant digit.

The U.S. EPA has also derived an RfD for glyphosate of 0.1 mg/kg/day (U.S. EPA/IRIS 1990, as referenced in SERA 2003a). This RfD was originally derived in 1990 by the U.S. EPA Integrated Risk Information System (IRIS) workgroup and is the current RfD posted on IRIS. This RfD is based on a dietary 3-generation reproduction study. In this study, rats were exposed to glyphosate in the diet with resulting dose rates of 0, 3, 10 and 30 mg/kg/day. No signs of maternal toxicity were observed. The only effect in offspring was an increase in the incidence of unilateral renal tubular dilation in male pups from the F3b mating. Thus, the NOAEL was identified as 10 mg/kg/day and an uncertainty factor of 100 was applied to derive an RfD of 0.1 mg/kg/day.

Unlike the two RfD values proposed by the U.S. EPA, the ADI proposed by WHO (1994, as referenced in SERA 2003a) is not based on a reproductive toxicity study. Instead, WHO (1994) selected a life-time feeding study in rats. This study involved dietary concentrations of 0, 30, 100, or 300 ppm for 26 months which corresponded to approximate daily doses of 0, 3.1, 10.3, or 31.5 mg/kg/day for males and 0, 3.4, 11.3, or 34.0 mg/kg/day for females. No effects were seen at any dose levels and thus WHO (1994) used a NOAEL of 31.5 mg/kg/day and uncertainty factor of 100. Rounding to one significant digit, the recommended ADI was set at 0.3 mg/kg/day.

The U.S. EPA/OPP will sometimes derive acute RfD values that can be used to assess risks associated with very short-term exposures – i.e., accidental spills. No acute RfD has been proposed, however, for glyphosate.

For the current risk assessment, the RfD of 2 mg/kg/day derived by U.S. EPA/OPP (1993c) will be used as the basis for characterizing risk from longer term exposures in this risk assessment. For short-term exposures, the value of 2 mg/kg/day recommended by U.S. EPA/ODW (1992, as referenced in SERA 2003a) will be used. Since this is identical to the chronic RfD, this approach is equivalent to applying the same RfD to be short-term and long-term exposures. Given the lack of a significant dose-duration relationship for glyphosate, this approach seems appropriate.

The U.S. EPA Office of Water has established a lifetime health advisory level (HA) of 0.7 mg/L (700 ppb) and a 10-day HA of 20 mg/L (20 ppm) for glyphosate in drinking water (U.S. EPA, 2004b). The lifetime HA is an estimate of acceptable drinking water levels for a contaminant at which adverse health effects would not be expected to occur, even over a lifetime of exposure. The 10-day HA is designed to be protective of a child consuming 1 liter of water a day. These are not legally enforceable Federal standards, but serve as technical guidance to assist others. In addition, U.S. EPA has set a Maximum Contaminant Level (MCL) of 0.7 mg/L. This is an enforceable standard for drinking water quality. The state of California has also established a Public Health Goal (PHG) of 1 mg/L (1 ppm), based on a similar analysis as U.S. EPA (CalEPA, 1997b). The PHG describes a level of contamination at which adverse health effects would not be expected to occur, even over a lifetime of exposure

Triclopyr

The U.S. EPA has established a chronic RfD for triclopyr at 0.05 mg/kg/day (U.S. EPA 1998b). The U.S. EPA has concluded that the triethylamine acid (TEA) and butoxyethyl ester (BEE) of triclopyr are toxicologically equivalent; thus, this RfD is applicable to both forms of triclopyr. The RfD is based on a two-generation reproduction study in rats, with a NOEL of 5.0 mg/kg/day, the lowest dose tested. At the next dose level (25 mg/kg/day), an increased incidence of proximal tubular degeneration of the kidneys was observed in parental rats. An uncertainty factor of 100 was applied to this NOEL.

Under the Food Quality Protection Act (FQPA), the U.S. EPA is required to evaluate whether or not an additional uncertainty factor is required for the protection of children. The parental NOAEL of 5 mg/kg/day is below any adverse reproductive effects. Consequently, the U.S. EPA (1998b) has determined that no additional FQPA uncertainty factor is required.

In the most recent pesticide tolerance for triclopyr, the U.S. EPA has recommended an acute RfD of 1 mg/kg/day for the general population (U.S. EPA 2002a). This appears to be based on the NOAEL of 100 mg/kg/day from a study in which rats were administered gavage doses of triclopyr

BEE on days 6 through 15 of gestation. At 300 mg/kg/day, toxic responses included signs of marked maternal toxicity, overt clinical signs in a few dams, mean body weight loss and decreased mean body weight gain, decreased mean feed consumption, increased mean water consumption, and increased mean liver and kidney weights. In addition, fetal effects included both skeletal and soft-tissue malformations. This acute RfD is not applicable to females between the ages of 13-50 years – i.e., of childbearing age. For these individuals, the U.S. EPA recommends an acute RfD of 0.05 mg/kg/day, equivalent to the chronic RfD. This is based on a chronic 2-generation reproduction study with a NOAEL of 5 mg/kg/day and an increased incidence of defects in offspring at the next dose level of 25 mg/kg/day. In the triclopyr RED (U.S. EPA 1998b), U.S. EPA considers a value of 30 mg/kg/day as a measure of acute dietary risk, based on a developmental toxicity study in rabbits administered triclopyr BEE . At the next highest dose (100 mg/kg/day), effects included parental mortality as well as decreased number of live fetuses, increased number of fetal deaths, and increased number of fetal and/or litter incidence of skeletal anomalies and variants. The 30 mg/kg/day NOEL is supported by a number of other teratogenicity studies as well as a multi-generation reproduction study.

For risk characterization, the current risk assessment will adopt the most recent RfD values recommended by U.S. EPA – i.e., 1 mg/kg for acute exposures in the general population and 0.05 mg/kg/day for exposure scenarios of one month to a lifetime. Also consistent with the approach taken by U.S. EPA, the acute RfD of 1 mg/kg/day will be applied to the general population but not to women of child-bearing age.

Some exposure scenarios for the general public and workers yield estimates that are above the current chronic (and adult female acute) RfD of 0.05 mg/kg/day or above the acute RfD of 1.0 mg/kg/day for the general population. Consequently, some attempt must be made to characterize the consequences of exposures above the RfD. The RfD is intended to be a conservative estimate and does not explicitly incorporate information on dose-duration or dose-severity relationships. In other words, doses below the RfD, regardless of the duration of exposure, are of no substantial concern as long as the RfD is based on a sound set of data. The assumption that exposures above the RfD will result in adverse human health effects is not necessarily correct, particularly when the duration of exposure is substantially less than a lifetime. All exposure scenarios considered in this risk assessment are less than lifetime. Triclopyr rapidly dissipates or degrades, and high levels of exposure generally occur only over short periods. Workers may be exposed repeatedly during an application program in a particular season and may use triclopyr formulations over the course of a career but exposures at occupational levels will be intermittent and less than lifetime.

The most sensitive effect, and the effect on which the chronic RfD is based, involve kidney toxicity. All of the kidney effects noted in rats are based on histopathological changes or increased kidney weight. The effect and no effect levels based on changes in kidney weight in rats after chronic exposure are very similar to those for subchronic exposures.

The issue of species sensitivity is important in assessing the use of a 10-fold factor for species-to-species extrapolation, as used in the RfD for triclopyr. For many chemicals, differences in species sensitivity are apparent and generally indicate that small animals are less sensitive than large animals. Triclopyr does not follow this pattern: there is no apparent relationship between body weight and toxicity measured as acute oral LD_{50} values. The lack of consistent species differences in sensitivity suggests that U.S. EPA's use of an uncertainty factor of 10 for species-to-species extrapolation may be conservative. For assessing effects of exposures, an uncertainty factor of three will also be used as a range-bounding value.

Using data from acute studies on various species, including cattle and ponies, SERA (1996b) concluded that taking an approach analogous to that for the RfD, 60 mg/kg might be taken as a conservative 1-day NOAEL. Dividing by 100, as is done with the RfD, yields the adjusted value of 0.6 mg/kg for a reference 1-day exposure that should not be associated with adverse effects. As with the RfD, a 3-fold higher value, 1.8 mg/kg, could be proposed based on a less conservative but still protective species extrapolation.

From SERA (1996b), the AEL of 75 mg/kg, based on the data in cattle, yields a corresponding AEL range for humans of 0.75-2.25 mg/kg. This range of doses would not be associated with acute signs of toxicity but would be regarded as undesirable because adverse effects on the kidney might occur. The minimum dose associated with mortality in experimental mammals is 252 mg/kg in rabbits. After applying an uncertainty factor of 100, the estimated dose associated with concern for acute lethal effects in humans is 2.5 mg/kg, with an upper range of 7.5 mg/kg.

Table F4-2: Dose-severity relationships used for triclopyr risk characterization

Dose (mg/kg/day)	Plausible Effect
2.5 – 7.5	potentially lethal doses, especially at upper end of range, overt signs or symptoms of toxicity after acute exposures
0.75 to 2.25	with longer term exposure, probable effects on kidneys, offspring; acute exposures at upper end may also result in kidney effects, other clinical effects
0.05 to 0.75	nature and severity of toxic effects for chronic exposures are uncertain in general population; potential developmental effects in offspring of women
≤1.8	no effects anticipated with one-time exposures
≤0.05	no effects anticipated with chronic exposures.

Nonylphenol Polyethoxylate

At present there are no existing State or Federal human exposure guidelines for NP9E or NP. U.S. EPA has not established an RfD. Since it appears that NP could be a component of the NP9E mixture, NP could be a metabolite of NPE, and that NP appears to be more toxic in mammalian systems, one method of establishing a human threshold value would be to utilize NP toxicity studies to establish a benchmark level for use in assessing risks of exposure.

The use of the LOEL value of 12 mg/kg/day for NP from the study by Chapin et al. (1999, as referenced in USDA 2003a) as a functional NOAEL value is the approach utilized by the Canadian government. However, the more recent multigeneration study by Nagao et al. (2001 , as referenced in USDA 2003a) provides a NOEL value of 10 mg/kg/day for NP.

Utilizing a 10X safety factor for interspecies differences and a 10X safety factor for intraspecies differences provides a value of 0.10 mg/kg/day which should be protective of human health from chronic exposures to NP and NPEs. Since the toxicity of NPEs decreases with increasing numbers of ethoxylate groups, and that the general population is exposed to mixtures that include NPEs of longer chain lengths, this protective value, based on NP, should be considered conservative.

Another method would be to utilize the experimental values for NP9E, with the assumption that any testing involving the NP9E mixture would include minor amounts of NP and the short-chain NPEs. However there is a lack of chronic test results involving NP9E, and the subchronic test results are not much different than the corresponding values for NP. Hence the derived value of 0.10 mg/kg/day for NP will be used to assess risks of chronic human exposure.

For shorter-term exposures, 90-day subchronic tests involving NP9E in rats and beagles resulted in NOELs ranging from 10 to approximately 30 mg/kg/day. LOAELs from these same studies ranged upwards from 50 mg/kg/day. Slightly higher NOELs of 40 mg/kg/day were seen in 90-day sub-chronic studies with NP4E and NP6E. The use of the lowest sub-chronic NOEL of 10 mg/kg/day will be another conservative measure, considering that in these studies there is a considerable gap in dosing intervals between the NOEL and LOAEL levels determined in these studies. Again, using the same two safety factors as above, the human acute NOEL that will be used is 0.10 mg/kg/day. Based on the sub-chronic studies, however, short-term, or acute exposures to humans in the range of 0.1 to 0.4 mg/kg/day should not be associated with adverse health effects.

As regards the estrogenicity of NP and NPEs, it appears that most estrogenic effects are seen at relatively high exposure rates in mammals. The assessment level of 0.10 mg/kg/day should be

protective of any estrogenic or reproductive effects that NP and NPE exposure may represent in mammalian systems.

Hexachlorobenzene

The U.S. EPA RfD for hexachlorobenzene is 0.0008 mg/kg/day. This RfD is based on a 130-week feeding study in male and female rats that also included a 90-day exposure to offspring. The U.S. EPA judged the NOAEL for liver effects at a dose of 0.08 mg/kg/day with a LOAEL at 0.29 mg/kg/day. The U.S. EPA used an uncertainty factor of 100 to derive the RfD of 0.0008 mg/kg/day.

ATSDR has derived an acute Minimal Risk Level (MRL) for hexachlorobenzene of 0.008 mg/kg/day, a factor of 10 above the chronic RfD derived by U.S. EPA. The U.S. EPA Office of Drinking Water has derived a maximum contaminant level of 0.001 mg/L of drinking water and a 10-day health advisory of 0.05 mg/L in drinking water (U.S. EPA 2004b).

In addition to systemic toxicity, hexachlorobenzene has been shown to cause tumors of the liver, thyroid and kidney in three species of rodents - mice, rats, and hamsters. Based on a two-year feeding study in rats, the U.S. EPA derived a cancer slope factor for lifetime exposures of 1.6 $(mg/kg/day)^{-1}$. In other words, cancer risk over a lifetime (P) is calculated as the product of the daily dose (d) over a lifetime and the potency parameter (â) ($P = d \times \hat{a}$). The lifetime daily dose associated with a given risk level is therefore: $d = P \div \hat{a}$. Thus, the lifetime daily dose of hexachlorobenzene associated with a risk of one in one million is 0.000000625 mg/kg/day (6.25×10^{-7}).

As noted previously, clopyralid is not classified as a carcinogen. While it can be argued that the technical grade clopyralid used in the standard bioassays encompasses any toxicologic effects that could be caused by hexachlorobenzene, this argument is less compelling for carcinogenic effects because, for most cancer causing agents, the cancer risk is conservatively viewed as a non-threshold phenomenon - i.e., zero risk is achieved only at zero dose.

The potency factor of 1.6 $(mg/kg/day)^{-1}$ is intended to be applied to lifetime daily doses. Many of the exposure assessments used in this risk assessment involve much shorter periods of time. Following the approach recommended by U.S. EPA this risk assessment assumes that the average daily dose over a lifetime is the appropriate measure for the estimation of cancer risk. Thus, the lifetime potency of 1.6 $(mg/kg/day)^{-1}$ is scaled linearly when applied to shorter periods of exposure. As calculated in SERA (1999), the potency parameter for a one-day exposure is 0.000063 $(mg/kg/day)^{-1}$. Thus, the lifetime risk associated with a single dose of 0.001 mg/kg would be calculated as 6.3×10^{-8} or 6.3 in one hundred million. This method of estimating cancer risk from short-term exposures is used in the next section for hexachlorobenzene.

No explicit dose response assessment is made for the potential carcinogenic effects of pentachlorobenzene. This is consistent with the approach taken by U.S. EPA and reflects the fact that the available data on pentachlorobenzene are inadequate to classify this compound as a carcinogen or to estimate carcinogenic potency. Because pentachlorobenzene and hexachlorobenzene are structurally and toxicologically similar and because the chronic RfD for both compounds are identical, a more conservative approach would be to assume that pentachlorobenzene is a carcinogen and that the carcinogenic potency of pentachlorobenzene is equal to that of hexachlorobenzene. If such an approach were taken, the cancer risks taken in this risk assessment would increase by a factor of about 0.1. In other words, pentachlorobenzene would be assumed to have the same potency but occurs at a ten-fold lower concentration relative to hexachlorobenzene. This relatively modest difference has little impact on the characterization of cancer risk.

Section 5 - Risk Characterization

A quantitative summary of the risk characterization for workers associated with exposure to these herbicides is presented in Tables F5-1a to F-10a. The quantitative risk characterization is expressed as the hazard quotient, which is the ratio of the estimated exposure doses from Tables F3-3a to F3-3i to the RfD. The quantitative hazard characterization for the general public associated with exposure to these herbicides is summarized in Tables F5-1b to F5-10b. Like the quantitative risk characterization for workers, the quantitative risk characterization for the general public is expressed as the hazard quotient, which again is the ratio of the estimated exposure doses from Tables F3-5a to F3-5i to the RfD.

As a standard for formatting, numbers 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.

The only 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 contains uncertainty. Prudence dictates that normal and reasonable care should be taken in the handling of these herbicides.

Chlorsulfuron

Workers -The toxicity data on chlorsulfuron allows for separate dose-response assessments for acute and chronic exposures. For acute exposures, the hazard quotients are based on U.S. EPA's

recommended acute RfD of 0.25 mg/kg/day. For chronic exposures, the hazard quotients are based on the proposed chronic RfD from U.S. EPA of 0.02 mg/kg/day.

Given the very low hazard quotients for both general occupational exposures as well as accidental exposures, the risk characterization for workers is unambiguous. None of the exposure scenarios approach a level of concern.

While the accidental exposure scenarios are not the most severe one might imagine, they are representative of reasonable accidental exposures. Given that the highest hazard quotient for any of the accidental exposures is a factor of about 3,000 below the level of concern, more severe and less plausible scenarios would be required to suggest a potential for systemic toxic effects.

The hazard quotients for general occupational exposure scenarios are somewhat higher than those for the accidental exposure scenarios. Nonetheless, the upper limit of the hazard quotients (HQ=0.1) are below the level of concern - i..e., a hazard quotient of 1. As previously discussed, these upper limits of exposure are constructed using the highest anticipated application rate, the highest anticipated number of acres treated per day, and the upper limit of the occupational exposure rate. If any of these conservative assumptions were modified the hazard quotients would drop substantially. The simple verbal interpretation of this quantitative characterization of risk is that even under the most conservative set of exposure assumptions, workers would not be exposed to levels of chlorsulfuron that are regarded as unacceptable. Under typical application conditions, levels of exposure will be far below levels of concern.

Mild irritation to the skin and eyes can result from exposure to relatively high levels of chlorsulfuron- i.e., placement of chlorsulfuron directly onto the eye or skin. From a practical perspective, eye or skin irritation is likely to be the only overt effect as a consequence of mishandling chlorsulfuron. These effects can be minimized or avoided by prudent industrial hygiene practices during the handling of the compound.

General Public – As with the corresponding worksheet for workers, the hazard quotients for acute exposure are based on an acute oral RfD of 0.25 mg/kg/day and the hazard quotients for chronic exposures are based on a proposed chronic RfD of 0.02 mg/kg/day.

None of the acute or longer-term exposure scenarios approach a level of concern. Although there are several uncertainties in the longer-term exposure assessments for the general public, the upper limits for hazard quotients are sufficiently far below a level of concern that the risk characterization is relatively unambiguous: based on the available information and under the foreseeable conditions of

application, there is no route of exposure or scenario suggesting that the general public will be at any substantial risk from longer-term exposure to chlorsulfuron.

For the acute/accidental scenarios, the exposure resulting from the consumption of contaminated water by a child is the only scenario that approaches a level of concern (HQ=0.1 at upper level). It must be noted that the exposure scenario for the consumption of contaminated water is an arbitrary scenario: scenarios that are more or less severe, all of which may be equally probable or improbable, easily could be constructed. All of the specific assumptions used to develop this scenario have a simple linear relationship to the resulting hazard quotient. Thus, if the accidental spill were to involve 20 rather than 200 gallons of a field solution of chlorsulfuron, all of the hazard quotients would be a factor of 10 less. Nonetheless, this and other acute scenarios help to identify the types of scenarios that are of greatest concern and may warrant the greatest steps to mitigate. For chlorsulfuron, such scenarios involve oral (contaminated water) rather than dermal (spills or accidental spray) exposure.

Table F5-1a: Summary of Risk Characterization for Workers – Chlorsulfuron

Chronic RfD = 0.02 mg/kg/day Acute RfD = 0.25 mg/kg/day			
Scenario	**Hazard Quotient[1]**		
	Typical	**Lower**	**Upper**
General Exposures			
Backpack application	1.E-02	6.E-04	1.E-01
Boom Spray	1.E-02	2.E-04	1.E-01
Accidental/Incidental Exposures			
Immersion of hands, 1 minute	4.E-07	8.E-08	2.E-06
Contaminated Gloves, 1 hour	3.E-05	5.E-06	1.E-04
Spill on hands. 1 hour	2.E-05	2.E-06	1.E-04
Spill on lower legs, 1 hour	4.E-05	4.E-06	3.E-04

[1] Hazard quotient is the level of exposure divided by the RfD, then rounded to one significant digit.

Table F5-1b: Summary of Risk Characterization for the Public – Chlorsulfuron

Chronic RfD = 0.02 mg/kg/day Acute RfD = 0.25 mg/kg/day			
Scenario	**Hazard Quotient[1]**		
	Typical	**Lower**	**Upper**
Acute/Accidental Exposures			
Direct Spray, entire body, child	6.E-04	6.E-05	5.E-03
Direct Spray, lower legs, woman	6.E-05	6.E-06	5.E-04
Dermal Exposure, contaminated vegetation	6.E-05	9.E-06	4.E-04
Contaminated Fruit	2.E-03	2.E-03	5.E-02
Contaminated Water, spill, child	5.E-02	2.E-02	1.E-01
Contaminated Water, stream, child	1.E-03	6.E-05	6.E-03
Consumption of Fish, general public	2.E-03	8.E-04	3.E-03
Consumption of Fish, subsistence populations	8.E-03	4.E-03	1.E-02
Chronic/Longer Term Exposures			
Contaminated Fruit	1.E-02	9.E-03	2.E-01
Consumption of Water	4.E-05	4.E-06	1.E-04
Consumption of Fish, general public	3.E-07	4.E-08	6.E-07
Consumption of Fish, subsistence population	2.E-06	3.E-07	5.E-06

[1] Hazard quotient is the level of exposure divided by the RfD, then rounded to one significant digit.

Clopyralid

Workers -The toxicity data on clopyralid allows for separate dose-response assessments for acute and chronic exposures. For acute exposures, the hazard quotients are based on U.S. EPA's acute oral RfD of 0.75 mg/kg/day (U.S. EPA 2001). For chronic exposures, the hazard quotients are based on the provisional chronic RfD from U.S. EPA of 0.15 mg/kg/day.

Given the very low hazard quotients for both general occupational exposures as well as accidental exposures, the risk characterization for workers is unambiguous. None of the exposure scenarios approach a level of concern.

While the accidental exposure scenarios are not the most severe one might imagine, they are representative of reasonable accidental exposures. Given that the highest hazard quotient for any of the accidental exposures is a factor of about 1,000 below the level of concern, more severe and less plausible scenarios would be required to suggest a potential for systemic toxic effects.

The hazard quotients for general occupational exposure scenarios are somewhat higher than those for the accidental exposure scenarios. Nonetheless, the upper limit of the hazard quotients are below the level of concern - i..e., a hazard quotient of 1. As previously discussed, these upper limits of exposure are constructed using the highest anticipated application rate, the highest anticipated number of acres treated per day, and the upper limit of the occupational exposure rate. If any of these conservative assumptions were modified the hazard quotients would drop substantially. The simple verbal interpretation of this quantitative characterization of risk is that even under the most conservative set of exposure assumptions, workers would not be exposed to levels of clopyralid that are regarded as unacceptable. Under typical application conditions, levels of exposure will be far below levels of concern.

Irritation and damage to the skin and eyes can result from exposure to relatively high levels of clopyralid - i.e., placement of clopyralid directly onto the eye or skin. From a practical perspective, eye or skin irritation is likely to be the only overt effect as a consequence of mishandling clopyralid. These effects can be minimized or avoided by prudent industrial hygiene practices during the handling of clopyralid.

General Public – As with the corresponding worksheet for workers, the hazard quotients for acute exposure are based on an acute oral RfD of 0.75 mg/kg/day and the hazard quotients for chronic exposures are based on a provisional chronic RfD of 0.15 mg/kg/day.

None of the acute or longer-term exposure scenarios approach a level of concern. Although there are several uncertainties in the longer-term exposure assessments for the general public, the upper limits for hazard quotients are sufficiently far below a level of concern that the risk characterization is relatively unambiguous: based on the available information and under the foreseeable conditions of application, there is no route of exposure or scenario suggesting that the general public will be at any substantial risk from longer-term exposure to clopyralid.

For the acute/accidental scenarios, the exposure resulting from the consumption of contaminated water by a child is the only scenario that approaches a level of concern. It must be noted that the exposure scenario for the consumption of contaminated water is an arbitrary scenario: scenarios that are more or less severe, all of which may be equally probable or improbable, easily could be constructed. All of the specific assumptions used to develop this scenario have a simple linear relationship to the resulting hazard quotient. Thus, if the accidental spill were to involve 20 rather than 200 gallons of a field solution of clopyralid, all of the hazard quotients would be a factor of 10 less. Nonetheless, this and other acute scenarios help to identify the types of scenarios that are of greatest concern and may warrant the greatest steps to mitigate. For clopyralid, such scenarios involve oral (contaminated water) rather than dermal (spills or accidental spray) exposure.

For chronic scenarios, only the consumption of contaminated fruit approaches a level of concern, and only at the upper levels of exposure. This scenario points out the importance of directing the herbicide onto the targeted vegetation and avoiding non-target deposition through overspray or drift.

Table F5-2a: Summary of Risk Characterization for Workers – Clopyralid

Chronic RfD = 0.15 mg/kg/day Acute RfD = 0.75 mg/kg/day			
Scenario	**Hazard Quotient[1]**		
	Typical	**Lower**	**Upper**
General Exposures			
Backpack application	1 E-2	3 E-4	7 E-2
Boom Spray	9 E-3	1 E-4	7 E-2
Accidental/Incidental Exposures			
Immersion of hands, 1 minute	5 E-7	5 E-8	3 E-6
Contaminated Gloves, 1 hour	3 E-5	3 E-6	2 E-4
Spill on hands. 1 hour	1 E-4	7 E-6	6 E-4
Spill on lower legs, 1 hour	2 E-4	2 E-5	1 E-3

[1] Hazard quotient is the level of exposure divided by the RfD, then rounded to one significant digit.

Table F5-2b: Summary of Risk Characterization for the Public – Clopyralid

Chronic RfD = 0.15 mg/kg/day Acute RfD = 0.75 mg/kg/day			
Scenario	**Hazard Quotient[1]**		
	Typical	**Lower**	**Upper**
Acute/Accidental Exposures			

Direct Spray, entire body, child	4 E-3	3 E-4	2 E-2
Direct Spray, lower legs, woman	4 E-4	3 E-5	2 E-3
Dermal Exposure, contaminated vegetation	5 E-4	5 E-5	2 E-3
Contaminated Fruit	4 E-3	2 E-3	6 E-2
Contaminated Water, spill, child	9 E-2	2 E-2	2 E-1
Contaminated Water, stream, child	5 E-4	4 E-5	3 E-3
Consumption of Fish, general public	3 E-3	1 E-3	3 E-3
Consumption of Fish, subsistence populations	1 E-2	5 E-3	2 E-2
Chronic/Longer Term Exposures			
Contaminated Fruit	8 E-3	3 E-3	2 E-1
Consumption of Water	3 E-4	2 E-5	7 E-4
Consumption of Fish, general public	2 E-6	1 E-7	3 E-6
Consumption of Fish, subsistence population	1 E-5	1 E-6	3 E-5

[1] Hazard quotient is the level of exposure divided by the RfD, then rounded to one significant digit.

2,4-D

Workers – For all accidental exposures, none of the scenarios exceeds a hazard quotient of one, although at the upper rates of exposure, a value of unity is approached. 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 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.

As stated, some formulations of 2,4-D are severe eye irritants. Quantitative risk assessments for irritation are not usually derived, and, for 2,4-D specifically, the available data do not support any reasonable quantitative dose-response modeling. Splashing liquid formulations into the eye would probably cause severe eye irritation. While skin irritation could also occur, it would probably be less severe than effects on the eyes.

General Public - For the acute/accidental scenarios, the exposures resulting from the consumption of contaminated water after a spill by a child or by consuming fish found in such contaminated waters, at the typical application rates exceed the level of concern. The doses associated with these typical application rates ranges from 0.41 to 2.4 mg/kg per incident. Again, assuming that new studies don't change the current hazard discussions, levels of acute exposures from 1 to 3 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.

At the upper exposure levels, all the acute/accidental public exposures approach or exceed the level of concern, with hazard quotients ranging from 0.6 to 60. 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. As stated, where the acute human exposures exceed about 1 mg/kg/day, potential subclinical effects could be seen. Based on the values in Table F-5c, the only upper range acute exposure scenarios that exceed this level of exposure (1 mg/kg/day) are the consumption of water and fish after a spill.

The exposure scenarios involving contaminated water are arbitrary scenarios: scenarios that are more or less severe, all of which may be equally probable or improbable, easily could be constructed. All of the specific assumptions used to develop this scenario have a simple linear relationship to the resulting hazard quotient. Thus, if the accidental spill were to involve 20 rather than 200 gallons of a field solution of 2,4-D, all of the hazard quotients would be a factor of 10 less. A further conservative aspect to the 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. The contaminated stream scenario presents a more realistic scenario for potential operational water contamination. The HQ values for this scenario range from 0.04 to 1.4 with acute doses below 1 mg/kg/day so would not be expected to result in acute toxic effects.

Of the longer-term scenarios, only the consumption of unwashed berries immediately 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.

Table F5-3a: Summary of Risk Characterization for Workers – 2,4-D

Chronic RfD = 0.005 mg/kg/day Acute RfD = 0.067 mg/kg/day (general population) Acute RfD = 0.025 mg/kg/day (women)			
Scenario	**Hazard Quotient[1]**		
	Typical	**Lower**	**Upper**
General Exposures			
Backpack application	2	4 E-2	16
Boom Spray	2	1 E-2	17
Accidental/Incidental Exposures			
Immersion of hands, 1 minute	5 E-4	5 E-5	2 E-3

Contaminated Gloves, 1 hour	3 E-2	3 E-3	1 E-1
Spill on hands, 1 hour	1 E-2	9 E-4	6 E-2
Spill on lower legs, 1 hour	3 E-2	2 E-3	2 E-1

[1] Hazard quotient is the level of exposure divided by the RfD, then rounded to one significant digit.

Table F5-3b: Summary of Risk Characterization for the Public – 2,4-D

Chronic RfD = 0.005 mg/kg/day Acute RfD = 0.067 mg/kg/day (general population) Acute RfD = 0.025 mg/kg/day (women)			
Scenario	**Hazard Quotient[1]**		
	Typical	**Lower**	**Upper**
Acute/Accidental Exposures			
Direct Spray, entire body, child	5 E-1	4 E-2	2
Direct Spray, lower legs, woman	1 E-1	1 E-2	1
Dermal Exposure, contaminated vegetation	2 E-1	2 E-2	1
Contaminated Fruit	7 E-1	2 E-1	15
Contaminated Water, spill, child	6	1	15
Contaminated Water, stream, child	3 E-1	4 E-2	1
Consumption of Fish, general public	7	2	12
Consumption of Fish, subsistence populations	36	8	60
Chronic/Longer Term Exposures			
Contaminated Fruit	1	3 E-1	17
Consumption of Water	2 E-2	2 E-3	5 E-2
Consumption of Fish, general public	3 E-3	6 E-4	9 E-3
Consumption of Fish, subsistence population	3 E-2	5 E-3	7 E-2

[1] Hazard quotient is the level of exposure divided by the RfD, then rounded to one significant digit.

Dicamba

Workers – For all accidental exposures, none of the scenarios exceeds a hazard quotient of one, although at the upper rates of exposure, a value of unity is approached. At the typical and lower application rates, the hazard quotients are below unity for both backpack and boom spray applications. At the upper application rate, the hazard quotient slightly exceeds one with a value of 2 for both backpack and boom spray applications. 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 exceedance. These doses are below the 45 mg/kg/day rat NOAEL by a factor of ~560.

As discussed in Section 2, dicamba may be irritating to the eyes and cause mild and transient skin irritation. Quantitative risk assessments for skin and eye irritation are not derived; however, from a practical perspective, effects on the eyes and skin are likely to be the most common effects as a

consequence of mishandling dicamba. These effects can be minimized or avoided by prudent industrial hygiene practices during the handling of dicamba.

General Public - For the acute/accidental scenarios, the exposure resulting from the consumption of contaminated water after a spill by a child at the typical application rates slightly exceeds the level of concern (HQ = 3). 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 subclinical effects to a child, although the toxicity data do not clearly point to this conclusion. As stated in Section 4, 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.

At the upper exposure levels, two other acute/accidental public exposures slightly exceed the level of concern, with hazard quotients ranging from 1.7 to 4. Again, it is uncertain from the toxicology studies whether such acute exposures would result in any overt effects to adults.

The exposure scenarios involving contaminated water are arbitrary scenarios: scenarios that are more or less severe, all of which may be equally probable or improbable, easily could be constructed. All of the specific assumptions used to develop this scenario have a simple linear relationship to the resulting hazard quotient. Thus, if the accidental spill were to involve 20 rather than 200 gallons of a field solution of dicamba, all of the hazard quotients would be a factor of 10 less. A further conservative aspect to the 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. The contaminated stream scenario presents a more realistic scenario for potential operational water contamination; the HQ values are below 1 at all application rates.

Of the longer-term scenarios, only the consumption of unwashed berries immediately after application of the highest dose yields a hazard quotient that is greater than unity. At the highest application rate of 2 lbs ae/acre, 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. 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.

Table F5-4a: Summary of Risk Characterization for Workers – Dicamba

Chronic RfD = 0.045 mg/kg/day Acute RfD = 0.1 mg/kg/day			
Scenario	**Hazard Quotient[1]**		
	Typical	**Lower**	**Upper**
General Exposures			
Backpack application	1 E-1	2 E-3	2
Boom Spray	1 E-1	7 E-4	2
Accidental/Incidental Exposures			
Immersion of hands, 1 minute	3 E-4	2 E-5	2 E-3
Contaminated Gloves, 1 hour	2 E-2	1 E-3	1 E-1
Spill on hands, 1 hour	6 E-3	4 E-4	4 E-2
Spill on lower legs, 1 hour	1 E-2	9 E-4	1 E-1

[1] Hazard quotient is the level of exposure divided by the RfD, then rounded to one significant digit.

Table F5-4b: Summary of Risk Characterization for the Public – Dicamba

Chronic RfD = 0.045 mg/kg/day Acute RfD = 0.1 mg/kg/day			
Scenario	**Hazard Quotient1**		
	Typical	**Lower**	**Upper**
Acute/Accidental Exposures			
Direct Spray, entire body, child	2 E-1	1 E-2	1.7
Direct Spray, lower legs, woman	2 E-2	1 E-3	2 E-1
Dermal Exposure, contaminated vegetation	3 E-2	2 E-3	2 E-1
Contaminated Fruit	1 E-1	3 E-2	4
Contaminated Water, spill, child	3	3 E-1	10
Contaminated Water, stream, child	2 E-3	7 E-6	2 E-2
Consumption of Fish, general public	5 E-2	1 E-2	1 E-1
Consumption of Fish, subsistence populations	3 E-1	5 E-2	7 E-1
Chronic/Longer Term Exposures			
Contaminated Fruit	4 E-2	9 E-3	1.2
Consumption of Water	6 E-6	6 E-7	5 E-5
Consumption of Fish, general public	2 E-8	3 E-9	1 E-7
Consumption of Fish, subsistence population	2 E-7	2 E-8	1 E-6

[1] Hazard quotient is the level of exposure divided by the RfD, then rounded to one significant digit.

Glyphosate

Workers - Given the low hazard quotients for both general occupational exposures as well as accidental exposures, the risk characterization for workers is unambiguous. None of the exposure scenarios exceed a level of concern.

While the accidental exposure scenarios are not the most severe one might imagine, they are representative of reasonable accidental exposures. Given that the highest hazard quotient for any of the accidental exposures is a factor of about 330 below the level of concern, more severe and less

plausible scenarios would be required to suggest a potential for systemic toxic effects. The hazard quotients for these acute occupational exposures are based on a chronic RfD. This adds an additional level of conservatism and, given the very low hazard quotients for these scenarios, reinforces the conclusion that there is no basis for asserting that systemic toxic effects are plausible.

The hazard quotients for general occupational exposure scenarios are somewhat higher than those for the accidental exposure scenarios. Nonetheless, the upper limit of the hazard quotients are below the level of concern - i..e., a hazard index of 1. As previously discussed, these upper limits of exposure are constructed using the highest anticipated application rate, the highest anticipated number of acres treated per day, and the upper limit of the occupational exposure rate. If any of these conservative assumptions were modified the hazard quotients would drop substantially. The simple verbal interpretation of this quantitative characterization of risk is that even under the most conservative set of exposure assumptions, workers would not be exposed to levels of glyphosate that are regarded as unacceptable. Under typical backpack application conditions, levels of exposure will be at least 125 times below the level of concern.

Glyphosate and glyphosate formulations are skin and eye irritants. Quantitative risk assessments for irritation are not normally derived, and, for glyphosate specifically, there is no indication that such a derivation is warranted. As discussed in SERA, 2003a, glyphosate with the POEA surfactant, is about as irritating as standard dishwashing detergents, all purpose cleaners, and baby shampoos.

General Public - None of the longer-term exposure scenarios approach a level of concern. Although there are several uncertainties in the longer-term exposure assessments for the general public, the upper limits for hazard quotients are sufficiently far below a level of concern that the risk characterization is relatively unambiguous: based on the available information and under the foreseeable conditions of application, there is no route of exposure or scenario suggesting that the general public will be at any substantial risk from longer-term exposure to glyphosate.

For the acute/accidental scenarios, the exposure resulting from the consumption of contaminated water by a child, at the highest application rates, approaches the level of concern. None of the other acute/accidental exposures reach or exceed a hazard quotient of one. At the exposure level for a child drinking water, as per the discussion in Section 4, no effects would be anticipated for doses up to 20 mg/kg/day. It is important to realize that the exposure scenarios involving contaminated water are arbitrary scenarios: scenarios that are more or less severe, all of which may be equally probable or improbable, easily could be constructed. All of the specific assumptions used to develop this scenario have a simple linear relationship to the resulting hazard quotient. Thus, if the accidental spill were to involve 20 rather than 200 gallons of a field solution of glyphosate, all of the hazard quotients would

be a factor of 10 less. A further conservative aspect to the 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. The contaminated stream scenario presents a more realistic scenario for potential operational contamination of a stream; the HQ values are substantially below 1. Nonetheless, this and other acute scenarios help to identify the types of scenarios that are of greatest concern and may warrant the greatest steps to mitigate. For glyphosate, such scenarios involve oral (contaminated water) rather than dermal (spills or accidental spray) exposure.

Table F5-5a: Summary of Risk Characterization for Workers – Glyphosate

RfD = 2.0 mg/kg/day			
Scenario	**Hazard Quotient[1]**		
	Typical	**Lower**	**Upper**
General Exposures			
Backpack application	8 E-3	1 E-4	8 E-2
Boom Spray	7 E-3	5 E-5	8 E-2
Accidental/Incidental Exposures			
Immersion of hands, 1 minute	2 E-6	1 E-7	1 E-5
Contaminated Gloves, 1 hour	1 E-4	6 E-6	8 E-4
Spill on hands, 1 hour	2 E-4	2 E-5	1 E-3
Spill on lower legs, 1 hour	6 E-4	4 E-5	3 E-3

[1] Hazard quotient is the level of exposure divided by the RfD, then rounded to one significant digit.

Table F5-5b: Summary of Risk Characterization for the Public – Glyphosate

RfD = 2.0 mg/kg/day			
Scenario	**Hazard Quotient[1]**		
	Typical	**Lower**	**Upper**
Acute/Accidental Exposures			
Direct Spray, entire body, child	9 E-3	6 E-4	4 E-2
Direct Spray, lower legs, woman	9 E-4	6 E-5	4 E-3
Dermal Exposure, contaminated vegetation	1 E-3	1 E-4	5 E-3
Contaminated Fruit	1 E-2	4 E-3	3 E-1
Contaminated Water, spill, child	3 E-1	5 E-2	9 E-1
Contaminated Water, stream, child	2 E-3	2 E-5	8 E-2
Consumption of Fish, general public	4 E-3	8 E-4	7 E-3
Consumption of Fish, subsistence populations	2 E-2	4 E-3	4 E-2
Chronic/Longer Term Exposures			
Contaminated Fruit	8 E-3	2 E-3	2 E-1
Consumption of Water	4 E-5	8 E-7	5 E-4
Consumption of Fish, general public	7 E-8	2 E-9	8 E-7
Consumption of Fish, subsistence population	5 E-7	2 E-8	7 E-6

[1] Hazard quotient is the level of exposure divided by the RfD, then rounded to one significant digit.

Triclopyr

Workers – The toxicity data on triclopyr allows for separate dose-response assessments for acute and chronic exposures. For acute exposures, the hazard quotients are based on an acute NOAEL of 100 mg/kg/day from a gestational study in rats resulting in a provisional acute RfD of 1 mg/kg/day. For women of childbearing age, the acute RfD is based on the reproductive study resulting in the NOAEL of 5 mg/kg/day - the basis for the chronic RfD. For chronic exposures, the hazard quotients are based on the provisional chronic RfD from U.S. EPA of 0.05 mg/kg/day.

Typical and lower estimates of exposure for all groups of 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. It is also important to keep in mind that the chronic RfD is based on daily, lifetime exposures, which are unlikely for a worker.

None of the accidental scenarios for workers, involving triclopyr TEA exceed a level of concern.

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.

General Public – As with the corresponding worksheet for workers, the hazard quotients for acute exposure are based on acute RfD of 1.0 mg/kg/day and the hazard quotients for chronic exposures are based on the chronic RfD from U.S. EPA of 0.05 mg/kg/day. For women of childbearing age, the acute RfD is 0.05 mg/kg/day.

None of the longer-term exposure scenarios exceed the level of concern. Although there are several uncertainties in the longer-term exposure assessments for the general public, the upper limits for the chronic hazard indices are sufficiently far below a level of concern that the risk characterization is relatively unambiguous: based on the available information and under the

foreseeable conditions of application, there is no route of exposure or scenario suggesting that the general public will be at any substantial risk from longer-term exposure to triclopyr (either the BEE or TEA formulations).

In the acute/accidental scenarios involving triclopyr, based on the high exposure assumptions, four of the acute/accidental scenarios reach or slightly exceed a level of concern (i.e., child sprayed, woman sprayed on lower legs, exposure to sprayed vegetation, and consumption of contaminated fruit). 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.

TCP is of concern to the human health risk assessment both because it is a metabolite of triclopyr and because the aggregate risks of exposure to TCP from the breakdown of both triclopyr and chlorpyrifos must be considered. While the U.S. EPA has not derived a formal RfD for TCP, the RED on triclopyr (U.S. EPA 1998, p. 31) as well as the RED on chlorpyrifos (U.S. EPA 2001b, as referenced in SERA 2003b) use a chronic value of 0.03 mg/kg/day for the risk characterization for TCP. In the more recent pesticide tolerances for triclopyr (U.S. EPA 2002a), a somewhat lower value is used for the risk characterization of TCP: a dose of 0.012 mg TCP/kg/day derived using an uncertainty factor of 1000 and data from a chronic study in dogs in which changes in clinical chemistry at a dose of 48 mg/kg/day (LOAEL) but no effects at 12 mg/kg/day (NOAEL). For acute effects, the pesticide tolerances for triclopyr (U.S. EPA 2002a) use an acute value of 0.025 mg/kg/day based on a developmental toxicity study in rabbits with NOAEL of 25 mg/kg/day and a corresponding LOAEL of 100 mg/kg/day in which an increased incidence of hydrocephaly and dilated ventricles were noted in rabbits.

For both acute and chronic exposures the uncertainty factor for TCP is set at 1000. This value is comprised of the factors of 10 to account for uncertainties in species-to-species extrapolation and another factor of 10 to encompass sensitive individuals in the population as well as an additional factor of 10 for the potentially higher sensitivity of children – i.e., the FQPA uncertainty factor. For the current risk assessment, the values used for risk characterization are identical to the most recent and conservative values proposed by U.S. EPA: 0.025 mg/kg/day for acute exposures and 0.012 mg/kg/day for chronic exposures.

Table F5-6a: Summary of Risk Characterization for Workers – Triclopyr TEA

Chronic RfD = 0.05 mg/kg/day Acute RfD = 1 mg/kg/day			
Scenario	**Hazard Quotient1**		
	Typical	**Lower**	**Upper**
General Exposures			

Backpack application	1 E-1	4 E-3	1.2
Boom Spray	1 E-1	1 E-3	1.3
Accidental/Incidental Exposures			
Immersion of hands, 1 minute	2 E-5	4 E-6	1 E-4
Contaminated Gloves, 1 hour	1 E-3	2 E-4	6 E-3
Spill on hands, 1 hour	6 E-3	8 E-4	3 E-2
Spill on lower legs, 1 hour	2 E-2	2 E-3	9 E-2

[1] Hazard quotient is the level of exposure divided by the RfD, then rounded to one significant digit.

Table F5-6b: Summary of Risk Characterization for the Public – Triclopyr TEA

Chronic RfD = 0.05 mg/kg/day Acute RfD = 1 mg/kg/day			
Scenario	**Hazard Quotient[1]**		
	Typical	**Lower**	**Upper**
Acute/Accidental Exposures			
Direct Spray, entire body, child	2 E-1	3 E-2	1.3
Direct Spray, lower legs, woman	5 E-1	6 E-2	3
Dermal Exposure, contaminated vegetation	6 E-1	1 E-1	2
Contaminated Fruit	6 E-2	3 E-2	1.0
Contaminated Water, spill, child	3 E-1	6 E-2	8 E-1
Contaminated Water, stream, child	7 E-3	2 E-5	7 E-2
Consumption of Fish, general public	5 E-4	2 E-4	9 E-4
Consumption of Fish, subsistence populations	2 E-3	8 E-4	4 E-3
Chronic/Longer Term Exposures			
Contaminated Fruit	3 E-2	1 E-2	7 E-1
Consumption of Water	2 E-2	2 E-3	5 E-2
Consumption of Fish, general public	5 E-6	7 E-7	1 E-5
Consumption of Fish, subsistence population	4 E-5	6 E-6	1 E-4

[1] Hazard quotient is the level of exposure divided by the RfD, then rounded to one significant digit. NOTE: chronic RfD used for acute scenarios involving women.

Table F5-7a: Summary of Risk Characterization for Workers – Triclopyr BEE

Chronic RfD = 0.05 mg/kg/day Acute RfD = 1.0 mg/kg/day			
Scenario	**Hazard Quotient[1]**		
	Typical	**Lower**	**Upper**
General Exposures			
Backpack application	1 E-1	4 E-3	1.2
Boom Spray	1 E-1	1 E-3	1.3
Accidental/Incidental Exposures			
Immersion of hands, 1 minute	8 E-3	1 E-3	3 E-2
Contaminated Gloves, 1 hour	5 E-1	9 E-2	1.6
Spill on hands, 1 hour	2 E-2	4 E-5	6 E-2
Spill on lower legs, 1 hour	5 E-2	1 E-4	1 E-1

[1] Hazard quotient is the level of exposure divided by the RfD, then rounded to one significant digit.

