

Salmon River Noxious Weed Control Program and Management Strategy for Restoring Native Plant Communities

An Action Plan for the Salmon River Restoration Council



Forks School successfully digging knapweed at their Adopt A Site, Can you dig it!

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Noxious Weed Control Program
and
Management Plan
For Restoring Native Plant
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**Draft Action Plan
for the
Salmon River Restoration Council**

November 2002

INTRODUCTION

The Salmon River Restoration Council (SRRC) has been progressively involved in noxious weed management since the early 1990's. The SRRC, a community based non-profit organization whose mission is to collaboratively promote ecosystem health, highlighting the recovery of the native anadromous fish runs, believes that effective control of noxious weeds can succeed only when those who affect and are affected by noxious weed species are integrally involved. To control any targeted invasive species at the Basin level (½ million acres plus), the local community must be supportive, particularly due to the extreme remoteness and rugged terrain associated with the Salmon River area.. Federal land managers must have the cooperative involvement of the landowners and other stakeholders to best achieve restoration goals (FEMAT -1994). Resource users and managers are integral in a successful noxious weed control program in the Salmon River ecosystem.

In its research the SRRC has identified that the most successful approaches for problematic noxious weed species include well thought out strategies. In response, the Council has committed to the development of a noxious weed strategy for the Salmon River ecosystem and the creation of specific action plans for each prioritized species, detailing activities, needs, and evaluation. The SRRC, with the local community, sees the use of toxic herbicides as posing an unacceptable risk to the ecosystem. A key challenge for the SRRC is to distinguish the different levels of risk that each noxious weed poses to this wildland ecosystem. Most state and county information rates weeds by their impact on grazing and agriculture. This system is of little use in the drastically different Salmon River Watershed.

In this plan we hope to set forth a model for managing various types of noxious weeds in other wildlands. This plan empowers communities, organizations, tribes, landowners, agencies, individuals, and others to meet the challenge. We believe that more heavily managed lands, that have on-going resource use, such as forestry, mining, grazing, road management, and recreation, will need a separate planning approach to deal specifically with associated problems.

This Noxious Weed Management Plan for the Salmon River Ecosystem will address problems associated with these weeds as a general problem and as individual species. This document is tiered to various planning documents and takes direction from Federal, State, Tribal and other strategies. It will be circulated to seek review and involvement from a variety of people, tribes, researchers, academia, agencies, and other organizations, Please send comments to: weedplan@srcc.org or SRRC, PO Box 10898. Sawyers Bar Ca 96027 or call 540-362-4729 for more information.

The Salmon River community based cooperative effort is an extremely effective programmatic approach to controlling prioritized noxious weeds at a watershed level (500,000 acres average size). This community-led effort predicts long term success because it highlights the goal of involving all of the stakeholders to prevent the spread of prioritized weeds and to control and monitor existing populations.

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I) Executive Summary

The Salmon River area is one of the most biologically intact ecosystems in the west. It hosts many unique aquatic and terrestrial species and habitat, including the last run of spring chinook salmon in the Klamath Basin, excluding the Trinity River (Klamath Basin Fisheries Restoration Plan 1991). The Land and Resource Management Plan for the Klamath National Forest (KNF) identifies the Salmon River subbasin as having the best anadromous fisheries habitat in the Forest (KNF -Land and Resource Management Plan -1994). The almost ½ million acre subbasin is 98.7% public lands and is known to have some of the most diverse and unique botanical features in the world. Due to its remoteness, the Salmon River has had generally less intensive industrial extraction and associated impacts. Historic mining, roads and more recently, fire and salvage logging, have created significant disturbance patterns in the watershed. Many people view this river basin as a biological refugium for native plants. It is one of the cleanest rivers in the country and should be managed in an extremely sensitive manner. The Salmon River is an area of high potential for noxious weeds control, because of its comparatively intact biological functions; relatively small presence of noxious weeds; strong stakeholder commitment; low travel frequency and largely federal ownership which offers a high potential for consistent management across the watershed.

The Salmon River community finds herbicides and other pesticides unacceptable as a management tool (SRCAP 2001). This is partly in response to past local exposure to herbicides, such as Agent Orange. Numerous community members have complained of experiencing acute and chronic symptoms in response to their exposure to these toxic chemicals. Several residents identify themselves as being injured and chemically sensitive. The majority of the community members believe that these chemicals should not be used, due to human and environmental concerns caused by herbicide exposure. The SRRC has chosen only non-chemical methods to target the control of specific invasive weed species (SRRC- Community Restoration Plan 2001). This is due to the overwhelming opposition toward Federal and/ or County herbicide use in the Salmon River, from individual community members as well as from Native American tribes in the area. A community survey conducted in association with the Salmon River Community Action Planning process identified a non-chemical approach to management of the natural resources as the highest priority.