Table F5-7b: Summary of Risk Characterization for the Public – Triclopyr BEE

Chronic RfD = 0.05 mg/kg/day Acute RfD = 1.0 mg/kg/day			
Scenario	**Hazard Quotient[1]**		
	Typical	**Lower**	**Upper**
Acute/Accidental Exposures			
Direct Spray, entire body, child	7 E-1	2 E-3	2
Direct Spray, lower legs, woman	1.4	3 E-3	4

Dermal Exposure, contaminated vegetation	1.3	6 E-3	3
Contaminated Fruit	6 E-2	3 E-2	1.0
Contaminated Water, spill, child	3 E-1	6 E-2	8 E-1
Contaminated Water, stream, child	7 E-3	2 E-5	7 E-2
Consumption of Fish, general public	5 E-4	2 E-4	9 E-4
Consumption of Fish, subsistence populations	2 E-3	8 E-4	4 E-3
Chronic/Longer Term Exposures			
Contaminated Fruit	3 E-2	1 E-2	7 E-1
Consumption of Water	2 E-2	2 E-3	5 E-2
Consumption of Fish, general public	5 E-6	7 E-7	1 E-5
Consumption of Fish, subsistence population	4 E-5	6 E-6	1 E-4

[1] Hazard quotient is the level of exposure divided by the RfD, then rounded to one significant digit. NOTE: chronic RfD used for acute scenarios involving women.

Nonylphenol Polyethoxylate

Workers - Given the low hazard quotients for accidental exposure, the risk characterization is reasonably unambiguous. None of the accidental exposure scenarios exceed a level of concern. While the accidental exposure scenarios are not the most severe one might imagine (e.g., complete immersion of the worker or contamination of the entire body surface for a prolonged period of time) they are representative of reasonable accidental exposures. Confidence in this assessment is diminished by the lack of information regarding the dermal absorption kinetics of NP9E in humans. Nonetheless, the statistical uncertainties in the estimated dermal absorption rates, both zero-order and first-order, are incorporated into the exposure assessment and risk characterization.

The upper limit of general worker exposure scenarios approaches or just reaches the derived RfD. Given the conservative nature of the RfD itself, it is unlikely that there would be any signs of toxicity.

NP9E can cause irritation and damage to the skin and eyes. Quantitative risk assessments for irritation are not derived; however, from a practical perspective, eye or skin irritation is likely to be the only overt effect as a consequence of mishandling NP9E. These effects can be minimized or avoided by prudent industrial hygiene practices during the handling of NP9E.

General Public –Like the quantitative risk characterization for workers, the quantitative risk characterization for the general public is expressed as the hazard quotient using the derived RfD of 0.10 mg/kg/day.

Although there are several uncertainties in the longer-term exposure assessments for the general public, the upper limits for hazard indices are sufficiently far below a level of concern that the risk characterization is relatively unambiguous: based on the available information and under the foreseeable conditions of application, there is no route of exposure or scenario suggesting that the general public will be at any substantial risk from longer-term exposure to NP9E.

For the acute/accidental scenarios, exposure resulting from the consumption of contaminated water and exposure resulting from the consumption of contaminated vegetation are of concern. None of the other acute exposure scenarios represent a risk of effects to the public from NP9E exposure.

The spill scenario represents the greatest risk, with an HQ of 5 for the typical application rate, and an HQ exceeding unity even with the lowest application rates. An HQ of 5 represents a risk of subclinical effects to the liver and kidney. The upper HQ of 7 represents an increasing risk of clinical effects to the kidney, liver, and other organ systems. The exposure scenario for the consumption of contaminated water is an arbitrary scenario: scenarios that are more or less severe, all of which may be equally probable or improbable, easily could be constructed. All of the specific assumptions used to develop this scenario have a simple linear relationship to the resulting hazard quotient. Thus, if the accidental spill were to involve 20 rather than 200 gallons of a field solution of NP9E, all of the hazard quotients would be a factor of 10 less.

The consumption of contaminated vegetation also represents a risk of clinical effects at the high application rates only (HQ = 4). At the typical rate of application, the HQ is less than one. Nonetheless, this and other acute scenarios help to identify the types of scenarios that are of greatest concern and may warrant the greatest steps to mitigate. For NP9E, such scenarios involve oral rather than dermal exposure.

Table F5-8a: Summary of Risk Characterization for Workers – Nonylphenol Polyethoxylate

RfD = 0.10 mg/kg/day			
Scenario	**Hazard Quotient[1]**		
	Typical	**Lower**	**Upper**
General Exposures			
Backpack application	1 E-1	5 E-3	9 E-1
Boom Spray	9 E-2	2 E-3	1.0
Accidental/Incidental Exposures			
Immersion of hands, 1 minute	2 E-3	6 E-4	4 E-3
Contaminated Gloves, 1 hour	1 E-1	4 E-2	3 E-1
Spill on hands, 1 hour	5 E-4	8 E-5	7 E-3
Spill on lower legs, 1 hour	1 E-3	2 E-4	2 E-2

[1] Hazard quotient is the level of exposure divided by the RfD, then rounded to one significant digit.

Table F5-8b: Summary of Risk Characterization for the Public – Nonylphenol Polyethoxylate

RfD = 0.10 mg/kg/day			
Scenario	**Hazard Quotient[1]**		
	Typical	**Lower**	**Upper**
Acute/Accidental Exposures			
Direct Spray, entire body, child	2 E-2	3 E-3	3 E-1
Direct Spray, lower legs, woman	2 E-3	3 E-4	3 E-2
Dermal Exposure, contaminated vegetation	3 E-3	3 E-4	6 E-2
Contaminated Fruit	2 E-1	2 E-1	4
Contaminated Water, spill, child	5	3	7
Contaminated Water, stream, child	9 E-3	1 E-3	4 E-2

Consumption of Fish, general public	1 E-1	1 E-1	1 E-1
Consumption of Fish, subsistence populations	7 E-1	7 E-1	7 E-1
Chronic/Longer Term Exposures			
Contaminated Fruit	3 E-3	3 E-3	7 E-2
Consumption of Water	2 E-3	2 E-6	5 E-3
Consumption of Fish, general public	1 E-5	1 E-8	2 E-5
Consumption of Fish, subsistence population	8 E-5	1 E-7	2 E-4

[1] Hazard quotient is the level of exposure divided by the RfD, then rounded to one significant digit.

Hexachlorobenzene

Workers –The toxicity data on hexachlorobenzene allows for separate dose-response assessments for acute and chronic exposures. For acute exposures, the hazard quotients are based on ATSDR's short-term MRL of 0.008 mg/kg/day (ATSDR 1998, as referenced in SERA, 1999). For chronic exposures, the hazard quotients are based on the chronic RfD from U.S. EPA of 0.0008 mg/kg/day.

For general worker exposures, the hazard quotients associated with hexachlorobenzene are approximately two to three orders of magnitude below the corresponding hazard quotients for clopyralid. Similarly, hazard quotients associated with accidental scenarios are consistently lower for hexachlorobenzene than the corresponding scenarios for clopyralid. Thus, for the reasonably diverse exposure scenarios covered in this risk assessment, the amount of hexachlorobenzene in technical grade clopyralid is not toxicologically significant.

The cancer risks presented in Table F5-10a are presented as the estimated exposure divided by the lifetime dose associated with a cancer risk of 1 in one million. Thus, the interpretation of these hazard quotients is identical to that of hazard quotients for toxicity – i.e., if the hazard quotient is below unity, the cancer risk is below 1 in one million. As indicated in Table F5-10a, none of the cancer risks in workers exceed 1 in one million.

While there are substantial uncertainties involved in any cancer risk assessment, the verbal interpretation of the numeric risk characterization derived in this risk assessment is relatively simple. Using the assumptions and methods typically applied in Forest Service risk assessments, there is no plausible basis for asserting that the contamination of clopyralid with hexachlorobenzene will result in any substantial risk of cancer in workers applying clopyralid under normal circumstances.

While the chronic cancer potency could be scaled linearly and the cancer risk associated with short term exposures could be calculated, this sort of extrapolation is highly uncertain and, more importantly, ignores the normal background exposures to hexachlorobenzene from other sources. For example, background levels of exposure to hexachlorobenzene are in the range of 0.000001 mg/kg/day or 1×10^{-6} mg/kg/day. As summarized in Table F3-3i, even the upper range general worker

exposure values are below this background dose – i.e., in the range of 2×10^{-8} to 3×10^{-8} mg/kg/day. As discussed in the next section, the upper range of the longer term exposure scenarios for the general public are substantially below the background dose – i.e., about 1×10^{-8} to 2×10^{-11}. Thus, there is no basis for asserting that the presence of -pentachlorobenzene or hexachlorobenzene in clopyralid will impact substantially the cancer risk under conditions characteristic of applications made in Forest Service programs.

As indicated in Section 2, all of these risk characterizations are based on the typical or average 2.5 ppm concentration of hexachlorobenzene in technical grade clopyralid. This is the upper range of hexachlorobenzene that may be expected in technical grade clopyralid and thus the actual risks are probably much lower than those given in these tables

While there are substantial uncertainties involved in any cancer risk assessment, the verbal interpretation of the numeric risk characterization derived in this risk assessment is relatively simple. Using the assumptions and methods typically applied in Forest Service risk assessments, there is no plausible basis for asserting that the contamination of clopyralid with hexachlorobenzene or pentachlorobenzene will result in any substantial risk of cancer in workers applying them under normal circumstances.

The above discussion is not to suggest that general exposures to hexachlorobenzene – i.e., those associated with normal background exposures that are not related to Forest Service applications of clopyralid – are acceptable. At background exposure levels of about 1×10^{-6} mg/kg/day, the background risk associated with exposure to hexachlorobenzene would be 0.0000016 or about 1 in 625,000.

General Public –As with the corresponding worksheet for workers, the hazard quotients for acute exposure are based on the short-term MRL of 0.008 mg/kg/day and the hazard quotients for chronic exposures are based on the U.S. EPA RfD of 0.0008 mg/kg/day.

All exposure scenarios result in hazard quotients that are below unity - i.e., the level of exposure is below the RfD for chronic exposures and below the MRL for acute exposures. In addition, all of the acute exposure scenarios result in hazard quotients that are substantially below the corresponding hazard quotient for clopyralid. The highest acute hazard quotient for hexachlorobenzene is about 0.008, the upper range of the hazard quotient associated with the consumption of contaminated fish by subsistence populations. The consumption of fish contaminated with hexachlorobenzene is a primary exposure scenario of concern because of the tendency of hexachlorobenzene to bioconcentrate from water into fish. For chronic exposures, the highest chronic HQ is about 0.00002,

the upper range of the hazard quotient associated with the subsistence consumption of fish. This is also consistent with the general observation that exposure to hexachlorobenzene occurs primarily through the consumption of contaminated food.

As with worker exposures, none of the hazard quotients for cancer risk levels of 1 in 1-million exceed unity. As indicated in Table F3-5i, the highest longer-term exposure rate associated with Forest Service programs is 1.4×10^{-8} mg/kg/day – i.e., the upper range of exposure for the consumption of contaminated fish by subsistence populations. This is below the typical background exposure by a factor of about 70.

No explicit dose response assessment is made for the potential carcinogenic effects of pentachlorobenzene, another impurity in clopyralid Based on the comparison of apparent toxic potencies and the relative amounts of both hexachlorobenzene and pentachlorobenzene in clopyralid, a case could be made for suggesting that pentachlorobenzene may double the cancer risk over that associated with hexachlorobenzene. Given the extremely low levels of estimated cancer risk, this has essentially no impact on the risk characterization.

The simple verbal interpretation of this risk characterization is that, in general, the contamination of clopyralid with hexachlorobenzene and pentachlorobenzene does not appear to pose a risk to the general public. This is consistent with the conclusions reached by the U.S. EPA (1995a, as referenced in SERA, 1999.

Table F5-9a: Summary of Risk Characterization for Workers – Hexachlorobenzene

Chronic RfD = 0.0008 mg/kg/day Acute MRL = 0.008 mg/kg/day			
Scenario	**Hazard Quotient[1]**		
	Typical	**Lower**	**Upper**
General Exposures			
Backpack application	5 E-6	1 E-7	3 E-5
Boom Spray	4 E-6	5 E-8	3 E-5
Accidental/Incidental Exposures			
Immersion of hands, 1 minute	6 E-5	2 E-5	2 E-4
Contaminated Gloves, 1 hour	4 E-3	1 E-3	1 E-2
Spill on hands, 1 hour	8 E-7	2 E-7	4 E-6
Spill on lower legs, 1 hour	2 E-6	5 E-7	6 E-5

[1] Hazard quotient is the level of exposure divided by the RfD, then rounded to one significant digit.

Table F5-9b: Summary of Risk Characterization for the Public – Hexachlorobenzene

Chronic RfD = 0.0008 mg/kg/day Acute MRL = 0.008 mg/kg/day			
Scenario	**Hazard Quotient[1]**		
	Typical	**Lower**	**Upper**
Acute/Accidental Exposures			
Direct Spray, entire body, child	3 E-5	8 E-6	2 E-4

Chronic RfD = 0.0008 mg/kg/day Acute MRL = 0.008 mg/kg/day			
Scenario	**Hazard Quotient[1]**		
	Typical	**Lower**	**Upper**
Direct Spray, lower legs, woman	3 E-6	8 E-7	2 E-5
Dermal Exposure, contaminated vegetation	9 E-7	1 E-7	2 E-6
Contaminated Fruit	2 E-6	9 E-7	1 E-5
Contaminated Water, spill, child	2 E-5	2 E-5	4 E-5
Contaminated Water, stream, child	5 E-7	2 E-9	3 E-6
Consumption of Fish, general public	1 E-3	2 E-3	2 E-3
Consumption of Fish, subsistence populations	6 E-3	8 E-3	8 E-3
Chronic/Longer Term Exposures			
Contaminated Fruit	6 E-7	8 E-8	6 E-6
Consumption of Water	1 E-8	2 E-10	3 E-8
Consumption of Fish, general public	1 E-6	3 E-8	2 E-6
Consumption of Fish, subsistence population	9 E-6	3 E-7	2 E-5

[1] Hazard quotient is the level of exposure divided by the RfD, then rounded to one significant digit.

Table F5-10a: Cancer Risk Characterization for Workers – Hexachlorobenzene

Dose representing a risk of 1 in 1 million = 6.25 E-7 $(mg/kg/day)^{-1}$			
Scenario	**Hazard Quotient**		
	Typical	**Lower**	**Upper**
General Exposures			
Backpack application	6 E-3	2 E-4	4 E-2
Boom Spray	6 E-3	6 E-5	4 E-2

Table F5-10b: Cancer Risk Characterization for Public – Hexachlorobenzene

Dose representing a risk of 1 in 1 million = 6.25 E-7 $(mg/kg/day)^{-1}$			
Scenario	**Hazard Quotient**		
	Typical	**Lower**	**Upper**
Chronic/Longer Term Exposures			
Contaminated Fruit	8 E-4	1 E-4	7 E-3
Consumption of Water	1 E-5	3 E-7	3 E-5
Consumption of Fish, general public	1 E-3	4 E-5	3 E-3
Consumption of Fish, subsistence population	1 E-2	4 E-4	2 E-2

Cumulative Effects

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. Alternative 6 proposes using significantly less herbicide (only 7.5% of the amounts proposed for Alternatives 2 and 4). Therefore, potentially cumulative doses under Alternative 6 would be far less than under Alternatives 2 or 4.

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 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).

Most of the remaining uses of 2,4-D, dicamba, and glyphosate are in agricultural applications. In these counties, 2,4-D and dicamba are used on grain crops such as wheat, barley, forage hay, and oats. Clopyralid is used for pasture restoration and in mint fields. Glyphosate is used in a variety of field, row, and orchard crops, such as wheat, alfalfa, onions, and apples.

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 Modoc national forest has not been extensively involved in herbicide applications in the last five years (for 2002, there was minor use of clopyralid, 2,4-D, dicamba, glyphosate, and hexazinone, all for noxious weed control and in 2003 and 2004 there were no herbicides applied on the Modoc NF).

Table F5-11: Forestry, Range, and ROW Herbicide Applications within Modoc National Forest Counties – 2002 and 2003

Herbicide	Pounds of Active Ingredient Applied	Acres Treated1	Average Rate per Acre (lbs/ac) 2	Forestry, Range, and ROW Use (lbs) as a % of Total Use in the Counties
Chlorsulfuron	115	0	-	71
Clopyralid	1013	367	0.2	71
2,4-D	20,501	7,985	1.2	28
Dicamba	2,394	91	0.8	43
Glyphosate	37,328	16,175	1.1	50
Triclopyr	7,054	4,246	1.1	88

Sources – USFS, Region 5, 2002 and 2003 Pesticide Use Reports; California Department of Pesticide Regulation, 2002 and 2003 Annual Pesticide Use Reports for Lassen, Shasta, Modoc, and Siskiyou counties, accessed on line at http://www.cdpr.ca.gov/docs/pur/purmain.htm on November 9, 2004 and August 25, 2005

1 – Acres Treated are only for forestry and rangeland uses as these are the only categories that have acres reported in the CDPR database.

2 – Average rate per acre is based on forestry and rangeland uses only.

Table F5-12a: Total Forestry, Range, and ROW Herbicide Applications within Modoc National Forest Counties, Calendar Year 2002, in Pounds

Category	Lassen	Modoc	Shasta	Siskiyou
Forestry	14,478	8,637	20,804	12,665
Rangeland	1	0	46	94
Rights-of-Way	5,766	12,585	54,790	20,930

Source - California Department of Pesticide Regulation, 2002 Annual Pesticide Use Reports for Lassen, Shasta, Modoc, and Siskiyou counties, accessed on line at http://www.cdpr.ca.gov/docs/pur/purmain.htm on November 9, 2004. This table includes all herbicides used in 2002, not just the six proposed for use in this EIS.

Table F5-12b: Total Forestry, Range, and ROW Herbicide Applications within Modoc National Forest Counties, Calendar Year 2003, in Pounds

Category	Lassen	Modoc	Shasta	Siskiyou
Forestry	8,737	5,538	18,908	19,455
Rangeland	0	287	10	929
Rights-of-Way	2,214	6,180	12,944	17,369

Source - California Department of Pesticide Regulation, 2003 Annual Pesticide Use Reports for Lassen, Shasta, Modoc, and Siskiyou counties, accessed on line at http://www.cdpr.ca.gov/docs/pur/purmain.htm on August 25, 2005. This table includes all herbicides used in 2003, not just the six proposed for use in this EIS.

We assume that, with the exception of uses proposed under Alternatives 2, 4, and 6 there would not be any extensive changes in the use patterns displayed in Tables F5-11, F5-12a and F5-12b into the near future.

Other projects that potentially could involve herbicides within the planning area on National Forest lands might involve the restoration of wildfire areas, such as the recent Blue Fire. However, at this time, there are no other pesticide-related projects listed on the Modoc National Forest Schedule of Proposed Action.

Under Alternatives 2 and 4, it is estimated that from 300 to 1,500 acres would be treated annually. It is assumed that Alternatives 1, 3, and 5 would not involve any herbicide use in this analysis. Based on the pesticide use from 2002-2003 displayed in Table F5-11, Alternatives 2, 4, and 6 would result in at most a 10% increase in forest and rangeland acreage treated in the Modoc National Forest area. [Total acres from column 3 of Table F5-11 = 28,864 acres. (3,000 acres in Alts 2,4,6)/28,864 = 0.103 or approximately 10%.] This is an overestimation, as the acres for rights-of-ways are not included in the totals in Table F5-11.

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 Forest Service 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 0.02. 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). 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 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). 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.

Table F5-13: TMRC values for US population as a whole

Herbicide	TMRC (mg/kg/day)	% of RfD	Data Source
Chlorsulfuron	0.00386	19.3	US EPA 2002f
Clopyralid	0.00903	6.0	US EPA 1999b
2,4-D	0.000168	3.4	U.S. EPA 2004a
Dicamba	0.01075	35.8	US EPA 1999a
Glyphosate	0.02996	1.5	US EPA 2000a
Triclopyr	0.00105	2.1	US EPA 2002a

Cumulative effects can be caused by the interaction of 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 previously stated, the primary metabolite of triclopyr is TCP. TCP is also the primary metabolite of an insecticide called chlorpyrifos. U.S. EPA (1998, 2002a) considered exposures to TCP from both triclopyr and chlorpyrifos in their general dietary and drinking water exposure

assessments. In the RED on triclopyr (U.S. EPA 1998) 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. – U.S. EPA (1998, p. 34).

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) Table 3-10 for a small stream and Table 3-11 for a small pond.

There is very little monitoring data with which to assess the plausibility of the modeling for TCP. As discussed by U.S. EPA (1998, p. 65), TCP is seldom detected in surface water after applications of triclopyr that result in triclopyr concentrations of up to about 25µg/L, with a limit of detection (LOD) for TCP of 10 µg/L. Thompson et al. (1991, as referenced in SERA 2003b) examined the formation of TCP from triclopyr in a forest stream. Consistent with the results reported by U.S. EPA, these investigators failed to detect TCP (LOD=50 µg/L) in stream water with

concentrations of triclopyr up to 140 µg/L. This is at least consistent with the GLEAMS modeling of both triclopyr and TCP. As indicated in SERA (2003b), the maximum modeled concentrations of triclopyr in stream water range from about 161 to 428 µg/L (for sandy and clay soils respectively) and the corresponding maximum modeled concentration of TCP in stream water range from about 5 to 11 µg/L. Thus, given the LOD of 50 µg/L in the study by Thompson et al. (1991, as referenced in SERA 2003b), the failure to find TCP in stream water is consistent with the GLEAMS modeling.

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). It should be noted that the maximum concentrations for TCP in water do not necessarily reflect simultaneous application of triclopyr and chlorpyrifos. Because triclopyr and chlorpyrifos degrade at different rates, maximum concentration in soil, and hence maximum runoff to water, will occur at different times. Thus, in order to provide the most conservative estimate of exposure to TCP, the maximum concentrations reflect applications of triclopyr and chlorpyrifos spaced in such a way as to result in the maximum possible concentrations of TCP in water. 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 0.12 mg/L or ppm [0.012 mg/kg/day × 10 kg/1 L/day] which is in turn equivalent to 120 ppb. Since the peak exposure to TCP in water 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 (0.013 μg/L or 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) can be caused by additive amounts of NP, NPE, and their breakdown products. In other words, an effect could arise from the additive dose of a number of different xenoestrogens, none of which individually have high enough concentrations to cause effects (USDA 2003a). 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 NPEs, 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 Environment Canada (2001a, as referenced in USDA 2003a), the authors made some estimates of these background exposures based on extrapolation of admittedly limited data and very conservative assumptions. One of the more critical, and extreme, assumptions made was that dermal absorption of NP and NPEs would be 100%. This assumption was based on the inadequacy of the one *in vitro* study of absorption in human skin that showed absorption rates below 1%. However, this would seem to be an extreme over-assessment of absorption and leads to estimates of exposure that greatly exceed the threshold value for kidney damage in rats from NP exposure of 12 mg/kg/day. Based on a review of the literature on surfactants and absorption (USDA 2002) it would appear that a 100% figure is extremely conservative. The use of a 1% absorption rate would appear to be a realistic figure; the 100% figure should be considered a worst-case figure.

Contributions from the air, water, soil, and food of NP and NPEs in adult Canadians was estimated at 0.034 mg/kg/day (Environment Canada 2001a, as referenced in USDA 2003a). The contribution of NP and NPEs from the exposure to skin moisturizers, makeup, deodorant, fragrances, detergents, cleaners, paints, and spermicides are also estimated in Environment Canada (2001a). Both of these exposure sources are based on very small sample sizes and should be considered worst-case. Using the skin absorption figure of 100%, and the highest concentration estimates, these products

contribute up to 27.0 mg/kg/day, assuming each is used every day. If 1% dermal absorption is used, this total would be reduced to 0.27 mg/kg/day. In another study from Europe, the daily human exposure to NP is estimated at 0.002 mg/kg/day (2 µg/kg/day) as a worst-case assumption (note that this estimate does not include the ethoxylates) (Bolt 2001, as referenced in USDA 2003a).

In addition to xenoestrogens, humans are exposed to various phytoestrogens, which are hormone-mimicking substances naturally present in plants. Specific compounds that have been identified as phytoestrogens include coumestrol, formononetin, daidzein, biochanin A, and genistein. 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. Background exposures of Europeans to natural phytoestrogens (isoflavones (daidzein, genistein) and lignans), mainly from soybeans and flaxseed, is estimated at 4.5-8 mg/kg body weight for infants on soy-based formulae, and up to 1 mg/kg body weight for adults (USDA 2003a). In East Asian populations where soy-based foods are more commonly consumed, estimates of intake of phytoestrogens are in the range of 50-100 mg/kg/day (ibid). Some might consider that the contribution from these natural phytoestrogens should be disregarded, as the human species has adapted over time to daily exposures to such compounds. However, at a biochemical level, these phytoestrogens can react similarly to the estrogenic xenoestrogens, such as NP. There is some indication that a soy-based diet could act to ameliorate the effects of exposure to NP.

From Section 2, the lowest reproductive NOAEL for NP is 10 mg/kg/day from studies in rats. Assuming a 100X safety factor to convert to a human reproductive NOAEL, this would result in a value of 0.10 mg/kg/day. Adding together the contributions from the worst-case background environment and consumer products, as described in Environment Canada (2001a), 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 this risk assessment, the non-acute contribution of NP9E (worker exposure ranged from 0.00016 to 0.1 mg/kg/day) would contribute up to 1 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 NP9E would add 0.00002 to 0.07 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.

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, and this analysis to assess the human health effects of inert ingredients and full formulations has been to: (1) compare acute toxicity data between the formulated products (including inert ingredients) and their active ingredients alone; (2) disclose whether or not the formulated products have undergone chronic toxicity testing; and (3) identify, with the help of U.S. 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). 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 1200 inert ingredients into four lists. Lists 1 and 2 contain inert ingredients of toxicological concern. List 3 includes substances for which U.S. EPA has insufficient information to classify as either hazardous (List 1 and 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 the thirteen herbicides for the preparation of USDA 1989 (includes 2,4-D, dicamba, glyphosate, hexazinone, and triclopyr) and the commercial formulations and advise if they contained inert ingredients of toxicological concern (Inerts List 1 or 2)(USDA 1989, Appendix F, Attachment B). The U.S. EPA determined that there were no inerts on List 1 or 2, with the exception of kerosene in certain formulations of 2,4-D and triclopyr, and xylenes and naptha in certain formulations of 2,4-D. Kerosene has since been moved to List 3. In addition, the CBI files were reviewed in the development of most of the SERA risk assessments. Information has also been received from the companies who produce the herbicides and spray additives.

The 2,4-D formulation Weedone 638 label mentions petroleum distillates as being in the formulation. The current material data safety sheet (MSDS) also mentions two inerts: propylene glycol and titanium oxide (both on EPA list 4B). Heavy aromatic naptha ("other petroleum hydrocarbons") was identified in a 1988 letter from the FS Washington office to the Regions as the carrier for Weedone 638. Information from a Rhone-Poulenc 1995 MSDS (as described in NCAP, 2000) lists the following inerts for the Weedone 638 formulation of 2,4-D: methanol (CAS 67-56-1, EPA inert list 3), butoxyethanol (111-76-2, list 2), xylene (1330-20-7, list 2), and naphthalene (91-20-3, list 3).

EPA considers xylene to be a potentially toxic inert ingredient, with an oral RfD of 2 mg/kg/day, and is considered fetotoxic and teratogenic in mice at high doses, but EPA stated that the calculated RfD should be protective of these effects. EPA has not reached a conclusion on the carcinogenicity of xylene (USDA, 1997). In USDA, 1997, a human health risk assessment analyzed the risk of using xylene (an inert in two pesticides analyzed in that assessment). The conclusion from that assessment was that the proposed use of pesticides containing xylene did not represent a risk to either the public or the workers. Assuming that xylene makes up about 10% of the Weedone 638 formulation, and knowing that the RfD for xylene is 200 times higher than the value for 2,4-D, it would be unlikely that the RfD for xylene would be exceeded in the scenarios analyzed in this risk assessment. The lack of knowing the actual percentage of xylene in Weedone 638, as well as the lack of consensus on the carcinogenic potential of xylene adds some uncertainty to this risk assessment.

Butoxyethanol (or EGBE) has been assessed for human health risk as an impurity in the Garlon 4 formulation of triclopyr (Borrecco and Neisess, 1991). In that risk assessment, the addition of butoxyethanol did not substantially increase the risk to human health over the risk of using the active ingredient of triclopyr. The amount of butoxyethanol in Garlon 4 is listed as 0.3% in that assessment. As the actual amount of butoxyethanol in Weedone 638 is not known, there is some uncertainty in this risk assessment, however the toxicity of EGBE is a factor of 20 times lower than 2,4-D, and assuming that EGBE makes up less than 1% of Weedone 638, it is unlikely that the addition of EGBE represents a significantly increased hazard over the use of 2,4-D itself.

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).

While these formulated products have not undergone chronic toxicity testing like their active ingredients, the acute toxicity comparisons, the U.S. EPA review, and our examination of toxicity

information on the inert ingredients in each product leads us to conclude 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.

Adjuvants

The use of NPE-based surfactants is analyzed in this risk assessment, and their use under typical conditions should result in acceptable levels of risk to workers and the public. As with the herbicides, eye and skin irritation may be the only manifestations of exposure seen in the absence of spills and accidents. The exposure to ethylene oxide as a contaminant of NPE-based surfactants should also be at acceptable levels of risk.

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 to be a potential carcinogen. A risk assessment for the carcinogenic properties of this dye was completed (SERA 1997b). 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 the SERA (1997b) reference adequately analyzes for the health risks of utilizing this dye, it will not be discussed further in this risk assessment. Another colorant that could be used is Hi-Light™ Blue colorant. Hi-Light® Blue dye is not required to be registered as a pesticide; therefore it has no signal word associated with it. It is mildly irritating to the skin and eyes. It would likely be considered a Category III or IV material and have a Caution signal word if it carried one. It is considered to be virtually non-toxic to humans. Its effect on non-target terrestrial and aquatic species is unknown; however its use has not resulted in any known problems. The dye used in Hi-Light® Blue is commonly used in toilet bowl cleaners and as a colorant for lakes and ponds (SERA 1997b). The use of these colorants in the formulations would result in almost no increase in risk to the health and safety of the workers or public, and in fact the use of a dye can reduce exposures and hence the risks since treated vegetation can be avoided.

As for other adjuvants, as stated on page 2 and in USDA (2002), there is a considerable range of such products that might be considered for use. USDA (2002) provides an overview of the various types of adjuvants likely to be used in forest herbicide applications and provides acute toxicity data for many of the formulations used by the USFS. A brief discussion of silicone-based and oil-based surfactants is below. An analysis of the ingredients in these adjuvants did not identify any of specific toxic concern with the exception of the ingredients discussed in this risk assessment (ibid). None were on U.S. 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 points up 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.

Silicone-Based Surfactants

Also known as organosilicones, these are increasing in popularity because of their superior spreading ability. This class contains a polysiloxane chain. Some of these are a blend of non-ionic surfactants (NIS) and silicone while others are entirely silicone. The combination of NIS and a silicone surfactant can increase absorption into a plant so that the time between application and rainfall can be shortened. This is known as rainfastness. The surfactants extreme spreading ability may lead to droplet coalescence and subsequent runoff if applied at inappropriately high rates.

Based on a review of the current research, it would appear that surfactants have the potential to affect terrestrial insects. However, as is true with many toxicity issues, it would appear that any effect is dose related. The research does indicate that the silicone-based surfactants, because of their very effective spreading ability, may represent a risk of lethality through the physical effect of drowning, rather than through any toxicological effects. Silicone surfactants are typically used at relatively low rates and are not applied at high spray volumes because they are very effective surfactants. Hence it is unlikely that insects would be exposed to rates of application that could cause the effects noted in these studies. Other surfactants, which are less effective at reducing surface tension, can also cause the drowning effect. But as with the silicones, exposures have to be high, to the point of being unrealistically high, for such effects.

Oils

Adjuvants that are primarily oil-based have been gaining in popularity especially for the control of grassy weeds. Oil additives function to increase herbicide absorption through plant tissues and increase spray retention. They are especially useful in applications of herbicides to woody brush or tree stems to allow for penetration through the bark. Oil adjuvants are made up of either petroleum, vegetable, or methylated vegetable or seed oils plus an emulsifier for dispersion in water.

Vegetable Oils – The methylated seed oils are formed from common seed oils, such as canola, soybean, or cotton. They act to increase penetration of the herbicide. These are comparable in

performance to crop oil concentrates. In addition, silicone-seed oil blends are also available that take advantage of the spreading ability of the silicones and the penetrating characteristics of the seed oils.

The U.S. Food and Drug Administration (FDA) considers methyl and ethyl esters of fatty acids produced from edible fats and oils to be food grade additives (CFR 172.225). Because of the lack of exact ingredient statements on these surfactants, it is not always clear whether the oils that are used in them meet the U.S. FDA standard.

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. Reviews 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 (US EPA 2000; ATSDR 2004; Kociba and Mullison 1985). The literature review by ATSDR (2004) cited several studies that found no synergistic effects for mixtures of four, eight, and nine chemicals at low (sub-toxic) doses. In assessing health risk associated with drinking water, Crouch et al. (1983) reach a similar conclusion when they stated:

"...in most cases we are concerned with small doses of one pollutant added to a sea of many pollutants. For those small doses a multiplicative effect is not expected."

U.S. EPA (1986) concludes:

"There seems to be a consensus that for public health concerns regarding causative (toxic) agents, the additive model is more appropriate [than a multiplicative model]."

Synergism has rarely been observed in toxicological tests involving combinations of these herbicides with other commercial pesticides. The herbicide mixtures proposed for this project have not shown synergistic effects in humans who have used them 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 the proposed treatment, these effects are dose dependent (Dost 1991). 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. As Dost explains:

> "While there is little specific published study of forestry herbicides in this particular regard, there is a large body of research on medical drugs, from which principles arise that govern such interactions. Amplifications of effect are not massive; one chemical cannot change the impact of another by hundreds or thousands of times. Rarely will such change be more than a few fold. This difference can be dangerous when dealing with drugs that are already at levels intended to significantly alter bodily functions, but is insignificant when both compounds are at the very low levels of exposure to be found associated with an herbicide treatment."

It is not anticipated that synergistic effects would be seen with the herbicides and the adjuvants that might be added to them. Based on a review of several recent studies, there is no demonstrated synergistic relationship between herbicides and surfactants (Abdelghani et al 1997; Henry et al 1994; Lewis 1992; Oakes and Pollak 1999, 2000 as referenced in USDA 2002).

Although the combination of surfactant and herbicide might indicate an increased rate of absorption through the skin, a review of recent studies indicates this is not often true (Ashton et al 1986; Boman et al 1989; Chowan and Pritchard 1978; Dalvi and Zatz 1981; Eagle et al 1992; Sarpotdar and Zatz 1986; Walters et al 1993, 1998; Whitworth and Carter 1969 as referenced in USDA 2002). 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 will be no change in absorption as compared to the other compound alone. The studies 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), while in Alternative 7 the dicamba/2,4-D mixture is proposed for use.

The guidance resulting from the reviews and analyses of available information by both US EPA (2000) and ATSDR (2004) is that, in the absence of known toxicity information on the mixture, mixtures of herbicides that have similar modes of toxic action can be assumed to have additive effects. Further, effects from mixtures are not likely to occur where the dose from each chemical in the mixture is at least one order of magnitude below its respective RfD (i.e. HQ < 0.1), and the sum of individual HQs does not approach an additive HQ = 1. If only one component is present at a HQ>0.1, and if the HQ for that component exceeds unity, this situation is not considered a mixtures problem but should focus on the one chemical that exceeds an HQ of unity.

Looking at the Tables in this risk assessment that display the risk characterizations for chlorsulfuron, 2,4-D, and dicamba (Tables F-6a-1 and 2, F-6c-1 and 2, and F-6d-1 and 2), 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 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.

Herbicide-Specific Interaction Data

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, particularly in combination with picloram. There are no data in the literature suggesting that clopyralid will interact, either synergistically or antagonistically with this or other compounds (SERA, 1999a).

A commercial formulation of picloram and 2,4-D, Tordon 202C, has been shown to inhibit immune response in mice (SERA 1999c). 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 EIS, 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 SERA 2004c) 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 POEA surfactant found in some formulations (e.g., Roundup) from plausible routes of exposure (SERA 1996a).

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).

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 will 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), 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, preexisting 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.

Further information concerning risks to sensitive individuals can be found in USDA (1989, pages 4-114 through 4-116).

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 produce alterations in hematological parameters. However, it is unclear if individuals with pre-existing diseases of the hematological 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.

The likely critical effect of clopyralid in humans cannot be identified clearly (SERA 1999a). Clopyralid can cause decreased body weight, increases in kidney and liver weight, deceased red blood cell counts, as well as hyperplasia in gastric epithelial tissue (ibid). These effects, however, are not consistent among species or even between different studies in the same species (ibid). 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 are no data or case reports on idiosyncratic responses to clopyralid (ibid).

As reviewed by Mullison (1981, as referenced in SERA 1998a), there is anecdotal information (case histories) suggesting that some individuals may be sensitive to 2,4-D. These individuals may develop neuropathy/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. Probenecid enhances the acute toxicity of 2,4-D and 2,4,5-T to rats (Ylitalo et al. 1990, as referenced in SERA

1998a). This effect is attributable, in part, to the displacement of the phenoxy acids from proteins. Thus, individuals taking probenecid, as an adjuvant to penicillin therapy, 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 (Arnold and Beasley 1989 as referenced in SERA 1998a). 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).

Because triclopyr may impair glomerular filtration, individuals with pre-existing kidney diseases are likely to be at increased risk (SERA 1996b). 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). 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.

Worksheets

All worksheets related to the information noted in this document can be found in the Project Record and are hereby incorporated by reference. The Project Record is located at the Modoc National Forest Supervisor's Office, 800 West 12th Street, Alturas, CA. Phone 530-233-5811

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Appendix G:

Noxious Weed Species Information

Appendix G: Weed Species Information

Appendix G of the DEIS included weed sheets gathered and prepared by staff in the Non-Cropland Weed group of the UC Cooperative Extension Service, in the Weed Science Program, Department of Vegetable Crops, University of California, Davis, CA 95616 and provided on the web site of the California Department of Food and Agriculture, Integrated Pest Control Branch, provided the support for the development of the weed information sheets - http://www.cdfa.ca.gov/phpps/ipc/encycloweedia/encycloweedia_hp.htm.

The information from the weed sheets has not been reproduced in this appendix as this site and the weed sheets are not the only source utilized in evaluating noxious weeds. The information was provided in the DEIS to provide the public a non-Forest Service source for information about the noxious weeds evaluated in the EIS. In addition to this site information of noxious weeds included but is not limited to information from the list below.

Federal

The USDA Forest Service at: http://www.fs.fed.us/invasivespecies/index.shtml

FS Guide to Noxious Weed Prevention Practices

Invasivespeciesinfo. gov: A gateway to Federal and State invasive species activities and programs

Federal Interagency Committee for the Management of Noxious and Exotic Weeds (FICMNEW)

Animal and Plant Health inspection Service (APHIS) programs for weed management and identification. Accesses other sites and information about weed management. http://www.aphis.usda.gov/ppq/weeds/

Federal Noxious Weed List http://www.aphis.usda.gov/ppq/permits/fnwsbycate.PDF

Agricultural Research Service Home Page (USDA) Accesses agricultural research areas including weed management. http://www.ars.usda.gov

Bureau of Land Managment (BLM) National Weeds Home Page. http://www.blm.gov/weeds

Invasive Weeds Toolkit http://www.or.blm.gov/Prineville/weed/weed_ed.htm

Utah State BLM Weed Page www.blm.gov/utah/resources/weeds

Blue Mountain Natural Resources Institute Information on identification and management of weed species. Good color images of weeds. http://www.fs.fed.us/pnw/bmnri/weeds.htm

Natural Resources Conservation Service. PLANTS Data Base http://plants.usda.gov/

Plant Conservation Alliance http://www.nps.gov/plants/

State and Local

CFDA Noxious Weed Information Project (NWIP)

California Noxious Weed Control Projects Inventory

California Invasive Plant Council

California Interagency Noxious Weed Coordinating Committee (CINWCC)

California Department of Food and Agriculture Weed Management Information Project http://www.cdfa.ca.gov/phpps/ipc/noxweedinfo/noxweedinfo_hp.htm

California Department of Food and Agriculture Intigrated Pest Management http://www.cdfa.ca.gov/phpps/ipc/index.htm

California Plants and Habitats Photographs of California's flowering plants, including noxious weeds.http://galaxy.cs.berkeley.edu/photos/flora

Modoc County Weed Management Area http://www.cdfa.ca.gov/phpps/ipc/weedmgtareas/Modoc/modoc_hp.htm

Models and Data Bases

INVADERS Database System A comprehensive database of exotic plant names, distribution records, and regulatory information for the northwestern United States. http://invader.dbs.umt.edu

National Agricultural Pest Information System. Home page for NAPIS which is the database for the Cooperative Agricultural Pest Survey (CAPS). http://ceris.purdue.edu/napis

National Biologic Information Infrastructure - Invasive Species. Invasive Species Page. http://www.nbii.gov/invasive/index.html

Natural Resources Conservation Service. PLANTS Data Base http://plants.usda.gov/

Pacific Northwest Weed Control Handbook. http://weeds.ippc.orst.edu/pnw/weeds

University of Wyoming CAPS program. Wyoming databases on ecology and distribution and biological control of noxious weeds. http://w3.uwyo.edu/~caps/caps.html

LINKS TO SCHOOLS & UNIVERSITIES

Cornell Biological Control Guide to photographs and descriptions of biological control, including noxious weeds. http://www.nysaes.cornell.edu/ent/biocontrol

Integrated Pest Management A national Integrated Pest Management network of the latest scientific based information. http://www.colostate.edu/Depts/IPM/

National Agricultural Pest Information System Home page for NAPIS which is the database for the Cooperative Agricultural Pest Survey (CAPS). http://ceris.purdue.edu/napis

Weed Images and Descriptions www.rce.rutgers.edu/weed

The Nature Conservancy

Weed Control Methods Handbook: Tools and Techniques for Use in Natural Areas - Authors: Mandy Tu, Callie Hurd, & John M. Randall -Version date: April 2001
http://tncweeds.ucdavis.edu/handbook.html

Appendix H:

Monitoring

Appendix H: Noxious Weed Treatment Monitoring

Introduction

An Annual Noxious Weed Treatment Work Plan will be developed identifying the specific weed treatment locations, treatment prescriptions and treatment monitoring protocols and locations proposed for the coming year. This Work Plan will be reviewed with affected interests including but not limited to Native American Tribes and livestock permittees, prior to its approval by the appropriate line officer(s).

Noxious weed treatment monitoring is divided into two phases: implementation monitoring and effectiveness monitoring. Implementation monitoring will document whether the individual treatments were implemented according to their individual prescriptions, including whether the Design Standards included in the prescriptions such as the implementation of Best Management Practices (BMPs), were successful in meeting their prescription objectives for protection or mitigation of environmental effects connected to treatment actvitities. Effectiveness monitoring will document whether the individual treatments accomplish the specific weed control and/or eradication purpose for which they were designed and implemented.

Separate from noxious weed treatment monitoring, as part of its Noxious Weed Management Strategy the Forest will have an ongoing inventory program to locate new or expanding populations of noxious weeds.

Implementation Monitoring

Implementation Monitoring includes a number of different aspects which will be coordinated and documented by the individual treatment project manager(s). These aspects include all:

- Required Design Standards, including BMPs, public notification signs, etc. were implemented
- Prescription requirements, such as timing, method, application, etc. were implemented
- Contracts or agreements were administered to standard
- Required water quality implementation monitoring was completed
- Unanticipated environmental effects connected to treatment activities are documented and appropriate reporting and/or mitigation of these effects is accomplished

Water Quality Implementation Monitoring Protocol for Herbicide Treatments

An implementation monitoring protocol for surface water quality related to noxious weed herbicide treatments has been developed for the Modoc National Forest Noxious Weed Treatment Project. The protocol will be used to assess compliance with State of California standards as described in the Regional Water Quality Control Boards' Basin Plans (Lahontan, Central Valley and North Coast Regions) and application of Best Management Practices. Annual surface water quality herbicide treatment monitoring based upon the protocol will be included in the Annual Noxious Weed Treatment Work Plan.

The protocol outlines surface water monitoring requirements for proposed application of herbicides. In general terms, the solubility of the herbicides in water and the ability for them to be transmitted into public waters drives this sampling protocol. The Forest Hydrologist or their designated representative will conduct the monitoring conducted under this protocol.

Annually, based on identification of proposed herbicide treatment areas, appropriate monitoring station(s) will be identified by the Forest Hydrologist or their designated representative, GPS'd on the ground, and assigned identifier number(s). The identifier numbers will be used on monitoring station maps and narrative descriptions. The monitoring stations will be identified in proximity to perennial stream courses or other water sources, and transmission routes to perennial streams or other water sources, based upon the locations of the proposed herbicide treatment areas.

Water samples will be taken so as to be representative of the total volume of water passing the monitoring stations at any moment. Samples will be collected at the lower end of a straight, riffle section of channel, preferably near the center of the stream. In past monitoring, composite sampling has not been shown to be more effective in detecting herbicide residues than the simpler grab water sampling. It is not believed at this time that the added expense, opportunities for contamination of samples and risk to personnel is justified for composite sampling. Therefore, all samples will be 1-liter grab samples.

A pre-application sample will be collected at all monitoring stations 24 to 72 hours prior to herbicide application. Pre-treatment samples will serve as control samples. Following herbicide application, water samples will be taken during storm runoff periods to determine the amount of herbicide that may have entered the water through surface runoff.. Post-treatment samples will be taken within 24 hours following storm events that are likely to produce surface runoff. On the Modoc National Forest, the storm events that are likely to produce surface runoff are 2-year and 10-year storm events that occur during the summer season, or storm events that occur when soils are at field capacity during the fall and winter seasons. Samples taken during storm runoff periods will attempt

to catch the rising limb of the hydrograph. The exact dates will depend on weather conditions and monitoring station access.

For stations monitoring glyphosate movement, one sample will be taken during the first significant runoff-producing storm that occurs within 90 days of herbicide application. If no such event occurs, no sample will be collected.

If a herbicide residue is detected at a monitoring station following a storm event, the monitoring station will be re-sampled during the next significant runoff-producing storm that occurs after the results are received.

Extreme care will be taken to prevent sample contamination. The collector will not have any herbicide or other contaminant on his/her clothing, hands, or boots. Sample containers will not be transported or stored with herbicides or herbicide application equipment. The analyzing laboratory will provide the sample containers.

Samples will be delivered to the Forest Hydrologist or their designated representative, who will coordinate transport to the laboratory. A sample documentation form, which will serve as a "chain of custody" form, will accompany each sample. Each sample bottle will be clearly identified as follows:

- Monitoring station ID number;
- Date and time of sample collection;
- Name of person collecting sample;
- Type of sample;
- Herbicide to be analyzed.

This information, along with remarks on weather conditions and any other occurrence that might affect water analysis results; a listing of the treatment units within the drainage area of the sample point; and an estimate of stream discharge at the time of sampling will also be recorded on the sampling documentation form. Samples will be transported from field to laboratory in an ice cooler. The samples will be sent to a State certified laboratory within 48 hours of collection for analysis. For quality control, a blank and spiked sample will be sent to the lab with selected batches of samples approximately once per month while samples are being taken.

A water quality monitoring record for all herbicide treatment water quality monitoring will be kept on file in the Supervisor's Office. It will include the following information and documents for all monitoring locations:

- Maps of all treatment units and monitoring stations
- Sampling documentation forms

- Field notes
- Correspondence with labs
- Results of sampling analysis

If herbicide residue is detected at a monitoring location, the Forest Supervisor/District Ranger or Forest Ecosystem Staff Officer will be notified and advised if further monitoring of the location is recommended. That recommendation will be made by the Forest Hydrologist or their designated representative based on the magnitude of discovery and the individual attributes of the sample location.

An annual summary report will be prepared by the Forest Hydrologist or their designated representative that will contain a summary of the annual water quality monitoring results for herbicide treatments for the year. This report will be kept on file with the Forest Hydrologist and a copy of the report will be provided to the Forest Supervisor, District Rangers and the Ecosystem Staff Officer. In addition, a copy of this report will be made available to other interested parties.

Effectiveness Monitoring

Numerous methodologies can be used for detailed quantitative measurement of the changes in existing infestations of invasive species following noxious weed treatment, whether the treatment is a hand, herbicide or cultural treatment. Changes in distribution, relative density, and changes in the infestation size (extent) are important characteristics that will be used to measure treatment effectiveness. Pre treatment and post treatment distribution, relative density, and changes in the infestation size (extent) for representative treatment sites will be documented in tabular and spatial formats following the protocols described in the USDA-Forest Service publication Data Recording Protocols for Invasive Species Management (Treatment and Treatment Monitoring). An annual noxious weed treatment effectiveness summary will be prepared.

References

Mai, Christine and District Ranger, Eldorado National Forest. Water Quality Monitoring Plan, 1999

Herbicide Handbook of the Weed Society of America - 6th Edition. 1989.

USDA. Forest Service. Pesticide Background Statements

USDA-FS Region 5, A Review and Assessment of the Results of Water Monitoring for Herbicide Residues For the Years 1991 to 1999

Appendix I:

Project Record

About the Project Record

The project record is the detailed, formal account of the planning process for the Noxious Weed Treatment Project. The project record includes all information used and considered in the development of the Environmental Impact Statement. It includes scoping comments, meeting notes, information and notes on Tribal consultation, literature consulted and cited, maps, GIS database, and project specialist reports. The project record is composed of thousands of pages of information that was consulted in the development of this FEIS. It includes documents that are in electronic as well as in hard copy format. The project record is housed and may be viewed at the Supervisor's Office of the Modoc National Forest in Alturas, CA.

The FEIS Volume 2 (Parts 1 and 2) contains all specialist reports and other major information from the project record, and Volume 3 contains all substantial comment letters received on the DEIS as well as the response to the individual comments contained in those letters.

Appendix J:

Noxious Weed Risk Assessment

Appendix J: Noxious Weed Risk Assessment

Noxious Weed Risk Assessment
Modoc National Forest Noxious Weed Control Project

Bruce Davidson, Forest Botanist
December 23, 2002

Noxious Weed Risk Assessment Direction

The Sierra Nevada Forest Plan Amendment outlines direction and steps for completing a noxious weed risk assessment (SNFP, Appendix L).

Forest Service Manual 2080 Noxious Weed Management (effective since 11/29/95) includes a policy statement calling for a risk assessment for noxious weeds to be completed for every project. Specifically, the manual states:

2081.03 Policy. When any ground disturbing action or activity is proposed, determine the risk of introducing or spreading noxious weeds associated with the proposed action.

1. For projects having moderate to high risk of introducing or spreading noxious weeds, the project decision document must identify noxious weed control measures that must be undertaken during project implementation.

2. Make every effort to ensure that all seed, feed, hay, and straw used on National Forest System lands is free of noxious weed seeds (FSH 6309.12, sec. 42 and 42.1)

3. Where States have enacted legislation and have an active program to make weed-free forage available, Forest Officers shall issue orders restricting the transport of feed, hay, straw, or mulch which is not declared as weed-free, as provided in 36 CFR 261.50 (a) and 261.58(t).

4. Use contract and permit clauses to prevent the introduction or spread of noxious weeds by contractors and permittees. For example, where determined to be appropriate, use clauses requiring contractors or permittees to clean their equipment prior to entering National Forest System lands.

2081.2 Prevention and Control Measures. Determine the factors, which favor establishment and spread of noxious weeds and design management practices or prescriptions to reduce risk of infestation or spread of noxious weeds.

Where funds and other resources do not permit undertaking all desired measures, address and schedule noxious weed prevention and control in the following order:

First Priority: Prevent the introduction of new invaders,

Second Priority: Conduct early treatment of new infestations, and

Third Priority: Contain and control established infestations.

These policies set the stage for weed management on each Forest. The Sierra Nevada Forest Amendment also emphasizes prevention and implementing Integrated Weed Management.

II. Risk Assessment

The proposed Modoc National Forest Noxious Weed Control Project is located throughout the Modoc National Forest. Currently known noxious weed occurrences are proposed for treatment with physical and chemical methods.

The risk assessment process considers eight factors when analyzing projects. A matrix was used to look at pre-existing conditions in the planning area and to consider factors generated by the implementation of the proposed action and alternatives.

Table 1: Noxious Weed Species in or near the project area

Common Name	Scientific Name	State Rating	Extent of Infestation
Crupina	*Crupina vulgaris*	A	1 site
Dalmatian toadflax	*Linaria dalmatica*	A	10 sites
Diffuse knapweed	*Centaurea diffusa*	A	11 sites
Musk thistle	*Carduus nutans*	A	12 sites
Plumeless thistle	*Carduus acanthoides*	A	1 site
Scotch thistle	*Onopordum acanthium*	A	329 sites
Spotted knapweed	*Centaurea maculosa*	A	13 sites
Squarrose knapweed	*Centaurea squarrosa*	A	3 sites
Wavyleaf thistle	*Cirsium undulatum*	A	1 site
Canada thistle	*Cirsium arvense*	B	25 sites
Dyer's woad	*Isatis tinctoria*	B	56 sites
Mediterranean sage	*Salvia aethiopis*	B	23 sites
Tall whitetop	*Lepidium latifolium*	B	1 site
Klamathweed	*Hypericum perforatum*	C	3 sites
Yellow starthistle	*Centaurea solstitialis*	C	8 sites

Table 2: California Department of Food and Agriculture Noxious Weed Control Ratings

Rating	Explanation
A	Noxious weed and noxious weed seed: eradication, containment, rejection, or other holding action at the state-county level. Quarantine interceptions to be rejected or treated at any point in the state.
B	Noxious weed and noxious weed seed: eradication, containment, control or other holding action at the discretion of the commissioner
C	Noxious weed and noxious weed seed: state-endorsed holding action and eradication only when found in a nursery; action to retard spread outside of nurseries at the discretion of the commissioner; reject only when found in a crop seed for planting or at the discretion of the commissioner. Designated noxious weeds in the CA Code of Regulations.
N	Non-Rated
Q	Noxious weed and noxious weed seed: temporary "A" action outside of nurseries at the state-county level pending determination of a permanent rating.

Seven of the eight factors were rated and a risk level was assigned to each factor. When the assessment for this project was completed it had two high risk, one moderate risk and four low risk factors. The final factor is an overall rating based on the rated factors.

RATED RISK FACTORS

1 **Inventory** – A noxious weed inventory has been completed within the project area.

Risk: Low – Surveys completed

2 Known noxious weeds, numbers of A, B, or C rated – Lots of noxious weeds are present and are proposed for active control measures. They are listed in Table 1. This table also identifies the California Department of Food and Agriculture rating (Ratings explained in Table 2).

Risk: High – High priority species present in project area

3 Habitat vulnerability (previous disturbance, plant cover, soil cover, shade, soil type, aspect/moisture.) – The treatment areas have typically been disturbed previously. Most receive ongoing livestock grazing. Sites are commonly along roadsides, in campsites, and in old skid trails and landings. Native plant cover is often low, and the sites are obviously vulnerable to noxious weed invasion because they are there already. The sites occupy a wide variety of habitat types, including rocky lava flows and riparian areas.

Risk: High – High levels of previous disturbances, livestock grazing, low native plant cover

4 Non-project dependent vectors (Existing roads and trails, traffic use, livestock/wildlife migration, wind patterns, drainage flow direction) – Treatment areas are often adjacent to roads, receiving a variety of traffic levels. Nearly the entire project area is grazed by livestock.

Risk: Moderate – Existing traffic and livestock movement provide moderate current vulnerability.

5 Habitat alteration expected as a result of the project – Soil disturbance by hand digging and grubbing.

Risk: Low – Some new ground disturbance

6 Increased vectors as a result of project implementation – Short-term traffic will increase slightly with project implementation, and OHV use could provide a means for movement of weed seeds.

Risk: Low – Use of off-road equipment is the main vector

Mitigation Measures (Prevention, control, and cultural practices) – For this project, prevention is very important for reducing the risk of noxious weed spread. OHV use is the only factor related to this project that carries significant risks for introducing or spreading weeds. Specifically, the risk is the possible transport of weed parts or seeds into the project from areas previously traveled, and transport of weeds out of the area. The following mitigation measures will be applied during project implementation.

OHVs will be clean before initial entry into a treatment area, so that no mud or other debris that could carry weed seeds remains attached to the equipment. The equipment will be visually inspected and attached mud or debris that could carry weed seeds will be removed at the treatment area before moving to a new site.

Risk: Low (greatly reduced risk) – implement all relevant mitigation measures

8 ANTICIPATED WEED RESPONSE TO PROPOSED ACTION – Two factors remain at high risk – Presence of high priority weed species, and high habitat vulnerability. With mitigation measures implemented during the project the risk is lowered, but the project still carries a MODERATE risk for increasing the spread of noxious weeds.

OVERALL ASSESSMENT OF RISK FOR PROJECT – MODERATE

EFFECTS ANALYSIS

Alternative 1 - No Action (Prevention Measures allowed, but No Control Measures)

Direct and Indirect Effects

This alternative would not implement noxious weed control measures. Prevention measures would still be employed as appropriate for all Forest activities. No direct effects to noxious weeds would occur. By not actively controlling noxious weeds, currently known weed sites would be allowed to regenerate themselves and spread to new areas. Weed seeds that may not have been produced if control measures were implemented would then be available for dispersal to new sites. The methods of dispersal vary by species. Seeds are carried to new sites by vehicle traffic (both on and off-road), wind and animals. Several weed species, including diffuse knapweed, Mediterranean sage, form a somewhat round structure (similar to tumbleweed) that can be tumbled by the wind for long distances, scattering seed along the way. Eventually, healthy native plant communities would be infiltrated. Even now, a significant effort is required to keep the advance of noxious weeds in check, much less to actually eradicate them. If they are allowed to spread further into the various plant communities across the Forest, that effort will be multiplied.

Cumulative Effects

Modoc County Agricultural Department (County) has a treatment plan for treating noxious weeds in the county. Their first priority is to treat State of California “A” rated species. Some noxious weed species, such as Yellow Starthistle are “C” rated species but are not predominant in the County and are also treated, to eradicate them from the County. Under an agreement with the Modoc National Forest, the County has treated Scotch thistle, Dalmatian toadflax, dyer’s woad and knapweed occurrences on National Forest Land in the past. These treatments will no longer be allowed with the selection of the No Action alternative. Some of the gains from past treatments will be lost in a few years of unchecked weed seed production.

Many projects carrying a risk of noxious weed spread are currently being implemented across the Forest. These include timber management actions (site preparation, planting, thinning, harvesting), prescribed fire, juniper removal and aspen enhancement projects, wetlands creation and maintenance programs, and recreational development and site maintenance. Ground disturbance creates exposed soil and decreases native plant cover. Noxious weeds colonize these disturbed areas easily. Equipment can move soil containing weed seeds from one area to another. Increased traffic along access routes gives weeds an additional opportunity to spread along roads. Even with preventive measures incorporated into project design and implementation, all of these activities create disturbed conditions that are more vulnerable to weed establishment, and all may still provide dispersal routes for hitchhiking weed seeds.

Grazing occurs across most of the Forest. The effects of grazing include vegetation trampling, herbivory, and potential for weed spread from their movements. Seeds and plant parts can become lodged in their hooves and hair and be distributed anywhere the cows move in an area. For the most part, livestock do not eat noxious weeds. When the desired plants at a site are grazed, their competitive ability is decreased, giving a further advantage to noxious weeds. When cows congregate, they can cause damage to vegetative cover. The resulting disturbed soil provides a good place for noxious weeds to establish. Livestock may not only spread noxious weeds within their allotments, they can bring weeds with them when they arrive and take weeds with them when leaving the Forest. This can then increase weed occurrences in the county and in other areas of the Forest.

With the exception of the County weed treatments, all of the above activities will likely continue into the foreseeable future and will likely result in the establishment of new noxious weed sites.

Alternative 2 – Proposed Action (Implementation of Physical and Chemical Treatments)

Direct and Indirect Effects

Noxious weeds will be killed (treated) in this alternative. As with the No Action alternative, prevention measures will be implemented. Control of the spread and production of seeds is the key to weed management for most of our noxious weeds. Only a portion of the sites will be treated each year, so seed production will continue at the untreated sites, adding to the seed bank in the soil. When a weed site is treated the plants will be killed, but seed will remain in the soil and will germinate and grow in future years. Repeated treatments over the course of many years are required to eradicate weed populations. Persistent efforts, effectively killing the plants or at least preventing seed production, will eventually deplete the seed bank in the soil. Skipping even one year of treatment will allow the weeds to replenish the seed bank, adding years to the time required for eradication.

It soon becomes apparent that eradication of all noxious weeds is not a feasible goal. Particular sites may be targeted for eradication efforts, but the main strategy must be to set a realistic goal of preventing the spread of the existing weeds. Control, rather than eradication, means that treatments will prevent or reduce seed production some years, but not every year. Limited funding and resources for accomplishing weed control restrict the number of sites that may be treated. Without an army of weed warriors battling the spread of these well-adapted plants, it becomes clear that even stopping the increase of weeds is not attainable. So, our real goal is to slow the spread of these invasive plants.

The control of perennial noxious weed species requires more than preventing seed production. Our perennial noxious weeds proposed for treatment are Canada thistle, Dalmatian toadflax, Klamathweed, tall whitetop, spotted knapweed, squarrose knapweed, and wavyleaf thistle. Except the two knapweeds, these all reproduce by creeping rootstocks in addition to seed. Hand-pulling alone will not effectively control well-established populations of these plants, so chemical treatments are often recommended. Continued treatments, even if not done every year, will slow the spread of the weeds.

Cumulative Effects

The effects of ongoing actions and those of the foreseeable future are the same as described for the No Action alternative, with one exception. Physical and chemical control treatments will be allowed; the work will be performed by the County, private contractor or Forest Service personnel. Continuing to control the weeds at these sites would maximize the benefit of previous treatments.

Addendum to the Noxious Weed Risk Assessment for Modoc National Forest Noxious Weed Treatment Project

Modoc National Forest, California

Cheryl Beyer, Forest Botanist

1/23/2006

Summary

The USDA Forest Service, Modoc National Forest proposes to treat noxious weeds on the Forest.[1]

A Biological Assessment (BA) has been prepared for the threatened plant species suspected or occurring within the project area. *Orcuttia tenuis*, slender Orcutt grass, a threatened species, occurs on the Forest. This species is found near vernal pools or vernal pool-like drainage edges. *Tuctoria greenei*, awnless spiralgrass, a federally endangered species, is known to occur on the Modoc Plateau (USFWS 2005), but not on the Modoc National Forest.

A Biological Evaluation (BE) has been prepared for Forest sensitive plant species, and an Addendum to the BE has supplemented that information. A Botany Report, supplemented by an Addendum to the Botany Report, addressing watchlist plant species, diversity of native plant communities, and diversity of native plant species has been prepared.

The purpose of this document is to supplement the Noxious Weed Risk Assessment (2002) to review effects of the additional alternatives and to update the list of noxious weeds to be treated.

It is my determination that:

- **ANTICIPATED WEED RESPONSE TO THE ACTION ALTERNATIVES – Two factors remain at high risk – Presence of high priority weed species, and high habitat vulnerability. With Design Standards implemented during the project the risk is lowered, but the project still carries a MODERATE risk for increasing the density or spread of noxious weeds for alternatives that propose manual and cultural treatments, because of ground disturbance and ability of some weeds to rejuvenate from underground rhizomes and buds. The risk is LOW for alternatives that employ herbicide treatments. Effects to noxious weeds from the different alternatives are discussed in the document.**

Prepared by

Cheryl Beyer, Forest Botanist

Introduction

The Modoc National Forest Integrated Weed Management Strategy (USDA USFS 2005) was developed by compiling existing National and Regional direction, policy, programs, and laws into a short operational guide for the Modoc National Forest. The primary emphasis of this Strategy is prevention and management strategies to eradicate or control noxious weeds.

The purpose of the Modoc National Forest Noxious Weed Treatment Project is to apply those portions of the Strategy that call for implementation of a program to control and eradicate identified noxious weed species.

The Forest is complying with direction in the Forest Land and Resource Management Plan and the Sierra Nevada Forest Plan Amendment to complete a Noxious Weed Risk Assessment for planned projects on the Forest. This Addendum to the Noxious Weed Risk Assessment for the Modoc National Forest Noxious Weed Treatment Project includes an update on the list of noxious weeds to be treated, an update on the alternatives, and a section on herbicide resistance in weeds.

This Risk Assessment and the Project comply with the **Strategy Objective**:

"Secure appropriate funding to identify and eradicate noxious weed species on National Forest Lands.

Complete appropriate treatment of noxious weed infestations on the Forest."

This Risk Assessment and Project also comply with the **Strategy Actions**:

"Complete Noxious Weed Treatment EIS to allow the treatment of existing noxious weed sites to control or eradicate noxious weeds. EIS will be used to assist in securing future treatment funding.

Ensure that revegetation occurs, where appropriate, following treatment.

Complete appropriate environmental analysis prior to ground disturbing activities and use all methods in the control and eradication of noxious weeds."

Two alternatives were analyzed in the 2002 Noxious Weed Risk Assessment. Four additional alternatives have since been developed in response to issues and public comments. Alternative 3 has no herbicide use, Alternative 4 builds on Alternative 2 by increasing the treatment periods from a maximum of 5 years to at least 10 years, eliminates the cap on the number of acres to be treated annually, in addition to allowing for treatment of expanding populations in current or newly discovered sites through Early Detection – Rapid Response opportunities. Alternative 5 proposes only manual and cultural treatments with an increase in the types of manual treatments that can be implemented, while Alternative 6 includes all manual, cultural and herbicide treatments and adds several new herbicides. Implementation period for Alternatives 5 and 6 is 10 years. For a more detailed discussion of the alternatives, please see the FEIS, Chapter 2.

Summary Comparison of Alternatives for the Noxious Weed Treatment Project

Alternatives / Alternative Features	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6
Treatment Timeframe	**Ongoing***	**5 years**	**5 years**	**10 years**	**10 years**	**10 years**
Treatment Sites and Acres	Sites/Acres	Sites/Acres	Sites/Acres	Sites/Acres	Sites/Acres	Sites/Acres
Total Inventoried Weeds (2004)	541/6908	541/6908	541/6908	541/6908	541/6908	541/6908
Inventoried Weeds Fully Treated	20-30 ac/yr[1]	520/5,995	494/5,993	520/5,995	520/180	538/241
Inventoried Weeds Receiving Partial Treatment[2]	0/0	16/904[2]	0/0	16/904[2]	0/0	0/0
Inventoried Weeds Receiving Limited Treatment[3]	0/0	0/0	0/0	0/0	9/100[3]	3/100[3]
Inventoried Weeds Not Treated[4]	6,878[1]	5/9[4]	47/916[4]	5/9[4]	5/5515	0/6,567[4]
Proportion of Inventoried Weeds Treated	0.4%	99%/99%	91%/87%	99%/99%	100%/4%	100%/5%
Noxious Weeds Treated Through Early Detection – Rapid Response (ED – RR, acres) [5]	0	0	0	Up to 200 acres (100 ac max/yr)	Up to 200 acres (100 ac max/yr)	Up to 200 acres (100 ac max/yr)
Total Acres of Weeds Treated	20-30 ac/yr[1]	6,899 acres	5,993 acres	7,099 acres	480 acres	541 acres
Treatment Methods for Inventoried Noxious Weeds (2004)	Sites/Acres	Sites/Acres	Sites/Acres	Sites/Acres	Sites/Acres	Sites/Acres
Physical – hand pulling, hoeing, grubbing	0/0	161/31	494/5,993	161/31	0/0	0/0

Alternatives / Alternative Features	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6
Physical+ – Physical plus, clipping seed head or plant, weed eater, mulch/tarp	20-30 ac/yr[1]	0/0	0/0	0/0	527/139	116/19
Physical and/or Herbicide Treatment	0/0	333/5,961	0/0	333/5,961	0/0	371/116
Herbicide	0/0	42/907	0/0	42/907	0/0	46/65
Limited Treatment[3]	0/0	0/0	0/0	0/0	9/100	3/100
Goat Grazing or Herbicide Treatment	0/0	0/0	0/0	0/0	5/41	5/41
Total Acres Potentially Treated with Herbicides (Incl. ED-RR acres)[6]	0/0	355/6,868	0/0	355/7,7068	0/0	425/522

[1]Under Current Management (Alt. 1), approximately 20 to 30 acres of noxious weeds are treated each year through other site specific NEPA decisions as part of other projects in accordance with the Modoc NF Integrated Weed Management Strategy (2005).

[2]These sites are rhizomotous species that occur within 10 feet of H2O. Those sites that are within 10 feet of H2O would not be treated. Sites with acreage ooutside of this 10 foot no treatment zone would receive partial treatment. The acreage within the 10 foot zone would not be treated, the acreage outside the 10 foot zone would be treated with herbicides.

[3]Includes treating along borders of infestations to prevent spread using the methods specific to each alternative. Treatment is estimated at 100 acres to be proportionally distributed based on the size of the individual infestations. These acres are included in the Inventoried Noxious Weeds Treated acreage.

[4]Excluded in Alt. 2 and Alt. 4: 5 sites of rhizamotous species that are within 10' of live water and partial acreage of 16 sites of rhizamotous species that are within 10' of live water. Rhizamotous species will not be treated by physical methods in these alternatives. Excluded in Alt. 3: 47 sites of rhizamotous species. Excluded in Alt. 5: 5,658 acre Dyer's woad, 850 acre Dalmatian toadflax, 159 acre crupina, and 6 sites of rhizamotous species. These sites will receive limited treatment around the perimeter estimated at 100 acres proportionally distributed based on the size of these sites. Excluded in Alt. 6: 5,658 acre Dyer's woad, 850 acre Dalmatian toadflax, 159 acre crupina. These sites will receive limited treatment around the perimeter estimated at 100 acres proportionally distributed based on the size of these sites.

[5]May use any of the methods approved for use in this NEPA decision.

[6]For Alt. 2 this includes the acres under the physical and/or herbicide method plus the herbicide treated acres. Alt. 4 adds the same categories as Alt. 2 plus adds in the potentially treated 200 acres through early detection rapid response. Alt. 6 includes the Physical and/or Herbicide acres, the herbicide acres, the acres under goat grazing, the acres under the limited treatment category, and the 200 acres under Early Detection-Rapid Response.

Effects Analysis

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 (see the Final Environmental Impact Statement (FEIS). For further discussion of this alternative and direct and indirect effects, please see Davidson 2002 Noxious Weed Risk Assessment, Modoc NF Noxious Weed Project.

Cumulative Impacts

Natural events (fire, flood, drought, disease, insects, landslides, climate change) have provided habitat for ruderal plant species in the past, and continue to do so. However, where normally native ruderal plants would reestablish after a disturbance, and, gradually, later-stage seral natives would move in, now invasive noxious weeds, highly adapted to infesting disturbed sites, are just as likely to invade and take over these places, and manipulate the conditions on those sites so that they remain inhabited primarily by the weeds themselves.

The effects of past actions may have affected noxious weeds and may continue to impact them. Roads construction and use, railroad construction and use, and power line construction and maintenance have created pathways and vectors that facilitate weed spread and infestation.

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. This is especially true of medusahead, a C-rated noxious weed in Modoc County, which will not be treated as part of this project.

Past fire suppression has allowed non-fire-adapted species to thrive, while selecting against fire-adapted species. Past fire suppression may be one cause for the invasion of native grasslands and sagebrush steppe by western juniper, changing these areas to juniper woodlands with loss of understory plant biodiversity. Many areas that have a large number of juniper also are infested with cheatgrass and/or medusahead.

Canopy cover removal during timber management and fuels reduction may have changed understory soil moisture and light conditions. Plant communities and their accompanying species that require low light and moist soil may have subsequently been selected against in these places. Bull thistle, a moderately invasive weed in California which is unrated in Modoc County, appears to have taken advantage of areas that have been opened up by logging, and also by fire.

Past road construction and trampling by cattle has disturbed soil, providing a ready seedbed for invasive and noxious weeds. Pile burning has the potential to sterilize the soil and kill the native seedbed, creating disturbed openings where noxious weeds can invade and begin to disperse their propagules.

Similar projects on the Forest may continue into the present and future to effect noxious weeds, providing habitat and dispersal mechanisms, such as corridors along which seeds can travel and means of disbursing seeds along these corridors, such as vehicles.

Effects of reasonably foreseeable future actions from projects that are on the schedule of proposed actions (SOPA) include extensive visitation across the Forest to cut juniper during the proposed sagebrush steppe ecosystem restoration project. This project covers a large area of the Forest; plans are to revert back to a landscape less dominated by juniper.

Grazing will continue on allotments on the Forest. Trampling can potentially disturb soils, creating habitat for invasive and noxious weeds. Cattle will continue to congregate in shady areas during hot summer months, including under trees or along creeks and at springs. This may lead to trampling native vegetation and disturbing soils in those areas, subsequently providing habitat for invasive weeds. Recreation (OHV, horseriding, hiking, camping), firewood gathering, and many other activities have the potential to affect noxious weeds by disturbing soil and spreading weed seeds.

Alternative 2

This alternative would authorize treatment of noxious and invasive weeds going from a low of 300 acres per year to a high of 1,500 acres per year of which 75 percent is projected to include some herbicide use. The proposed action calls for eradication or controlling 14 specific noxious weed species in 520 locations covering approximately 5,995 acres. The various methods analyzed include manual, cultural, and herbicide, with adaptive management strategies.

Methods of application of herbicides include only spot treatment by backpack sprayer or wick. For a complete discussion of this alternative and the direct and indirect effects, please see Davidson 2002 Noxious Weed Risk Assessment, Modoc NF Noxious Weed Project. See Alternative 1 above for a discussion of cumulative effects.

Alternative 3

This alternative would not use herbicides. Noxious weeds would be treated manually or culturally. Only a portion of the sites would be treated each year, so seed production will continue at the untreated sites, adding to the seed bank in the soil. Because not all the 'tools in the toolbox' (such as herbicides) would be used, the ability to successfully control and eradicate noxious weeds would be diminished. This alternative would not treat rhizomatous species. Large infestations would have to be treated by hand, which may hamper control and eradication because of the need for large crews to revisit sites repeatedly. Repeat visits are necessary in both herbicide and non-herbicide alternatives because of seeds germinating from the seedbank and replenishing the population. Long-term, cumulative effects of this alternative relates to the continual disturbance of the soil over 5 years, which provides the type of habitat that is conducive to new weed invasions. This alternative may allow for the continuing infestation of noxious weeds on disturbed soil.

Direct and Indirect Effects

Only a portion of the sites will be treated each year, so seed production will continue at the untreated sites, adding to the seed bank in the soil. When a weed site is treated the plants will be killed, but seed will remain in the soil and will germinate and grow in future years. Repeated treatments over the course of many years are required to eradicate weed populations. Persistent efforts, effectively killing the plants or at least preventing seed production, will eventually deplete the seed bank in the soil. Skipping even one year of treatment will allow the weeds to replenish the seed bank, adding years to the time required for eradication.

Without an army of weed warriors battling the spread of these well-adapted plants, it becomes clear that even stopping the increase of weeds is difficult. The control of perennial noxious weed species requires more than preventing seed production. Our perennial noxious weeds proposed for treatment are Canada thistle, Dalmatian toadflax, Klamathweed, tall whitetop, spotted knapweed, and squarrose knapweed. Except the two knapweeds, these all reproduce by creeping rootstocks in addition to seed. Hand-pulling alone most likely will not effectively control well-established populations of these plants.

Weed occurrences of the treated noxious weeds will decline during the time period that this alternative is active (5 years). However, after that period, unless a new NEPA decision is enacted, the noxious weeds will again grow from viable seeds still in the soil. Noxious weeds not addressed in the decision will continue to grow and expand their coverage unhampered. Large sites of noxious weeds that reproduce vegetatively would most likely not decrease in number of stems or size of occurrence.

Cumulative Effects

The effect on the environment resulting from incremental effect of the action when added to the effects of other past, present, and reasonably foreseeable future actions would most likely be eradication and control of smaller occurrences. Roads will continue to be a major conduit for invasive plants. Recreation, firewood gathering, and other uses of the National Forest will most likely continue to increase, adding to ground disturbance. Other land management and use activities such as grazing, vegetation management, fuels management, and fire suppression will continue to cause ground disturbances and contribute to the introduction, spread and establishment of invasive plants on National Forest System lands. Because of ground disturbing activities and continuing seed production in sites not treated, control and eradication of larger

occurrences and of rhizomatous/vegetatively reproducing species would not occur. There would be no control of noxious weeds new to the Forest or those noxious species not on the list for this Project. See Alternative 1 above for further discussion of cumulative effects.

Alternative 4

This alternative is similar to Alternative 2, however it would authorize treatment of noxious weeds going from a low of 300 new acres per year to a high of 1,500 per year. This alternative includes adaptive management strategies to control expanding infestations and new infestations of noxious weeds. Effects from this alternative are similar to those in Alternative 2, however, the effects would last longer. Cumulative effects for this alternative would be the maximizing of control of the 14 noxious weeds on the Forest. However, the Early Detection – Rapid Response Strategy for this alternative addresses the same plants with the same treatments, and new weed species could grow and reproduce uninhibited. Additionally, newly developed and more effective herbicides could not be used.

Early Detection – Rapid Response Strategy (EDRRS) By Alternative

No EDRRS - Alternative 2 and 3	EDRRS - Alternatives 4, 5, and 6
Treatment only of identified weed species and identified sites	Treatment of same and new weed species; new or expanded sites

Direct and Indirect Effects

Only a portion of the sites will be treated each year, so seed production will continue at the untreated sites, adding to the seed bank in the soil. When a weed site is treated the plants will be killed, but seed will remain in the soil and will germinate and grow in future years. Repeated treatments over the course of many years are required to eradicate weed populations. Persistent efforts, effectively killing the plants or at least preventing seed production, will eventually deplete the seed bank in the soil. Skipping even one year of treatment will allow the weeds to replenish the seed bank, adding years to the time required for eradication.

Limited funding and resources for accomplishing weed control can restrict the number of sites that may be treated. The control of perennial noxious weed species requires more than preventing seed production. Our perennial noxious weeds proposed for treatment are Canada thistle, Dalmatian toadflax, Klamath weed, tall whitetop, spotted knapweed, and squarrose knapweed. Except the two knapweeds, these all reproduce by creeping rootstocks in addition to seed. Usually, hand-pulling alone will not effectively control well-established populations of these plants, so chemical treatments are often recommended.

Weed occurrences of the treated noxious weeds will most likely decline during the time period that this alternative is active (5 years). However, after that period, unless a new NEPA decision is enacted, the noxious weeds will again grow from viable seeds or rhizomes still in the soil. Noxious weeds not addressed in the decision will continue to grow and expand their coverage unhampered.

Cumulative Effects

The effect on the environment resulting from incremental effect of the action when added to the effects of other past, present, and reasonably foreseeable future actions would most likely be eradication and control of smaller to moderate size occurrences, and possibly control of some larger sites. Roads will continue to be a major conduit for invasive plants. Recreation, firewood gathering, and other uses of the National Forest will most likely continue to increase, adding to ground disturbance. Other land management and use activities such as grazing, vegetation management, fuels management, and fire suppression will continue to cause ground disturbances and contribute to the introduction, spread and establishment of invasive plants on National Forest System lands. Because of ground disturbing activities and continuing seed production, control and eradication of larger occurrences and of rhizomatous/vegetatively reproducing species might be thwarted. There would be no control of noxious weeds new to the Forest or those noxious species not on the list for this Project. However, Early Detection – Rapid Response Strategy will provide the opportunity to treat new sites of the identified species that have developed or existing sites that have expanded using the same treatments. See Alternative 1 above for further discussion of cumulative effects.

Alternative 5

Alternative 5 was developed in response to public comments. This alternative is a no-herbicide alternative utilizing a range of manual and cultural methods to eradicate, control, or contain approximately 280 acres of known sites and 200 acres through Early Detection – Rapid Response Strategy.

Direct and Indirect Effects

Manual methods are usually not as effective for deep-rooted or rhizomatous perennials where hand-pulling and hoeing often leave root fragments that can generate new plants. Hand-pulling or hoeing also disturbs the soil surface, which may increase susceptibility of a site to reinvasion by weeds (USDA 2005a).

Early Detection – Rapid Response Strategy would allow eradication of new infestations of the identified species along with adapting the methods outlined in this alternative, while utilizing the Design Standards (please see Final EIS 2005), to remove infestations of new noxious weed species which have been proven to be eradicated, controlled, or contained by the methods evaluated.

This alternative addresses a smaller acreage than the former alternatives, and the chances of success of **eradication** may therefore be more realistic. However, since manual treatments are often ground disturbing, this alternative may actually provide more opportunities for noxious weed seed to germinate, and noxious weeds to re-infest a site.

Alternative 5 treats only the periphery of 6 sites with rhizomatous weed species. A summary of those sites and possible results of not treating the entire infestation are summarized below:

Certain sites of rhizomatous weeds that would be sprayed with herbicide in Alternative 6 would receive limited treatment under Alternative 5. This limited treatment would aim not to eradicate the sites, but to control them along their perimeters through manual means. The following six sites are of concern to the botany program (please note, acreages are approximate):

WM003LIDA: 44 acres Near Sugar Hill, beside Planters' Camp and open pit mines. This site presents a problem because, potentially, disturbance caused by the Lassen Creek Forest Health Project could spread propagules and create large, contiguous habitat for the spread of this noxious weed from this central location.

WM008LIDA: 3 acres Near New Pine Creek, close to the entrance to the Forest via County Road 2. A large portion of this site is on non-Federal land. This Dalmatian Toadflax infestation is near three occurrences of Warner Mountain Bedstraw, a Region 5 Sensitive species.

WM010LIDA: 3 acres In the north Warners, north of Mount Bidwell. Although a polygon showing the extent of this infestation is unavailable to us, we do see that a good portion of the land in this area is private. The map section indicated as the site for this Dalmatian Toadflax infestation is near many springs Springs often provide habitat for sensitive species.

WM009CIAR4: 10 acres One or two miles southwest of Mt. Vida. This ten acre infestation of Canada Thistle is very close to a number of sensitive plant populations; this is all the more worrisome because Canada Thistle and these sensitive plants share habitat (wetlands, meadows, and streamsides).

WM005CIAR4: 0.17 acres This small site is located upon a fork of Couch Creek, two or three miles southeast of Halls Meadows. Although greater than 0.1 acre, it is still relatively small, but easily has the potential to spread into the Joseph Creek Basin..

DG017CIAR4: 0.15 acres This small Canada thistle site is located at the northern extremity of Fairchild Swamp, a large vernal meadow which is perfect habitat for Canada thistle. This noxious weed has a high potential for exponential spread in this area. There is also a concern because Fairchild Swamp is sensitive plant habitat.

Cumulative Effects

The effect on the environment resulting from incremental effect of the action when added to the effects of other past, present, and reasonably foreseeable future actions would most likely be eradication and control of

treated occurrences, however, the acreage to be treated is only 280 out of the possible nearly 6,908 infested acres.

Roads will continue to be a major conduit for invasive plants. Recreation, firewood gathering, and other uses of the National Forest will most likely continue to increase, adding to ground disturbance. Other land management and use activities such as grazing, vegetation management, fuels management, and fire suppression will continue to cause ground disturbances and contribute to the introduction, spread and establishment of invasive plants on National Forest System lands. Because of ground disturbing activities and continuing seed production, control and eradication of larger occurrences and of rhizomatous/vegetatively reproducing species might be thwarted.

There would be no control of noxious weeds new to the Forest or those noxious species not on the list for this Project. However, adaptive management will provide the opportunity to treat new sites of the identified species that have developed or existing sites that have expanded using the same treatments.

The effects of ongoing actions and those of the foreseeable future would be control and elimination of the treated infestations. Control and elimination of larger infestations, rhizomatous species, and untreated sites would be problematic. See Alternative 1 above for further discussion of cumulative effects.

Alternative 6

Alternative 6 was also developed in response to public comments. This alternative utilizes non-herbicide and herbicide treatment methods, adding a new herbicide and two mixes. It proposes to treat approximately 541 acres (341 known and 200 Early Detection – Rapid Response acres). Treatments may include use of surfactants and dyes, as do all alternatives that use herbicides. Surfactants increase the absorption of herbicide by the weeds, and dyes assist the applicator in efficiently treating target weeds.

Early Detection – Rapid Response Strategy would allow treating new occurrences and new weed species within the identified Design Standards and the full range of treatment methods listed for this alternative in the FEIS.

This alternative provides for non-ground disturbing actions in the treatment of weeds in additional to such manual methods as digging, grubbing, grazing, etc. The acreage is less than in alternatives 2-4, which makes success more likely, and adaptive management allows the treatment of new noxious weed species. This alternative also provides the maximum number of tools to the manager to use in the control and eradication of noxious weeds. The effects of this alternative would be control of all noxious weed species on the smaller acreage, and eradication of some of the species over the 10-year time frame.

Direct and Indirect Effects

Only a portion of the sites will be treated each year, so seed production will continue at the untreated sites, adding to the seed bank in the soil. When a weed site is treated the plants will be killed, but seed will remain in the soil and will germinate and grow in future years. Repeated treatments over a number of years are required to eradicate weed populations. Persistent efforts, effectively killing the plants or at least preventing seed production, will eventually deplete the seed bank in the soil. Skipping even one year of treatment will allow the weeds to replenish the seed bank, adding years to the time required for eradication.

Limited funding and resources for accomplishing weed control restrict the number of sites that may be treated. The control of perennial noxious weed species requires more than preventing seed production. Our perennial noxious weeds proposed for treatment are Canada thistle, Dalmatian toadflax, Klamathweed, tall whitetop, spotted knapweed, and squarrose knapweed. Except the two knapweeds, these all reproduce by creeping rootstocks in addition to seed. Hand-pulling alone will not effectively control well-established populations of these plants, so chemical treatments are often recommended.

Cumulative Effects

The effect on the environment resulting from incremental effect of the action when added to the effects of other past, present, and reasonably foreseeable future actions would most likely be eradication and/or control of treated occurrences, however, the number of sites to be treated aggressively is reduced to541, and the number of acres to 341. Roads will continue to be a major conduit for invasive plants. Recreation, firewood gathering,

and other uses of the National Forest will most likely continue to increase, adding to ground disturbance. Other land management and use activities such as grazing, vegetation management, fuels management, and fire suppression will continue to cause ground disturbances and contribute to the introduction, spread and establishment of invasive plants on National Forest System lands. Because of ground disturbing activities and continuing seed production, control and eradication of larger occurrences and of rhizomatous/vegetatively reproducing species might be thwarted. Early Detection – Rapid Response Strategy will provide the opportunity to treat new sites and additional noxious weed species using the same treatments.

The effects of ongoing actions and those of the foreseeable future would be some control and elimination of treated infestations. Containment of untreated infestations may be accomplished, but not control or eradication. See Alternative 1 above for further discussion of cumulative effects.

Dropping Wavyleaf Thistle from the "Noxious Weeds to be Treated"

Wavyleaf thistle has been dropped from the list of noxious weeds to be treated in the Modoc National Forest Noxious Weed Treatment Project. That determination is the result of a reassessment of the taxonomy of the species, as detailed below.

After examination of *Cirsium* specimens within the California Department of Food and Agriculture herbarium by Dr. David Keil in October 2002, he is of the opinion that the wavyleaf thistle (*Cirsium undulatum* (Nutt.) Spreng.) in northeastern California (Modoc and Lassen Counties) is referable to a native form of the species. This form is also found in eastern Oregon; eastern Washington; also probably Idaho, Montana and other northwest states, although details of the distribution and range of the regional *C. undulatum* variants are not currently known. In addition, some of the plants previously referred to *C. undulatum* from the Modoc Plateau are actually *C. canescens* Nutt, a similar-appearing taxon of the Rocky Mountains foothills, not previously recognized to occur in California.

However, not all *Cirsium undulatum* in California are native here. Non-native populations referable to typical *Cirsium undulatum* are confirmed in the historic record from the Bay Area and Southern California. Until recently, these Bay Area, Southern California and Northeastern California "populations" were all included within a broadly defined, and assumed to be non-native, *Cirsium undulatum.*

With this new taxonomic determination, control efforts against "wavyleaf thistle" have come to a complete stop. Dr. Keil is currently working on the treatment of *Cirsium* for an upcoming volume of "Flora of North America North of Mexico". At the present time this document is not yet in print, so a formal literature citation is not currently available (Pirosko 2005).

Name Change for Spotted Knapweed

According to the US Department of Agriculture website, www.plants.usda.gov, the scientific name of spotted knapweed is currently *Centaurea stoebe* L. ssp. *micranthos* (Gugler) Hayek. *Centaurea maculosa* auct non Lam. was misapplied.

Herbicide Resistance

A number of weed species that once were susceptible to and easily managed by certain herbicides have developed resistance (http://www.extension.umn.edu/distribution/cropsystems/DC6077.html#Worry). Herbicide resistance is the inherited ability of a plant to survive and reproduce following exposure to a dose of herbicide normally lethal to the wild type. In contrast, tolerance can be defined as the inherent ability of a plant to survive an herbicide treatment at a normal use rate.

In a plant, resistance may be naturally occurring or induced by such techniques as genetic engineering. Resistance may occur in plants by random and infrequent mutations; no evidence has been presented to demonstrate herbicide-induced mutation.

Through selection, where the herbicide is the selection pressure, susceptible plants are killed while herbicide resistant plants survive to reproduce without competition from susceptible plants. Thus, the appearance of herbicide resistance in a field is an example of rapid weed evolution (http://cottoninfo.ucdavis.edu/images/GL_herbresist.pdf). Following is a table of herbicide-resistant weeds in California. The chart shows that most of the resistance, at least in California, has been developed in cropland and roadside situations.

Table 2. Specific instances of herbicide-resistant weeds in California and situations of occurrence (for additional information or updates see: University of California Weed Research and Information Center website at http://www.wric.ucdavis.edu).[1]

Species	Common Name	Area or Field Situation	Year of Occurrence	Herbicide Material Involved
Senecio vulgaris	Common Groundsel	Orchard	1981	Triazine (atrazine)
Lolium perenne	Perennial ryegrass	Roadside	1989	Sulfonylurea (sulfometuron)
Cyperus difformis	Smallflower Umbrella sedge	Rice	1993	Sulfonylurea (bensulfuron)
Sagittaria montevidensis	California Arrowhead	Rice	1993	Sulfonylurea (bensulfuron)
Salsola tragus	Russian thistle	Roadside	1994	Sulfonylurea (sulfometuron)
Echinochloa crus-galli	Barnyardgrass	Cotton	1995	Dinitroaniline
Ammania auriculata	Redstem	Rice	1997	Sulfonylurea (bensulfuron)
Scripus mucronatus	Ricefield Bulrush	Rice	1997	Sulfonylurea (bensulfuron)
Echinochloa phyllopogon	Late Watergrass	Rice	1998	Thiocarbamate (thiobencarb)
Echinochloa phyllopogon	Late Watergrass	Rice	1998	Arylozyphenoxy (fenoxaprop)
Lolium rigidum	Rigid ryegrass	Orchard	1998	Glyphosate

[1] From http://cottoninfo.ucdavis.edu/images/GL_herbresist.pdf

Since weeds contain a tremendous amount of genetic variation that allows them to survive under a variety of environmental conditions, the development of a resistant species is brought about through selection pressure imposed by the continuous use of an herbicide. It is, therefore, advantageous to have several herbicides in the weed control 'toolkit.'

Weed characters that are conducive to rapid development of resistance to a particular herbicide include annual growth habit, high seed production, high percentage rate of yearly seed germination, several reproductive generations per growing season, extreme susceptibility to a particular herbicide, and a high frequency of resistant genes.

Herbicide characteristics that may lead to rapid development of herbicide resistance include a single site of "action," broad spectrum of control, and long residual activity in the soil.

In general, complete reliance on herbicides for weed control can greatly enhance the occurrence of herbicide resistant weeds. Other factors include lack of elimination of weeds that escape herbicide control, continuous or repeated use of a single herbicide or several herbicides with the same mode of

action, high herbicide use rate relative to the amount needed for weed control, and presence of roadside areas and the quality and methods of weed control used in those areas.

Weed management strategies that discourage the evolution of herbicide resistance include herbicide rotation (the use of a variety of herbicides, with broadly different modes of action where possible) in the long-term management approach. If selection pressure is maintained through the continuous use of the same herbicide, herbicide resistance will soon render it ineffective (http://cottoninfo.ucdavis.edu/images/GL_herbresist.pdf).

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Appendix A: Project Risk Assessment for Alternative 6

In a noxious weed risk assessment, seven factors are rated for risk of introduction and spread of noxious weed species. The risks are tallied to get an overall risk for the proposed project.

Factors	Current condition	Risk
Weed spread factors not connected to Proposed Action (pre-existing circumstances):		
1. Inventory	From Modoc NF Geographical Information Systems (GIS) layer, 541 sites/6908 acres (less than 5% of Forest)	Moderate
2. Known noxious weeds	14 species as described in *Final Environmental Impact Statement*	High
3. Habitat vulnerability	High	High
4. Vectors unrelated to proposed project	See Cumulative Effects discussion	Moderate
Weed spread factors related to the Proposed Action:		
5. Habitat alteration expected as a result of the project	Depends on Alternative	Low to none
6. Increased vectors as a result of project implementation	Depends on Alternative	Low to none
7. Mitigation measures	See Design Standards for project in *Final Environmental Impact Statement*	Low
Overall assessment of Risk for Project: Numerous High risk factors = High overall risk Few High risk factors = Moderate overall risk No High risk factors = Low overall risk		
Anticipated weed response to proposed action:		**Moderate**
Comments:		

Appendix B: Suggested Treatments for Noxious Weed Species with Literature Citations[1]

Table B-1: Suggested Treatments for Dalmatian Toadflax

Species		Manual	Chemical
Dalmatian toadflax	Perennial	1) Grubbing or hand pulling may be effective for controlling small infestations, but must be repeated several times a year for many years. Dalmation toadflax has an extensive underground network of lateral roots with numerous dormant root buds. Complete removal of the root system is generally infeasible. Mowing generally provides very limited control of dalmation toadflax. Mowing may prevent seed production, but does not appear to significantly deplete root carbohydrate reserves. Mowing also reduces the competitive effects of surrounding vegetation. Mowing should not be used if plants have set seed, as this will facilitate seed dispersal. (http://www.cdfa.ca.gov/phpps/ipc/weedinfo/linaria.htm) accessed 5/24/2005	1) Chemical control of dalmation toadflax has been highly variable. Picloram has been the most effective herbicide for toadflax control, but is not currently labeled in California. Rates range from 0.25 - 1.0 lb ae/A. Picloram efficacy may be reduced where heavy rains move it below the root zone, or where incorporation is limited due to a lack of moisture, and subsequent photodegradation occurs. Picloram will injure or kill most other dicots and some monocot seedlings. Fall applications have been more effective in Colorado and Montana. Optimal timing in California's Mediterranean type climate is uncertain. Dicamba may be effective at very high rates (4 lb ae/A) and 2,4-D alone is generally ineffective. Glyphosate may be applied as a spot treatment to plants in early bloom, but will also kill other vegetation it contacts. Establishing competitive vegetation such as perennial grasses is critical to prevent reinfestation. (http://www.cdfa.ca.gov/phpps/ipc/weedinfo/linaria.htm) accessed 5/24/2005
			2) Permanent, long-term control cannot be achieved with herbicide treatment alone (Saner *et al.* 1995). Herbicides should be applied during flowering when carbohydrate reserves in the root of the plants are at their lowest. At the latest, herbicide treatment should be applied before seed dispersal, if it is to be effective. The herbicides glyphosate, dicamba and picloram are considered effective for controlling toadflax. A six-year study found that phenoxypropionic herbicides such as diclorprop were more effective at controlling toadflax than phenoxyacetic herbicides such as 2,4-D (Robocker 1968). 2,4-D, MCPA, MCPB, and mecoprop do not control toadflax. **Dicamba** applied at concentrations of 2.25 kg/ha was considered effective at controlling toadflax (Morishita 1991). Dicamba controls annual and perennial broad-leaved weeds in grain crops, grasslands, pastures, and range land. Like picloram, dicamba is also an auxin-type herbicide, and has the same side effects. It is a relatively non-selective compound and can have a residual effect on non-target broad-leaved plants. **Glyphosate** has been used in Canada to control toadflax in crops, and is also recommended for spot treatments. Glyphosate applied at early bloom at 1, 2, and 4 kg per hectare provided 40, 70, and 90% control that season (Saner *et al.* 1995). However, abundant regrowth from the root systems occurred the following year. (http://tncweeds.ucdavis.edu/esadocs/documnts/linadal.rtf) accessed 5/24/2005

[1] See FEIS for additional treatment documentation

Table B-2: Suggested Treatments for Diffuse Knapweed

Species		Manual	Chemical
Diffuse knapweed	Biennial	1) Careful and continual hand pulling or digging can control small infestations or scattered diffuse knapweed plants if enough of the taproot is removed to prevent sprouting. It is easiest to pull the plants when the soil is wet. Plants with seeds should be securely bagged and disposed of in a landfill or in a hot fire. http://www.unce.unr.edu/publications/FS04/FS0429.pdf) accessed 5/24/2005	1) Glyphosate kills knapweed plants, but will also destroy competitive grasses. If using glyphosate, apply to actively growing plants in the bud stage at a rate of 3 lb acid equivalent/acre (ae/A). Seed a locally adapted grass at least ten days after the application. (http://www.unce.unr.edu/publications/FS04/FS0429.pdf) accessed 5/24/2005
		2) Hand pulling of small infestations of diffuse knapweed has shown considerable success. Since resprouting from the crown can occur, the entire plant must be removed. Hand pulling must be repeated 2-4 times a year and is easiest when the plants have begun to bolt in the late spring and the soil is still moist. Hand pulling of large infestations is very labor intensive and may not always be feasible. Proper disposal of removed plants is important to prevent spread. Piling and burning in a hot fire is a proven method of disposal. (http://www.cdfa.ca.gov/phpps/ipc/weedinfo/centaurea.htm) accessed 5/24/2005	2) Herbicides can be used to control existing stands of C. diffusa and C. maculosa and substantially reduce seed production. However, since the seed of both species is viable in the soil for up to seven years, retreatment will be necessary. (http://www.cdfa.ca.gov/phpps/ipc/weedinfo/centaurea.htm) accessed 5/24/2005
			In California, there are three herbicides important for knapweed management: 2,4-D, dicamba, and clopyralid. All three are most effective when applied in the spring, when plants are beginning to bolt. 2,4-D should be applied at 2 lb ae/A; dicamba at 1 lb ae/A; and clopyralid at 0.25 lb ae/A. Clopyralid and dicamba are the most effective treatments. Both will provide some residual control, particularly clopyralid, and retreatments may be necessary in the second, third, or fourth years. Dicamba will injure or kill most other broadleaves it contacts, including desirable forage and native broadleaf species. Clopyralid is more selective, but will injure legumes such as clovers. 2,4-D is the least expensive treatment, but is less effective than dicamba and clopyralid, and retreatment will be required every year. 2,4-D will also injure other broadleaves, similar to dicamba. The most effective knapweed treatment is picloram applied at 0.25 lb ae/A. However, it is not labeled for use in California. http://www.cdfa.ca.gov/phpps/ipc/weedinfo/centaurea.htm) accessed 5/24/2005
			4) However, any herbicide management program should integrate rotation between herbicides to prevent the development of resistance. (http://www.cdfa.ca.gov/phpps/ipc/weedinfo/centaurea.htm) accessed 5/24/2005

Table B-3: Suggested Treatments for Musk Thistle

Species		Manual	Chemical
Musk thistle	Annual or	1) Mowing can help reduce seed production, but alone will	1) Treatment with chlorosulfuron 0.75-1.5 oz ai/A in early bloom

Species		Manual	Chemical
	biennial	not eliminate an infestation http://www.cdfa.ca.gov/phpps/ipc/weedinfo/carduus.htm accessed 5/10/2005).	stage reduced seed production by 99% (http://www.cdfa.ca.gov/phpps/ipc/weedinfo/carduus.htm accessed 5/10/2005).
		2) Optimum mowing is 2-4 days after initial flowering http://www.cdfa.ca.gov/phpps/ipc/weedinfo/carduus.htm accessed 5/10/2005).	2) Spring treatments give better results than fall treatments (http://www.cdfa.ca.gov/phpps/ipc/weedinfo/carduus.htm accessed 5/10/2005).
		3) Thistles quickly recover from mowing from remaining buds near base of plant http://www.cdfa.ca.gov/phpps/ipc/weedinfo/carduus.htm accessed 5/10/2005).	3) Dicamba, 2,4-D, clopyralid, glyphosate and combinations of these compounds provide excellent control with a spring application, and somewhat less control with a fall treatment http://www.cdfa.ca.gov/phpps/ipc/weedinfo/carduus.htm accessed 5/10/2005).
			4) The effectiveness of chemical control is influenced both by weather and by growth stage (http://tncweeds.ucdavis.edu/esadocs/documnts/cardnut.html accessed 5/10/2005).
			5) 2,4-D most commonly used herbicide because of cost (http://tncweeds.ucdavis.edu/esadocs/documnts/cardnut.html accessed 5/10/2005).
			6) Effective is dependent on application during favorable periods when temperatures are not too cool nor the weather too dry (http://tncweeds.ucdavis.edu/esadocs/documnts/cardnut.html accessed 5/10/2005).
			7) 2,4-D most effective when applied 10-14 days before bolting in the spring (http://tncweeds.ucdavis.edu/esadocs/documnts/cardnut.html accessed 5/10/2005).

Herbicide recommendations for musk thistle control (http://www.cdfa.ca.gov/phpps/ipc/weedinfo/carduus.htm accessed 5/10/2005).

Herbicide	Rate	Timing	Remarks
2,4-D	1 - 2 lb ae/A	March to early April in rosette stage	Newly planted legumes may be killed
dicamba	0.5 - 1 lb ae/A	March to early April in rosette stage	May kill all legumes
dicamba + 2,4-D	0.75 + 0.25 lb ae/A	March to early April in rosette stage	May kill all legumes
clopyralid	1.5 - 4 oz ae/A	Can apply up to the bud stage	Will kill annual legumes and damage perennial legumes
glyphosate	1 - 2 lb ae/A	Apply in spring or up to rosette stage	Non-selective. Do not use with perennial grasses
chlorsulfuron	0.75 - 2.25 oz ai/A	Late season applications for reduced seed production	Will injure some grasses as well as broadleaf species

Table B-4: Suggested Treatments for Plumeless Thistle

Species		**Manual**	**Chemical**
Plumeless thistle	Winter annual or biennial		

Table B-5: Suggested Treatments for Scotch Thistle

Species		Manual	Chemical
Scotch thistle	Biennial	1) Small infestations should be physically removed or cut a few inches below the soil surface. Mowing by early flowering will reduce seed production, but may require repeated treatment because populations typically exhibit a wide range of developmental stages among individual plants. Slashing should be done prior to flowering since seed may mature in the capitula (seed head) after cutting. Plants should not be mowed following seed set, as this increases chances for dispersal. (http://www.cdfa.ca.gov/phpps/ipc/weedinfo/onopordum.htm) accessed 5/24/2005	1) No documents available http://tncweeds.ucdavis.edu/esadocs/onopacan.html) accessed 5/24/2005
		2) Because scotch thistle reproduces by seed, it is one of the few invasive weeds that can be controlled by mechanical, chemical and cultural methods. A persistent combination of these methods will yield the best results. Keep in mind that scotch thistle has the ability to germinate nearly year round. This adds to the difficulties associated with control and the timing of herbicide applications. A combination of control methods is recommended. http://www.unce.unr.edu/publications/FS02/FS0257.pdf) accessed 5/24/2005	2) One of the primary difficulties in chemical control of these thistles is their ability to germinate nearly year round. From fall to spring, a range of plant sizes can be found which may result in variable chemical control. These herbicides are all very effective on seedlings and young rosettes, but control becomes more variable with increasing plant age. Onopordum spp. seeds may persist for several years in the soil. Buried seed may persist for up to twenty years, and reinfestation is likely without yearly management. Therefore several years of retreatment may be necessary. Dicamba and 2,4-D will inure or kill other broadleaf plants including legumes. Clopyralid is more selective for controlling plants in the Asteraceae family but will also injure or kill legumes. http://www.cdfa.ca.gov/phpps/ipc/weedinfo/onopordum.htm) accessed 5/24/2005
		3) Mechanical and physical control is very effective if completed before scotch thistle goes to seed. Mechanical control is effective because scotch thistle does not reproduce vegetatively. Severing the roots of the rosette or the plant kills it. Small infestations can be pulled by hand. http://www.unce.unr.edu/publications/FS02/FS0257.pdf) accessed 5/24/2005	3) Seedbank longevity is a major factor in managing these thistles. Reestablishing competitive perennial grasses and monitoring infested areas on a yearly basis is critical. Herbicides can successfully be used for reducing thistle populations and giving grasses a competitive advantage. However, they cannot be used as a stand alone solution. These techniques must be linked with good grazing practices in rangeland areas. Otherwise, the thistles will recolonize and rapidly replenish the seed bank to pre-control levels. (http://www.cdfa.ca.gov/phpps/ipc/weedinfo/onopordum.htm) accessed 5/24/2005
		4) Mowing makes the stand more uniform, which makes herbicide applications more effective, but mowing does not kill scotch thistle. Mowing before seed dispersal will limit the amount of seed available for germination. However, plants are able to produce seed even after they have been mowed. Consequently, mowing is not recommended unless used with a follow-up herbicide application or tillage. (http://www.unce.unr.edu/publications/FS02/FS0257.pdf) accessed 5/24/2005	

Table 1. Herbicides used for Onopordum spp. management (http://www.cdfa.ca.gov/phpps/ipc/weedinfo/onopordum.htm) accessed 5/24/2005

Herbicide	Rate	Timing	Remarks
2,4-D	1.5-2.0 lb ae / A	Apply fall applications to control rosettes Apply spring applications by early bolting stage	Lower rate will control seedlings and rosettes Larger plants require the higher rate
dicamba	0.5-1.0 lb ae / A	Same as above	Longer residual activity: 12-18 months depending on the rate and environmental conditions
clopyralid	0.09-0.38 lb ae / A	May apply to actively growing plants until bud stage	Effective on a wide range of thistles, but will also injure legumes

Table B-6: Suggested Treatments for Spotted Knapweed

Species		Manual	Chemical
Spotted knapweed	Biennial	1) Careful and continual hand pulling can control small infestations of potted knapweed. The entire plant must be removed each year before it produces seed in order to prevent regrowth. It is easiest and most effective to pull the plant when the soil is wet. Plants with seeds should be placed in plastic bags and disposed of by deep burial, or by burning in a hot fire. http://www.unce.unr.edu/publications/FS04/FS0439.pdf) accessed 5/24/2005	1) Control of knapweeds with herbicides can be effective if used in combination with other control methods. Annual treatments for several years will be needed. The latent seed from previous years will germinate and reestablish the infestation if not controlled with follow-up treatments. Establishing a competitive crop or sod, such as a perennial grass, will enhance control of any regrowth and deter the establishment of new seedlings.http://www.unce.unr.edu/publications/FS04/FS0439.pdf) accessed 5/24/2005
		2) Hand pulling must be repeated 2-4 times a year and is easiest when the plants have begun to bolt in the late spring and the soil is still moist. Hand pulling of large infestations is very labor intensive and may not always be feasible. Proper disposal of removed plants is important to prevent spread. Piling and burning in a hot fire is a proven method of disposal. Hand pulling spotted knapweed may be less effective, since vegetative reproduction from short lateral roots can occur for several years. (http://www.cdfa.ca.gov/phpps/ipc/weedinfo/centaurea.htm) accessed 5/24/2005	2) The most effective treatment is to apply Tordon ® (picloram) to knapweed plants in late spring before or during flower stem elongation at a rate of 0.25 to 1.5 lb ai/A. This rate will provide four years control and will not damage perennial grasses. Treatment of plants in the bud stage may not prevent seed production in the year of application, but seed germination will be noticeably reduced. (http://www.unce.unr.edu/publications/FS04/FS0439.pdf) accessed 5/24/2005
		3) Seed production by C. diffusa or C. maculosa is typically 1000 times greater than required to maintain infestations. Thus, relatively few plants per acre are needed for rapid reinfestation. Management must be continuous or reinfestation is inevitable. **Reseeding** and establishment of competitive grasses or other native species is critical. Native bunchgrass communities are generally very resistant to knapweed invasion. However, almost any form of disturbance (including inclement weather such as hailstorms) may open a niche for invasion. Research has also shown that areas receiving 10-14 inches of precipitation annually are most susceptible to knapweed invasion, even in established perennial bunchgrass communities. The severity of knapweed infestations in other states such as Montana and Wyoming should serve as an indicator of the potential economic and environmental problems that knapweeds pose to California.	3) Glyphosate effectively controls knapweed plants, but will also destroy competitive grasses and forbs. If using glyphosate, apply to actively growing plants in the bud stage at a rate of 3 lb ai/A. Seed a locally adapted grass at least ten days after the application. (http://www.unce.unr.edu/publications/FS04/FS0439.pdf) accessed 5/24/2005

Species		Manual	Chemical
		(http://www.cdfa.ca.gov/phpps/ipc/weedinfo/centaurea.htm) accessed 5/24/2005	
		4) There are several methods of control for this species. It is important to determine and document the methods most effective for different sized infestations, different communities, and the specific characteristics of the site, including soil type, exposure, drainage, and degree of disturbance, human or otherwise. (http://tncweeds.ucdavis.edu/esadocs/documnts/centmac.rtf) accessed 5/24/2005	4) After most rosettes have emerged, but before flower stems elongate, knapweeds can be treated with 2 to 5 quarts/A of Curtail ® (clopyralid plus 2-4D amine) for up to two years control. (http://www.unce.unr.edu/publications/FS04/FS0439.pdf) accessed 5/24/2005
		5) Herbicides--C. maculosa can be controlled with picloram (4-amino-3,5,6-trichloropicolinic acid) and 2,4-D but there are problems. Control by 2,4-D is temporary since it does not prevent germination from seeds in the soil. Picloram persists in soils but in 4 years, enough is lost from a .4-.6 kg/ha treatment to allow germination and reinfestation. (http://tncweeds.ucdavis.edu/esadocs/documnts/centmac.rtf) accessed 5/24/2005	5) Herbicides can be used to control existing stands of C. diffusa and C. maculosa and substantially reduce seed production. However, since the seed of both species is viable in the soil for up to seven years, retreatment will be necessary. Long term reductions in the seed bank must be the goal for effective knapweed management with herbicides. (http://www.cdfa.ca.gov/phpps/ipc/weedinfo/centaurea.htm) accessed 5/24/2005
			6) Proper timing of herbicide applications is critical to effective control. In California, there are three herbicides important for knapweed management: 2,4-D, dicamba, and clopyralid. All three are most effective when applied in the spring, when plants are beginning to bolt. 2,4-D should be applied at 2 lb ae/A; dicamba at 1 lb ae/A; and clopyralid at 0.25 lb ae/A. Clopyralid and dicamba are the most effective treatments. Both will provide some residual control, particularly clopyralid, and retreatments may be necessary in the second, third, or fourth years. Dicamba will injure or kill most other broadleaves it contacts, including desirable forage and native broadleaf species. Clopyralid is more selective, but will injure legumes such as clovers. 2,4-D is the least expensive treatment, but is less effective than dicamba and clopyralid, and retreatment will be required every year. 2,4-D will also injure other broadleaves, similar to dicamba. The most effective knapweed treatment is picloram applied at 0.25 lb ae/A. However, it is not labeled for use in California. (http://www.cdfa.ca.gov/phpps/ipc/weedinfo/centaurea.htm) accessed 5/24/2005
			7) However, any herbicide management program should integrate rotation between herbicides to prevent the development of resistance. (http://www.cdfa.ca.gov/phpps/ipc/weedinfo/centaurea.htm) accessed 5/24/2005

Table B-7: Suggested Treatments for Squarrose Knapweed

Species		Manual	Chemical
Squarrose	Perennial	1) Manual treatment not specifically discussed for squarrose	1) All three herbicides, 2,4-D, dicamba, and clopyralid, are important for general

Species		Manual	Chemical
knapweed		knapweed (http://www.cdfa.ca.gov/phpps/ipc/weedinfo/centaurea.htm accessed 5/10/2005).	knapweed management. All three are most effective when applied in the spring, when plants are beginning to bolt. Clopyralid and dicamba are the most effective treatments (http://www.cdfa.ca.gov/phpps/ipc/weedinfo/centaurea.htm accessed 5/10/2005).
		2) Digging or pulling may be effective if most of taproot is removed. Stout taproots resprout when broken off (http://www.unce.unr.edu/publications/FS04/FS0438.pdf accessed 5/10/2005).	2) 2,4-D should be applied at 2 lb ae/A http://www.cdfa.ca.gov/phpps/ipc/weedinfo/centaurea.htm accessed 5/10/2005).
		3) No documents available for squarrose knapweed at this site (http://tncweeds.ucdavis.edu/esadocs/salvaeth.html) accessed 5/24/2005	3) Dicamba should be applied at 1 lb ae/A http://www.cdfa.ca.gov/phpps/ipc/weedinfo/centaurea.htm accessed 5/10/2005).
			4) Clopyralid should be applied at 0.25 lb ae/A http://www.cdfa.ca.gov/phpps/ipc/weedinfo/centaurea.htm accessed 5/10/2005).
			5) Dicamba willl injure or kill most other broadleaves it contacts, including desireable forage and native broadleaf species. Clopyralid is more selective, but will injure legumes. 2,4-D is the least expensive treatment, but is less effective than dicamba and clopyralid, and retreatment will be required every year. 2,4-D will also insure other broadleaves, similar to dicamba treatments (http://www.cdfa.ca.gov/phpps/ipc/weedinfo/centaurea.htm accessed 5/10/2005).
			5) Glyphosate – will also destroy competitive grasses; apply to actively growing plants in bud stage at rate of 3 lb ae/A. Seed a locally adapted perennial grass in the fall and at least 10 days after application (http://www.unce.unr.edu/publications/FS04/FS0438.pdf accessed 5/10/2005)
			6) 2,4-D – will only control plants emered at the time of applicatin and often only the above ground parts, not the roots. 2,4-D should be applied in the early stage of flower stem elongation at a rate of 1-2 lb ae/A to be most effective. It usually does not kill existing squarrose knapweed plants, but helps prevent seed production (http://www.unce.unr.edu/publications/FS04/FS0438.pdf accessed 5/10/2005).
			7) Curtail (clopyralid plus 2,4-D amine) – after most rosettes have emerged but before flower stems elongate, knapweeds can be treated with 2-5 quarts/A (http://www.unce.unr.edu/publications/FS04/FS0438.pdf accessed 5/10/2005).
			8) Stinger (clopyralid) or Transline (clopyralid) can be applied to knapweeds up to the bud stage of growth. The best results will be obtained if actively growing weeds are treated. The recommended rate of application for knapweeds is 0.25 to 0.5 lb ae/A (http://www.unce.unr.edu/publications/FS04/FS0438.pdf accessed 5/10/2005).
			9) Any herbicide management program should integrate between herbicides to prevent the development of resistence (http://www.cdfa.ca.gov/phpps/ipc/weedinfo/centaurea.htm accessed 5/10/2005).

Table B-8: Suggested Treatments for Common Crupina

Species		Manual	Chemical
Common crupina	Winter annual	1) Hand-pulling,hoeing, or other tillage is not recommendedfor large-scale infestations. These controls work best for small infestations. (http://www.unce.unr.edu/publications/FS03/FS0344.pdf) accessed 5/24/2005	1) Control of common crupina in most infested sites has depended mainly on use of herbicides. Effective herbicides include clopyralid, 2,4-D, dicamba, and picloram. Treatment timing and application rate are important for effective control. (http://www.unce.unr.edu/publications/FS03/FS0344.pdf) accessed 5/24/2005
		2) Hand pulling, hoeing, or tillage before flowering will be effective for controlling small infestations. Infestations should be checked every two to four weeks in the spring for newly emerged plants. (http://www.cdfa.ca.gov/phpps/ipc/weedinfo/crupina.htm) accessed 5/24/2005	2) Tank mixes of dicamba (0.5 lb ae/A) + 2,4-D (1.0 lb ae/A) applied in the fall or spring will provide season long control. Retreatment may be necessary for two to tree years to ensure seedbank depletion. These herbicides will injure or kill any other susceptible broadleaves they contact. Later spring applications may reduce control variability, but may increase the risk of injury to perennial forbes or shrubs due to volatilization. Spring applications of gyphosate (1.0 lb ae/A) will also provide season long control but will kill or injure any other vegetation present. Sequential fall and spring applications of clopyralid (0.13 lb ae/A) or triclopyr (.25 lb ae/A) also provide >95 % control. Clopyralid (Transline)will injure legumes and triclopyr will injure or kill other broadleaves. (http://www.cdfa.ca.gov/phpps/ipc/weedinfo/crupina.htm) accessed 5/24/2005

Table B-9: Suggested Treatments for Canada Thistle

Species		Manual	Chemical
Canada thistle	Perennial	1) Unmanaged Canada thistle will likely develop into a vast infestation. (http://www.unce.unr.edu/publications/FS03/FS0343.pdf) accessed 5/24/2005	1) Recent research that tested the combined effects of mowing with herbicides showed that mowing two or three times following applications of picloram, picloram with 2,4-D, clopyralid with 2,4-D, or dicamba enhanced the control of Canada thistle. (http://www.unce.unr.edu/publications/FS03/FS0343.pdf) accessed 5/24/2005
		2) Hand-pulling or grubbing is not economically or physically effective in controlling established Canada thistle. Its extensive root system and carbohydrate reserve allows Canada thistle to endure through grubbing for many years. (http://www.unce.unr.edu/publications/FS03/FS0343.pdf) accessed 5/24/2005	2) Chemical control research shows that single herbicide applications do not provide long-term control of Canada thistle because of the complexity in killing the root system. (http://www.unce.unr.edu/publications/FS03/FS0343.pdf) accessed 5/24/2005
		3) Recent research that tested the combined effects of mowing with herbicides showed that mowing two or three times following applications of picloram, picloram with 2,4-D, clopyralid with 2,4-D, or dicamba enhanced the control of Canada thistle. (http://www.unce.unr.edu/publications/FS03/FS0343.pdf) accessed 5/24/2005	3) Several herbicides are registered for the control of Canada thistle in rangeland, but applying the product at the proper rate and at the correct time is critical. Herbicides used include 2,4-D, dicamba, clopyralid, MCPA, glyphosate, and picloram. (http://www.unce.unr.edu/publications/FS03/FS0343.pdf) accessed 5/24/2005
		4) Control efforts may be more successful when the plant is under environmental stress. The plant is drought and flood sensitive, and its roots are cold-sensitive. Cutting or applying herbicide to shoots after a very severe winter may add sufficient stress to kill plants. (http://www.issg.org/database/species/ecology.asp?si=413&fr=1&sts=sss) accessed 5/24/2005	4) 2,4-D is a phenoxy acetic acid and is the herbicide used the most for control of Canada thistle. For best results, apply 2,4-D at a rate of 1.5 to 2.0 lb acid equivalent (ae)/acre before the plant reaches the bud stage. (http://www.unce.unr.edu/publications/FS03/FS0343.pdf) accessed 5/24/2005
		13) Mowing: The most effective mowing technique is to mow the infestation at 25 to 30 days intervals, 4 to 5 times per season, throughout the entire growing season over several (4-5) years. The purpose of the intensive mowing is to stimulate Canada thistle shoot growth thereby depleting the plants root reserve. Mowing alone will not eradicate an infestation but can reduce infestation density by 50%. Due to Canada thistles extensive root reserves a one-time mowing of the plants during the growing season is not an effective control technique. Similarly, a one-time hand pulling of Canada thistle during the growing season is also not an effective control technique. A one-time mowing or hand pulling will stimulate plant growth and increase infestation size and density. (http://gallatincomt.virtualtownhall.net/public_documents/gallatincomt_weed/canadathistle) accessed 5/24/2005	5) Dicamba is a growth regulator-type herbicide that can be applied during any stage of growth, but appears to be most effective when applied to Canada thistle during the late vegetative to bud stage or in the fall if Canada thistle has eight to twelve inches of regrowth. difficult and lengthy. (http://www.unce.unr.edu/publications/FS03/FS0343.pdf) accessed 5/24/2005

Species		Manual	Chemical
			6) Clopyralid, another growth regulator-type herbicide, can be applied when Canada thistle is actively growing. CurtailÒ, a preformulated mixture of clopyralid with 2,4-D, should beapplied at a rate of 1.2 to 1.8 lb ae/acre, the higher rate for dense infestations or treatments in bad growing conditions. StingerÒ contains only clopyralid and can be used at a rate of 0.25 to 0.38 lb ae/acre. When applied at the rosette to prebud stage, use the lower application rate, and use the higher rate for treatments up to the bud stage or in the fall. These herbicides should not be applied on newly seeded areas. (http://www.unce.unr.edu/publications/FS03/FS0343.pdf) accessed 5/24/2005
			7) Glyphosate, a nonselective herbicide, should be applied to Canada thistle at a rate of 2 to 3 lb active ingredient (ai)/acre when the plants are at or past the bud growth stage. This herbicide must be used with caution because it kills nearby desirable vegetation. (http://www.unce.unr.edu/publications/FS03/FS0343.pdf) accessed 5/24/2005
			8) Chemical Control: It is important to know that several ecotypes of Canada thistle occur that differ in their susceptibility to herbicide treatment. However, the most effective treatments include glyphosate, clopyralid chlorsulfuron, and dicamba. The rate, timing, and effectiveness of these treatments may vary. (http://www.cdfa.ca.gov/phpps/ipc/weedinfo/cirsium.htm) accessed 5/24/2005
			Picloram (Tordon), Dicamba (Banvel), Metsulfuron (Ally), 2,4-D, and Bentazon (Basagran) are not recommended. Clopyralid plus 2,4-D (sold under the trade name Curtail) provides the best and most consistent control in agricultural areas but may damage native forbs and shrubs. Fall application of clopyralid delayed shoot emergence by two weeks, and reduced shoot density the following summer. The impact of clopyralid increased with increased application rate, and application of 840 g/ha had the greatest impact. One fall application with clopyralid at 560 g/ha prevented almost all *C. arvense* shoot emergence the following spring. (http://www.issg.org/database/species/ecology.asp?si=413&fr=1&sts=sss) accessed 5/24/2005
			10) Glyphosate is a non-selective systemic herbicide that kills all green vegetation at the time of application. It has little or no soil residual. Glyphosate impacts *C. arvense* by reducing the number of root buds and regrowth of secondary shoots more than by reducing root biomass. No root bud regrowth occurred when glyphosate was applied at 0.28 kg/ha. For optimal results, apply glyphosate under warm conditions prior to the first killing frost and when soil moisture is good, or after plants have adjusted to colder weather. (http://www.issg.org/database/species/ecology.asp?si=413&fr=1&sts=sss) accessed 5/24/2005
			11) Chlorsulfuron is a post-emergent herbicide that primarily suppresses regrowth, and secondarily reduces the number of root buds and plant weight. Addition of growth

Species		Manual	Chemical
			regulators (chlorflurenol and dicamba) to chlorsulfuron enhanced control, but not under field conditions. Its density was reduced 2-5 years after spring application of chlorsulfuron. (http://www.issg.org/database/species/ecology.asp?si=413&fr=1&sts=sss) accessed 5/24/2005
			12) The key for effective long-term control is to implement a management plan that consistently prevents the formation and dispersal of seed and to stress the plant and force it to use stored root nutrients. **Therefore, a one-time treatment for Canada thistle will not be effective. Management and control effects must be planned for several consecutive growing seasons in order to prevent new seed formation/dispersal and at the same time deplete the nutrient reserves that have built up in the root system. (**http://gallatincomt.virtualtownhall.net/public_documents/gallatincomt_weed/canadathistle**) accessed 5/24/2005**
			14) Remember; use the proper herbicide for the targeted noxious weed(s). For example, non-selective herbicides (such as Roundup and similar glyphosate products) are marginally effective at controlling Canada thistle but are very effective at killing grasses. (http://gallatincomt.virtualtownhall.net/public_documents/gallatincomt_weed/canadathistle) accessed 5/24/2005

Table B-10: Suggested Treatments for Dyers Woad

Species		Manual	Chemical
Dyers woad	Biennial	1) Cutting off the tops before seeds are produced and dispersed reduces the spread of dyer's woad. When seeds are present, cut off the top and put it in a bag to be burned. This does not eradicate dyer's woad, but reduces the number off seeds available to disperse and germinate. This control method works best if done before the seeds are produced, preferably in the flower bud stage. (http://www.unce.unr.edu/publications/FS02/FS0297.pdf) accessed 5/24/2005	1) Chemicals such as 2, 4-D amine or ester, metsulfuron, and chlorsulfuron can be used on dyer's woad. (http://www.unce.unr.edu/publications/FS02/FS0297.pdf) accessed 5/24/2005
		2) Mowing is not considered an effective treatment due to resprouting from the crown. However, hand pulling may be very effective in reducing infestations. It is critical to remove the crown to prevent resprouting. Hand pulling is easiest after the plants have bolted but should be done before seed set. Most hand pulling programs have indicated it is necessary to followup for several years to prevent reinfestation. The longevity of the seed in the soil seedbank is currently unclear. However, anecdotal evidence has suggested the seedbank may persist for several years. (http://www.cdfa.ca.gov/phpps/ipc/weedinfo/isatis.htm) accessed 5/24/2005	2) Dyers woad is very expensive to manage with herbicides on a large-scale. 2,4-D is the most economical treatment. Plants should be treated in the seedling to rosette stages. A one-percent solution is effective for spot treatments. Dense infestations require higher labeled rates (1.9-2.85 lb ae/A) for control. Late season control of flowering plants is difficult and may not eliminate seed production. Other auxin type herbicides such as dicamba are no more effective than 2,4-D and are not recommended. On roadsides, chlorsulfuron (0.75 oz ai/A) may be applied preemergence or postemergence to seedlings and rosettes. Postemergent applications should be made with a 0.25% v/v non ionic surfactant. (http://www.cdfa.ca.gov/phpps/ipc/weedinfo/isatis.htm) accessed 5/24/2005

Table B-11: Suggested Treatments for Mediterranean Sage

Species		Manual	Chemical
Mediterranean sage	Biennial / perennial	1) Small infestations may be controlled by hand digging or severing the root approximately three inches below the soil surface when the plants are beginning to bolt. Cutting at a shallower depth will generally result in crown resprouting. Mowing has not been an effective control strategy due to the prostrate growth habit of the rosettes. (http://www.cdfa.ca.gov/phpps/ipc/weedinfo/salvia.htm accessed 5/17/2005)	1) Dicamba and 2,4-D have been reported to control Mediterranean sage. Plants should be treated after bolting but before seed are produced. The hairy nature of the leaf surface may reduce herbicide efficacy and a surfactant should be included. (http://www.cdfa.ca.gov/phpps/ipc/weedinfo/salvia.htm accessed 5/17/2005)
		2) Digging and removing plants of small or scattered infestations of Mediterranean sage is effective if they have not produced seed. Cutting the taproot two to three inches below the crown when the plants are beginning to bolt prevents most resprouting. (http://www.unce.unr.edu/publications/FS04/FS0427.pdf accessed 5/17/2005)	No documents available on Med sage at this site (http://tncweeds.ucdavis.edu/esadocs/salvaeth.html) accessed 5/24/2005

Table B-12: Suggested Treatments for Tall Whitetop

Species		Manual	Chemical
Tall whitetop	Perennial	1) Single techniques, such as repeated mowing, hand-digging, cultivation, grazing, and burning, typically do not adequately control **perennial pepperweed**. In addition, cultivation may increase infestations by dispersing root fragments. (http://www.cdfa.ca.gov/phpps/ipc/weedinfo/lepidium.htm) accessed 5/24/2005	Herbicides can be used effectively in areas where this plant occurs in small patches by using a wicking or wipe applicator or spot spraying with a small (1 to 5 gallon) tank sprayer. These methods allow for minimum amount of herbicide to be used and exact placement on the target plant. Wicking or wiping and spot spraying also avoids application of herbicide on desirable plants. These application methods using 2,4-D and glyphosate are effective, as is chlorsulfuron; however the later is more expensive. (http://www.unce.unr.edu/publications/FS02/FS0298.pdf) accessed 5/24/2005
		2) Hand pulling has been used in situations where only a few plants are present, (relatively new infestations) or in riparian areas where herbicides cannot be used. It is most effective in moist, loose soils where a slow and steady pulling action will remove 6 to 8 inches or more of root. This is a long-term control effort, since new plants will sprout from remaining root fragments. Hand-pulled areas must be monitored frequently and new growth pulled as soon as it appears. This is a labor-intensive method that is only appropriate in limited circumstances where herbicides are not an alternative. (http://www.unce.unr.edu/publications/FS02/FS0298.pdf) accessed 5/24/2005	

Herbicide	Site	Restrictions	Effectiveness
Telar® (chlorsulfuron)	Noncrop Industrial	Selective herbicide (will not harm most grasses), do not apply near water.	Excellent control for 1-2 years
Arsenal®/Chopper® (imazapyr) Stalker (imazapyr)	Forestry Noncrop Industrial	Nonselective herbicide, do not apply near water.	Excellent control for 1-2 years. Treated areas typically remain void of any vegetatioin for 1-2 years after treatment.
Roundup® and others (glyphosate) Rodeo® and others (glyphosate)	Wildlands Aquatic	Nonselective herbicide. Rodeo for areas near/in aquatic sites.	Effective unless infestation is dense. If dense, mow area and apply to resprouting plants.
Weedar 64® (2,4-D)	Wildlands Aquatic	Selective herbicide (will not harm grasses)	Somewhat effective unless infestation is dense. If dense, mow area and apply to resprouting plants.

(http://wric.ucdavis.edu/information/pepperweed/pepperweed5.html) **accessed 5/24/2005**

Table B-13: Suggested Treatments for Klamathweed

Species		Manual	Chemical
Klamathweed	Perennial	**1)** On small and isolated infestations, hand pulling or digging of young plants may be effective if repeated several times per season. Remove resprouts before they get large and certainly before they flower and produce seed. Plants that have been pulled or dug should be taken away from the area and destroyed, burned or buried deeply, to prevent vegetative regrowth and seed distribution. Small infestations should be bagged and buried in a landfill. (http://www.unce.unr.edu/publications/FS03/FS0314.pdf) accessed 5/24/2005	1) St. Johnswort can be difficult to eradicate with herbicides because of its extensive root system, but control of new or small infestations can be accomplished. In pasture, rangeland, and non-cropland sites, foliar applications of 2,4-D at 2 quarts per acre will destroy the plant in seedling and pre-flowering stages. (http://www.unce.unr.edu/publications/FS03/FS0314.pdf) accessed 5/24/2005
		2) Introduced from Europe where it has been used medicinally for centuries. (http://www.cdfa.ca.gov/phpps/ipc/weedinfo/hypericum.htm) accessed 5/24/2005	
		3) the leaf-feeding flea beetles *Chrysolina quadrigemina* and *C. hyperici* and the root-boring beetle *Agrilus hyperici* were successfully introduced as biocontrol agents. (http://www.cdfa.ca.gov/phpps/ipc/weedinfo/hypericum.htm) accessed 5/24/2005	
		4) **Rhizomes** develop just below the soil surface from the crown and can extend outwards to ~ 0.5 m. New shoots grow from the crown and rhizomes in early spring. Fragmented rhizomes can develop new plants. Under favorable conditions, roots grow deeper and fewer rhizomes develop. (http://www.cdfa.ca.gov/phpps/ipc/weedinfo/hypericum.htm) accessed 5/24/2005	

Table B-14: Suggested Treatments for Yellow Starthistle

Species		Manual	Chemical
Yellow starthistle	Annual/biennial	1 Hand pulling and hoeing are the oldest forms of weed control used by humans. Although they are labor intensive and relatively ineffective for the control of perennial weeds (with exception of the weed wrench on some shrubs such as the brooms), they typically cause minimal environmental impact. When using manual removal techniques it is important to minimize soil disturbance around the removed plants. Disturbance can create an ideal site for re-establishment of new seedlings or rapid invasion of another undesirable species (http://wric.ucdavis.edu/yst/manage/management2.html) accessed 5/24/2005	1) The development of picloram-resistant starthistle indicates the potential for development of resistance to clopyralid if the herbicide is used year after year. Integrated approaches for the control of invasive weeds can greatly reduce the incidence of herbicide resistant biotypes. (http://wric.ucdavis.edu/yst/manage/management10.html) accessed 5/24/2005
		2) Manual removal of yellow starthistle is most effective with small patches or in maintenance programs where plants are sporadically located in the grassland system. This usually occurs with a new infestation or in the third	2) For yellow starthistle control, herbicides are an appropriate tool on large infestations, in highly productive soils, and around the perimeter of infestations to contain their spread (Sheley et al. 1999b). Most available

Species		Manual	Chemical
		year or later in a long-term management program. It can also be an important tool in steep or uneven terrain where other mechanical tools (e.g., mowing and tillage) are impossible to use. To ensure that plants do not recover it is important to detach all above ground stem material. Leaving even a 2 inches piece of the stem can result in recovery if leaves and buds are still attached to the base of the plant. (http://wric.ucdavis.edu/yst/manage/management2.html) accessed 5/24/2005	compounds used for starthistle control in grasslands provide postemergence activity and very few give preemergence control (see table). In a couple of cases, a herbicide can provide excellent postemergence activity and a significant period of preemergence control, e.g. clopyralid, picloram and imazapyr. Herbicides are categorized below as preemergence, postemergence and both (http://wric.ucdavis.edu/yst/manage/management11.html) accessed 5/24/2005
		The best timing for manual removal is after plants have bolted but before they produce viable seed (early flowering). At this time, plants are easy to recognize and some or most of the lower leaves have senesced. (http://wric.ucdavis.edu/yst/manage/management2.html) accessed 5/24/2005	
		4) In the Bradley method (Fuller and Barbe 1995), a larger starthistle population can be controlled through physical removal by starting at the outward edge of the population and moving in. The technique requires repeated visits but ensures that no new seeds are produced, and soil disturbance is minimized. Using the Bradley method, it is possible to control relatively large starthistle-infested areas (<40 acres) with low-cost and low-impact. (http://wric.ucdavis.edu/yst/manage/management2.html) accessed 5/24/2005	

Appendix C: Summary Of The Known Infestation Sites By Species on Forest Service Lands (Reflects GIS Database on September 2, 2005) and seeds per plant and seed longevity.

Common Name	Species	Number of Sites	Gross Acres	Seeds per plant/seed longevity	Reference
Canada thistle	Cirsium arvense	33	13.3	680/3 yrs (mainly reproduces vegetatively)	http://www.gov.mb.ca/agriculture/soilwater/manure/fdb01s05.html (accessed 1/28/2006)
Common crupina or bearded creeper	Crupina vulgaris	1	158.7	130/3 yrs	http://www.cdfa.ca.gov/phpps/ipc/weedinfo/crupina.htm (accessed 1/28/2006)/http://colocode.com/weld/weld_15.pdf (accessed 1/28/2006)
Dalmatian toadflax	Linaria dalmatica *aka* Linaria genistifolia *spp.* dalmatica	12	902.6	Up to 500,000/10 yrs	http://www.unce.unr.edu/publications/FS02/FS0296.pdf (Accessed 1/28/2006)
Diffuse knapweed	Centaurea diffusa	12	3.9	up to 18,000/up to several yrs	http://www.cwma.org/nx_plants/diff.htm (accessed 1/28/2006)
Dyers woad	Isatis tinctoria	64	5,725.8	350-500(10,000)at /at least 8 yrs	http://extension.usu.edu/weedweb/ecology/Dyerwd_ec.htm (accessed 1/28/2006)/ http://colocode.com/weld/weld_15.pdf (accessed 1/28/2006)
Klamath weed or St. Johnswort	Hypericum perforatum	9	2.7	Ave. 15,000-33,000/at least 20 yrs	http://www.cdfa.ca.gov/phpps/ipc/weedinfo/hypericum.htm (accessed 1/28/2006)/http://www.weeds.crc.org.au/documents/st_johns_wort_wshop.pdf (accessed 1/28/2006)
Mediterranean sage	Salvia aethiopis	26	9.2	50-100,000/unk	Sheley & Petroff 1999[2]
Musk thistle	Carduus nutans	12	9.4	2,000-100,000/15 yrs+	Sheley & Petroff 1999
Plumeless thistle	Carduus acanthoides	1	0.1	8,400/unk	http://www.ext.nodak.edu/extpubs/plantsci/weeds/w799w.htm (accessed 1/28/2006)
Scotch thistle	Onopordum acanthium	340	80.4	Up to 50,000/15 yrs-30 yrs	http://www.co.stevens.wa.us/weedboard/htm_programs/scotch_thistle_cost_share.htm (Accessed 1/28/06)- http://wwwnotes.fs.fed.us:81/r4/payments_to_states.nsf/0/61b35207561295b988256fab00790a7e?OpenDocument (accessed 1/28/2006)

[2] Sheley, R.L. and J.K. Petroff. 1999. Biology and Management of Noxious Rangeland Weeds. Oregon State University Press.

Common Name	Species	Number of Sites	Gross Acres	Seeds per plant/seed longevity	Reference
Spotted knapweed	Centaurea maculosa *aka* Centaurea biebersteinii	14	3.9	1,000-18,000/7 yrs	http://infosys.ars.usda.gov/wknpwed2.pdf (Accessed 1/28/2006)
Squarrose knapweed	Centaurea squarrosa	5	.5	/at least 3 yrs	/http://colocode.com/weld/weld_15.pdf (accessed 1/28/2006)
Tall whitetop or Perennial pepperweed	Lepidium latifolium	2	0.2	10,000/unk (mainly reproduces vegetatively)	http://www.cal-ipc.org/file_library/11844.pdf (accessed 1/28/2006)/
Yellow starthistle	Centaurea solstitialis	10	2.6	up to 150,000/at least 10 yrs	http://eesc.orst.edu/agcomwebfile/edmat/html/EM/EM8580/EM8580.html (accessed 1/28/2006)/http://colocode.com/weld/weld_15.pdf (accessed 1/28/2006)
Total Sites		541			
Total Acres			6,913.3		

Appendix K:

Vegetation Information

Appendix K: Vegetation Information

Table K1-1: Sensitive Plant Species within the Modoc National Forest

Species	Common Name	Habitat
Astragalus anxius	Ash Valley Milk-vetch	*Dry, volcanic slopes and hills often in pine Forests*
Astragalus lemmonii	*Lemmon's milkvetch*	*Great Basin scrub, meadows and seeps, marshes and swamps (lake shores);between 4200-7200 ft.*
Astragalus pulsiferae var. coronensis	Crown milkvetch	*Loose, often rocky volcanic soils with pines and sagebrush*
Botrychium ascendens	Upswept Moonwort	*Fields, meadows, creek sides*
Botrychium crenulatum	Scalloped Moonwort	*Fields, meadows, creek sides*
Botrychium lunaria	Moonwort	*Fields, meadows, creek sides*
Botrychium minganense	Mingan moonwort	*Fields, meadows, creek sides*
Botrychium montanum	Mountain Moonwort	*Fields, meadows, creek sides*
Botrychium pinnatum	*Northwestern Moonwort*	*Fields, meadows, fens, creek sides*
Botrychium pumicola	pumice moonwort	Pumice gravel in openings in lodgepole or whitebark pine, moist in late spring.
Bruchia bolanderi	*Bolander's bruchia moss*	*Lower montane conferous forest, meadows and seeps, upper montane coniferous forest/dam soil; elevation 5580-9200 ft.*
Buxbaumia viridis	Bug-on-a-stick moss	*Punky, moist decorticated logs in old growth stands*
Calochortus longebarbatus var. longebarbatus	Long-haired Star Tulip	*Seasonally wet meadow margins, often on the edges of pine Forests*
Cypripedium montanum	Mountain Lady's-Slipper	*Moist woods below 5,000 feet, mixed evergreen to pine Forests*
Eriogonum prociduum	Prostrate Buckwheat	*Dry, rocky volcanic slopes and hills mostly in pine Forests*
Eriogonum umbellatum var. glaberrimum	Green Buckwheat	*Sand and gravel*
Galium glabrescens ssp. modocense	Modoc Bedstraw	*Gravelly slopes and under the edges of rocks*
Galium serpenticum ssp. warnerense	Warner Mountain Bedstraw	*Steep serpentine talus slopes.*
Helodium blandowii	*Blandow's bog moss*	*Fens within montane forest; elevation 4250-8200 ft.*
Ivesia paniculata	Ash Creek Ivesia	*Open volcanic ridges, gravelly flats, and openings*
Lomatium roseanum	*Adobe parsley; Rose-flower Desert-parsley*	*Open, dry, basalt talus stripes and scree fields overlying clay soils on gentle slopes in low sagebrush vegetation*
Lupinus latifolius v. barbatus	*Bearded lupine*	*Upper montane coniferous forest (mesic); elevation 4900-8200 ft.*
Meesia triquetra	*Three-ranked hump-moss*	*Fens within montane forest; elevation 4250-8200 ft.*
Meesia uliginosa	*Broad-nerved hump-moss*	*Meadows, fens, seeps, upper montane coniferous forest/damp soil; elevation 4250-8200 ft.*
Mimulus evanescens	Ephemeral monkeyflower	*In gravelly and rocky areas around the edges of reservoirs*
Phacelia inundata	Playa Phacelia	*Sub alkaline flats, inundated early in the season within sagebrush and pine habitats*
Polygonum polygaloides ssp. esotericum	Modoc County Knotweed	*Vernal pools and swales*

Species	Common Name	Habitat
Ptilidium californicum	*Pacific fuzzwort*	On bark, in moist mature hemlock or white fir, not burned for 30 yrs.
Rorippa columbiae	Columbia Yellow Cress	*Moist areas generally along rivers, lakeshores and other wet sites*
Thelypodium howellii ssp. howellii	*Howell's thelypody*	*Great Basin scrub, meadows and seeps (alkaline); elevation 3900-6000 ft.*

Table K1-2: Watch List Plant Species on the Modoc National Forest

Species	Common Name	Habitat
Alisma gramineum	narrow-leaved water-plantain	*Marshes, swamps, freshwater aquatic. Elev. 1,300-5,900'*
Arabis cobrensis	Masonic rock cress	*Sandy soils, sagebrush. Elev. 4,500-9,200'*
Arnica fulgens	hillside arnica	*Open, damp depressions in sagebrush scrub and grasslands. Elev. 4,900-8,900'*
Balsamorhiza serrata	serrated balsamroot	*Great basin scrub. Elev. 4,600-5,300'*
Betula pumila var. glandulifera	bog birch	*Meadows, seeps, marshes, bogs. Elev. 4,300-7,500'*
Botrychium simplex	common moonwort	*Fields, meadows, seeps, springs.*
Carex halliana	Hall's sedge	*Dry Forest edges, meadows, seeps, often in pumice. Elev. 4,500-6,900'*
Carex limosa	shore sedge	*Bogs/fens, within mixed coniferous Forests. Elev. 4,000-8,900'*
Carex petasata	Liddon's sedge	*Dry to wet meadows in lower montane coniferous Forests. Elev. 2,000-10,500'*
Carex sheldonii	Sheldon's sedge	*Riparian scrub. Elev. 4,000-6,000'*
Carex vallicola	valley sedge	*Great basin scrub, meadows and seeps. Elev. 5,000-9,200'*
Claytonia megarhiza	fell-fields claytonia	*Subalpine and alpine gravel, talus and crevices. Elev. 8,500-10,800'*
Claytonia umbellata	Great Basin claytonia	*Talus slopes, stony flats, crevices. Elev. 5,500-11,500'*
Collomia larsenii aka Collomia debilis var. larsenii (TNC)	talus collomia	*Loose volcanic gravel on talus slopes of alpine fell-fields. Elev. 7,500-11,500'*
Cordylanthus capitatus	Yakima bird's-beak	*Sagebrush and juniper at the edges of fir Forests. Elev. 5,900-7,600'*
Delphinium stachydeum	spiked larkspur	*Coniferous Forest edges, sagebrush scrub. Elev. 4,500-8,500'*
Dimeresia howellii	doublet	*Dry volcanic soils. Elev. 4,400-7,800'*
Downingia laeta	Great Basin downingia	*Great basin meadows, seeps, juniper woodland, vernal pools. Elev. 4,000-7,500'*
Drosera anglica	English sundew	*Bogs, fens, meadows, seeps. Elev. 4,300-6,600'*
Drosera rotundifolia	Roundleaf sundew	*Bogs, fens, meadows, seeps. Elev. 4,300-6,600'*
Erigeron disparipilus	Snake River daisy	*Great basin scrub. (Hat Mtn.). Elev. 8,600'*
Erigeron eatonii var. nevadincola	Nevada daisy	Great basin scrub, low elevation woodland, rocky. Elev. 4,600-9,500'
Geum allepicum	Aleppo avens	Sagebrush scrub, meadows. Elev. 1,500-4,900'
Gratiola heterosepala	Bogg's Lake hedge-hyssop	Vernal pools and wet edges of lakes and reservoirs. Elev. 0-7,800'
Hulsea nana	little hulsea	Alpine, subalpine boulder fields, rocky gravelly areas. Elev. 6,500-11,000'
Iliamna bakeri	*Baker's Globe Mallow*	Volcanic loam or lava beds, especially after a burn. Juniper woodlands, sagebrush, and pine forests.
Ivesia baileyi var. beneolens	Owyhee ivesia	Great basin scrub, volcanic crevices, rocky areas. Elev. 4,500-8,500'
Lathyrus rigidus	rigid pea	Great basin scrub, juniper woodland, disturbed

Species	Common Name	Habitat
		areas. Elev. 2,600-5,000'
Lomatium foeniculaceum var. macdougalii	MacDougal's lomatium	Chenopod scrub, juniper woodland. Elev. 4,000-6,300'
Lomatium grayi	Gray's lomatium	Great basin scrub, juniper woodland. Elev. 4,600' (+)
Lomatium hendersonii	Henderson's lomatium	Great basin scrub, rocky and clay areas.
Lomatium ravenii	Raven's lomatium	Great basin scrub, alkaline. Elev. 3,300-1,0000'
Lupinus pusillus var. intermontanus	intermontane lupine	Great basin scrub, sandy. Elev. 4,000-5,300'
Meesia longiseta	*Long-stalked hump-moss*	Fens within montane forest; elevation 1300-2500 m.
Mertensia cusickii	Toiyabe bluebells	Great basin scrub, meadows, seeps. Elev. 4900-8000'
Mertensia longiflora	long bluebells	Great basin scrub, lower elevation coniferous Forest. Elev. 5,000-7,000'
Mertensia oblongifolia var. amoena	beautiful bluebells	Great basin scrub, meadows, seeps. Elev. 5,400-7,500'
Mertensia oblongifolia var. oblongifolia	sagebrush bluebells	Great basin scrub, meadows, seeps, subalpine Forests. Elev. 3,300-10,800'
Mimulus cusickii	Cusick's monkeyflower	Great basin scrub, lower montane coniferous Forest.
Nemophila breviflora	Great Basin nemophila	Great basin scrub, meadows, seeps. Elev. 4,000-8,000'
Osmorhiza depauperata	blunt-fruited sweet-cicely	Deep Creek, Warner Mountains. Elev. 6,000'
Penstemon janishiae	Janish's beardtongue	Great basin scrub, lower elevation coniferous, juniper woodland, gravelly soils. Elev. 3,500-7,800'
Phacelia sericea var. ciliosa	blue alpine phacelia	Great basin scrub, upper montane coniferous Forest, ridges, talus slopes. Elev. 6,900-9,200'
Phlox muscoides	Moss phlox	Rocky alpine slopes. Elev. 4,300-8,900'
Pogogyne floribunda	*Profuse-flowered Pogogyne*	Vernal pools and similar habitats.
Polyctenium fremontii var. fremontii	*Fremont's combleaf*	Great Basin scrub, lower montane coniferous forest, meadows and seeps, pinyon and juniper woodl, playas/mesic; elev. 3280-6760'
Potamogeton epihydrus ssp. nuttallii	Nuttall's pondweed	Shallow water, irrigation ditches, ponds, lakes and streams. Elev. 1300-6300'
Potamogeton zosteriformis	eel-grass pondweed	Ponds, lakes, streams. Elev. 0-6,000'
Potentilla newberryi	Newberry's cinquefoil	Receding shorelines, vernal pools. Elev. 4,200-7,300'
Ranunculus macounii	Macoun's buttercup	Goose Lake. Elev. 4,600-5,900'
Ribes hudsonianum var. petiolare	western black current	Riparian, streamsides. Elev. 4,900-7,400'
Salix bebbiana	gray willow	Streams, lakeshores. Elev. 4,000-7,400'
Saxifraga cespitosa	tufted saxifrage	Damp, rocky places. Elev. 3,000-6,500'
Scutellaria galericulata	marsh skullcap	Marshes, swamps, streamsides. Elev. 0-6,900'
Senecio indecorus	rayless mountain ragwort	Meadows, seeps. Elev. 5,200-6,500'
Silene oregana	Oregon campion	Great basin scrub, subalpine conifer Forest. Elev. 4,900-8,200'
Solidago gigantea	smooth goldenrod	Moist streambanks, lakesides. Elev. 3,300-4,900'
Sphagnum spp.	Sphagnum	Moist areas in Warner Mountains
Stenotus lanuginosus	woolly stenotus	Volcanic rocks, meadows, juniper woodland, gravelly loam. Elev. 5,000-6,000'
Suaeda occidentalis	western seablite	Great basin alkaline, mesic. Elev. 4,000-5,000'
Synthyris missurica ssp. missurica	kitten-tails	lower, upper and subalpine coniferous Forest. Elev. 6,500-8,200'
Thelypodium milleflorum	many-flowered thelypodium	Chenopod scrub. Elev. 4,000-8,000'
Thermopsis californica var.	Silvery false lupine	Lower montane coniferous forest, pinyon and

Species	Common Name	Habitat
argentata		juniper woodland.
Trifolium gymnocarpon var. plummerae	Plummer's clover	Great basin scrub, juniper woodland. Elev. 5,000-6,300'
Trimorpha acris var. debilis	northern daisy	Alpine boulder and rock fields, subalpine coniferous Forest. Elev. 6,000-9,500’
Triteleia grandiflora ssp. howellii	Howell's triteleia	Sagebrush scrub and juniper woodlands. Elev. 2,500-4,900'
Utricularia intermedia	flat-leaved bladderwort	Bogs, fens, meadows, seeps, lake margins. Elev. 4,000-8,900'
Valeriana occidentalis	western valerian	lower montane coniferous Forest. Elev. 4,900-5,900'

Appendix L:

Example Participating Agreement

PARTICIPATING AGREEMENT
Between
USDA FOREST SERVICE, MODOC NATIONAL FOREST
And the
(INSERT TRIBE NAME) TRIBE

This PARTICIPATING AGREEMENT is hereby entered into by and between the USDA Forest Service, Modoc National Forest, hereinafter referred to as the Forest Service and the (Insert Tribe Name) Tribe, hereinafter referred to as the Tribe under the authority of the Cooperative Funds and Deposits Act of December 12, 1975, Pub. L. 94-148, 16 U.S.C. 565a1 – a3 and the Wyden Amendment, Section 323(a) of the Department of Interior and Related Agencies Appropriations Act, 1999 as included in P.L. 105-277, Div. A., Section 101 (e) as amended by P.L. 107-63, Sec. 330.

A. PURPOSE:

The purpose of this agreement is to allow the Forest Service and the (Insert Tribe Name) Tribe to work together cooperatively in the treatment of noxious weeds within the boundaries of the Modoc National Forest and on adjacent (Insert Tribe Name) tribal lands. This agreement is to treat weeds using the methods identified in the Record of Decision (ROD) for the Noxious Weed Treatment Project Final Environmental Impact Statement (FEIS).

B. STATEMENT OF MUTUAL BENEFIT AND INTERESTS:

Many of the areas of the Modoc National Forest lie within the ancestral homeland of the (Insert Tribe Name) Tribe. The (Insert Tribe Name) Tribe is a federally recognized sovereign government. The Forest Service has an interest in honoring the agency's government-to-government relationship with federally recognized Tribes. The parties agree that this federal responsibility is met, in part, through land stewardship partnerships with the (Insert Tribe Name) Tribe.

This agreement will facilitate tribal participation in the control of noxious weeds within the boundaries of the Modoc National Forest and on adjacent (Insert Tribe Name) tribal lands. The Tribe has unique knowledge relative to the care and tending of surrounding plants that have cultural importance. The Tribe wants to protect and enhance their culture by securing the sustainability of traditional plants, wildlife and natural setting so that their traditional, cultural and spiritual practices may endure. In addition, meaningful, on-the-job work experience in natural resource management and cultural protection will be provided to Tribal members under professional Forest Service and Tribal supervision.

The mutual benefit also lies in the creation of a framework that promotes a two-way transfer of knowledge and skills between the Tribe and Forest Service land managers. In this framework, tribal members and cultural trainees receive on-the-job training in land and resource management and agency land managers and resource specialists gain an understanding of traditional ecological management practices and values important to the Tribe. The result will be the implementation of projects that protect cultural values associated with the land by integrating traditional ecological knowledge into conventional Forest Service management practices and treatments for noxious weeds.

C. THE FOREST SERVICE SHALL:

1. Provide work opportunities in which to host the Tribe's existing manpower, job training, education and/or other human resource development programs within available funding and other resource capabilities.
2. Identify noxious weed treatment areas and implement projects utilizing tribal workers, trainees and cultural practitioners, whose work and expertise provide an overall benefit to National Forest System lands.
3. Assign Forest specialists to work cooperatively with the Tribe on the development of the Project Plan(s) developed within the scope of the ROD for the Noxious Weed Treatment Project FEIS and to provide the technical direction necessary to accomplish projects outlined in the Project Plan(s).
4. Designate in the Project Plan(s) a Forest Service Project coordinator to act as a liaison between the Tribal Project Coordinator and the Forest Service. The Forest Service Coordinator's specific duties will be outlined in the Project Plan(s).
5. Reimburse the Tribe for the Forest Service's proportionate share of actual expenses incurred as presented in the Financial Plan. This agreement will be modified yearly with an updated Financial Plan to continue noxious weed treatments as long as funds are available and or the agreement expires.

D. THE TRIBE SHALL:

1. In cooperation with the Forest Service, determine the best methods for treating noxious weeds in culturally significant areas. Treatment methods will be within the scope of the ROD for the Noxious Weed Treatment Project FEIS.
2. Contribute personnel, provide equipment and supplies as needed, and manage the employees so that work is completed as mutually agreed upon, and to the specifications stated within the Project Plan(s).
3. Recruit workers and trainees and identify knowledgeable tribal members and traditionalists who can provide special services and training in traditional ecological knowledge, and/or who have experience in the care and tending of surrounding plants that have cultural importance.
4. Bill the Forest Service for their prorated share of actual costs incurred.
5. Designate a Tribal Project Coordinator to act as a liaison between the Forest Service Project coordinator and the Tribe. The Tribal Coordinator's specific duties will be outlined in each Project Plan.
6. Provide and maintain work environments and procedures which will safeguard tribal employees, the public and Forest Service personnel, property, materials, supplies and equipment exposed to the operations and activities, and avoid interruptions of government operations and delays of other projects and completion dates.

7. Be responsible for Workman's Compensation and other employee benefits.

E. IT IS MUTUALLY UNDERSTOOD AND AGREED BY AND BETWEEN THE PARTIES THAT:

8. FUNDING EQUIPMENT AND SUPPLIES. Federal funding under this instrument is not available for reimbursement of recipient/cooperator purchase of equipment (and supplies).
9. PAYMENT /REIMBURSEMENT. Reimburse the cooperator for the Forest Service's proportionate share_ percent of actual expenses incurred, not to exceed $____, reduced by program income, and other Federal and nonfederal cash contributions, as shown in the incorporated Financial Plan. If program income generated from the project exceeds the cooperator's actual expenses, the Forest Service share is zero. The cooperator is approved to submit____ billings(s). The Forest will make payment for its proportionate share of project costs upon receipt of an invoice. Each invoice shall display the cooperator's actual expenditures to date of the invoice (not just the Forest Service share of actual expenditures), display by separate cost elements as documented in the Financial Plan, less program income and other Federal and nonfederal cash contributions and previous Forest Service payments. The invoice should be forwarded as follows:

   Send an original to:

   USDA Forest Service
   Albuquerque Service Center
   Payments Grants and Agreements
   101 B Sun Avenue NE
   Albuquerque, NM 87109

   Send a copy to:

   Modoc National Forest
   Dina McElwain
   800 West 12th Street
   Alturas, CA 96101

10. ADVANCE PAYMENT (2). The cooperator is approved to submit requests for advance payments on a_____ basis, for the Forest Service's proportionate shall_____ percent of anticipated actual expenses, not to exceed $_, reduced by program income, and other Federal and nonfederal cash contributions, as shown in the incorporated Financial Plan. If program income generated from the project exceeds the cooperator's actual expenses, the Forest Service share is zero. The Forest Service will make advance payment upon receipt of an invoice. The first invoice may request an advance based upon estimated cost not to exceed 30 days expenditures. Each subsequent invoice shall display the cooperator's (1) additional advance funding, if needed, and (2) the actual expenses incurred to date of the invoice (not just the Forest Service share of actual expenditures), displayed by separate cost elements as documented in the Financial Plan, less program income and other Federal and nonfederal cash contributions and previous Forest Service payments. Any funds advanced, but not spent, upon expiration of this instrument shall be returned to the Forest Service. The invoice should be forwarded as follows:

Send an original to:

USDA Forest Service
Albuquerque Service Center
Payments Grants and Agreements
101 B Sun Avenue NE
Albuquerque, NM 87109

Send a copy to:

Modoc National Forest
Dina McElwain
800 West 12th Street
Alturas, CA 96101

11. ELECTRONIC FUNDS TRANSFER. The recipient/cooperator shall designate a financial institution or an authorized payment agent through which a Federal payment may be made in accordance with U.S. Treasury Regulations, Money and Finance at 31 CFR 208, which requires that Federal payments are to be made by electronic funds transfer (EFT) to the maximum extent possible. A waiver may be requested and payment received by check by certifying in writing that one of the following situations apply:

    a) The payment recipient/cooperator does not have an account at a financial institution.
    b) EFT creates a financial hardship because direct deposit will cost the payment recipient more than receiving check.
    c) The payment recipient/cooperator has a physical or mental disability, or ageographic, language, or literacy barrier.

    To initiate receiving your payment(s) by electronic transfer, contact the National Finance Center (NFC) on the worldwide web at www.nfc.usda.gov, or call the NFC at 1-800-421-0323, or (504) 255-4647. Upon enrollment in the program you may begin to receive payment by electronic funds transfer directly into your account.
12. FREEDOM OF INFORMATION ACT (FOIA). Any information furnished to the Forest Service under this instrument is subject to the Freedom of Information Act (5 U.S.C. 552).
13. RETENTION AND ACCESS REQUIREMENTS FOR RECORDS. The Forest Service, Inspector General, or Comptroller General, through any authorized representative, shall have access to and the right to examine all records related to this instrument. As used in this provision, “records” includes books, documents, accounting procedures and practices, and other data regardless of type and regardless of whether such items are in written form, in the form of computer data, or in any other form. All records pertinent to this agreement shall be retained for a period of 3 years.
14. NONDISCRIMINATION. The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or part of an individual’s income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should

contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W. Washington, D.C. 20250-9410, or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

15. MODIFICATION. Modifications within the scope of the instrument shall be made by mutual consent of the parties, by the issuance of a written modification, signed and dated by all parties, prior to any changes being performed. The Forest Service is not obligated to fund any changes not properly approved in advance.
16. FOREST SERVICE ACKNOWLEDGED IN PUBLICATIONS AND AUDIOVISUALS. Forest Service support shall be acknowledged in any publications and audiovisuals developed as a result of this instrument.
17. COLLECTION OF AMOUNTS DUE THE FEDERAL GOVERNMENT. Any funds paid to a cooperator in excess of the amount to which the cooperator is finally determined to be entitled under the terms and conditions of the award constitute a debt to the Federal Government. If not paid within a reasonable period after the demand for payment, the Federal awarding agency may reduce the debt by:
    a) Making an administrative offset against other requests for reimbursements.
    b) Withholding advance payments otherwise due to the cooperator
    c) Taking other action permitted by statute.

    Except as otherwise provided by law, the Federal awarding agency shall charge interest on an overdue debt.
18. TAXPAYER IDENTIFICATION NUMBER. The cooperator shall furnish their tax identification number upon execution of this instrument.
19. LEGAL AUTHORITY. The cooperator(s) have the legal authority to enter into this instrument, and the institutional, managerial and financial capability (including funds sufficient to pay nonfederal share of project costs) to ensure proper planning, management, and completion of the project.
20. AVAILABILITY OF FUNDS. Funds in the amount of $_____are currently available for performance of this instrument through_____September 30, 2006. The Forest Service's obligation for performance of this instrument beyond this date is contingent upon the availability of appropriated funds from which payment can be made. No legal liability on the part of the Forest Service for any payment may arise for performance under this instrument beyond September 30, 2006, until funds are made available to the Forest Service for performance and until the cooperator receives notice of availability by written modification by the Forest Service.
21. DAVIS-BACON OR SERVICE CONTRACT ACT. Federal wage provisions (Davis-Bacon or Service Contract Act) are applicable to any contract developed and awarded under this instrument where all or part of the funding is provided with Federal funds. Davis-Bacon wage rates apply on all public works contracts in excess of $2,000 and Service Contract Act wage provisions apply to service contracts in excess of $2,500. The Forest Service will award contracts in all situations where their contribution exceeds 50 percent of the costs of the contract. If a cooperator is approved to issue a contract it shall be awarded on a competitive basis.
22. PARTICIPATION IN SIMILAR ACTIVITIES. This instrument in no way restricts the Forest Service or the Cooperator(s) from participating in similar activities with other public or private agencies, organizations, and individuals.
23. EXTENSION OF PERFORMANCE PERIOD. The Forest Service, by written modification may extend the performance period of this instrument for a total duration not to exceed 5 years from its original date of execution.

24. TERMINATION. Any of the parties, in writing, may terminate the instrument in whole, or in part, at any time before the date of expiration.
25. Neither party shall incur any new obligations for the terminated portion of the instrument after the effective date and shall cancel as many obligations as possible. Full credit shall be allowed for each Party's expenses and all non-cancelable obligations properly incurred up to the effective date of termination.
26. PRINCIPAL CONTACTS. The principal contacts for this instrument are:

Forest Service Project Contact	**(Insert Tribe Name) Tribe Project Contact**
Phone: **FAX:** **E-Mail:**	**Phone:** **FAX:** **E-Mail:**
Forest Service Administrative Contact **Janice Bishop** **Sierra Cascade Province, Plumas N.F.** **P.O. Box 11500** **Quincy, CA 95971** **Phone: 530-283-7768** **FAX: 530-283-7746** **E-Mail: jbishop@fs.fed.us**	**(Insert Tribe Name)Tribe Administrative Contact**

27. ENDORSEMENT. Any cooperator contributions made under this instrument do not by direct reference or implication convey Forest Service endorsement of the cooperator's product or activities.
28. ALTERNATE DISPUTE RESOLUTION. In the event of any issue of controversy under this Agreement, the parties may pursue Alternate Dispute Resolution procedures to voluntarily resolve those issues. These procedures may include, but are not limited to, conciliation, facilitation, mediation, and fact finding.
29. ANNUAL OPERATING/FINANCIAL PLAN. The attached AOP/financial plan is hereby incorporated and becomes a part of this agreement.
30. COMMENCEMENT/EXPIRATION DATE. This instrument is executed as of the date of last signature and is effective through 12/31/2011 at which time it will expire unless extended.
31. AUTHORIZED REPRESENTATIVES. By signature below, the cooperator certifies that the individuals listed in this document as representatives of the cooperator are authorized to act in their respective areas for matters related to this agreement.

IN WITNESS WHEREOF, the parties hereto have executed this agreement as of the last written date below.

USDA FOREST SERVICE
MODOC NATIONAL FOREST

_____

STANLEY G. SYLVA **DATE**
Forest Supervisor

(Insert Tribe Name)

_____

XXXXXXXXXXXXX **DATE**
XXXXXXXXXX

The authority and format of this instrument has been reviewed and approved for signature.

_____

Janice Bishop **DATE**
Grants and Agreements Specialist

Appendix M:

Geographic Information System

Appendix M: Geographic Information Systems

Extensive use was made of the Forest GIS database and GIS analysis tools in conducting the analysis for this FEIS. GIS information is developed from field gathered information. In addition to the sample queries listed below numerous specialized queries were made by GIS for resource specialists.

Sample Listing of Specialist Maps and Data Produced and Filed in the Project Record

- Noxious Weeds and Sensitive Soils
- Noxious Weeds and Soil Types
- Know Noxious Weed Sites as of 2003 and 2005
- Noxious Weed Sites within 10, 100, 150, 300 feet of lakes and streams and 50 feet of springs
- Noxious Weed Sites in Relation to TES Wildlife Species and MIS Habitat
- Noxious Weeds by Watershed
- Noxious Weeds by Range Allotments
- Noxious Weeds and TES Plants and MIS Habitat
- Noxious Weeds within ¼ mile of Campgrounds.
- Noxious Weeds within ¼ mile of a road.

Sample Listing GIS Layers Utilized in Analysis

- Transportation
- Water Resources
- Soil Resources
- Wildlife Resources
- Range Allotments and Improvements
- Land Ownership
- Land Allocations of Forest Plan as Amended
- Recreation Developments
- Cultural Resource Inventory Areas

Data Accuracy

The Forest Service uses the most current and complete data available. GIS data and product accuracy may vary. They may be developed from sources of differing accuracy, accurate only at certain scales, based on modeling or interpretation, incomplete while being created revised, etc. Using GIS products for purposes other than those for which they were created may yield inaccurate or misleading results. The Forest Service reserves the right to correct, update, modify, or replace GIS products without notification.

If a map contains contours, these contours were generated and filtered using the Digital Elevation Model (DEM) files. Any contours generated from DEMs using a scale of less than 1:100,000 will lead to less reliable results and should only be used for display purposes only.

The analysis is based on gross acres and refers to the site size used for analysis. Noxious Weed Inventories utilize points and polygons to identify sites. In this analysis all points were counted as a tenth of an acre (0.10) although they may actually cover less area. Like wise an infestation that was identified as 200 acres may actually only have an infestation covering a net area of only 10% or 20 acres while the FEIS evaluation was conducted at the larger 200 acre size. For this analysis effects were analyzed on the gross acres of the site while the proposed action is to treat net acres.

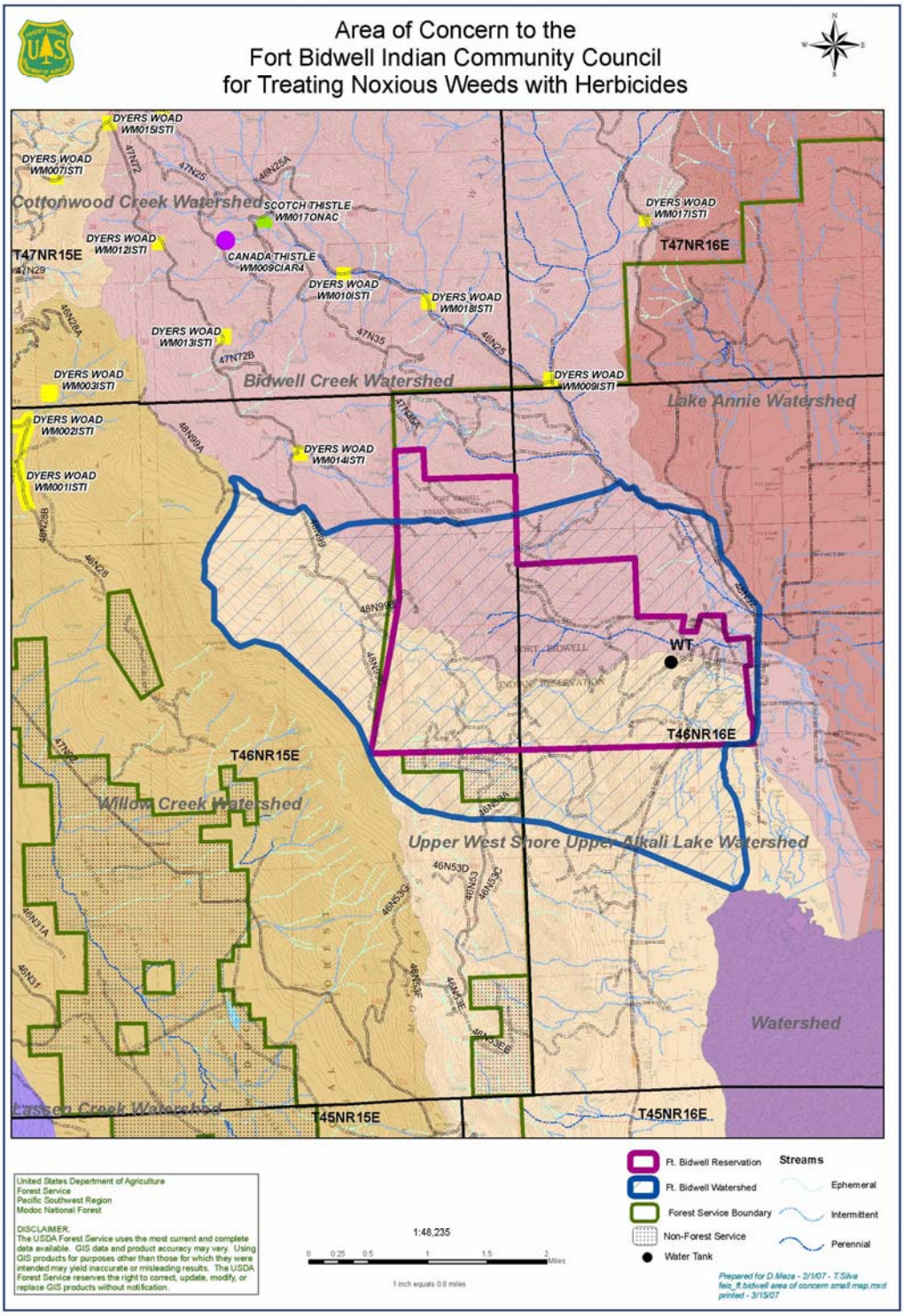
Treatment will be based on net acres which is the actual area covered by a noxious weed species that will be treated - using the example above would mean treating the 20 acres of the 200 acre site. Net acres can vary from year to year depending on growing conditions, time of year, and noxious weed vigor.

Appendix N:

Ft. Bidwell Map of Concern

Appendix N: Area of Concern Map of Fort Bidwell Indian Council

The black and white map of this Appendix is pinted in color in Volume 4 – Map Book.


Area of Concern to the
Fort Bidwell Indian Community Council
for Treating Noxious Weeds with Herbicides
Cottonwood Creek Watershed
Bidwell Creek Watershed
Lake Annie Watershed
Willow Creek Watershed
Upper West Shore Upper Alkali Lake Watershed
Watershed
T47NR15E
T47NR16E
T46NR15E
T46NR16E
T45NR15E
T45NR16E
WT
SCOTCH THISTLE WM017ONAC
CANADA THISTLE WM009CIAR4
DYERS WOAD WM015ISTI
DYERS WOAD WM007ISTI
DYERS WOAD WM012ISTI
DYERS WOAD WM010ISTI
DYERS WOAD WM018ISTI
DYERS WOAD WM013ISTI
DYERS WOAD WM003ISTI
DYERS WOAD WM002ISTI
DYERS WOAD WM001ISTI
DYERS WOAD WM014ISTI
DYERS WOAD WM017ISTI
DYERS WOAD WM009ISTI
Ft. Bidwell Reservation
Ft. Bidwell Watershed
Forest Service Boundary
Non-Forest Service
Water Tank
Streams
Ephemeral
Intermittent
Perennial
1:48,235
1 inch equals 0.8 miles
United States Department of Agriculture
Forest Service
Pacific Southwest Region
Modoc National Forest
DISCLAIMER:
The USDA Forest Service uses the most current and complete data available. GIS data and product accuracy may vary. Using GIS products for purposes other than those for which they were intended may yield inaccurate or misleading results. The USDA Forest Service reserves the right to correct, update, modify, or replace GIS products without notification.
Prepared for D.Meza - 2/1/07 - T.Silva
fais_ft.bidwell area of concern small map.mxd
printed - 3/15/07

Appendix O:

Range Management Specialist Report

Rangeland Management Specialist Report

Noxious Weed Treatment Project

Purpose

The purpose of this report is to provide a summary of the existing conditions and a basis for the disclosure of effects on the rangeland management program from the implementation of the various alternatives described for Noxious Weed Control. It provides a summary of the rangeland resources present on the Modoc National Forest, goals and objectives of the rangeland management program, along with a summary of effects as they relate to the alternatives being analyzed in Modoc Noxious Weed Treatment EIS.

Background Information

The rangeland management program on the Modoc National Forest provides up to122,500 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 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 285-325 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 LRMP), of which 90% is suitable for grazing. The 10% of the Forest deemed unsuitable 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 weeds populations have been identified on 51 of the 84 grazing allotments on the Modoc National Forest.

Rangeland Management Program Objectives (From Modoc N.F. LRMP)

- Revise allotment management plans every 10 years.
- Adjust permitted livestock grazing to meet Forest Standards and Guidelines, including to improve water quality, fisheries, riparian areas, and meet State deer herd goals.
- Increase forage production in designated allotments through 6,800 acres of nonstructural range improvements, such as prescribed burning; and maintain 22,000 acres of seedings.
- Improve ecological condition by managing livestock distribution through structural improvements such as fences and watering areas.
- Continue managing wild horses.

Program Standards and Guidelines

Below are listed applicable S&Gs for Rangeland Management from the Modoc National Forest Land and Resource Plan.

1. Through allotment management planning, manage rangeland vegetation to provide for healthy ecosystems; and to make forage available for livestock, wild horse herds and wildlife species.
    A. Maintain or enhance satisfactory ecological condition.
    B. Manage allotments to protect soil, water, and streamside-dependent resources.
2. Manage livestock and wild horses to maintain range resource productivity.

Proposed Action and Alternatives

Table 1, below, provides a comparison between the alternatives showing the timeframes, treatment methods, and number of sites and acreage to be treated.

Table 1: Summary Comparison of Alternatives for the Noxious Weed Treatment Project

Alternative Features / Alternatives	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6
Treatment Timeframe	**Ongoing***	**5 years**	**5 years**	**10 years**	**10 years**	**10 years**
Treatment Sites and Acres	Sites/Acres	Sites/Acres	Sites/Acres	Sites/Acres	Sites/Acres	Sites/Acres
Total Inventoried Weeds (2004)	541/6908	541/6908	541/6908	541/6908	541/6908	541/6908
Inventoried Weeds Fully Treated	20-30 ac/yr[1]	520/5,995	494/5,993	520/5,995	520/180	538/241
Inventoried Weeds Receiving Partial Treatment[2]	0/0	16/904[2]	0/0	16/904[2]	0/0	0/0
Inventoried Weeds Receiving Limited Treatment[3]	0/0	0/0	0/0	0/0	9/100[3]	3/100[3]
Inventoried Weeds Not Treated[4]	6,878[1]	5/9[4]	47/916[4]	5/9[4]	5/5515	0/6,567[4]
Proportion of Inventoried Weeds Treated	0.4%	99%/99%	91%/87%	99%/99%	100%/4%	100%/5%
Noxious Weeds Treated Through Early Detection – Rapid Response (ED – RR, acres) [5]	0	0	0	Up to 200 acres (100 ac max/yr)	Up to 200 acres (100 ac max/yr)	Up to 200 acres (100 ac max/yr)
Total Acres of Weeds Treated	20-30 ac/yr[1]	6,899 acres	5,993 acres	7,099 acres	480 acres	541 acres
Treatment Methods for Inventoried Noxious Weeds (2004)	Sites/Acres	Sites/Acres	Sites/Acres	Sites/Acres	Sites/Acres	Sites/Acres
Physical – hand pulling, hoeing, grubbing	0/0	161/31	494/5,993	161/31	0/0	0/0
Physical+ – Physical plus, clipping seed head or plant, weed eater, mulch/tarp	20-30 ac/yr[1]	0/0	0/0	0/0	527/139	116/19
Physical and/or Herbicide Treatment	0/0	333/5,961	0/0	333/5,961	0/0	371/116
Herbicide	0/0	42/907	0/0	42/907	0/0	46/65
Limited Treatment[3]	0/0	0/0	0/0	0/0	9/100	3/100
Goat Grazing or Herbicide Treatmen	0/0	0/0	0/0	0/0	5/41	5/41

Alternatives / Alternative Features	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6
Total Acres Potentially Treated with Herbicides (Incl. ED-RR acres)[6]	0/0	355/6,868	0/0	355/7,7068	0/0	425/522

[1]Under Current Management (Alt. 1), approximately 20 to 30 acres of noxious weeds are treated each year through other site specific NEPA decisions as part of other projects in accordance with the Modoc NF Integrated Weed Management Strategy (2005).

[2]These sites are rhizomotous species that occur within 10 feet of H2O. Those sites that are within 10 feet of H2O would not be treated. Sites with acreage ooutside of this 10 foot no treatment zone would receive partial treatment. The acreage within the 10 foot zone would not be treated, the acreage outside the 10 foot zone would be treated with herbicides.

[3]Includes treating along borders of infestations to prevent spread using the methods specific to each alternative. Treatment is estimated at 100 acres to be proportionally distributed based on the size of the individual infestations. These acres are included in the Inventoried Noxious Weeds Treated acreage.

[4]Excluded in Alt. 2 and Alt. 4: 5 sites of rhizamotous species that are within 10' of live water and partial acreage of 16 sites of rhizamotous species that are within 10' of live water. Rhizamotous species will not be treated by physical methods in these alternatives. Excluded in Alt. 3: 47 sites of rhizamotous species. Excluded in Alt. 5: 5,658 acre Dyer's woad, 850 acre Dalmatian toadflax, 159 acre crupina, and 6 sites of rhizamotous species. These sites will receive limited treatment around the perimeter estimated at 100 acres proportionally distributed based on the size of these sites. Excluded in Alt. 6: 5,658 acre Dyer's woad, 850 acre Dalmatian toadflax, 159 acre crupina. These sites will receive limited treatment around the perimeter estimated at 100 acres proportionally distributed based on the size of these sites.

[5]May use any of the methods approved for use in this NEPA decision.

[6]For Alt. 2 this includes the acres under the physical and/or herbicide method plus the herbicide treated acres. Alt. 4 adds the same categories as Alt. 2 plus adds in the potentially treated 200 acres through early detection rapid response. Alt. 6 includes the Physical and/or Herbicide acres, the herbicide acres, the acres under goat grazing, the acres under the limited treatment category, and the 200 acres under Early Detection-Rapid Response.

Direct and Indirect Effects

Below is a summary of direct and indirect of the Proposed Action and Alternatives on the rangeland resource of the Modoc National Forest.

Alternative 1 - No Action (Current Management): This alternative allows very limited physical treatment of noxious weeds (20-30 acres per year).

Under this alternative, it is anticipated weeds would continue to spread within NFS lands. As 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, this could lead to downward adjustments in the allowable use made by livestock and to wild horses inhabiting the Devils Garden Herd Territory.

Alternative 2 - Proposed Action: This alternative would allow the treatment of 300-1500 acres per year for the next 5 years, through a combination of manual and herbicide treatments. Total area treated would be 6,899 acres (99% of the infested acreage) over the 5 year implementation period, utilizing herbicide and/or physical methods of control.

This alternative would allow for an active treatment program for noxious weed control, resulting in positive impacts to upland native plant communities, including desirable forage species. Under this alternative, livestock and wild horse carrying capacities should be maintained in upland plant communities. The positive benefits of this alternative would be somewhat lower than for Alternative 4, due to the reduced acreage receiving treatment each year.

This alternative would exclude the treatment of 5 sites (9 acres) that are rhizomatous species occurring within 10 feet of water. In these areas, it is expected that the rhizomatous species would continue to expand their populations, impacting the condition of these riparian habitats and resulting in reduced forage available to livestock and wild horses.

Under this alternative, a maximum of 6,868 acres, which is about four tenths of one percent of the national forest lands in the project area, would be treated with herbicide over the 5-year implementation period. Based on this low percentage and because noxious weeds are generally unpalatable to livestock, the chance of animals consuming enough treated forage to cause adverse animal health effects would be extremely remote.

Additionally, herbicide label directions will be followed, which may require some deferment of grazing. This is normally a short time (days) and normally livestock operations can be easily adjusted to accommodate such restrictions.

Alternative 3 - This alternative calls for the treatment of 300-1500 acres annually (5,993 acres total) during a five year implementation period, utilizing physical and cultural methods of control. No herbicides would be used under this alternative.

This alternative would allow treatment of 87% of the infested acreage. Due to the large scale treatment of noxious weeds allowed under this alternative, there would be beneficial impacts to the rangeland resource. However, there would be 47 sites with 916 acres of

rhizomatous species that would not be treated due to the ineffectiveness of physical treatment on these species. On these sites, noxious weed populations would continue to expand, and in the long term, livestock and wild horse carrying capacities would likely decline.

If cultural treatments are used, areas reseeded would require rest for 2-4 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 implement the necessary rest. If livestock must be completely removed from an allotment, there would be a negative economic impact on grazing permittee(s) if they must purchase alternative forage sources for their livestock.

Alternative 4 - Alternative 4 provides for a large scale treatment program for noxious weeds through a combination of methods, including manual, cultural, and herbicide use. This alternative calls for a total treatment of up to 7,068 acres of currently infested acreage over the next ten years (99% of the infested acreage), including 200 total acres (up to100 acres in any year) under an Early Detection- Rapid Response strategy, utilizing any of the methods described in this alternative. There would be no treatment of 5 sites (9 acres) that consist of rhizomatous species, within 10 feet of water.

Due to the variety of methods that could be used, and the large number of acres proposed for treatment, this Alternative would be the most beneficial to the upland rangeland resource, resulting in 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.

Under this alternative, a maximum of 7,068 acres, which is less than five tenths of one percent of the national forest lands in the project area, would be treated with herbicides over the 10 year implementation period. Based on this low percentage and because noxious weeds are generally unpalatable to livestock, the chance of animals consuming enough treated forage to cause adverse animal health effects would be extremely remote.

Additionally, herbicide label directions will be followed, which may require some deferment of grazing. This is normally a short time (days) and normally livestock operations can be easily adjusted to accommodate such restrictions.

If cultural treatments are used, areas that are reseeded would require rest for 2-4 years to allow new plants to become established. This would require a change in pasture rotation, complete rest of the pasture(s) /allotment(s) or structural improvements such as fencing to implement the necessary rest. If livestock must be removed completely from an allotment, there would be a negative economic impact on the grazing permittee(s) if they must purchase alternative forage sources for their livestock.

Alternative 5 - This Alternative calls for treating up to 480 acres (7% of the infested acres) over the next 10 years utilizing non-herbicide methods. This includes treating up to 200 acres (100 acres in any one year) under a Early Detection – Rapid Response strategy, utilizing any methods described in this alternative. Treatments in this alternative would include manual and

cultural treatments, such as limited goat grazing and mulching and tarping of small areas. There would be limited treatment along the borders of 9 sites (6,728 acres) including large infestations and sites with rhizomatous species to contain populations.

This alternative would only allow treatment of 7% of the currently infested acreage. Due to the small acreage treated, this alternative would have very minimal beneficial impacts to the rangeland resource. It is expected that those sites with rhizomatous species left untreated would continue to spread and expand into new areas. In the long term, livestock carrying capacities would likely decline, leading to reduced allowable use by livestock and wild horses.

If cultural treatments are used, those areas reseeded would require rest for 2-4 years to allow new plants to become established. This might require a change in pasture rotation, complete rest of the pasture(s)/allotment(s) or structural improvements such as fencing to implement the necessary rest. If livestock must be removed completely from an allotment, there will be a negative economic impact on the grazing permittee(s) if they must purchase alternative forage sources for their livestock.

The treatment of noxious weeds by goat grazing will have negligible impacts to livestock operations due to the limited number and 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. This method, therefore, would have negligible impacts to the rangeland resources.

Alternative 6 - This Alternative calls for the treatment of up to 541 acres (7% of infested acreage) over the 10-year implementation period, including up to 200 acres (100 acres in any one year) that could be treated under the Early Detection – Rapid Response strategy, allowing treatments with any method described in this alternative. Treatments would be through the use of a broad variety of herbicides and mixes, manual, mechanical, cultural treatments, goat grazing and mulching and tarping of small areas. There would be limited treatment (100 acres) along the borders to contain large infestations of dyer’s woad, common crupina, and Dalmation toadflax.

This alternative would provide for the most variable and effective methods for treatment of noxious weeds. Due to the number of weed control techniques available under this alternative, it would be expected to provide the most control of the species targeted for treatment. In the long term, outside of the large Dyers woad, Dalmation toadflax and Common crupina sites, where the objective is containment, it is expected that noxious weed populations would be greatly reduced, and in many cases, eradicated. In the long term, it is expected that forage species will have less competition for available water and nutrients, leading to a stabilized or increased grazing capacity for livestock and wild horses.

Under this alternative, a maximum of 522 acres, which is less than one tenth of one percent of the national forest lands in the project area, could be treated with herbicide over the 10 year implementation period. Based on this low percentage and because noxious weeds are generally

unpalatable to livestock, the chance of animals consuming enough treated forage to cause adverse animal health effects would be extremely remote.

Additionally, herbicide label directions will be followed, which may require some deferment of grazing. This is normally a short time (days) and normally livestock operations can be easily adjusted to accommodate such restrictions.

As with the other alternatives calling for cultural treatments (seeding), areas reseeded would require rest for 2-4 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 will be a negative economic impact to the livestock operation if the grazing permittee(s) has to find additional 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 application of the project 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 will be coordinated with the affected grazing permittees on a site specific basis and incorporated into Annual Operating Instructions as necessary.

Consistency with Forest Plan Standards

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.

All alternatives would be consistent with Forest Plan Standards to some degree. The No Action (Current Management) Alternative would be least consistent as with very limited treatment of noxious weeds, infestations will 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 sites 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, temporarily 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 will be considered during the development of site specific environmental analysis for the renewal of grazing permits.

Prepared by:

/s/ Robinson Jeffers
Rob Jeffers, Rangeland Program Manager Date: 2-8-2005
Modoc National Forest

References

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Appendix P:

Social Economic Analysis

Noxious Weed Treatment Project

Social and Economic Report

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April 13, 2007

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Introduction

The purpose and need of this Noxious Weed Treatment Project is to economically implement those portions of the Modoc National Forest Weed Management Strategy and Action Plan that call for implementation of a program to control and eradicate 14 identified species of noxious weeds. This report documents the analysis of social and economic effects of the alternatives proposed to achieve the purpose and need.

This project is designed to contribute to achieving the goals of the Modoc National Forest Land and Resource Management Plan (Forest Plan) by promoting ecosystem health of forested and rangeland habitats. Control or eradication of noxious weed infestation sites is important to prevent adverse impacts to native plant communities, wildlife habitat, soils, domestic animals, and humans.

Four significant issues were identified by the interdisciplinary team during scoping and were used for the development of alternatives. Analysis of comments on the Draft Environmental Impact Statement did not reveal additional issues. The significant issues are:

1. The use of herbicides for invasive weed control may cause health problems for people who are exposed to the herbicides and/or treated areas. Although federal and state licensing and certification requirements for herbicide use builds in strict safety features before use, some people have reservations about the use of these products. If an alternative is selected which authorized the use of herbicides, there is a potential that health problems could surface.
2. The proposed 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. As with Issue 1 above, this concern relates to potential human health problems that may be caused by the application of herbicides. In addition, herbicides may kill specific plants that are collected and used for medicinal or traditional purposes in specific areas.
3. An alternative is needed to respond to the need to evaluate an aggressive approach using additional treatment methods and adaptive management for treating more acres annually over a ten-year period to control and eradicate noxious weeds. The proposed action is seen as too limited and ineffective.
4. The proposed application of herbicides for weed control has the potential to harm the physical and biological resources of the Forest. The use of herbicides has the potential to adversely affect the soil and water resources and harms native plants and animals.

The analysis of social and economic effects is most pertinent with regard to Issues 1 and 2. The indicators used to evaluate potential social and economic impacts are listed below:

Social Impact Indicators:

- Total acres to be treated (public and worker exposure)
    - Acres of herbicide treatment
    - Acres of physical treatment

- Total acres of herbicide treatment within identified traditional cultural properties (exposure of Native American gatherers)

Economic Impact Indicators:

- Estimated cost of implementation
  - Five-Year discounted cost of implementation
  - Total discounted cost of full implementation for the specified life of all alternatives
  - Average cost per effectively treated acre
- Estimated number of jobs potentially supported
- Estimated income potentially supported

Methodology for Analysis

Assumptions

In order to compare the alternatives, implementation costs were estimated based on a uniform set of assumptions. Cost estimates displayed in this report should not be assumed to be exact. They are an approximation developed to provide a comparison of alternatives. Regardless of which alternative is selected, costs will vary from year to year based on annual budget allocations, the annual operating plan, and the conditions present in the sites scheduled for treatment.

The period of treatment proposed under the alternatives considered varies from five to ten years. Therefore, in addition to estimating the total discounted cost for each alternative, an estimate for five years of implementation under each alternative is also provided. Forest Service Handbook 1909 requires that the environmental documentation of actions awaiting implementation and those of ongoing programs or projects be reviewed at least every three to five years. Should an alternative with a ten-year period of implementation be selected by the deciding official, the analysis of costs would need to be re-evaluated after five years as part of the required environmental review.

Cost estimates for each action alternative include the estimated cost of re-treatment activities based on industry standards for the effectiveness of proposed treatments. Treatements under the No Action Alternative were assumed to remain stable, at 30 acres annually based on the past experience of the Forest. Due to a lack of data relative to the rate at which local inventoried infestations spread, the rate of noxious weed spread was not estimated under any of the alternatives.

The average cost per effectively treated acre was estimated for each alternative. This average cost incorporated the cost of all required annual activities, including inventory and required monitoring activities. The averages cost per effectively treated acres under Early Detection – Rapid Response was estimated based on treatment costs alone..

The assumptions used to derive the cost estimates for each treatment method are described in Appendix A.

Jobs and Income

Estimates of total industry output and jobs potentially supported under each alternative are calculated by IMPLAN, using data for 2002. IMPLAN is a computerized economic modeling program originally developed by the Forest Service in cooperation with the Federal Emergency Management Agency and the Bureau of Land Management. IMPLAN has since been privatized and is now provided by Minnesota IMPLAN Group (MIG). IMPLAN utilizes a database of basic economic statistics constructed by MIG. Information for this database was obtained from major government sources such as the Bureau of Economic Analysis, County Business Patterns, Bureau of Labor Statistics, U.S. Census, etc., and converted to a consistent format using widely accepted methodologies.

An IMPLAN analysis area model was used to determine the employment and income consequences through the economy of one-million-dollar changes for each kind of impact. The results are called response coefficients. Because input-output models are linear, multipliers or response coefficients need only be calculated once per model and then applied to the direct change in output. Effects were estimated by multiplying the response coefficients by estimated levels of dollar activity. Specifications for developing response coefficients and levels of dollar activity are stated below.

Herbicide Treatment. One million dollars of exports were modeled through sector 18, Agricultural Services, to determine a response coefficient. Using the assumptions described in Appendix A, the cost of a contract to conduct herbicide treatments was estimated. The resultant cost estimate was then multiplied by the appropriate response coefficient to determine total economic impact.

Federal Salary Impacts. Forest Service employment costs by alternative were estimated based on the assumptions described in Appendix A. Salary impacts result from Forest employees spending a portion of their salaries locally. IMPLAN includes a profile of personal consumption expenditures for several income categories. The average annual compensation for employees involved in the implementation of the alternatives is approximately $25,000 to $30,000. Only a portion of which is take home pay. Using information derived from the IMPLAN database, the economic impact of take home pay being spent in the area was calculated.

Federal Expenditure Impacts. An average of Forest obligations by budget object code for actual expenditures in Fiscal Years 2002, 2003, and 2004 were obtained from the National Finance Center through the agency's Inventory and Monitoring Institute to estimate how non-salary expenditures would be spent. This profile was input into the IMPLAN model for non-salary expenditures. Sales to the federal government were treated in the same manner as exports; money coming from outside the model area.

Implementation of a weed treatment program of work stimulates direct, indirect, and induced job and income effects. As described above, herbicide treatment services are reflected in the Agricultural Services sector. In response to the demand for a given level of weed treatment services, one or more businesses within the Agricultural Services sector respond by producing an appropriate level of output to meet that demand. The output produced and the employment required to produce that level of output are direct effects. In order to produce the output included in the direct effects, the businesses within

the Agricultural Services sector must purchase supplies and services from other industries. The output and employment stimulated in other sectors by these purchases are the indirect effects of the Agricultural Services sector. In addition to the direct and indirect effects, induced effects represent the output and employment stimulated throughout the local economy as a result of the expenditure of new household income generated by direct and indirect employment.

Another factor considered when estimating economic impacts of various sectors is commonly referred to as leakage. Part of the monies spent by businesses and individuals is spent within the local economy, while a portion of those monies is spent outside of the local economy. The money expended outside the local economy is referred to as leakage. By the same token, economic activity is introduced when businesses within the area export goods and services that are paid for by purchasers from outside of the local economy, thereby introducing new money into the local economy.

IMPLAN attempts to estimate these complex economic relationships in order to approximate the effects on the economy as a whole. Multipliers are developed as a means to estimate the change in direct, indirect, and induced effects as a result of an adjustment in the level of final demand for the goods or services provided by a given sector of the economy. These multipliers also take into account the effects of leakage and exports.

Existing Condition

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 surrounding unincorporated areas of Lassen and Siskiyou Counties.

The Modoc National Forest encompasses approximately 2 million acres. National Forest System lands total 1.6 million acres while private landowners and other public agencies administer the remaining land. Modoc County includes approximately 2,689,246 acres. Approximately 64 percent 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 percent is tribal trust land. The remainder is held in private ownership.

People living within the analysis area experience the effects of Forest Service policy and programs directly. Important minority populations exist within the local area.

Population

Modoc County had an estimated population of 9,640 residents in 2004 reflecting growth of about 2 percent since 2000 according to the California Department of Finance. By way of contrast, California's population grew by approximately 7 percent during the same period. Although Modoc County experienced modest population growth, the population of the city of Alturas declined by 1.7 percent. The overall analysis area population grew by 2.8 percent 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.

Table 1. California and Analysis Area (Cities and Unincorporated Areas by County) Total Population with 2000 Demographic Research Unit Benchmark.

Location	2000	2004	Percent Change 2000-2004
State of California	33,873,086	36,271,091	7.1 %
Lassen County:			
Unicorporated portion of County	16,363	16,750	2.4 %
Modoc County:			
Alturas	2,892	2,840	-1.8 %
Balance (Unicorporated) of County	6,557	6,800	3.7 %
Siskiyou County:			
Dorris	886	890	0.5 %
Tulelake	1,020	1,011	-0.9 %
Balance (Unicorporated) of County	23,686	24,544	3.6 %
Analysis Area Total	51,404	52,835	2.8 %

(California Department of Finance 2005)

The racial diversity of the counties in the analysis area is displayed in Table 2 below.

Table 2. Racial/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 percent 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 percent 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 are locals who tended not to stop for the interviews.

Estimates of recreation use for calendar year 2000 at the 80 percent confidence level were 146,155 forest visits +/- 32.1 percent. Of visitors interviewed, 98 percent categorized themselves as White; 0.4 percent as American Indian/Alaska Native; 0.3 percent as Spanish, Hispanic, or Latino; 1.1 percent as Native Hawaiian or Other Pacific Islander; and 0.2 percent as Asian. Approximately 2 percent 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 following table 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 percent 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. Poverty Status.

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
Percent Below Poverty Level	14.2 %	21.5 %	14.0 %	18.6 %
Percent 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 percent 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 the table below. Unemployment in Modoc County in 2004 was estimated at 8.6 percent compared to 6.2 percent for the state. Unemployment rates were at 9.3 percent in Siskiyou County and 7.7 percent in Lassen County.

Table 4. 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. Admittedly 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 check the spread of noxious weeds in Modoc County due to the nature of the problem.

Stakeholder Attitudes, Beliefs, and Values

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 Mountains or in other regions of the United States.

The Modoc National Forest uses a local Resource Advisory Committee (RAC) under the auspices of “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 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., 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 following table 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 5. 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

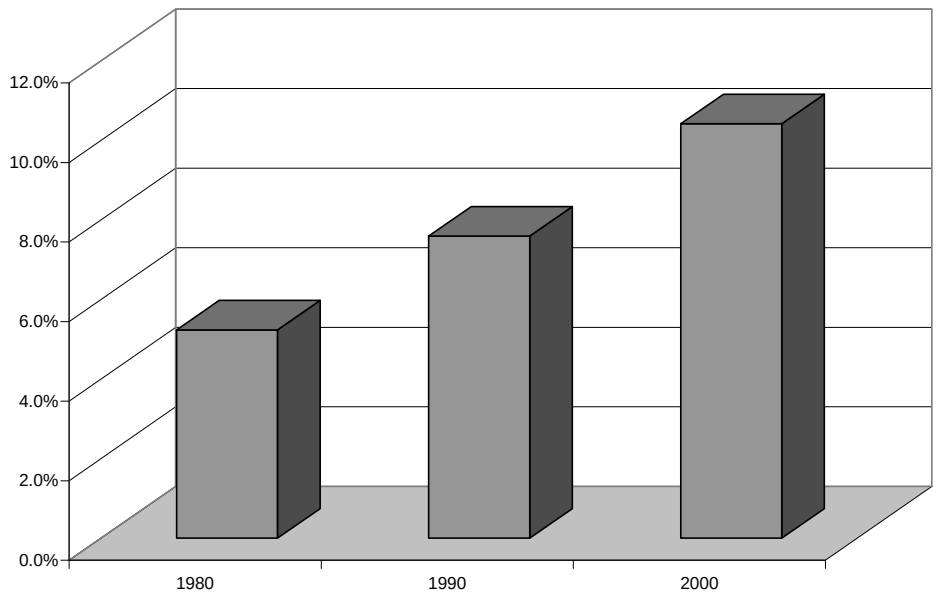
Source: USDA National Agricultural Statistical Service (http://usda.mannlib.cornell.edu/).

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 invasive weeds on their private property.

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 percent in 2000 compared to only 4 percent in 1980.



Note: The question on race for Census 2000 was different from the one for the 1990 census. Respondents were given the option of selecting one or more race categories to indicate their racial identity. For this reason, Census 2000 data is not directly comparable with data from the 1990 and earlier census. The figure above is intented to illustrate general trends only.

Figure 1. Hispanic or Latino Population as a Percentage of the Total Population Over Time (U.S. Census Bureau 2006)

As noted above in Table 3, poverty rates in Modoc County are well above the average for the state as a whole at 21.5 percent. Poverty rates among many minorities are more than double that of white residents and range from 41.7 to 48.8 percent for Hispanics, American Indians, Blacks or African Americans, and those who indicated "some other race." Asian residents had a poverty rate of 21.2 percent, which was also higher than whites with a poverty rate of 18.6 percent.

Minorities, particularly Hispanics, hold the majority of farm labor jobs in the analysis area. As such, Hispanics or other minorities would likely be employed by potential contractors for the treatment of 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 percent 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 6 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 percent of the tribal areas identified.

Table 6. 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, such as The Nature Conservancy (science-based collaborative approach to problem-solving, http://nature.org/) to Earth First (“No Compromise in Defense of Mother Earth,” http://www.earthfirst.org/about.htm).

Environmental organizations generally seek to keep federal lands free of pesticide use in the treatment of noxious weed. Among other 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 / 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, Winema-Freemont, 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 Government

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).

Desired Condition

Some general characteristics of noxious weeds are their ability to spread rapidly, reproduce in high numbers, and crowd out native plants. Noxious weeds also tend to be very expensive to control. Millions of acres of public lands in the West are rapidly undergoing degradation because of the spread of invasive non-native plants. Nationwide, the invasion of non-native invasive species (NNIS) into forest and rangeland threatens forest health by displacing native species. The spread of noxious and non-native invasive plant species reduces biological diversity, impacts threatened and endangered species, degrades wildlife habitat, modifies vegetative structure and species composition, changes fire and nutrient cycles, and degrades soil structure.

In 1995, the Forest Service revised its national policy on noxious weed management (FS Manual 2080). The policy places stronger emphasis on integrated weed management. It outlines responsibilities for integrated pest management, prevention and control measures, cooperation and information collection and reporting. The Forest Supervisor responsibilities include: goals and objectives identified in the Forest Land and Resource Management Plan (LRMP); maintaining a noxious weed inventory for the Forest in accord with Forest Service Manual and Handbook direction; and coordinating with State and County agencies and landowners in prevention, control, containment, and monitoring efforts concerning the management of noxious weeds.

The Forest Service, Bureau of Land Management, and the Federal Interagency Committee for the Management of Noxious and Exotic Weeds have prepared strategies for the management of noxious and invasive weeds. In February 1999, President Clinton issued an Executive Order No. 13112 stressing the importance of addressing the noxious and invasive weed problem and created the Invasive Species Council.

Increased public awareness has also prompted changes in noxious weed management in the State of California. Weed Management Areas (WMAs) cover much of the state, recognizing the need for coordinated management and control of noxious weeds across jurisdictional boundaries. National Forests have become active participants in WMAs.

In 2003, Forest Service Chief Dale Bosworth identified four inter-related threats to our ability to protect and restore our forests to health conditions. The major threats identified were: fuels and fires, invasive species, loss of open space, and unmanaged recreation.

The increased importance of noxious weed management was recognized in the Sierra Nevada Forest Plan Amendment Record of Decision published in January 2004.

The desired future condition for the Modoc National Forest is to halt the spread of noxious weeds from National Forest lands to surrounding private, state, county, other federal agency, and tribal lands and reduce noxious weed impacts on humans, animals both domestic and wild, and native plant communities on the National Forest.

The primary goal for this proposal is to treat small weed infestations quickly and continually in order to control or remove the noxious weed infestations that currently spread seeds. By doing so, the Modic National Forest can reduce the overall costs of control and eradication associated with large infestations. Allowing large infestations to occur would not only result in increased economic costs of removal but also increased adverse environmental impacts to the soil, water, desired vegetation, and animals.

Overview of the Proposed Action

The action proposed by the Forest Service to meet the purpose and need is to aggressively and efficiently (within budget constraints):

- Eradicate, or control and contain the occurrences of 14 specific noxious weed species from Modoc National Forest lands,
- Utilize hand pulling, directed spray applications of selected herbicides or a combination of these on weed occurrences,
- Treat between 300 to 1,500 acres annually for the next five years, while
    - Minimizing risk to wildlife and people,
    - Creating as little soil disturbance as possible, and
    - Minimizing risks to desired plant species where noxious weed treatments occur.

Fourteen species of noxious weeds occur on approximately 541 sites comprising approximately 6,908 acres scattered throughout the 1.6 million acres of the Modoc National Forest. The majority of treatments would occur within ponderosa pine ecosystems and juniper sagebrush ecosystems as well as along travel corridors (e.g., railroads, Forest Service roads, county roads, and state highways).

The following three treatment methods are proposed for use.

Physical/manual treatment. This includes hand pulling, grubbing, and excavation of plants with a shovel at or just below the soil surface. This treatment is proposed within a ten foot buffer on all streams where deemed necessary for resource concerns and/or when occurrences are small consisting of < 100 plants or the site is < 0.10 acre. This treatment may not be appropriate for all noxious species. For example, rhizomatous species would not be treated using this method unless small in number.

Herbicide treatment. Noxious weed sites may be treated with the herbicides identified (2,4-D, Dicamba, Clopyralid, Glyphosate, and Triclopyr) as determined by treatment timing, treatment strategy, or application method. Herbicide treatments are most effective on rhizomatous species and larger infestations.

Combination treatment. Some sites can or will be treated with a combination of treatments. Since this is a long-term strategy for treatment, increases or reductions in the numbers of plants or size of a site may move it from one treatment method to another. For example, after several applications of herbicides a site may have few enough plants to effectively treat it using physical/manual treatment.

The annual combination of treatment methods would vary depending on specific conditions. There will be no applications of herbicides on aquatic species. However, riparian invasive weeds could be treated using non-chemical means within 10 feet of the stream, and utilizing directed spray applications of glyphosate from ten feet to the outside edge of the identified streamside management zone. Hand pulling and/grubbing, when species appropriate, would be the primary treatment within riparian areas.

Infestation sites planned for treatment range in size from: single plants on <0.1 acre to, occupancy of an entire acre to, occupancy of multiple acres at various levels of infestation.

High treatment priority is placed on known sites and pathways of spread from those sites. Areas adjacent to stream courses and road and trail systems have great potential for spread as well as locations within administrative sites (campgrounds, parking lots, trail heads, river accesses).

The project will not include aerial spraying of herbicides, treatment of aquatic species, or applications of herbicides within ten feet of live water.

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.

The features of Alternative 1 are displayed below.

Table 7. Alternative 1 Features and Treatment Methods.

Alternative Features	Alternative 1
Treatment Timeframe	Ongoing*
Total Inventoried Weeds (2004)	541 sites / 6908 acres
Inventoried Weeds Fully Treated	20-30 acres per year[1]
Inventoried Weeds Not Treated	6,878 acres[1]
Proportion of Inventoried Weeds Treated	0.4%
Total Acres of Weeds Treated	20-30 acres per year[1]
Treatment Methods	
Physical+ – Physical plus, clipping seed head or plant, weed eater, mulch/tarp	20-30 acres per year[1]
Total Acres Potentially Treated with Herbicides	0 sites / 0 acres

[1]Under Current Management (Alt. 1), approximately 20 to 30 acres of noxious weeds are treated each year through other site specific NEPA decisions as part of other projects in accordance with the Modoc NF Integrated Weed Management Strategy (2005).

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 recreation 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.

Issue 1

Concern was expressed by some stakeholders 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. Due to the inability to use manual or cultural treatment 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.

Issue 2

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. Additionally, in the long-term, noxious weed populations may threaten traditional gathering areas used by Tribal members.

Economic

Cost estimates associated with the implementation of Alternative 1 are displayed in Table 8. 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 percent estimated rate of effectiveness. Using this assumption, the average cost per effectively treated acre is approximately $1,183 per acre.

Table 8. 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.

Table 9 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 9. Alternative 1 Estimated Job and Income Impacts

Impact	Amount
Jobs	2
Labor Income ($1,000)	$39

(USDA Forest Service 2005)

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. Under the No Action Alternative, few 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 to be conducted. Additionally, some weed treatment activities authorized under site specific NEPA analysis would continue to occur.

The National Visitor Use Monitoring Survey conducted in calendar year 2000 on the Modoc National Forest indicates that only 2 percent of the visitors surveyed categorized themselves as an ethnicity other than white. However, this estimate may be low as many local residents did not stop and participate in the survey. The impacts of noxious weed infestations on recreation activities would be felt by all visitors regardless of ethnicity or income level.

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.

Civil Rights

A Civil Rights Impact Analysis was prepared and is available in the project record (Ott 2007).

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 adversely impacts 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 continued growth and expansion of these sites. Additionally, 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 increasing large 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. Listed below are features of Alternative 2:

Table 10. Alternative 2 Features and Treatment Methods.

Alternative Features	Alternative 2
Treatment Time frame	5 years
Total Inventoried Weeds (2004)	541 sites / 6908 acres
Inventoried Weeds Fully Treated	520 sites / 5,995 acres
Inventoried Weeds Receiving Partial Treatment[1]	16 sites /904 acres[1]
Inventoried Weeds Not Treated[2]	5 sites / 9 acres[2]
Proportion of Inventoried Weeds Treated	99% / 99%
Total Acres of Weeds Treated	6,899 acres
Treatment Methods	
Physical – hand pulling, hoeing, grubbing	161 sites / 31 acres
Physical and/or Herbicide Treatment	333 sites / 5,961 acres
Herbicide	42 sites / 907 acres
Total Acres Potentially Treated with Herbicides[3]	355 sites / 6,868 acres[3]

[1]These sites are rhizomatous species that occur within 10 feet of H2O. Those sites that are within 10 feet of H2O would not be treated. Sites with acreage outside of this 10 foot no treatment zone would receive partial treatment. The acreage within the 10 foot zone would not be treated; the acreage outside the 10 foot zone would be treated with herbicides.

[2]Excluded 5 sites of rhizomatous species that are within 10' of live water and partial acreage of 16 sites of rhizomatous species that are within 10' of live water. Rhizomatous species will not be treated by physical methods in these alternatives.

[3]Includes the acres under the physical and/or herbicide method plus the herbicide treated acres.

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 would be limited to hand or mechanical 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.

Table 11 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 11. 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, a 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 was only slightly higher than for herbicide treatment methods.

A combination of physical and herbicide 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.

Issue 1

Concern was expressed by some stakeholders regarding 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 will generally be small and scattered. Total annual treatment acres (300-1,500 acres) represent between 0.02 to 0.09 percent of the lands administered by the Modoc National Forest; in total, less than 0.41 percent (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 and will not be repeated in detail here. However, assuming 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.

Concern was expressed 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.

Issue 2

Concern was expressed that the proposed 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. 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. As with Issue 1 above, this concern relates to potential human health problems that may be caused as a result of the application of herbicides. In addition, herbicides may kill specific plants that are collected and used for medicinal or traditional purposes in specific areas.

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, triclopyr, or liquid hexazinone 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 percent 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 on to 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. Advanced 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 advanced 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.

NVUM survey results indicate that Native Americans represented only 0.4 percent of Forest recreation visitors surveyed. Of all visitors surveyed, those who participate in gathering natural products represented only 2 percent. Although NVUM 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, NVUM results are likely to have underestimated the number of these users. None-the-less, 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.

Economics

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 due to the use of herbicide treatments. 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 (Table 12). 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 per acre.

Table 12. 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 percent effective, and that the remaining 20 percent 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 percent 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 9 percent 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 percent 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 13 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 13. 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 specialist's reports for further discussion of the effects of the alternatives on the above resources.

Environmental Justice

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. As discussed above under Issue 2, impacts to Native American Forest users are expected to be minimal.

Crews employed for weed treatment activities may be composed of Native American or other minority workers. As stated above, appropriate training, supervision, and inspection would be implemented to ensure that worker exposure to herbicides or physical hazards does not result in unacceptably high risks to worker health.

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 it has been determined that this alternative would not have disproportionate adverse impacts on any minority or low-income populations.

Civil Rights

A Civil Rights Impact Analysis was prepared and is available in the project record (Ott 2007).

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. Although new infestations of existing species or newly occurring species would not be treated, overall future costs to the Forest Service and therefore to taxpayers would be reduced over those expected under Alternative 1.

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. Listed below are features of Alternative 3:

Table 14. Alternative 3 Features and Treatment Methods.

Treatment Features	Alternative 3
Treatment Timeframe	5 years
Total Inventoried Weeds (2004)	541 sites / 6908 acres
Inventoried Weeds Fully Treated	494 sites / 5,993 acres
Inventoried Weeds Not Treated[1]	47 sites / 916 acres[1]
Proportion of Inventoried Weeds Treated	91% / 87%
Total Acres of Weeds Treated	5,993 acres
Treatment Methods	
Physical – hand pulling, hoeing, grubbing	494/5,993
Physical+ – Physical plus, clipping seed head or plant, weed eater, mulch/tarp	0/0
Physical and/or Herbicide Treatment	0/0
Herbicide	0/0
Limited Treatment[3]	0/0
Goat Grazing or Herbicide Treatment	0/0
Total Acres Potentially Treated with Herbicides	0/0

[1] Excluded 47 sites of rhizomatous species. .

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 Table 15.

Table 15. 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 manual 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 manual 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.

Issue 1

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.

Issue 2

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 manual 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.

Economics

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 16. 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 manual treatments. The estimated cost per effectively treated acre is $418 per acre.

Table 16. Alternative 3 Estimated Treatment Costs

Economic Measure	Dollars
Five-Year Discounted Cost	$2,392,320
Total Discounted Cost (Life of Alternative = Five Years)	$2,392,320
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 percent effective, and that the remaining 20 percent 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 percent 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 percent 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 Table 17.

Table 17. 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 specialist's reports for other resource areas for a discussion of the effects of the alternatives on these resources.

Civil Rights

A Civil Rights Impact Analysis was prepared and is available in the project record (Ott 2007).

Environmental Justice

As discussed above, the effects of Alternative 3 would be similar to Alternative 2, except that no herbicides would be utilized. Based on the above analysis it has been determined that this alternative would not have disproportionate adverse impacts on any minority or low-income populations.

Cumulative Effects

Cumulative effects under Alternative 3 would be similar to those described under Alternative 2. 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 is also lower.

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. Listed below are features of Alternative 4:

Table 18. Alternative 4 Features and Treatment Methods.

Alternative Features	Alternative 4
Treatment Timeframe	10 years
Total Inventoried Weeds (2004)	541 sites / 6908 acres
Inventoried Weeds Fully Treated	520 sites / 5,995 acres
Inventoried Weeds Receiving Partial Treatment[1]	16 sites / 904 acres[1]
Inventoried Weeds Not Treated[2]	5 sites / 9 acres[2]
Proportion of Inventoried Weeds Treated	99% / 99%
Noxious Weeds Treated Through Early Detection – Rapid Response (ED – RR, acres) [3]	Up to 200 acres (100 ac max/yr)
Total Acres of Weeds Treated	7,068 acres
Treatment Methods	
Physical – hand pulling, hoeing, grubbing	161 sites / 31 acres
Physical and/or Herbicide Treatment	333 sites / 5,961 acres
Herbicide	42 sites / 907 acres
Total Acres Potentially Treated with Herbicides (Includes ED-RR acres)[4]	355 sites / 7,068 acres

[1]These sites are rhizomotous species that occur within 10 feet of H2O. Those sites that are within 10 feet of H2O would not be treated. Sites with acreage outside of this 10 foot no treatment zone would receive partial treatment. The acreage within the 10 foot zone would not be treated; the acreage outside the 10 foot zone would be treated with herbicides.

[2]Excluded 5 sites of rhizomatous species that are within 10’ of live water and partial acreage of 16 sites of rhizomatous species that are within 10’ of live water. Rhizomatous species will not be treated by physical methods in these alternatives.

[3]May use any of the methods approved for use in this NEPA decision.

[4]Includes the acres under the physical and/or herbicide method plus the herbicide treated acres, plus adds in the potentially treated 200 acres through Early Detection Rapid Response.

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 EIS. 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 would be limited to hand or mechanical 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 19 summaries 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 19. 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 %**

Treatment Method	Acres	Percentage of Treatment Acres*	Percentage of National Forest System Lands
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.

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.

Issue 1

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.

Issue 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 percent 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 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 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.

Economic

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 (Table 20). 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 20. Alternative 4 Estimated Treatment Costs

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 percent effective, and that the remaining 20 percent 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 percent 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 percent 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 Table 21.

Table 21. Alternative 4 Estimated Job and Income Impacts

Impact	Amount
Jobs	97
Labor Income ($1,000)	$1,262

(USDA Forest Service 2005)

Environmental Justice

The environmental justice concerns under Alternative 4 are the similar to those described under Alternative 2. If the maximum potential acres of new sites were also treated each year, the total impacted acres over the life of this alternative would be 0.41 percent of the Forest. Based on the above analysis and that a relatively small portion of the Forest would undergo treatment each year, it has been determined that this alternative would not have disproportionate adverse impacts on any minority or low-income populations.

Civil Rights

A Civil Rights Impact Analysis was prepared and is available in the project record (Ott 2007).

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. Listed below are features of Alternative 5:

Table 22. Alternative 5 Features and Treatment Methods.

Alternative Features	Alternative 5
Treatment Timeframe	10 years
Total Inventoried Weeds (2004)	541 sites / 6908 acres
Inventoried Weeds Fully Treated	520 sites / 180 acres
Inventoried Weeds Receiving Limited Treatment[1]	9 sites / 100 acres[1]
Inventoried Weeds Not Treated[2]	5 sites / 5,515 acres
Proportion of Inventoried Weeds Treated	100% / 4%
Noxious Weeds Treated Through Early Detection – Rapid Response (ED – RR, acres) [5]	Up to 200 acres (100 ac max/yr)
Total Acres of Weeds Treated	480 acres
Treatment Methods	
Physical+ – Physical plus, clipping seed head or plant, weed eater, mulch/tarp	527 sites / 139 acres
Limited Treatment[3]	9 sites / 100 acres
Goat Grazing or Physical+	5 sites / 41 acres
Total Acres Potentially Treated with Herbicides	0 sites / 0 acres

[1]Includes treating along borders of infestations to prevent spread using the methods specific to each alternative. Treatment is estimated at 100 acres to be proportionally distributed based on the size of the individual infestations. These acres are included in the Inventoried Noxious Weeds Treated acreage.

[2]Excluded 5,658 acre Dyer's woad, 850 acre Dalmatian toadflax, 159 acre crupina, and 6 sites of rhizomatous species. These sites will receive limited treatment around the perimeter estimated at 100 acres proportionally distributed based on the size of these sites. 5May use any of the methods approved for use in this NEPA decision.

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 EIS. 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.

Table 23 summaries the size of areas by treatment method relative to the total area proposed for treatment and to the Forest as a whole.

Table 23. 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, weed eater, 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 - manual 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 percent 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. Over all 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 480 acres or about 7 percent of the acres that would be treated under Alternative 3. As described under the alternatives above, Alternative 5 would require strict adherence to health and safety requirements for all workers implementing treatment activities.

Issue 1

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.

Issue 2

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.

Economic

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 (Table 24). 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 percent) of inventoried infestations untreated.

Table 24. Alternative 5 Estimated Treatment Costs (2006 dollars).

Economic Measure	Dollars
Five-Year Discounted Cost	$533,420

Economic Measure	Dollars
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 investations 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 per acre.

The estimated number of jobs and income potentially supported as a result of the implementation of Alternative 5 are detailed in Table 25.

Table 25. Alternative 5 Estimated Job and Income Impacts

Impact	Amount
Jobs	8
Labor Income ($1,000)	$192

(USDA Forest Service 2005)

Environmental Justice

Effects relative to environmental justice are the similar to those described under Alternative 3. However, because some large sites would not be treated 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. Nonetheless, based on the above analysis it has been determined that this alternative would not have disproportionate adverse impacts on any minority or low-income populations.

Civil Rights

A separate Civil Rights Impact Analysis was prepared and is available in the project record (Ott 2007).

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. Listed below are features of Alternative 6:

Table 26. Alternative 6 Features and Treatment Methods.

Alternative Features	Alternative 6
Treatment Timeframe	10 years
Total Inventoried Weeds (2004)	541 sites / 6,908 acres
Inventoried Weeds Fully Treated	538 sites / 241 acres
Inventoried Weeds Receiving Limited Treatment[1]	3 sites / 100 acres[1]
Inventoried Weeds Not Treated[2]	6,567[2]
Proportion of Inventoried Weeds Treated	100% / 5%
Noxious Weeds Treated Through Early Detection – Rapid Response (ED – RR, acres) [3]	Up to 200 acres (100 ac max/yr)
Total Acres of Weeds Treated	541 acres
Treatment Methods	
Physical+ – Physical plus, clipping seed head or plant, weed eater, mulch/tarp	116 sites / 19 acres
Physical and/or Herbicide Treatment	371 sites / 116 acres
Herbicide	46 sites / 65 acres
Limited Treatment[1]	3 sites / 100 acres
Goat Grazing or Herbicide Treatment	5 sites / 41 acres
Total Acres Potentially Treated with Herbicides (Includes ED-RR acres)[4]	425 sites / 522 acres

[1]Includes treating along borders of infestations to prevent spread using the methods specific to each alternative. Treatment is estimated at 100 acres to be proportionally distributed based on the size of the individual infestations. These acres are included in the Inventoried Noxious Weeds Treated acreage.

[2]Excluded 5,658 acre Dyer's woad, 850 acre Dalmatian toadflax, 159 acre crupina. These sites will receive limited treatment around the perimeter estimated at 100 acres proportionally distributed based on the size of these sites.

[3]May use any of the methods approved for use in this NEPA decision.

[4]Includes the Physical and/or Herbicide acres, the herbicide acres, the acres under goat grazing, the acres under the limited treatment category, and the 200 acres under Early Detection-Rapid Response.

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 EIS. 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 would be limited to hand or mechanical 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 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 Table 27.

Table 27. 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, weed eater, 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 Dalmation 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 eliminationare . 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 percent 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.

Issue 1

The effects relative to Issue 1 are similar to those describe 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.

Issue 2

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 percent 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 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.

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.

Economic

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 Table 28. 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 95 percent of inventoried noxious weed sites would not be treated.

Table 28. 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, 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 Table 29.

Table 29. Alternative 6 Estimated Job and Income Impacts

Impact	Amount

Impact	Amount
Jobs	22
Labor Income ($1,000)	$364

(USDA Forest Service 2005)

Environmental Justice

The effects relative to environmental justice under Alternative 6 are 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, it has been determined that this alternative would not have disproportionate adverse impacts on any minority or low-income populations.

Civil Rights

A Civil Rights Impact Analysis was prepared and is available in the project record (Ott 2007).

Cumulative Effects

The cumulative effects of Alternative 6 would be the same as described under Alternatives 2 and 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 percent 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 percent of the national forest system lands administered by the Modoc National Forest. Alternatives 2, 3, and 4 would propose the most acres of physical treatment, and would therefore present the greatest potential for physical injuries to workers implementing treatment activities.

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. Approximately 45.5 acres could potentially be treated with herbicides under this alternative which represents about 0.01 percent of all identified gathering area and 0.003 percent 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 over all 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.

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.

Table 30. 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 Physical Treatment (Worker exposure) [1]	0	5,992	5,993	6,192	480	435
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	$2,392	$1,383	$533	$455
Estimated Total Discounted Cost ($1000)	$248	$1,394	$2,392	$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

[1] Totals in these rows reflect some double counting due to acres specified for a combination of herbicide and physical treatments. The maximum number of acres of Early Detection – Rapid Response treatments for the full term of each alternative was also included in the totals given.

Appendix A: Estimation of Treatment Costs

Assumptions used to develop alternative cost estimates were developed in consultation with Forest staff and are detailed below (Jeffers 2006). All estimates are displayed in 2006 dollars.

Physical Treatment (Hand pulling, use of hand tools, grubbing, chopping, clipping, and digging):

- Crew of three with one GS-5 crew leader ($153 per day) and two GS-04 crew members ($102 per day each)
- Three-person crew can treat 1.5 acres per day.
- Vehicle costs: $2,000 per month (FOR and Mileage – estimated average cost per work day: $91.

Estimated cost per acre: $300

Cultural Mulching (tarping, mulching, covering very small areas):

- Tarping - Crew of 3 can do .75 acre per day
- Mulching – Crew of 3 can do .5 acres per day
- Assumed that the same crew used for manual treatment would be used for cultural mulching: Crew of three with one GS-5 crew leader ($153 per day)and two GS-04 crew members ($102 per day each)
- Vehicle costs: $2,000 per month (FOR and Mileage – estimated average cost per work day: $91.
- Cost of the mulch (wood chips) assuming 6” cover required to be effective = 545 tons per acre = $43,600 per acre.
- 75 Percent of acres treated would be tarped, 25 percent would be mulched

Estimated cost per acre: $11,572

Cultural Goat Grazing:

- Surprise Field Unit of the BLM found that the cost of goat grazing was $250 to $450 per acre – assumed average of the two figures

Estimated cost per acre: $350

Herbicide Treatment:

- The Forest does not have personnel certified to apply herbicides. All herbicide treatments would be contracted.
- Contract proposal with Resource Advisory Council estimated that $30,000 per year would be required to treat 200 acres.

Estimated cost per acre: $150

Limited Treatment

Limited treatment addresses the management of large weed sites and includes treating sites along the borders to prevent spread using the methods specific to the alternative. Costs were estimated by averaging the per acre costs of the other treatment methods proposed in the alternative.

- Alternative 5: $413 per acre
- Alternative 6: $209 per acre

Seed Bank Management

Seed bank management of small weed sites includes the cost associated with visiting previously treated sites on an annual basis to treat newly germinated weeds. Seed bank management is included under all action alternatives. The annual cost for seed bank management is calculated below.

- Four GS-4 employees ($102 per day) for 3 months each: $22,900
- Vehicle mileage and FOR: $9,000
- Misc. purchases (weeding tools, bags, gloves, disposal fees, etc.): $3,000

Estimated annual cost: $35,000

Inventory and Monitoring

The cost of monitoring and updating the inventory of noxious weed infestations is estimated at $16,000 per year.

The need to complete water quality monitoring is to determine if the decision to treat noxious weeds is resulting in an adverse effect to water quality. Based on the treatment of noxious weeds within the identified Streamside Management Zones (SMZ's) of perennial bodies of water (i.e. stream, lake or spring) the need to monitor the effects of water quality is disclosed in the Hydrology and Soils Specialist Reports. The leaching potential, water solubility and potential for the herbicide to move off site of the chemical used to treat noxious weeds would drive a different level of water quality monitoring for Alternatives 2, 4 and 6.

1. It is assumed that there would only be one herbicide treatment per site per year.
2. It is also assumed that based on funding to implement the noxious weed treatment that not all sites would be treated in one year. These cost estimates are over the life of the project and not per acre.
3. It is also assumed that all herbicide treatments would meet the expected effectiveness of the project and there would be no follow-up the following year. If there was a follow-up treatment in year 2 then water quality monitoring would most likely be completed depending on the proximity to water and the nature of the chemical to be applied.

Alternative 2: Under Alternatives 2, the only chemical that would be applied within the SMZ's for streams, lakes and springs would be Glyphosate. The nature of Glyphosate (binds with the soil particle and becomes chemically inert), fate and transport of the

chemical would respond in the environment leads to the conclusion that two samples would be taken. There are approximately 20 aggregates where Glyphosate could potentially be delivered to surface water.

- 20 samples at $500 per sample=$10000 x 2 samples= $20000
- 10 days at 250 per day= $2500
- Total Cost = $22500/5 years=$4500/yr

Total Cost: $22500

Alternatives 4: Under Alternatives 4, the only chemical that would be applied within the SMZ's for streams, lakes and springs would be Glyphosate. The nature of how Glyphosate (binds with the soil particle and becomes chemically inert), fate and transport of the chemical would respond in the environment leads to the conclusion that two samples would be taken. There are approximately 20 aggregates where Glyphosate could potentially be delivered to surface water.

- 20 samples at $500 per sample=$10000 x 2 samples= $20000
- 10 days at 250 per day= $2500
- Totals Cost = $22500/10 years=$2250/yr

Total Cost: $22500

Alternatives 3 and 5: Under Alternatives 3 and 5, only manual or physical/physical plus mulching/tarping methods would be utilized to treat noxious weeds. This would be evaluated under R5 Best Management Practices Evaluation Program (R5 BMPEP). There would be no cost to the noxious weed program as the R5 BMPEP is already funded on the forest.

Cost: $0

Alternative 6: Under Alternatives 6, multiple chemicals including Tank Mixes would be applied within the SMZ's for streams, lakes and special aquatic features. This would include 2, 4-D, Chlorosulfron, Clopyralid, Dicamba, Glyphosate as well as Tank Mix 1 and Tank Mix 2. The treatment of the SMZ's and the nature of how these chemicals would respond in the environment lead to the conclusion that up to four samples would be taken. There are approximately 20 aggregates where these chemicals could potentially be delivered to surface water.

- 20 samples at $500 per sample=$10000 x 4 samples= $40000
- 40 days at 250 per day= $10000
- Total Cost = $50000/10 years=$5000/yr

Total Cost: $50000

Treatment Effectiveness

The following are the assumptions used regarding the expected rates of treatment effectiveness.

- Herbicide treatments on any weed species: 80 percent of acres treated

- Physical or physical plus mulching/tarping on non-rhizomatous weed species: 80 percent of acres treated
- Physical or physical plus mulching/tarping on rhizomatous weed species: 20 percent of acres treated

Combination Treatments

Several alternatives list treatment methods that are a combination of manual and herbicide treatments. Sufficient information was not available to determine exactly how many acres would be treated with herbicides versus manual treatments should one of these alternatives be selected. For the purposes of developing an estimate, the following assumptions were made relative to the proportion of manual treatments to herbicide treatments (Personal Communication Beyer 2006).

- Physical and/or herbicide treatments: 5 percent physical, 95 percent herbicide
- Physical plus mulching/tarping: 99 percent physical, 1 percent mulching/tarping

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Appendix Q:

Civil Rights Impact Analysis

Noxious Weed Treatment Project

Civil Rights Impact Analysis

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April 13, 2007

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CIVIL RIGHTS IMPACT ANALYSIS
NOXIOUS WEED TREATMENT PROJECT
MODOC NATIONAL FOREST

Agency: U.S. Department of Agriculture
Forest Service
Modoc National Forest

Subject: Civil Rights Impact Analysis
Noxious Weed Treatment Project

Purpose of Civil Rights Impact Analysis

The Civil Rights Impact Analysis (CRIA) describes the civil rights implications of policy actions before the actions are approved and implemented. The CRIA provides information about the most likely beneficiaries of a decision, program, or activity; how and to what degree the benefits will be demonstrated; and whether the originally planned policy, action, decision, program, or activity should be modified or otherwise changed if possible to ensure increased benefits or more effective outcomes. The CRIA helps to advise USDA policy makers, managers, and administrators about whether the action or decision will have the effect of unintentionally or otherwise illegally discriminating against USDA customers. Also, the CRIA serves to advise USDA policy makers, managers, and administrators of the effectiveness of decisions as related to ensuring efficient, appropriate allocation or distribution of goods and services in a manner that ensures compliance with all the laws, rules, and regulations under which the USDA must operate.

USDA Civil Rights Policy

The Civil Rights Policy for the Department of Agriculture, Departmental Regulation 4300-4 dated May 30, 2003, provides the following objectives.

- Establish procedures for the evaluation of proposed policies, actions, or decisions for potential violations of civil rights statutes, Federal regulations, or USDA policy on nondiscrimination;
- Preclude the issuance of policies, actions, or decisions that contain eligibility criteria, methods of administration, or other agency-imposed requirements that may adversely and disproportionately impact employees or program beneficiaries because of their race color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, protected genetic information, political beliefs, reprisal, or because of all or a portion of an individual's income is derived from any public assistance program; and
- Utilize CRIAs as a management tool to ensure fair and equitable service to USDA employees and beneficiaries of federally assisted and federally conducted programs and activities.

Disparate impact, a theory of discrimination, has been applied to the proposed action in order to reveal any negative effects that may unfairly and inequitably impact beneficiaries through implementation and administration. The objective of this review and analysis is to 1) ensure that

all Civil Rights statues, Federal regulations, and USDA policies and procedures have been complied with; and 2) prevent disparate treatment and minimize adverse Civil Rights impacts that may have caused an effect of discrimination against a protected group's members. This review and analysis sought to determine whether the proposed action for the treatment of noxious weeds on the Modoc National Forest would have the effect of adversely and disproportionately impacting any group or class of persons on one or more prohibited bases.

Proposed Action

The action proposed by the Forest Service to meet the purpose and need is to aggressively and efficiently (within budget constraints):

- Eradicate, or control and contain the occurrences of 14 specific noxious weed species (Table 1-1) from Modoc National Forest lands,
- Utilizing hand pulling, spot applications of selected herbicides or a combination of these on weed occurrences,
- Treating between 300 to 1,500 acres annually for the next five years,
- Minimize risk to wildlife and people,
- Create as little soil disturbance as possible, and
- Minimize risks to desired plant species where noxious weed treatments occur.

Fourteen species of noxious weeds occur on approximately 541 sites comprising approximately 6,908 acres.

The following three treatment methods are proposed for use.

> **Physical/manual treatment.** This includes hand pulling, grubbing, and excavation of plants with a shovel at or just below the soil surface. This treatment is proposed within a 10 foot buffer on all streams where deemed necessary for resource concerns and/or when occurrences are small consisting of < 100 plants or the site is < 0.10 acre. This treatment may not be appropriate for all noxious species.
>
> **Herbicide treatment.** Noxious weed sites may be treated with any one of the herbicides identified and will be determined by treatment timing, treatment strategy and application method.
>
> **Combination treatments.** Some sites can or will be treated with a combination of treatments. Since this is a long-term strategy for treatment, increases or reductions of numbers of plants or size of a site may move it from one treatment method to another. For example, after several applications of herbicides a site may have few enough plants to effectively treat it using physical/manual treatment.

The USDA Forest Service proposes to authorize annual treatments of weed infestations ranging from an estimated 300 to 1,500 acres annually scattered throughout the Modoc National Forest's 1.6 million acres. Of the 1.6 million acres, approximately 6,908 acres have been identified as being impacted with noxious weeds. The majority of treatments will occur within the ponderosa

pine ecosystem and juniper sagebrush ecosystems within the Modoc National Forest as well as along travel corridors (e.g., railroads, Forest Service roads, county roads, and state highways).

The annual combination of treatment methods would vary depending on specific conditions. There will be no applications of herbicides on aquatic species. However, riparian invasive weeds could be treated using non-chemical means within ten feet of the stream, and utilizing spot applications of glyphosate to the outside edge of the identified streamside management zone. Hand pulling and/grubbing, when species appropriate, would be the primary treatment within riparian areas.

Infestation sites planned for treatment range in size from: single plants on <.1 acre to, occupancy of the entire acre to, occupancy of multiple acres comprising the site at various levels of infestation.

High treatment priority is placed on known sites and pathways of spread from those sites. Areas adjacent to stream courses and road and trail systems have moderate incidences of weed infestations and great potential for spread. Noxious weed locations within administrative sites (campgrounds, parking lots, trail heads, river accesses) are at risk of infestation and are included in the treatment analysis.

The project will not include aerial spraying of herbicides, treatment of aquatic species, or applications of herbicides within 10 feet of live water.

Alternatives Considered

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. This alternative provides a baseline for comparison and analysis of effects.

The features of Alternative 1 are displayed below.

Table 1. Alternative 1 Features and Treatment Methods.

Alternative Features	Alternative 1
Treatment Timeframe	Ongoing*
Total Inventoried Weeds (2004)	541 sites / 6908 acres
Inventoried Weeds Fully Treated	20-30 acres per year[1]
Inventoried Weeds Not Treated	6,878 acres[1]
Proportion of Inventoried Weeds Treated	0.4%
Total Acres of Weeds Treated	20-30 acres per year[1]
Treatment Methods	
Physical+ – Physical plus, clipping seed head or plant, weed eater, mulch/tarp	20-30 acres per year[1]
Total Acres Potentially Treated with Herbicides	0 sites / 0 acres

[1]Under Current Management (Alt. 1), approximately 20 to 30 acres of noxious weeds are treated annually through site specific NEPA decisions as part of other projects in accordance with the Modoc NF Integrated Weed Management Strategy (2005).

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. Listed below are features of Alternative 2:

Table 2. Alternative 2 Features and Treatment Methods.

Alternative Features	Alternative 2
Treatment Timeframe	5 years
Total Inventoried Weeds (2004)	541 sites / 6908 acres
Inventoried Weeds Fully Treated	520 sites / 5,995 acres
Inventoried Weeds Receiving Partial Treatment[1]	16 sites /904 acres[1]
Inventoried Weeds Not Treated[2]	5 sites / 9 acres[2]
Proportion of Inventoried Weeds Treated	99% / 99%
Total Acres of Weeds Treated	6,899 acres
Treatment Methods	
Physical – hand pulling, hoeing, grubbing	161 sites / 31 acres
Physical and/or Herbicide Treatment	333 sites / 5,961 acres
Herbicide	32 sites / 907 acres
Total Acres Potentially Treated with Herbicides[3]	355 sites / 6,868 acres[3]

[1]These sites are rhizomotous species that occur within 10 feet of H2O. Those sites that are within 10 feet of H2O would not be treated. Sites with acreage outside of this 10 foot no treatment zone would receive partial treatment. The acreage within the 10 foot zone would not be treated; the acreage outside the 10 foot zone would be treated with herbicides.

[2]Excluded 5 sites of rhizomatous species within 10' of live water and partial acreage of 16 sites of rhizomatous species within 10' of live water. Rhizomatous species will not be treated by physical methods in these alternatives.

[3]Includes the acres under the physical and/or herbicide method plus the herbicide treated acres.

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.

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 would be limited to hand or mechanical 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.

Table 2 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. 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 %**

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. Listed below are features of Alternative 3:

Table 4. Alternative 3 Features and Treatment Methods.

Treatment Features	Alternative 3
Treatment Timeframe	5 years
Total Inventoried Weeds (2004)	541 sites / 6908 acres
Inventoried Weeds Fully Treated	494 sites / 5,993 acres
Inventoried Weeds Not Treated[1]	47 sites / 916 acres[1]
Proportion of Inventoried Weeds Treated	91% / 87%
Total Acres of Weeds Treated	5,993 acres
Treatment Methods	
Physical – hand pulling, hoeing, grubbing	494/5,993
Physical+ – Physical plus, clipping seed head or plant, weed eater, mulch/tarp	0/0
Physical and/or Herbicide Treatment	0/0
Herbicide	0/0
Limited Treatment[3]	0/0
Goat Grazing or Herbicide Treatment	0/0
Total Acres Potentially Treated with Herbicides	0/0

[1] Excluded 47 sites of rhizomatous species. .

Between 300 to 1,500 acres would be treated annually for the next five years.

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 Table 5.

Table 5. 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 %

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 strategy. Listed below are features of Alternative 4:

Table 6. Alternative 4 Features and Treatment Methods.

Alternative Features	Alternative 4
Treatment Timeframe	10 years
Total Inventoried Weeds (2004)	541 sites / 6908 acres
Inventoried Weeds Fully Treated	520 sites / 5,995 acres
Inventoried Weeds Receiving Partial Treatment[1]	16 sites / 904 acres[1]
Inventoried Weeds Not Treated[2]	5 sites / 9 acres[2]
Proportion of Inventoried Weeds Treated	99% / 99%
Noxious Weeds Treated Through Early Detection – Rapid Response (ED – RR, acres) [3]	Up to 200 acres (100 ac max/yr)
Total Acres of Weeds Treated	7,099 acres
Treatment Methods	
Physical – hand pulling, hoeing, grubbing	161 sites / 31 acres
Physical and/or Herbicide Treatment	333 sites / 5,961 acres
Herbicide	32 sites / 907 acres
Total Acres Potentially Treated with Herbicides (Includes ED-RR acres)[4]	355 sites / 7,068 acres

[1]These sites are rhizomotous species that occur within 10 feet of H2O. Those sites that are within 10 feet of H2O would not be treated. Sites with acreage outside of this 10 foot no treatment zone would receive partial treatment. The acreage within the 10 foot zone would not be treated; the acreage outside the 10 foot zone would be treated with herbicides.

[2]Excluded 5 sites of rhizomatous species that are within 10' of live water and partial acreage of 16 sites of rhizomatous species that are within 10' of live water. Rhizomatous species will not be treated by physical methods in these alternatives.

[3]May use any of the methods approved for use in this NEPA decision.

[4]Includes the acres under the physical and/or herbicide method plus the herbicide treated acres, plus adds in the potentially treated 200 acres through Early Detection – Rapid Response.

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 EIS. 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 would be limited to hand or mechanical 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 7 summaries 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 7. 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.

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. Listed below are features of Alternative 5:

Table 8. Alternative 5 Features and Treatment Methods.

Alternative Features	Alternative 5
Treatment Timeframe	10 years
Total Inventoried Weeds (2004)	541 sites / 6908 acres
Inventoried Weeds Fully Treated	532 sites / 180 acres
Inventoried Weeds Receiving Limited Treatment[1]	9 sites / 100 acres[1]
Inventoried Weeds Not Treated[2]	0 sites / 6,728 sites[2]
Proportion of Inventoried Weeds Treated	100% / 4%
Noxious Weeds Treated Through Early Detection – Rapid Response (ED – RR, acres) [5]	Up to 200 acres (100 ac max/yr)
Total Acres of Weeds Treated	480 acres
Treatment Methods	
Physical+ – Physical plus, clipping seed head or plant, weed eater, mulch/tarp	527 sites / 139 acres
Limited Treatment[3]	9 sites / 100 acres
Goat Grazing or Herbicide Treatment	5 sites / 41 acres
Total Acres Potentially Treated with Herbicides	0 sites / 0 acres

[1]Includes treating along borders of infestations to prevent spread using the methods specific to each alternative. Treatment is estimated at 100 acres to be proportionally distributed based on the size of the individual infestations. These acres are included in the Inventoried Noxious Weeds Treated acreage.

[2]Excluded 5,658 acre Dyer's woad, 850 acre Dalmatian toadflax, 159 acre crupina, and 6 sites of rhizomatous species. These sites will receive limited treatment around the perimeter estimated at 100 acres proportionally distributed based on the size of these sites. 5May use any of the methods approved for use in this NEPA decision.

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 EIS. 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.

Table 9 summaries the size of areas by treatment method relative to the total area proposed for treatment and to the Forest as a whole.

Table 9. 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, weed eater, mulching/tarping	139	50 %	0.008 %
Goat Grazing	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 - manual 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.

Alternative 6

Alternative 6 was developed to respond to comments that requested a more flexible approach utilizing herbicide treatment methods, a larger range of adaptive management techniques, and additional herbicides. This alternative will be implemented over a ten year treatment period. Listed below are features of Alternative 6:

Table 10. Alternative 6 Features and Treatment Methods.

Alternative Features	Alternative 6
Treatment Timeframe	10 years
Total Inventoried Weeds (2004)	541 sites / 6,908 acres
Inventoried Weeds Fully Treated	538 sites / 241 acres
Inventoried Weeds Receiving Limited Treatment[1]	3 sites / 100 acres[1]
Inventoried Weeds Not Treated[2]	6,567[2]
Proportion of Inventoried Weeds Treated	100% / 5%
Noxious Weeds Treated Through Early Detection – Rapid Response (ED – RR, acres) [3]	Up to 200 acres (100 ac max/yr)
Total Acres of Weeds Treated	541 acres
Treatment Methods	
Physical+ – Physical plus, clipping seed head or plant, weed eater, mulch/tarp	116 sites / 19 acres
Physical and/or Herbicide Treatment	371 sites / 116 acres
Herbicide	46 sites / 65 acres
Limited Treatment[1]	3 sites / 100 acres
Goat Grazing or Herbicide Treatment	5 sites / 41 acres
Total Acres Potentially Treated with Herbicides (Includes ED-RR acres)[4]	425 sites / 522 acres

[1]Includes treating along borders of infestations to prevent spread using the methods specific to each alternative. Treatment is estimated at 100 acres to be proportionally distributed based on the size of the individual infestations. These acres are included in the Inventoried Noxious Weeds Treated acreage.

[2]Excluded 5,658 acre Dyer's woad, 850 acre Dalmatian toadflax, 159 acre crupina. These sites will receive limited treatment around the perimeter estimated at 100 acres proportionally distributed based on the size of these sites.

[3]May use any of the methods approved for use in this NEPA decision.

[4]Includes the Physical and/or Herbicide acres, the herbicide acres, the acres under goat grazing, the acres under the limited treatment category, and the 200 acres under Early Detection-Rapid Response.

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 EIS. 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 would be limited to hand or mechanical 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 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 Table 11.

Table 11. 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, weed eater, 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.

Data Gathering

The geographic region of influence considered for social and economic impacts of noxious weed management on the Modoc National Forest includes all of Modoc County as well as surrounding unincorporated areas of Lassen and Siskiyou Counties. The following describes pertinent portions of the social and economic environment relative to the proposed Noxious Weed Treatment Project. For additional information see the Social and Economic Report in the project record (Ott 2007).

The Modoc National Forest encompasses approximately 2 million acres. National Forest System lands total 1.6 million acres while private landowners and other public agencies administer the remaining land. Modoc County includes approximately 2,689,246 acres. Approximately 64 percent 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 percent is tribal trust lands. The remainder is held in private ownership.

Population

The analysis area has a very small, rural population. Modoc County had an estimated 9,640 residents in 2004 with estimated growth of about 2 percent between 2000 and 2004 according to the California Department of Finance. By way of contrast the State of California's population grew by an estimated 7 percent during the same period. Although Modoc County experienced modest population growth, the population of the city of Alturas declined by 1.7 percent. The overall analysis area population grew by 2.8 percent with the majority of growth occurring in the rural areas. The population density within Modoc County in 2000 was estimated at only 2.4 persons per square mile.

Table 12. California and Analysis Area (Cities and Unincorporated Areas by County) Total Population with 2000 Demographic Research Unit Benchmark.

Location	2000	2004	Percent Change 2000-2004
State of California	33,873,086	36,271,091	7.1 %
Lassen County:			
Unicorporated portion of County	16,363	16,750	2.4 %
Modoc County:			
Alturas	2,892	2,840	-1.8 %
Balance (Unicorporated) of County	6,557	6,800	3.7 %
Siskiyou County:			
Dorris	886	890	0.5 %
Tulelake	1,020	1,011	-0.9 %
Balance (Unicorporated) of County	23,686	24,544	3.6 %
Analysis Area Total	51,404	52,835	2.8 %

(California Department of Finance 2005)

The racial diversity of the counties in the analysis area is displayed in Table 13 below.

Table 13. Racial/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 2000b)

Note: Totals do not sum to 100 percent 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).

Income and Employment

The median household income in Modoc County in 1999 was $27,522 compared to $47,493 for the State of California 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 (California Department of Finance 2005).

The following table 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 percent 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 14. Poverty Status.

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
Percent Below Poverty Level	14.2 %	21.5 %	14.0 %	18.6 %
Percent 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 percent 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 the table below. Unemployment in Modoc County in 2004 was estimated at 8.6 percent compared to 6.2 percent for the State. Unemployment rates were at 9.3 percent in Siskiyou County and 7.7 percent in Lassen County.

Table 15. 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)

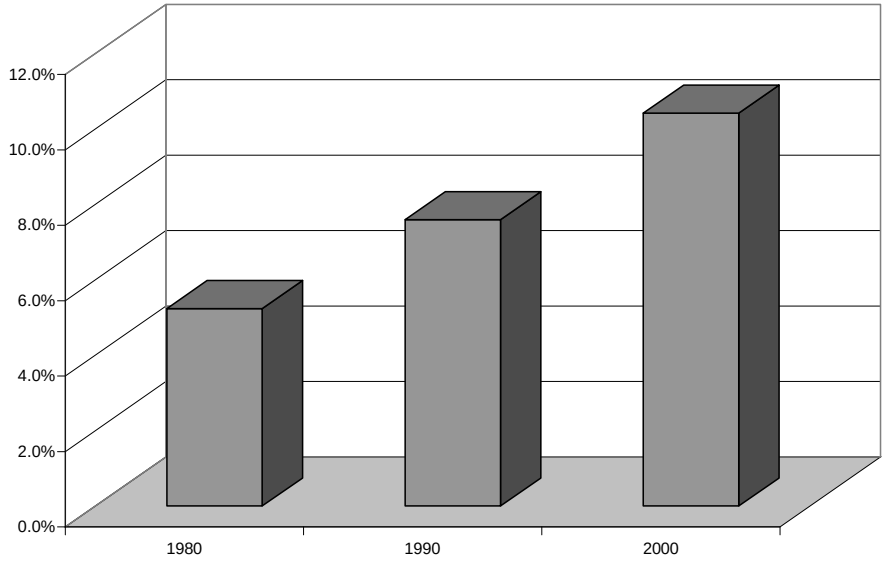
National Visitor Use Monitoring Survey Results

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 percent 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 are locals who tended not to stop for the interviews.

Estimates of recreation use for calendar year 2000 at the 80 percent confidence level were 146,155 forest visits +/- 32.1 percent. Of visitors interviewed, 98 percent categorized themselves as White; 0.4 percent as American Indian/Alaska Native; 0.3 percent as Spanish, Hispanic, or Latino;1.1 percent as Native Hawaiian or Other Pacific Islander; and 0.2 percent as Asian. Approximately 2 percent of those surveyed indicated that they participate in gathering mushrooms, berries, firewood, or other natural products USDA Forest Service 2001).

Minority Community and Farm Laborers

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 percent in 2000 compared to only 4 percent in 1980**.**



Note: The question on race for Census 2000 was different from the one for the 1990 census. Respondents were given the option of selecting one or more race categories to indicate their racial identity. For this reason, Census 2000 data is not directly comparable with data from the 1990 and earlier census. The figure above is intented to illustrate general trends only.

Figure 1. Hispanic or Latino Population as a Percentage of the Total Population Over Time (U.S. Census Bureau 2000b).

As noted above in Table 14, poverty rates in Modoc County are well above the average for the state as a whole at 21.5 percent. Poverty rates among many minorities are more than double that of white residents and range from 41.7 to 48.8 percent for Hispanics, American Indians, Blacks or African Americans, and those who indicated "some other race." Asian residents had a poverty rate of 21.2 percent, which was also higher than the poverty rate for whites of 18.6 percent.

Ethnic minorities, particularly Hispanics, hold the majority of farm labor jobs in the analysis area working for ranchers, farmers, and other forest and agricultural industries. As such, Hispanics or other minorities would likely be employed by potential contractors for the treatment of 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 percent 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 16 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 percent of the tribal areas identified.

Table 16. 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.

Issues and Concerns

Initial scoping began on April 13, 1998, a Notice of Intent to prepare an environmental impact statement was published in the Federal Register and the proposal for the treatment of noxious weeds was mailed to concerned citizens, Federal and State agencies, and environmental organizations identified within the forest's NEPA mailing lists. In March 1998, the California Indian Basketweavers Association (CIBA) and the California Department of Pesticide Regulation were contacted to obtain lists of individuals who were weavers. A public meeting was planned to solicit input from weavers. Letters and follow up phone calls to individual weavers were sent for the public meeting to be held in June 1998. A form was developed for individual weavers to mail in to indicate their interest in participation of the public meeting. The form was mailed to 36 individual weavers with a preaddressed envelope enclosed. One form was returned by a person that was unable to attend the meeting and wanted to continue to receive information about the development of the environmental assessment. The public meeting was held to accommodate individuals that failed to reply but still wanted to attend. The result was no participation.

As a result of analysis of all the public comments, the Forest revised the proposed action and in May 2001 a project update letter was mailed to individuals, groups, and other governmental organizations in which we detailed the process and timeline the agency was going to follow. Comments and recommendations made during previous scoping and tribal consultation were used to revise the 1998 Notice of Intent. A revision to the 1998 Notice of Intent (NOI) was published in the Federal Register on November 4, 2002. The 2001 proposal published in the Federal Register was sent to interested individuals, groups, agencies, tribes.

New mailing lists for individual weavers were requested. The weavers on the CIBA mailing list told the Forest of additional weavers that might be interested. Scoping meetings with weavers were held in Alturas, Susanville and Redding, California and in Klamath Falls, Oregon. Scoping letters were sent to new contacts and the Forest sent invitations to the meetings. Nineteen telephone calls were made to coordinate the meetings. Six home visits were made to determine interest.

Because many of the weavers of the Klamath Tribes do not belong to the CIBA, the Culture and Heritage Department of the Klamath Tribes suggested an article be placed in the tribal newsletter to invite weavers to the meeting in Oregon. A news article was developed to invite weavers to the public meetings. The Forest Botanist and the Forest Tribal Relations Program Manager met with weavers in Chiloquin and Klamath Falls, Oregon.

One weaver known to live in Alturas was contacted at home and a meeting was held in the Alturas Supervisor's Office to identify scoping issues from a weaver's perspective.

The proposed action reflected in the DEIS and the two additional alternatives published in the DEIS were based on the public comments received between March 1998 and June 2001.

The following groups and individuals provided comments in response to the DEIS that reflected concern about potential impacts. In addition to members of the public, Forest Service personnel knowledgeable about the Forest's noxious weed program and community environment, were consulted to determine if they anticipated any potential for impacts to a protected group.

- California Indian Basketweavers Association
- Klamath Forest Alliance
- Californians for Alternatives to Toxics

- Fort Bidwell Indian Community Council
- Alturas Rancheria
- Pit River Tribe Environmental Office
- Environmental Protection Agency
- Dan Meza, Tribal Relations Program Manager, Modoc National Forest
- Sarah Majdiak, Civil Rights Officer, Modoc National Forest

There is concern that traditional Native American gathering areas and cultural properties could be adversely impacted by encroachment of noxious weeds; however concerns were also raised about the potential for damage or loss of traditional gathering areas as a result of herbicide treatments.

Human health impacts are also a concern. The use of herbicides for invasive weed control may cause health problems for people who are exposed to the herbicides and/or treated areas. Herbicides have the potential to harm the physical and biological resources of the Forest adversely affecting the soil and water resources and therefore may harm humans, animals, and native plants. The ability of Native Americans and others to collect plants for traditional uses or medicinal reasons may be adversely impacted in specific areas. Traditional food sources could be contaminated resulting in adverse health impacts. Additionally, other traditional uses of plant material could expose users to health risks. For example, traditional basket weavers often use their teeth to hold fiber plants in preparing them for weaving; therefore fiber plants with herbicide residues are also of concern.

Those with the greatest risk of exposure would be the workers applying the herbicides. As described above, Hispanics and other minorities hold the majority of farm labor jobs in the analysis area. As such, these individuals could be employed by potential contractors for the treatment of noxious weeds. Concern has been expressed regarding potential impacts to these populations as a result of exposure to herbicide chemicals through their employment.

Impacts

Alternative 1 – No Action

Under the No Action Alternative, no herbicide treatments would be implemented, therefore there would be no human health risks to Forest users, contractors, cooperators, or employees as a result of herbicide exposure. Existing weed treatment activities as authorized by the Federal Highway Administration or the State of California would continue to be conducted. The impacts of these activities would be analyzed under site specific NEPA analysis. Additionally, some Forest Service weed treatment activities authorized under site specific NEPA analysis may occur.

Risks to traditional gathering areas as a result of noxious weed encroachment remain unchanged. Weed infestations on the forest may impact gathering areas or contribute to the spread of weeds on adjacent Tribal lands.

Hispanic, Native American, and other minority 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. Under the No Action Alternative, no jobs or income would be supported however; existing jobs and income would not be lost.

Based on the above analysis, no disproportionate adverse impacts to employees, contractors, cooperators, or members of the public because of their race color, national origin, age, disability, sex, marital status, familial status, parental status, religion, or sexual orientation are expected to occur as a result of implementation of Alternative 1.

Alternative 2

Those potentially at risk as a result of herbicide use under Alternative 2 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 treated areas, by eating game or fish containing herbicide residues, or by drinking water that contains such residues.

Forestwide, the area potentially subject to herbicide treatment annually represent 0.02 to 0.09 percent of the Forest. In total, areas potentially subject to herbicide treatments represent approximately 0.41 percent of the Forest. The location, methods, and types of herbicides used would conform to standards designed to ensure that state and federal water quality standards are met. To control drift, herbicides would not be applied if the weather forecast for the next 24 hours calls for rain. Applicators would utilize directed spray or application to individual plants by wick to minimize the potential for drift beyond the targeted plants.

To reduce the potential for public exposure, treatment areas would be posted in advance, notifying Forest users of the impending 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.

Those with the greatest risk of injury or herbicide exposure would be the workers conducting weed control activities. Potential contractors for weed control activities are likely to employ minority workers. Additionally, successful completion of the participating agreement with the Pit River Tribe described above would result in the use of Native American crews to implement weed treatment activities.

Although the most common public concern expressed was related to the health risk of herbicide use, physical control methods may also represent human health risks for crews implementing control activities. Weed control 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 required increased time in the field and extended 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. Crews found physical treatment methods to be physically demanding and tiring. Fatigued crews became less diligent about effective removal techniques which also contributed to the need for repeat treatments (Jefferies 2006). However, Worker Compensation Insurance data cited in the Human Health and Safety specialist's report (Bakke 2005) indicate that in 2002, compensation rates for physical treatment methods was only slightly higher than for herbicide treatment methods.

Human health and safety impacts to workers and the public under a variety of herbicide 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 and will not be repeated in detail here. However, results indicate that exposure levels would not be expected to exceed acceptable levels of risk, particularly given the relatively small area to be treated and assuming compliance with recommended safety practices and procedures.

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.

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, triclopyr, or liquid hexazinone 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 the 100 ft. down slope from treated areas for up to 12 weeks following treatment." (Ando 2002)

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 percent 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.

Concern was expressed 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.

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. 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. Advanced 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 advanced notice would allow those conducting traditional gathering activities to avoid exposure to recently treated areas.

NVUM survey results indicate that Native Americans represented only 0.4 percent of Forest recreation visitors surveyed. Two percent of the visitor's surveyed indicated that they were of a race other than white. Of all visitors surveyed, those who participate in gathering natural products represented only 2 percent. Although NVUM 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, NVUM results are likely to have underestimated the number of these users. None-the-less, even if undercounting is assumed, the very small area to be treated forestwide and in traditional gathering areas 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.

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.

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.

Based on the analysis above, no disproportionate adverse impacts to employees, contractors, cooperators, or members of the public because of their race color, national origin, age, disability, sex, marital status, familial status, parental status, religion, or sexual orientation are expected to occur under Alternative 2.

Alternative 3

Under Alternative 3, the direct and indirect impacts resulting from the implementation of proposed treatment activities would be similar to those described under Alternative 2 with the following exception. No herbicides would be used; therefore impacts related to the application of herbicides would not occur. Neither workers nor the public would be at risk as a result of exposure to herbicides; however worker exposure and risks relative to physical injury may be greater than described under Alternative 2 due to the increased number of acres to be treated with physical methods. Strict adherence to health and safety regulations would be mandatory 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 provided to ensure compliance with all safety requirements including the use of required personal protective equipment.

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 manual 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.

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 gathering areas. This advanced coordination will allow for adjustments to planned treatment activities designed to improve effectiveness and address tribal concerns.

Based on the analysis above, no disproportionate adverse impacts to employees, contractors, cooperators, or members of the public because of their race color, national origin, age, disability, sex, marital status, familial status, parental status, religion, or sexual orientation are expected to occur under Alternative 3.

Alternative 4

Up to 7,068 acres could potentially be treated with herbicides under this alternative. This figure includes up to 200 acres that could also be treated with herbicides (not to exceed 100 acres in one year) under an Early Detection – Rapid Response strategy. 3

The effects of Alternative 4 would be similar to those described under Alternative 2 above, but would occur over a longer period of time (ten years verses five). This alternative has a higher predicted effectiveness 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. Risk of encroachment by noxious weed species into traditional Native American gathering areas would be reduced, but not eliminated. The additional acres that could potentially be treated under Early Detection – Rapid Response would equate to an additional 0.06 percent of the Forest above what would occur under Alternative 2.

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 percent 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 or expansion 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.

This alternative would employ the same design features as Alternative 2 in terms of advanced coordination with tribal leadership, protection of heritage resources, and advanced signing of areas to be treated, as well as the use of dyes in herbicide applications. Such measures would allow those conducting traditional gathering activities to avoid exposure to recently treated areas.

As with Alternative 2, due to the very small portion of the Forest to be treated annually, risk to members of the public, including Native Americans and others seeking to collect forest products, would be minimal. Worker safety would be protected through training, certification, use of personal protective equipment, supervision, and inspection.

Based on the analysis above, no disproportionate adverse impacts to employees, contractors, cooperators, or members of the public because of their race color, national origin, age, disability, sex, marital status, familial status, parental status, religion, or sexual orientation are expected to occur under Alternative 4.

Alternative 5

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 percent of National Forest System acres.

Effects of Alternative 5 would be the same as described under Alternative 3 except that in total, fewer of the currently infested acres would be treated, but treatment activities could continue for a longer period of time. Large sites and rhizomatous species would be difficult to control using the treatment methods specified. Additionally, soil disturbance as a result of treatment activities may increase the susceptibility of a site to re-invasion by noxious weed species. This may represent a higher risk of spread to adjoining land ownerships, including tribal trust lands compared to Alternatives 2, 4, and 6, however, Early Detection – Rapid Response would allow the treatment of new or expanded infestations of the 14 identified weed species and infestations by new species.

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 480 acres or about 8 percent of the acres that would be treated under Alternative 3. As described under the alternatives above, Alternative 5 would require strict adherence to health and safety requirements for all workers implementing treatment activities.

American Indian traditional gathering areas 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.

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 advanced coordination will allow for adjustments to planned treatment activities designed to improve effectiveness and address Tribal concerns.

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.

Based on the analysis above, no disproportionate adverse impacts to employees, contractors, cooperators, or members of the public because of their race color, national origin, age, disability, sex, marital status, familial status, parental status, religion, or sexual orientation are expected to occur under Alternative 5.

Alternative 6

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 Dalmation 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 this site would utilize herbicides.

Efforts under this alternative would be focused more on eradication of small infestations and containment and control of large infestations rather than their elimination. This alternative allows for the use of an Early Detection – Rapid Response strategy to treat not only new occurrences of the 14 identified weed species, but also occurrences of new weed species when they are first discovered, 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 percent of all National Forest System lands. Approximately 200 acres of these would 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.

Within traditional gathering areas, 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. While this would be a greater use of herbicides within traditional tribal gathering areas than under Alternatives 2 and 4, it represents only 0.01 percent 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 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. This alternative would employ the same design features as Alternatives 2 and 4 in terms of advanced coordination with tribal leadership, protection of heritage resources, and advanced signing of areas to be treated. Such advanced

notice along with the signing would allow those conducting traditional gathering activities to avoid exposure to recently treated areas.

As with Alternatives 2 and 4 above, herbicide exposure levels for members of 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.

Based on the analysis above, no disproportionate adverse impacts to employees, contractors, cooperators, or members of the public because of their race color, national origin, age, disability, sex, marital status, familial status, parental status, religion, or sexual orientation are expected to occur under Alternative 6.

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Appendix R:

Tribal Relations Specialist Report

Noxious Weeds Treatment Project

Tribal Relations Report

Prepared by:

Dan Meza

Tribal Relations Program Manager

for:

Supervisor's Office

Modoc National Forest

March 8, 2007

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Introduction - Consistency with Forest Plans and Other Laws and Policies

The tribal consultation process for the Forest is guided through a variety of laws, Executive Orders, Memorandums and case law. Some of those laws include National Historic Preservation Act and subsequent amendments, Archaeological Resources Protection Act, American Indian Religious Freedom Act, National Environmental Policy Act, and the National Forest Management Act. Executive Orders and Memorandum include Executive Order 13175 Consultation and Coordination with Indian Tribal Governments, E.O. 13007 Accommodation of Sacred Sites, and E.O. 12898 Environmental Justice. This direction was considered in the consultation process described in Chapter 1 of this FEIS.

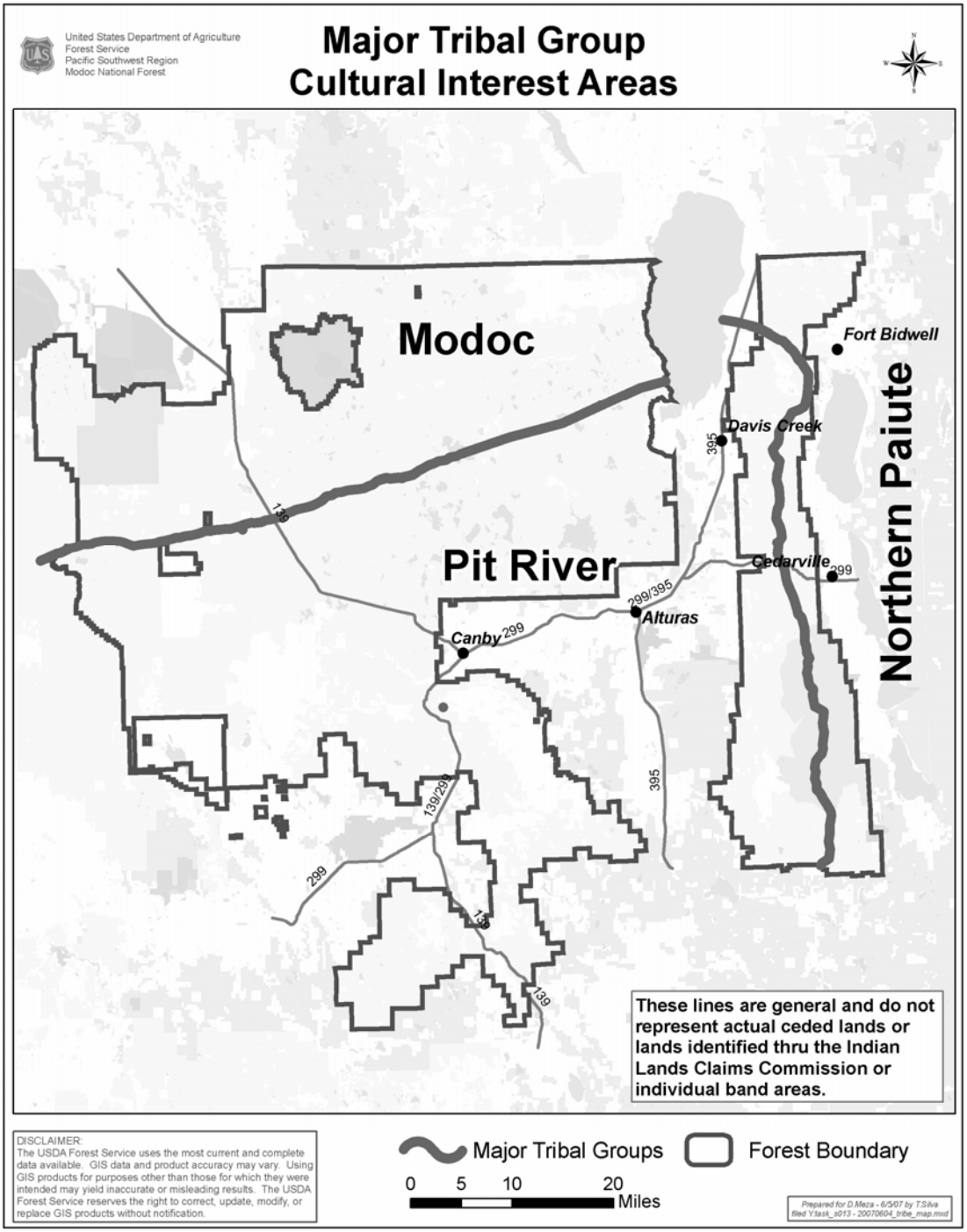
Methodology for Analysis – Tribal Consultation and Public Scoping

Five federally recognized Tribes have cultural interests in the Noxious Weed Treatment Project area. They are the Alturas Rancheria, the Cedarville Rancheria, the Ft. Bidwell Paiute Tribe, the Klamath Tribes and the Pit River Tribe. Each of the five tribes is a separate sovereign government with its own governing body and elected officials.

The Klamath Tribes have interests in the northern portion of the Forest. Their interest area is described as lands ceded by the Modoc Indians in the Treaty of 1864. That area is generally north of line from the Medicine Lake Highlands east to the southern tip of Goose Lake. The Pit River Tribe has interests based on the 100 mile square described in the Indian Claims Commission, Docket 347, 1959. That area is generally south of that Highlands to Goose Lake line and continues east to the crest of the Warner Mountains.

The Warner Mountains are a major north/south divide between the aboriginal territories of two tribal groups. Pit River Indians generally occupy the western portion of the mountains and extend along the Pit River proper. Northern Paiute Indians generally occupy the eastern portion of the mountains and extend into the Great Basin. On the western side of the Warner Mountains are the Alturas Rancheria and the Pit River Tribe. On the eastern side of the Warner Mountains are the Cedarville Rancheria and Ft. Bidwell Paiute Tribe. Each of the five tribes is a separate sovereign government with its own governing body and elected officials.

Additionally the unrecognized Shasta Tribe Inc. and the Shasta Nation Inc. have cultural interests in the project area. Both have interests in the Medicine Lake Highlands.



Tribal consultation with the federally recognized tribes began in March 1998 with preliminary telephone calls to individual tribes (see Table 1). Later, formal letters were sent to each tribe and face-to-face consultation meetings were held between line officers and tribal officials. Line officers traveled to each tribe's preferred meeting location.

In January 2001, tribal consultation with federally recognized tribes was reinitiated with telephone calls, formal letters and face-to-face meetings between line officers and tribal officials. Line officers met with tribal officials at the tribal offices of each respective tribe.

Telephone calls and letters were sent to unrecognized tribes whose relationship with the Forest had begun to develop. In February 2001, the Forest Botanist and the Forest Tribal Relations Program Manager traveled to Yreka, California to solicit input from one of the unrecognized tribes.

In November 2004, tribal consultation was reinitiated with line officer consultation meetings and staff presentations. In March 2005, formal letters were sent to the 3 tribes (Alturas Rancheria, Ft. Bidwell Indian Community Council, and The Pit River Tribe) that had submitted written comments. Formal meetings were requested to map important locations, clarify issues, develop partnerships, and continue work on the annual work plans and adaptive management. Between November 2004 and November 2006, seventeen meetings were held.

The tribes have expressed concerns about:

- The location of and population sizes of weeds.
- Weeds encroaching on tribal lands.
- Herbicides entering sub-watersheds that provide community drinking water.
- The Forest should conduct ethnobotanical inventories.
- Gathering areas need to be protected from both encroaching weeds and herbicide treatments.
- Weavers may suffer health effects due to exposure from herbicides because raw weaving materials are processed with hands, teeth and mouth.
- Herbicide use near water may impact water quality and increase weaver exposure.
- Biological controls may create other impacts because insects don’t recognize boundaries.
- Herbicide applicators need to have adequate training and certification in handling and application.
- Riparian heath.
- Treatment effects to wildlife.

The Ft. Bidwell Indian Community Council expressed specific concerns about herbicide use within the watershed that provides drinking water for the reservation. A map was developed and consultation was done. The map was redrawn based on the consultation with the Tribal Council (see Appendix N).

Through consultation, the Alturas Rancheria identified three individual plant gathering areas that are important to them on Forest Service lands. One gathering area is 184 acres, another is 103 acres and the last is 80 acres. The combined total area of these sites is 367 acres. Two of the areas do not have weed infestations in or near the gathering areas. Total acres for these 2 non-infested areas are 183 acres. The 184 acre site is infested with Dalmatian Toadflax. One

infestation is 44.33 acres and the second is 0.09 acres. The Forest will continue to work with the Tribe to determine appropriate treatment methods in the gathering area.

A plant gathering area important to the Pit River Tribe was mapped by Forest staff based on ethnographies and staff knowledge of the area. Through consultation with the Pit River Tribe the initial boundary was adjusted and a revised map was developed. Total area of the gathering site is 285,351 acres. There are 27 weed sites in the gathering area. 26 weed sites are less than 0.10 acre. One site is 0.16 acre.

Table 1: Tribal Consultation Log

Date	Tribe	Type of Contact	Location
1998			
June 16	The Klamath Tribes	Culture and Heritag Department	Tribal Fish Hatchery in Chiloquin, OF
October 2	Ft. Bidwell Paiute Tribe	Line Officer and Trib Council	Ft. Bidwell Tribal Community Building
2000			
December	Cedarville Rancheria Ft. Bidwell Paiute Tribe Klamath Tribes Pit River Tribe Shasta Tribe Inc. Confederated Bands of Shasta and Upper Klamath River Indian	Official correspondence requesting consultati meetings.	
2001			
February 1	The Shasta Tribe	Staff and Tribal Coun	Quartz Valley Road, Ft. Jones, CA
February 1	The Pit River Tribe	Line Officer and Trib Council	Forest Supervisor's Office, Alturas, C
March 24	Ft. Bidwell Paiute Tribe	Line Officer and Trib Council	Ft. Bidwell Tribal Community Building
March 26	Cedarville Rancheria	Line Officer and Trib Council	Tribal Community Building, Cedarville, CA
April 17	The Klamath Tribes	Culture and Heritag Department Staff	Culture and Heritage Office, Chiloquin OR
2004			
November	Ft. Bidwell Paiute Tribe	Line Officer and Sta	Ft. Bidwell Tribal Community Building
December	Alturas Rancheria Cedarville Rancheria Ft. Bidwell Paiute Tribe Klamath Tribes Pit River Tribe	Official Correspondence Se DEIS, additional consultation reques	
2005			
January 2	Ft. Bidwell Paiute Tribe Pit River Tribe	Staff phone call Offe to give presentation on DEIS to solicit comments	
January 2	Alturas Rancheria Cedarville Rancheria Klamath Tribes Pit River Tribe	Staff phone call Offe to give presentation on DEIS to solicit comments	
February	Ft. Bidwell Paiute Tribe	Staff to Staff	Ft. Bidwell Tribal Community Building
March 8	Pit River Tribe	Quarterly Meeting	Modoc NF Supervisor's Office, Altura CA
March 10	Ft. Bidwell Paiute Tribe	Official Correspondence Request for meeting resolve written	

Date	Tribe	Type of Contact	Location
		comments	
March 31	Alturas Rancheria Pit River Tribe	Official Correspondence Request for meeting resolve written comments	
April 6	Alturas Rancheria	Staff and Designate Cultural Representati	Conference Call
May 5	Pit River Tribe	Staff-to-Staff Meetin	Pit River Tribe Environmental Office Burney, CA
May 14	Ft. Bidwell Paiute Tribe	Staff-to-Council	Ft. Bidwell Tribal Housing Offices
June 1	Pit River Tribe	Designated Representatives	Shasta-Trinity NF Supervisor's Office Redding, CA
June 10	Ft. Bidwell Paiute Tribe	Staff and Council Members	Ft. Bidwell Tribal Community Building
2006			
March 1	Pit River Tribe	Quarterly Meeting	Supervisor's Office, Alturas, CA
April 6	Ft. Bidwell Paiute Tribe	Line and Tribal Coun	Ft. Bidwell Tribal Community Building
June 7	Pit River Tribe	Quarterly Meeting	Pit River Tribe Community Building, Burney, CA
November	Alturas Rancheria	Staff and Cultural Representatives	Field Trip

In March 1998, the California Indian Basketweavers Association (CIBA) and the California Department of Pesticide Regulation were contacted to obtain lists of individuals who were weavers. A public meeting was planned to solicit input from weavers. Letters and follow up phone calls to individual weavers were sent for the public meeting to be held in June 1998. A form was developed for individual weavers to mail in to indicate their interest in participation of the public meeting. The form was mailed to 36 individual weavers with a preaddressed envelope enclosed. One form was returned by a person that was unable to attend the meeting and wanted to continue to receive information about the development of the environmental assessment. The public meeting was held to accommodate individuals that failed to reply but still wanted to attend. The result was no participation.

In 2001, new mailing lists for individual weavers were requested. The weavers on the CIBA mailing list told the Forest of additional weavers that might be interested.

Scoping meetings with weavers were held in Alturas, Susanville and Redding, California and in Klamath Falls, Oregon. Scoping letters were sent to new contacts and the Forest sent invitations to the meetings. Nineteen telephone calls were made to coordinate the meetings. Six home visits were made to determine interest.

Because many of the weavers of the Klamath Tribes do not belong to the CIBA, the Culture and Heritage Department of the Klamath Tribes suggested an article be placed in the tribal newsletter to invite weavers to the meeting in Oregon. A news article was developed to invite weavers to the public meetings. The Forest Botanist and the Forest Tribal Relations Program

Manager met with weavers in Chiloquin and Klamath Falls, Oregon.

One weaver known to live in Alturas was contacted at home and a meeting was held in the Alturas Supervisor's Office to identify scoping issues from a weaver's perspective.

Meeting with weavers brought forth concerns related to several topics. Weavers identified the following:

- Weavers may suffer health effects due to exposure from herbicides because raw weaving materials are processed with hands, teeth and mouth.
- Consider other weed treatment methods that do not include the use of herbicides.
- St. John's Wort has medicinal value and should not be treated.
- Biological controls may create other impacts because insects don't recognize boundaries.
- Herbicide use near water may impact water quality and increase weaver exposure.
- Herbicide applicators need to have adequate training and certification in handling and application.
- Weavers need to know specific locations that herbicides have been or will be applied.
- Specific locations treated with herbicides should be identified by posting at the site location, at tribal health clinics, tribal EPA offices, libraries, post offices and through internet web sites.

In January 2005, the Forest Tribal Relations Program Manager made phone calls to individual weavers to formulate distribution of the DEIS, either through hard copy or compact disk

Through the public involvement process with basketweavers and the tribal consultation process described in Chapter 1; tribes, organizations and individuals expressed concerns regarding the project. The Content Analysis Process categorized those concerns into four Significant Issues. For this section tribal concerns are included under those four issues. Significant Issue 2 is unique to tribal communities. It is recognized that some tribal issues can be included in more than one Significant Issue; therefore some are listed more than once under each issue below. The following discussion will focus on the tribal concerns within each significant issue.

Significant Issue 1

The use of herbicides for invasive weed control may cause health problems for people who are exposed to the herbicides and/or treated areas. Although federal and state licencing and certification requirements for herbicide use build in strict safety features before use, some people have reservations about the use of these products. While many believe limited use of herbicides does not pose a significant threat to human health there are those who believe that if an alternative is selected that authorizes the use of herbicides, there is a potential that health problems could surface.

Tribal Concerns:

- Herbicide use in gathering areas may remain on plants and may create negative human health effects.
- Herbicide use near water could negatively affect water quality.
- Herbicide use near water could result in negative human health effects because culturally important plants grow near water.

- Weavers may suffer health effects to due to exposure from herbicides because raw weaving materials are processed with hands, teeth and mouth.
- The Forest should consider other treatment methods instead of herbicides to control weeds.
- Tribal communities need to know specific locations of planned and actual herbicide applications.
- If herbicides are going to be used to treat noxious weeds, applicators need to have adequate training and certification in handling and application.

Significant Issue 2

The proposed 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. As with Issue 1 above, this concern relates to potential human health problems that may be caused with the application of herbicides. In addition, herbicides may kill specific plants that are collected and used for medical or traditional purposes in specific areas.

Tribal Concerns:

- The Forest should do ethnobotanical surveys to inventory cultural plants.
- Gathering areas could be lost because of encroaching weeds.
- Herbicide use near water could result in negative human health effects because culturally important plants grow near water.
- Non-native insects released in the forested environment as biological controls may damage other native plant species.
- Weavers may suffer health effects to due to exposure from herbicides because raw weaving materials are processed with hands, teeth and mouth.
- The Forest should consider other treatment methods instead of herbicides to control weeds.
- St. John's Wart has medicinal value and should not be treated.
- Tribal communities need to know specific locations of planned and actual herbicide applications.

Significant Issue 3

An alternative is needed to respond to the need to evaluate and aggressive approach using additional treatment methods and adaptive management for treating more acres annually over a ten year period to control and eradicate noxious weeds. The Proposed Action is seen as too limited and ineffective.

Tribal Concerns:

- Noxious weeds may move onto trust lands that currently are free of certain species.
- The location and size of the weed sites may adversely affect use of the forest.

Significant Issue 4

The proposed application of herbicides for weed control has the potential to harm the physical and biological resources of the Forest. The use of herbicides has the potential to adversely affect the soil and water resources and therefore may harm humans, animals, and native plants.

Tribal Concerns:

- Noxious weeds may move onto trust lands that currently are free of certain species.
- Herbicides may pollute watersheds that provide community drinking water.
- Noxious weeds could out-compete native plants and create poor riparian health.
- Herbicides may create negative affects to wildlife and other threatened and endangered wildlife species.
- Herbicide use near water could negatively affect water quality.
- If herbicides are going to be used to treat noxious weeds, applicators need to have adequate training and certification in handling and application.

Affected Environment

The tribes gather forest products for consumption, medicinal and spiritual use. Consultation has indicated a wide range of plants important to the tribes. The California Indian Basketweavers Association has also expressed an interest in the project; particularly related to the protection of culturally significant gathering sites and herbicide use.

Some species which have been identified as culturally significant by one or more of these groups include: sagebrush (Artemisia tridentata), epos (Perideridia spp.), elderberries (Sambucus spp.), wild onions (Allium spp.), mules ears (Wyethia mollis), wild plums (Prunus spp.), Oregon grape (Berberis aquifolium), manzanita (Arctostaphylos nevadensis and A. patula), currant (Ribes spp.), willows (Salix spp.), white fir (Abies concolor), dogbane (Apocynum spp.), cedar (Calocedrus decurrens), juniper (Juniperus occidentalis), and various species of Pine (Pinus spp.) (LeBeau 1999). Additional plants have been identified in the Telephone Flat Geothermal Development Project Final EIS/EIR (February 1999); in A Field Guide to Ethnobotanical Plants of the Winema National Forest (Emanuel 1994); and in Ethnobotanical Surveys of the Medicine Lake Highlands (Miller 2004).

Many of the plants that have cultural importance to the tribes are very common throughout the Forest.

In addition to culturally significant species several documents identify areas on the Forest as traditional cultural properties, or places (TCPs) used by these contemporary groups. Among these are the Roybal-Evans (1982) report "Sites with Cultural Significance for the Upriver Bands of the Pit River Indian Tribe and John Allison's (1994) volume entitled "The Cultural Landscape of the Klamath, Modoc and Yahooskin Peoples: Spirit, Nature, History". Other relevant sources in this subject area include several ethnographic reports prepared for various utility projects that have crossed the Forest in the last decade. Examples of sites or areas considered as TCPs by Native Americans could include springs (where medicinal waters may be extracted), mountain peaks, and the vast epos fields in the Devil's Garden. Three of the currently identified TCPs are eligible for nomination to the National Register of Historic Places (NRHP).

Proposed Action and Alternatives

Table 2, on the next page, provides a comparison between the alternatives showing the timeframes, treatment methods, and number of sites and acreage to be treated.

Table 2: Summary Comparison of Alternatives for the Noxious Weed Treatment Project

Alternatives / Alternative Features	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6
Treatment Timeframe	**Ongoing***	**5 years**	**5 years**	**10 years**	**10 years**	**10 years**
Treatment Sites and Acres	Sites/Acres	Sites/Acres	Sites/Acres	Sites/Acres	Sites/Acres	Sites/Acres
Total Inventoried Weeds (2004)	541/6908	541/6908	541/6908	541/6908	541/6908	541/6908
Inventoried Weeds Fully Treated	20-30 ac/yr[1]	520/5,995	494/5,993	520/5,995	520/180	538/241
Inventoried Weeds Receiving Partial Treatment[2]	0/0	16/904[2]	0/0	16/904[2]	0/0	0/0
Inventoried Weeds Receiving Limited Treatment[3]	0/0	0/0	0/0	0/0	9/100[3]	3/100[3]
Inventoried Weeds Not Treated[4]	6,878[1]	5/9[4]	47/916[4]	5/9[4]	5/5515	0/6,567[4]
Proportion of Inventoried Weeds Treated	0.4%	n.a./87%	91%/87%	99%/99%	100%/4%	100%/5%
Noxious Weeds Treated Through Early Detection – Rapid Response (ED – RR, acres)[5]	0	0	0	Up to 200 acres (100 ac max/yr)	Up to 200 acres (100 ac max/yr)	Up to 200 acres (100 ac max/yr)
Total Acres of Weeds Treated	20-30 ac/yr[1]	6,899 acres	5,993 acres	7,099 acres	480 acres	541 acres
Treatment Methods for Inventoried Noxious Weeds (2004)	Sites/Acres	Sites/Acres	Sites/Acres	Sites/Acres	Sites/Acres	Sites/Acres
Physical – hand pulling, hoeing, grubbing	0/0	161/31	494/5,993	161/31	0/0	0/0
Physical+ – Physical plus, clipping seed head or plant, weed eater, mulch/tarp	20-30 ac/yr[1]	0/0	0/0	0/0	527/139	116/19

Alternatives / Alternative Features	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6
Physical and/or Herbicide Treatment	0/0	333/5,961	0/0	333/5,961	0/0	371/116
Herbicide	0/0	42/907	0/0	42/907	0/0	46/65
Limited Treatment[3]	0/0	0/0	0/0	0/0	9/100	3/100
Goat Grazing or Herbicide Treatment	0/0	0/0	0/0	0/0	5/41	5/41
Total Acres Potentially Treated with Herbicides (Incl. ED-RR acres)[6]	0/0	355/6,868	0/0	355/,7068	0/0	425/522

[1]Under Current Management (Alt. 1), approximately 20 to 30 acres of noxious weeds are treated each year through other site specific NEPA decisions as part of other projects in accordance with the Modoc NF Integrated Weed Management Strategy (2005).

[2]These sites are rhizomotous species that occur within 10 feet of H2O. Those sites that are within 10 feet of H2O would not be treated. Sites with acreage ooutside of this 10 foot no treatment zone would receive partial treatment. The acreage within the 10 foot zone would not be treated, the acreage outside the 10 foot zone would be treated with herbicides.

[3]Includes treating along borders of infestations to prevent spread using the methods specific to each alternative. Treatment is estimated at 100 acres to be proportionally distributed based on the size of the individual infestations. These acres are included in the Inventoried Noxious Weeds Treated acreage.

[4]Excluded in Alt. 2 and Alt. 4: 5 sites of rhizamotous species that are within 10' of live water and partial acreage of 16 sites of rhizamotous species that are within 10' of live water. Rhizamotous species will not be treated by physical methods in these alternatives. Excluded in Alt. 3: 47 sites of rhizamotous species. Excluded in Alt. 5: 5,658 acre Dyer's woad, 850 acre Dalmatian toadflax, 159 acre crupina, and 6 sites of rhizamotous species. These sites will receive limited treatment around the perimeter estimated at 100 acres proportionally distributed based on the size of these sites. Excluded in Alt. 6: 5,658 acre Dyer's woad, 850 acre Dalmatian toadflax, 159 acre crupina. These sites will receive limited treatment around the perimeter estimated at 100 acres proportionally distributed based on the size of these sites.

[5]May use any of the methods approved for use in this NEPA decision.

[6]For Alt. 2 this includes the acres under the physical and/or herbicide method plus the herbicide treated acres. Alt. 4 adds the same categories as Alt. 2 plus adds in the potentially treated 200 acres through early detection rapid response. Alt. 6 includes the Physical and/or Herbicide acres, the herbicide acres, the acres under goat grazing, the acres under the limited treatment category, and the 200 acres under Early Detection-Rapid Response.

Environmental Consequences

All Alternatives

Direct and Indirect Effects Common to All Alternatives

Location of Treatment Areas/Planning

Under all alternatives, the Forest will work closely with the federally recognized tribes in the area to share its annual work plan with the tribes and to consult on treatment methods near trust lands, the important gathering areas that have been identified through consultation on this FEIS, and other culturally important areas that could be identified in the future. Design Standard DS-2 addresses planning and treatment priorites. *Design Standard DS-01 states that consultation on the annual work plan will be done with the tribes;* has been incorporated in all alternatives.

Range of Alternatives

This FEIS considers a full range of alternatives. Chapter 2: Alternatives Description and Comparison of Alternatives, describes each alternative in detail.

Biological Controls

Biological Controls of non-native insects released in the forested environment are not considered for treatment of noxious weeds in this FEIS.

St. John's Wart

Klamath Weed (Hypericum perforatum), also known as St. John's Wart is one of the 14 weeds considered for treatment under this FEIS. Although it is considered to have medicinal uses it has been identified for treatment for the following reasons. This weed is a rhizomatous species that is a non-native plant that displaces native plant populations. Treatment under this FEIS is by physical methods only and does not include the use of herbicides. Treating Klamath weed will reduce its availability locally over time. The plant is readily available in other locations of the country. It will be treated by physical methods and no herbicides will be applied to this plant. The Forest does not anticipate any concerns in relation to human health effects to gatherers collecting this plant.

Inventory of Cultural Plants

Modoc National Forest Botanists have received training in Ethnobotany. They also participate in sessions that have cultural representatives as speakers to increase awareness about cultural plants. The Forest Botanist held in a temporary assignment in the National Office to do ethnobotanical work. It is more important to know where special gathering areas are than being able to "demarcate where no herbicides can be applied". This way the Forest can determine an appropriate treatment method that is also effective on a particular weed. This can be accomplished through consultation on the annual work plans and at other project level consultation.

Most of the cultural plants in the references used for this analysis are very common plants which are widely distributed and include large populations on the Forest. Additionally most of

the plant communities are very common on the surrounding National Forests and BLM lands. Because most cultural plant communities are so common, it is impossible to inventory the entire 1.6 million acres of the Forest for this analysis. The Forest includes cultural plants as part of its monitoring protocols for other projects under the Sierra Nevada Forest Plan Amendment.

Gathering Areas

There are three traditional cultural properties, eligible to the National Register of Historic Places on the Forest. Eligibility for all three properties is based on values important to the surrounding tribes. The TCPs also contain important plant gathering areas that contribute to those values. Total acreage for the three TCPs is 48,853 acres. These areas are free of the 14 weed species identified for treatment in this FEIS. None of the treatment alternatives would affect these TCPs.

Through consultation, the Alturas Rancheria identified three individual plant gathering areas that are important to them on Forest Service (FS) lands. One gathering area is 184 acres, another is 103 acres and the last is 80 acres. Total acreage for the three gathering areas is 367 acres. The 184 acre site is infested with Dalmatian Toadflax. Two of the areas do not have weed infestations in or near the gathering areas. Total acres for these two non-infested areas are 183 acres. None of the treatment alternatives would affect these two gathering areas. The gathering area infested with Dalmatian Toadflax is discussed below in more detail.

Alternative 1: No Action

Direct and Indirect Effects

Trust Lands

Under this alternative, noxious weeds would continue to spread and progress toward tribal trust lands. Currently populations of Scotch Thistle on Forest Road 47N09 pose a threat to lands held in trust for the Pit River Tribe on XL Ranch near McGinty Point. The Tribe has an active weed eradication program, which includes, manual/physical, biological and herbicide treatment methods; in cooperation with the Bureau of Indian Affairs on its trust lands.

Populations of Dyer’s Woad on Forest Road 47N72 have been increasing annually and pose a threat to lands held in trust on the Ft. Bidwell Indian Reservation. Today the Reservation is free of Dyer’s Woad.

In February, 2004, the forest on the Ft. Bidwell Paiute Reservation was certified as a well managed forest by Scientific Certification Systems under the Forest Conservation Program in accordance with the Forest Stewardship Council’s Principles and Criteria. Certified species include ponderosa pine, white fir, incense cedar, and other merchantable species. This was based in part, on the Tribe’s willingness to begin addressing noxious weeds on the Reservation. This work has been in partnership with the Modoc National Forest, Surprise Valley Resource District of the BLM and the Bureau of Indian Affairs. Technical assistance in the form of training and field trips has been provided. The Tribe has an active weed eradication program that uses manual/physical treatments on its trust lands.

By not treating noxious weeds the Forest would not be able to protect trust resources of interest to these federally recognized tribes.

Gathering Areas

Through consultation, the Alturas Rancheria identified three individual plant gathering areas that are important to them on FS lands. Two of the areas do not have weed infestations in or near the gathering areas. Total acres for these two areas are 183 acres. One 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.

A field visit, to the infested gathering area, was held between the Forest and tribal representatives. After the field trip, Tribe responded in writing; they want the Forest to treat the infestation in this gathering area. By not treating noxious weeds under the No Action Alternative, this gathering area could be lost due to encroaching Dalmatian Toadflax.

A plant gathering area important to the Pit River Tribe was mapped by FS staff based on ethnographies and staff knowledge of the area. Through consultation with the Pit River Tribe the initial boundary was discussed and the boundaries were adjusted as a result of this consultation. Total acreage of the gathering site is 285,351 acres. There are 27 weed sites in the gathering area. Twenty-six weed sites are less than 0.10 acres. One site is 0.16 acres. Although these sites are small in size, under the No Action Alternative; over time they would continue to grow and more of the resource would be lost.

Gatherers

Noxious weeds could pose a threat to other traditional gathering areas not identified on the Forest. Sometimes it is very hard to identify gathering areas used by traditionalists. Many traditional users are hesitant to disclose gathering areas. In the past, on other Forests, locations of gathering sites have been disclosed to the public. This has resulted in damage of the resource both through, using incorrect harvest methods and by collecting all the resource so regeneration does not occur. Many gathering areas are often within or adjacent to riparian areas and along roads. By not treating noxious weeds these gathering areas could be lost due to encroaching noxious weeds.

A GIS analysis of weed occurrence locations in relation to the FACTS database was completed. In this analysis, all weed occurrences were queried to determine their proximity to roads and waterways. Over 90% of the weed occurrences occur along roads. Roadside use for gathering is very important to elder women. They can no longer access the forest as they did in their youth and are sometimes limited to roadside collection. Under the No Action Alternative there would be a continued loss of gathering areas from encroaching weeds along roadsides. This could have a negative impact to elder women who depend on roadside gathering areas. There would not be any health effects to elder women from the use of herbicides under this alternative.

Cumulative Effects – Alternative 1: No Action

Although tribes, private landowners, federal, state and local governments administering lands adjacent to the Forest will continue noxious weed treatment activities, they will be unable to treat

all weed populations. Some weed infestations on lands adjacent to the Forest will remain untreated. By not treating noxious weeds, populations would contribute to, or accelerate the long-term decline in the health and sustainability of native plant communities. The resulting decrease in biological diversity and the reduction of cultural benefits that natural plant communities provide would adversely impact tribal communities. This could mean a loss of available materials that are vital to carrying on cultural practices and traditions associated with things like basket weaving, use of medicinal plants, ceremonies and prayer.

Costs incurred by tribes to treat noxious weeds on trust lands would likely increase as a result of increased spread of weeds from FS lands that remain untreated. Indian trust lands are classified as federal lands and the Forest has a responsibility to protect other federal lands. As a federal agency there is a special relationship between tribes and the Forest Service. This relationship is a fiduciary relationship to help tribes prosper and continue into perpetuity. By not treating noxious weeds, the Forest would not be protecting trust resources.

Alternatives 2, 4, and 6: Herbicide Use

Direct and Indirect Effects

Trust Lands

Under these alternatives, the Forest would have more flexibility and a wider range of treatment options to halt or slow down the noxious weeds spreading toward tribal trust lands.

The populations of Scotch Thistle on Forest Road 47N09 that are posing a threat to lands held in trust for the Pit River Tribe on XL Ranch near McGinty Point are less than 0.10 acres. Those populations could be treated either through physical methods or herbicides depending on consultation outcomes during the annual planning.

The populations of Dyer's Woad on Forest Road 47N72 that have been increasing annually and posing a threat to lands held in trust on the Ft. Bidwell Indian Reservation could be treated either through physical methods or herbicides depending on consultation outcomes during the annual planning. It should be noted that Table 2-10 Weed Table Comparison of the FEIS, indicates that mechanical methods are not effective treatment methods for this weed. Currently the Reservation is free of Dyer's Woad.

In February, 2004, the forest on the Ft. Bidwell Paiute Reservation was certified as a well managed forest by Scientific Certification Systems under the Forest Conservation Program in accordance with the Forest Stewardship Council's Principles and Criteria. Certified species include ponderosa pine, white fir, incense cedar, and other merchantable species. This was based in part, on the Tribe's willingness to begin addressing noxious weeds on the Reservation. This work has been in partnership with the Modoc National Forest, Surprise Valley Resource District of the Bureau of Land Management (BLM) and the Bureau of Indian Affairs (BIA). Technical assistance in the form of training and field trips has been provided. Keeping the reservation free of Dyer's Woad is important to the Tribe.

Community Drinking Water

The Ft. Bidwell Indian Community Council has changed its position on the use of herbicides

over the years. Tribal elections have produced changes in Tribal Council Members and Tribal Chairs. Previous Tribal Councils have supported the use of herbicides on FS lands. Currently the Tribe is not using herbicides on the Reservation as a treatment method under its Weed Treatment Program.

During formal consultation with the Council, they expressed specific concerns about herbicide use, within the sub-watershed, that provides drinking water for the reservation. The sub-watershed in which the community based water system is located, is not identified as a Municipal Watershed within the state of California. Nonetheless, given the trust responsibility the Forest has toward the Tribe, the Council's concerns about the community water system is an important consideration. The non-treatment with herbicides is supported by the Forest Hydrologist and the Forest. A map of the sub-watershed was developed by Forest Hydrologist and Tribal Relations Program Manager. Consultation was done with the Tribe on the initial boundary and the boundary was adjusted as a result of that consultation to meet the Tribe's concerns (See sub-watershed map displayed in Appendix N of the FEIS).

Currently there are no inventoried weed populations within this identified area of concern on FS lands. Although noxious weeds do not exist in this sub-watershed, consultation would continue to identify suitable treatment methods under Early Detection - Rapid Response should weeds become established in the future. The potential for infestations by noxious weed species that are treatable only by herbicides exists in the future. The Forest has made a commitment to the Tribe; it will not use herbicides to treat weeds in this area of concern without formal consultation. This commitment is documented in the Mitigation Section in Chapter 2 of the FEIS.

Gathering Areas

One of the plant gathering areas identified by the Alturas Rancheria on FS lands has two Dalmatian Toadflax infestations on the site. This gathering area is 184 acres. One infestation is 44.33 acres and the second is 0.09 acres. Table 2-10 Weed Treatment Comparison in the FEIS indicates that physical/manual methods are not effective to treat this rhizomatous weed. These two weed sites are identified to be treated with herbicides.

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 2-10 Weed Treatment Comparison in the FEIS. In their letter, the Tribe wrote; they have alternate places for gathering the resource provided by the gathering area. They requested a timeline for treatment and subsequent monitoring.

The 285,351 acre plant gathering area identified through ethnographies and remapped through consultation with the Pit River Tribal Council has 27 weed sites within the gathering area. Twenty-six (26) weed sites are less than 0.10 acres. One site is 0.16 acres. These populations could be treated either through physical methods or herbicides depending on consultation outcomes during the annual planning.

If Alternative 2, 4, or 6 were selected, treatment methods will be direct foliage spray or by

wicking individual plants. These application methods will result in treatment of only targeted plants and will minimize herbicide application to non-target plants.

Gathering Areas and Participating Agreements

The Pit River Tribe and the Fort Bidwell Indian Community Council, have active noxious weed eradication programs on trust lands in partnership with the Bureau of Indian Affairs and the Bureau of Land Management. The Forest has consulted with each tribe about using participating agreements to treat weeds in sensitive areas with their own weed crews.

Sensitive tribal cultural and gathering areas may be treated in accordance with Section 323 of Public Law 105-277, as amended by section 330 of Public Law 107-63. The law authorizes the Secretary of Agriculture to use appropriations for the FS for the purpose of entering into cooperative agreements with, tribal governments, private and nonprofit entities, and landowners to provide for the protection, restoration, and enhancement of fish and wildlife habitat and other resources. The Forest could utilize these same agreements to treat other FS lands for the control and eradication of noxious weeds. One example of an agreement the Forest is willing to use to treat weeds is shown in Appendix L of the FEIS.

Gathering Areas and the Tribal Forest Protection Act

Public Law 108-278, Tribal Forest Protection Act of 2004 enables federally recognized tribes to enter into agreements or contracts to carry out projects to protect Indian forest land or rangeland to restore Federal land that borders on or is adjacent to tribal trust lands. Tools for implementing the Tribal Forest Protection Act (TFPA) are included in FSH 2409.19, Renewable Resources Handbook, Chapter 60, Stewardship Contracting.

The Pit River and Ft. Bidwell Paiute Tribes have trust lands adjacent to the Forest. There have been discussions with each tribe about using TFPA since its passage. To date, neither tribe has requested to use TFPA. There is good potential to use the Act to treat weeds under this authority; TFPA specifically addresses the need for environmental review; this FEIS will fulfill those requirements.

Health Effects to Gatherers

Noxious weeds could pose a threat to other traditional gathering areas not identified on the Forest. Sometimes it is very hard to identify gathering areas used by traditionalists. Many traditional users are hesitant to disclose gathering areas. In the past, on other Forests, locations of gathering sites have been disclosed to the public. This has resulted in damage of the resource through both, using incorrect harvest methods and by collecting all the resource so regeneration does not occur. Many gathering areas are often within or adjacent to riparian areas and along roads.

Over 90% of the weed occurrences occur along roads. Treatment methods using herbicides could have direct and indirect effects to one segment of tribal communities, elder women. Tribes throughout the state of California have worked very hard to educate agencies about the need to eliminate or reduce the use of herbicides along roads, highways and other transportation systems. Roadside use for gathering is very important to these elder women. They can no longer access the forest as they did in their youth and are sometimes limited to roadside collection. These

elders could risk of more exposure to herbicides than any other segment of tribal communities. Although the risk is greater it would be lessened by Design Standard DS-2, Planning and Design Standard DS-36, Signing and Posting.

Specific to gatherers and weavers, the California Environmental Protection Agency, Department of Pesticide Regulation completed a study, *Residues Of Forestry Herbicides In Plants Of Interest To Native Americans In California Forests In December 2002.*

This study evaluated herbicide residue levels in bracken fern roots (rhizomes), buckbrush shoots, golden fleece foliage, and manzanita berries growing in herbicide application areas of the El Dorado, Stanislaus and Sierra National Forests resulting from ground applications of glyphosate, triclopyr, and liquid hexazinone, and aerial applications of granular hexazinone. Hexazinone is not being considered to treat weeds in this FEIS. Of the herbicides studied, glyphosate and triclopyr are proposed for use in treating noxious weeds in this FEIS.

Conclusions of the study are that; "Due to varied environmental conditions, different plant growth stages, and time of herbicide applications, results were highly variable. In general, low residue levels were detected … in roots of bracken fern treated with glyphosate, triclopyr, ... 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 that plant-herbicide combination.

Also, gatherers sampling shoots, foliage, and berries in herbicide 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 basketweavers are exposed to hazardous levels of the four forestry herbicides."

The study concluded that "As herbicide residues were found to move off-site to non-treatment areas, plant gatherers and basketweavers may want to select plants beyond the 100 ft down slope from treated areas for up to 12 weeks following treatment."

It is important to note, that treatment methods under alternatives 2, 4, and 6, will be direct foliage spray or by wicking individual plants. These application methods will result in treatment of only targeted plants and will minimize herbicide application to non-target plants.

The Human Health and Safety section and Appendix F of the FEIS displays other potential risks to using herbicides under these alternatives specific to this section.

Location of Treatment Areas/Signing and Posting

Members of the California Indian Basketweavers Association (CIBA) and the tribes expressed a strong desire for the Forest to post and sign locations that herbicides would be used for weed treatment. Design Standard DS-36, Safety and Health: *Signs regarding herbicide use will be placed at access points to treatment areas prior to initiating treatment. Signs will list herbicides to be used, effective dates, and name and phone number of Forest contact.;* has been incorporated

in all the alternatives that use herbicides.

Herbicide Handling Certification

Tribal concerns about adequate training and certification in handling and applying herbicides to control noxious weeds are addressed in Design Standard, DS-37 Safety and Health*: Herbicides will only be applied by trained and/or certified applicators in accordance with label instructions and applicable federal and state pesticide laws*; and Design Standard, DS-35 Safety and Health: *All Personal Protective Equipment, required by state and federal regulations, for the specific type of treatment being implemented, will be used during field operations.* These standards are included in all herbicide alternatives.

The Human Health, Botany, Wildlife, Water Quality, and Social Effects sections of the FEIS display other potential risks to using herbicides under these alternatives.

Cumulative Effects- Alternatives 2, 4, and 6: Herbicide Use

In combination with weed treatments on adjacent tribal and other lands, using these alternatives would contribute to the long term improvement and maintenance of biodiversity and ecosystem health. Under these alternatives, the Forest would have more flexibility and a wider range of treatment options to halt or slow down the noxious weeds spreading toward tribal trust lands. Cost to tribes and adjacent landowners to treat noxious weeds would be reduced in the long term because seed sources on FS lands would be reduced or eliminated.

Over 90% of the weed occurrences occur along roads. Treatment methods using herbicides could cause increased cumulative effects to one segment of tribal communities, elder women. Tribes throughout the state of California have worked very hard to educate agencies about the need to eliminate or reduce the use of herbicides along roads, highways and other transportation systems. In depth tribal knowledge of culture and traditions is now held by a small remaining number of elders. Indigenous intellectual knowledge is passed down from these remaining elders to children. These elders work through health clinics and education systems on the reservations to provide field trips to the youth of tribal future. In the majority of tribal communities this indigenous intellectual knowledge is also held by elder women. Roadside use for gathering is very important to these elder women. They can no longer access the forest as they did in their youth and are sometimes limited to roadside collection. These elders would suffer the greatest risk of exposure to herbicides than any other segment of tribal communities. Although the risk is greater for these elders it would be lessened by Design Standard DS-2, Planning and Design Standard DS-36, Signing and Posting. The risk would also be lessened when tribes use the Participating Agreements used as an example in Appendix L and the Tribal Forest Protection Act to treat weeds in areas of concern within the framework of the Record of Decision for this FEIS.

Herbicide treatment on FS lands, when combined with herbicide treatments on adjacent lands could result in a potential for increased exposure to some members of tribal communities. These risks are also discussed in the Human Health and Safety section and Appendix F of the FEIS. The anticipated risk to human health is low.

Alternatives 3 and 5: No Herbicide Use

Direct and Indirect Effects

Location of Treatment Areas/Planning

Under these alternatives, the Forest will still work closely with federally recognized tribes to share its annual work plan and to consult on treatment methods near trust lands, the important gathering areas identified above, and other culturally important areas that could be identified in the future. Under Alternatives 3 and 5, the Forest may not be able to halt or slow down the noxious weeds spreading toward important areas of tribal concern.

Trust Lands

The populations of Scotch Thistle on Forest Road 47N09 that pose a threat to lands held in trust for the Pit River Tribe, on XL Ranch near McGinty Point are less than 0.10 acres. Those populations could be treated through these alternatives.

The populations of Dyer's Woad on Forest Road 47N72 which been increasing annually pose a threat to lands held in trust on the Ft. Bidwell Indian Reservation. Today the Reservation is free of Dyer's Woad. Table 2-4 Weed Treatment Comparison on page 35 of the FEIS indicates that physical/manual methods may not effective to control this weed. Under Alternatives 3 and 5, the Forest may not be able to protect trust resources of interest to the Ft. Bidwell Indian Community Council though these alternatives.

Community Drinking Water

Currently the Ft. Bidwell Indian Community Council is not using herbicides on the Reservation as a treatment method under its Weed Treatment Program.

During formal consultation with the Council, they expressed specific concerns about herbicide use, within the sub-watershed, that provides drinking water for the reservation. The sub-watershed in which the community based water system is located, is not identified as a Municipal Watershed within the state of California. Nonetheless, given the trust responsibility the Forest has toward the Tribe, the Tribe's concerns about the community water system is an important consideration.

A map of the sub-watershed was developed by Forest Hydrologist and Tribal Relations Program Manager. Consultation was done with the Tribe on the initial boundary and the boundary was adjusted as a result of that consultation to meet the Tribe's concerns. Currently none of the 14 weeds identified for treatment under this FEIS are growing on FS lands in the sub-watershed.

Under Alternatives 3 and 5, the Tribe would not be concerned with herbicide use within the sub-watershed that supplies drinking water for the Reservation. Although noxious weeds do not exist in this sub-watershed on FS lands, consultation would continue to identify suitable treatment methods under Early Detection - Rapid Response should weeds become established here in the future (See sub-watershed map displayed in Appendix N).

Gathering Areas

Through consultation, the Alturas Rancheria identified three individual 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 acres. The 184 acre gathering area has 2 Dalmatian Toadflax infestations on the site. One infestation is 44.33 acres and the second is 0.09 acres. Table 2-4 Weed Treatment Comparison in the FEIS indicates that physical/manual methods are not effective to treat this rhizomatous weed. This gathering area could be lost due to encroaching Dalmatian Toadflax under Alternatives 3 and 5.

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 2-10 Weed Treatment Comparison of the FEIS. In their letter, the Tribe wrote; they have alternate places for gathering the resource provided by the gathering area. They requested a timeline for treatment and subsequent monitoring.

The 285,351 acre plant gathering area identified through ethnographies and remapped through consultation with the Pit River Tribal Council has 27 weed sites within the gathering area. Twenty-six (26) weed sites are less than 0.10 acres. One site is 0.16 acres. Although the sites are small, 1 site contains more than 500 plants of Canada Thistle. Two sites contain more than 1000 plants of Canada Thistle. Three sites contain more than 1000 plants of Scotch Thistle. An additional site is 25 plants of Dyers Woad. Table 2-10 Weed Treatment Comparison of the FEIS indicates that physical/manual methods are not effective to treat large populations of Canada and Scotch Thistles. The table also indicates that the Dyer's Woad site may not be treated effectively. Under Alternatives 3 and 5, these populations could be held in check, although it may be hard to adequately control them.

Health Effects to Gatherers

Using these alternatives, the Forest would not anticipate concerns from many of the basketweavers that met with representatives of the Forest in Susanville, Redding, Alturas, California and Klamath Falls, Oregon. At those meetings individual weavers expressed concerns about the use of herbicides on the Forest.

In 2002, the Forest obtained the California Indian Basketweavers Association's, CIBA Policy On Control of Non-Native Invasive Plants. One goal of the CIBA resource protection program is, "To halt the use of pesticides on public lands and in other areas where they affect native basketweavers and gatherers, and advocate for alternatives to pesticides." Under Alternatives 3 and 5, the Forest would meet the objectives of CIBA's policy, although it may not be able to prevent the loss of other gathering areas.

Cumulative Effects – Alternatives 3 and 5: No Herbicide Use

One of the plant gathering areas identified by the Alturas Rancheria on FS lands has two Dalmatian Toadflax infestations on the site. This gathering area is 184 acres. One infestation is 44.33 acres and the second is 0.09 acres. Table 2-10 Weed Treatment Comparison of the FEIS

indicates that physical/manual methods are not effective to treat this rhizomatous weed. These two weed sites are identified to be treated with herbicides.

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 2-10 Weed Treatment Comparison of the FEIS. In their letter, the Tribe wrote; they have alternate places for gathering the resource provided by the gathering area. They requested a timeline for treatment and subsequent monitoring. Under Alternatives 3 and 5 the Forest would not be able to effectively treat the weeds in this gathering area. The cumulative effects would be increased Dalmatian Toadflax in the gathering area.

Although tribes, private land owners, federal, state and local governments administering lands adjacent to the Forest will continue noxious weed treatment activities, they will be unable to treat all weed populations. Some weed infestations on lands adjacent to the Forest will remain untreated. By not treating noxious weeds, populations would contribute to, or accelerate the long-term decline in the health and sustainability of native plant communities. The resulting decrease in biological diversity and the reduction of cultural benefits that natural plant communities provide would adversely impact tribal communities. The cumulative effects could mean a continued loss of available materials that are vital to carrying on cultural practices and traditions associated with things like basket weaving, use of medicinal plants, ceremonies and prayer.

Costs incurred by tribes to treat noxious weeds on trust lands would likely increase as a result of increased spread of weeds from FS lands that remain untreated. Indian trust lands are classified as federal lands and the Forest has a responsibility to protect other federal lands. As a federal agency there is a special relationship between tribes and the Forest Service. This relationship is a fiduciary relationship to help tribes prosper and continue into perpetuity. Under Alternatives 3 and 5, it would be harder to protect trust resources important to the Ft. Bidwell Paiute Tribe and the Pit River Tribe.

Under these alternatives there would be no cumulative effects from herbicides in the sub-watershed that provides community drinking water to the Ft. Bidwell Paiute Tribe. The Forest would still consult on treatment methods if weeds were to become established in the sub-watershed.

The cumulative use of herbicides would be lower than under alternatives 2, 4 and 6. Potential for impacts to human health from these chemicals is also lower.

Cumulative Effects- By Resource Activity

This cumulative effects analysis was done on forest activities identified in *Table 3-1: Ongoing and Reasonably Foreseeable Activities* of the FEIS. The following activities were used in the analysis. They are Fuels/Prescribed Fire, Range Management, Recreation, Reforestation, Roads Administration, Timber Sale Administration/Vegetation Treatment, Special Uses, Past Noxious Weed Treatment and the Sagebrush Steppe Ecosystem Restoration Project.

The analysis is focused on activities primarily on National Forest land within the boundaries of the Forest. The analysis uses the concerns identified by Tribes and weavers to determine if the activity combined with either treating weeds or not treating weeds creates: 1) additional human health effects to tribal gatherers; 2) if access to important cultural or gathering areas is reduced; 3) if there would be a loss in gathering areas.

A GIS analysis of weed occurrence locations in relation to the FACTS database was completed. In this analysis, all weed occurrences were queried to determine their proximity to roads and waterways. Over 90% of the weed occurrences 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. Again over 90% of these infestations occur along roads indicating that roads are the major vector for the introduction and spread of noxious weeds on the Forest.

The Forest is now required to do Noxious Weed Risk Assessments (FSM 2081.03) prior to project activities. Before this requirement a number of forest activities had contributed to the spread of noxious weeds. Soil disturbance as a result of project implementation created a good environment for noxious weeds.

Cumulative effects to tribal communities have been the loss of gathering areas that once were along the sides of roads. The requirement to do Noxious Weed Risk Assessments prior to project activities has reduced the cumulative effects associated with the gradual loss of some gathering areas. This has been accomplished by implementing practices that reduce the spread of weeds into new areas. The decision to implement the Integrated Weed Management Strategy (USDA Forest Service, Modoc National Forest, September 2005) has also reduced the cumulative effects associated with the spread of weeds and the loss of gathering areas.

Cumulative Effects from Fuels/Prescribed Fire

Table 3-1 of the FEIS shows 518 acres of fuels were burned in 2005 and that 5,942 acres are planned for the next year. The Sierra Nevada Forest Plan Amendment (SNFPA), Record of Decision, Chapter VIII Implementation, Part E, Native American Relations identifies several items directly related to the Prescribed Fire program on the Forest.

- *We will consult with appropriate tribal governments and tribal communities regarding fire protection and fuels management activities that potentially affect rancherias, reservation, and other occupied areas. …"*
- *We will consider the relationship between fire management and plants culturally important to American Indians. Where fuels treatments may affect tribes or tribal communities, or plants culturally important to them, we will consult on the development of burn plans, and consider approaches that accommodate traditional scheduling and techniques of fire and vegetation management.*
- *We will, where appropriate, include culturally significant species in monitoring protocols related to management activities.*

The Forest has been consulting with tribes on projects in areas they have indicated are important to them. The Forest includes significant species in some of its monitoring protocols while implementing the Fuels program on the Forest.

The fuels program does not use herbicides for implementation therefore there are no increased negative human health effects to gatherers due to exposure to chemicals.

Smoke management has been an important component of the prescribed fire program and there have not been reports of negative human health effects by the public. Smoke management and air quality has been identified through consultation as an important issue for the Sagebrush Steppe Ecosystem Restoration analysis. If implemented more acres could be treated with prescribed fire on public lands in the area.

Access to some areas could be limited for short durations during project implementation due to the need to provide public safety during operations. The program does not have negative effects to other areas of concern identified in this section.

There is a temporary seasonal loss of plants that are burned under prescribed fire. Some of the positive cumulative effects of fuels and prescribed fire are enhancing culturally important plants and wildlife habitat the following season and for several years thereafter.

Cumulative Effects from Range Management

The range program does not use herbicides for implementation therefore there are no increased negative human health effects to gatherers due to exposure from chemicals. Range management does not limit access to culturally important areas.

Some individual projects that facilitate the implementation of the range program include cattle guard installation, fencing, developing water sources, thinning juniper and reissuing permits. The requirement to do Noxious Weed Risk Assessments prior to project activities has reduced the cumulative effects associated with the gradual loss of some gathering areas. This has been accomplished by implementing practices that reduce the spread of weeds into new areas.

Some members of the public feel cattle spread noxious weeds. A GIS analysis of weed occurrence locations in relation to the FACTS database was completed. In this analysis, all weed occurrences were queried to determine their proximity to roads and waterways. Over 90% of the weed occurrences occur along roads. The general forested environment that is used for grazing is not infested with weeds as perceived by some members of the public.

Individual projects such as fencing, scheduling on and off dates, and thinning juniper have restored riparian areas that produce cultural plants. The program does not have negative effects to other areas of concern identified in the cumulative effects section.

Cumulative Effects from Recreation

The recreation program does not use herbicides for implementation; therefore there are no increased negative human health effects to gatherers due to exposure to chemicals. There are no concessionaire campgrounds and the recreation program does not limit access to culturally

important areas.

As indicated by GIS analysis of weed occurrences, development of recreation sites has not contributed to the spread of noxious weeds. The most significant impact has probably been the spread of weeds by recreation users traveling the Forest transportation system roads. Cumulative effects to tribal communities have been the loss of some easily accessible gathering areas that once were along the sides of roads. In comparison to the 1.6 million acres administered by the Forest this loss is small.

The requirement to do Noxious Weed Risk Assessments prior to project activities has reduced the cumulative effects associated with the gradual loss of some gathering areas. This has been accomplished by implementing practices that reduce the spread of weeds into new areas. The decision to implement the Integrated Weed Management Strategy will reduce the cumulative effects related to other projects. Public awareness about the spread of noxious weeds will be increased.

The same qualities that the public desires for developed recreation sites are usually the same reasons that American Indians chose to occupy. The development of campgrounds probably resulted in the loss of gathering areas for important plants that grew in around the desired qualities of specific areas. This loss is small considering the 1.6 million acres administered by the Forest and the fact that many cultural plants are common species that occur throughout the forested environment.

Treating noxious weeds will not contribute to the loss of gathering areas like campground development might have in the past. The campground development/improvement projects identified in Table 3-1 of the FEIS have either been consulted on or are still in the consultation process to prevent these types of losses. In the last 3-4 years campground improvements have been intended to correct negative impacts to water quality, meadows and riparian areas created from poor campsite location in the past. Consultation on these projects has restored riparian areas that contain culturally important plants.

The program does not have negative effects to other areas of concern identified in this section.

Cumulative Effects from Reforestation

Reforestation generally occurs where trees previously were and have been removed after fires or timber sales. Associated activities with replanting trees may include the use of herbicides and or site prep to reduce the competition for soil nutrients and sunlight from grasses and shrubs (release); another associated activity includes the use strychnine for gopher control to reduce seedling mortality.

The Forest has not used herbicides for these activities since 1984. In 1982, 2,517 acres were treated with chemicals for site prep. In 1983, 2,233 acres were treated with chemicals for site prep. In 1984, 329 acres were treated with chemicals for site prep.

There are no projects identified in Table 3-1 of the FEIS to use herbicides for site prep. Because of this, negative human health effects to gatherers due to exposure to herbicides used for release or site prep no longer exist. Therefore there are no cumulative effects to gatherers from

this activity.

Table 3-1 of the FEIS indicates 800 acres are planned for gopher control. This activity involves placing strychnine laced oats under the ground in burrows to control gophers. Because this chemical is placed under the ground there are no increased negative human health effects to gatherers due to exposure to chemicals.

Reforestation does not limit access to culturally important areas. It does not contribute to the loss of established gathering areas. The program does not have negative effects to other areas of concern identified in this section.

Cumulative Effects from Roads Administration

As indicated by GIS analysis of weed occurrences, past road construction and maintenance and use of the Forest transportation system probably contributed significantly to the spread of noxious weeds on the Forest. The requirement to do Noxious Weed Risk Assessments prior to project activities has reduced the cumulative effects associated with the gradual loss of some gathering areas. This has been accomplished by implementing practices that reduce the spread of weeds into new areas. The decision to implement the Integrated Weed Management Strategy is also reducing the cumulative effects related to roads administration.

Cumulative effects to tribal communities have been the loss of gathering areas that once were along the sides of roads. In comparison to the 1.6 million acres administered by the Forest this loss is small although it may be significant because of access. Roadside use for gathering is important to elder Indian women.

Prior to the year, 2001, the budget allocation for road maintenance supported a minimum of two road graders that operated during the entire field season. Between 2001 and 2004 very limited road maintenance on arterial roads was done. In 2005, no road maintenance was done on the Forest. In 2006, one grader did some road maintenance on a limited basis. This trend has reduced the loss of roadside gathering areas from the spread of weeds through road maintenance.

This program does not use herbicides for implementation; therefore there are no increased negative human health effects to gatherers due to exposure to chemicals. The program does not limit access to culturally important areas although some roadside gathering areas may have been lost from the spread of weeds through road maintenance. The program does not have negative effects to other areas of concern identified in this section.

Cumulative Effects from Timber Administration/Vegetation Treatment

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 existed 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 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. This activity is limited to tree stumps after

harvest and does not create additional human health effects to gatherers due to exposure to chemicals in gathering areas.

Access to some areas could be limited for short durations during project implementation due to the need to provide public safety during operations. This is not considered significant due to the limited amount of vegetation treatments on the Forest.

The requirement to do Noxious Weed Risk Assessments prior to project activities has reduced the cumulative effects associated with the gradual loss of some gathering areas. This has been accomplished by implementing practices that reduce the spread of weeds into new areas.

Furthermore, contract guidelines implemented by manual direction include the use of wash stations for equipment. Implementing the timber sale contract "C" provisions also reduce the spread of noxious weeds. The decision to implement the Integrated Weed Management Strategy has also reduced the cumulative effects associated with the spread of weeds and the loss of gathering areas.

The program does not have negative effects to other areas of concern identified in this section.

Cumulative Effects from Special Uses

The Forest has a case load of about 160 special use authorizations annually. 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 the cleaning of all vehicles prior to entry on National Forest lands, the use of weed-free feed products, and the reporting of noxious weed populations within the authorized area. All special use permits contain requirements for reporting and controlling noxious weeds.

The 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.

Herbicides are known and currently approved for use on less than 10% of the authorized area in accordance with the standards set by environmental analysis and safety standards, and quantity of application is included in the Modoc County annual total.

The Forest administers some 1,460 acres rented to public and private agencies for communications purposes. Over 900 acres of that total is authorized to the Department of Defense for a radar installation. The remaining acres are within 9 designated communications sites or are parallel to transportation, power line and/or pipeline facilities. 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.

Some 60 miles of State highway cross portions of the 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 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.

Two railroads cross portions of the Modoc National Forest. The rights-of-way are owned by the railroad and herbicides are known to be periodically used for the control of vegetation. Use is reported in the total application within the County.

For more information on these authorizations see, Chapter 3 of the FEIS, Land Uses and Access Section, Special Uses, State and County Easements and Railroads. There is more discussion on the application of herbicides under these authorizations in the Cumulative Effects from Past Noxious Weed Treatments and Adjacent Treatments below and in the Human Health Section of this FEIS.

The program does not have negative effects to other areas of concern identified in this section.

Cumulative Effects from 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 3-21 of the FEIS displays the previous treatment of noxious weeds through the use of 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). In 2003 and 2004 herbicides were not applied on the Forest. Tables F5-11, F5-12a, F5-12b in Appendix F fo the FEIS 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 area (Lassen, Modoc, Shasta, and Siskiyou Counties).

Under Alternatives 2, 4 and 6 it is assumed that there would not be extensive changes in the use patterns displayed in Tables F5-11, F5-12a, and F5-12b of the FEIS into the near future. Under these alternatives it is estimated that from 300 to 1,500 acres would be treated annually. Based on pesticide use from 2002 and 2003, these alternatives would result in at most a 10% increase in forest and rangeland acreage treated in the Modoc National Forest area.

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. Herbicide treatment on FS lands, when combined with herbicide treatments on adjacent lands could result in a potential for increased exposure to some members of tribal communities. These risks are discussed in the Human Health Section, and Appendix F - Human Health Risk Assessment of the FEIS. The anticipated risk to human health is low.

Treating noxious weeds with herbicides, using Design Standard, DS 36 for signing and posting could cause tribal gatherers to stop using an area for a time. Access to some areas could be limited for up to a year during project implementation due to the need to provide public safety during treatments.

There could be a continued loss of gathering areas if weeds are not treated with effective means.

Cumulative Effects from Sagebrush Steppe Ecosystem Restoration Project

The Sagebrush Steppe Ecosystem Restoration Project (SSERP) could have additional cumulative effects to tribal concerns. The Forest and the Alturas Field Office of the BLM are preparing an Environmental Impact Statement (EIS) for the project. The EIS will be a programmatic document; site specific analysis will be required before implementation.

This project consists of restoring sagebrush communities that have been invaded by juniper over the last 100-150 years. The project area is about 6.5 million acres covering four counties between two states. Treatments will consist of mechanical, hand and fire treatments.

Based on scoping comments, significant issues have been identified. One issue relates directly to comments received through tribal consultation. Tribes have indicated the short and/or long term vegetative changes created by restoration treatments may have effects on the integrity of cultural resources. These vegetation changes may also have effects on Native American cultural practices and the gathering of traditional foods, such as the loss of habitat for culturally important wildlife and plant species. Native Americans also expressed concern that fire use at a large scale may have adverse impacts to air quality.

Although this project area is 6.5 million acres, the Noxious Weeds Treatment project analysis area is throughout the 1.6 million acres of lands administered by the Forest. Of these 1.6 million acres the 541 weed sites cover approximately 6,908 gross acres.

The existing TCPs and the gathering areas and identified through consultation on this FEIS are being used to analyze effects to the Sagebrush Steppe Restoration Project. The SSERP does not rely on using herbicides so negative human health effects to gatherers identified in this section will not be greater.

Smoke management has been an important component of the prescribed fire program and there have not been reports of negative human health effects by the public. Smoke management and air quality has been identified through consultation as an important issue for the Sagebrush Steppe Ecosystem Restoration analysis. If implemented more acres could be treated with prescribed fire on public lands in the area.

Access to some areas could be limited for short durations during Sagebrush Steppe project implementation due to the need to provide public safety during operations. The SSERP does not have negative effects to other areas of concern identified in this section.

The SSERP focus is to restore sagebrush communities this could create a positive affect to restoring gathering areas.