The **Salmon River Noxious Weed Control Program and Management Plan For Restoring Native Plant Communities** was developed by the SRRC to provide managers, landowners, resource users and others with a comprehensive, safe, and effective approach to controlling noxious weeds and maintaining healthy native plant communities in the Salmon River ecosystem. This approach to controlling invasive plants is acceptable to the local community. This Plan enhances and protects aquatic resources in a manner consistent with the federal Aquatic Conservation Strategy (Northwest Forest Plan -1994).

The SRRC realizes that there is evidence of very few successful noxious weed abatement programs that encompass areas the size of the Salmon River. The community is concerned that

an approach that primarily depends on chemical herbicides as a tool will not be effective. Instead herbicide use would leave unacceptable cumulative toxic impacts to the watershed and repel the local community from watershed restoration and land stewardship.

This SRRC Plan provides an overview of the ecological processes, land use patterns and social conditions in the Salmon River area which are related to noxious weeds. The Strategy includes 13 Goals which provide the Actions to be taken to control any species of noxious weeds. A Noxious Weed Species Rating Matrix, (see Appendix 2) which takes into account several plant characteristics, was developed to prioritize which species the SRRC should target for control. The prioritized species known to be present include: Knapweed (spotted, diffuse, and meadow-found in 2001) ; Broom (Scotch and Spanish), Mustard (Marlahan, Hedge, others); and Star Thistle (Yellow and Malta). Other noxious weed species that receive various degrees of treatment include: Himalayan Blackberry, Teasel, Fennel, Water Hemlock. The Risk Rating Matrix also looks at tenacious weeds with a high potential for introduction into the Salmon River. Specific “Action Plans“ that customize treatment for each species is included in the Appendices. These Action Plans provide prescriptions that are most effective in responding to the different life history of each species. The Salmon River Ranger District is targeting the knapweed species for eradication because they are rated as a Class “A” pest in California. Class “A” plants are rated as a “public nuisance” and mandated for eradication.

The SRRC has created a viable model for controlling noxious weeds through an approach that relies heavily on cooperation and non-chemical techniques. The desired result of the prescription will be the recovery of a healthy native plant community at the disturbed sites. A healthy native plant community is more resistant to the entry of noxious weeds.

Local, citizen-led efforts to control noxious weeds in the Salmon River are one of the best vehicles to organize a successful noxious weed control program with minimal dislocation of existing economic and social structures. There are currently several stakeholder groups in the Salmon River subbasin who have been involved in the local noxious weed control effort, such as; the United States Forest Service, State of California- Department of Fish & Game, Department of Forestry and Fire Protection, Siskiyou County Department of Agriculture and Road Department, Karuk Tribe of California, Americorp, and various community entities such as: Salmon River Restoration Council, Salmon River Volunteer Fire & Rescue, landowner associations, fishing and environmental organizations, schools, and stores. Recreation, particularly spring boating, has increased in recent years and has a high potential for interface with noxious weed species. In addition to the agencies, tribes , organizations, landowners, community members and schools, the SRRC is enlisting cooperation and support from resource use groups including : mining, logging, grazing, and recreation (boating, hiking, swimming, horse packing, fishing and hunting).

II) Description of Project Area

A) General Salmon River Ecosystem Information

The Salmon River is one of the most biologically intact ecosystems in the west. The headwaters of this 751 square mile riverine system flow predominantly from the Marble Mountain, the Trinity Alps, and the Russian Wilderness areas. The Salmon River has long been known for its exceptionally high quality waters and fisheries. The Salmon River is designated as a federal wild and scenic river due to its “outstanding anadromous fisheries values”. The area also boasts one of the richest regions of species diversity in the temperate zones, which includes a world renown concentration of 17 species of conifers in a single square mile of the Russian Wilderness. Several unique and “at risk” species are living within the ecosystem.

The Salmon River watershed is situated within the Klamath Mountains physiographic province. Elevations range from 500 to 9000 feet. Along much of its course, the river flows through a rugged gorge in which rock outcrops and bluffs are common. Landsliding is a dominant geomorphic process in the area. These landslides have devastating effects on channels and riparian vegetation. Several temporary landslide dams have formed along the Salmon River and its tributaries this century. Periods of high precipitation, seismic events, and activities which disturb the soil or the vegetation can initiate landslide activity. Landsliding episodes are known to have accompanied many floods, particularly those of 1964 and 1972. The combination of landslide episodes and flood conditions resulted in major channel alterations throughout the watershed. At the end of 1996 and beginning of 1997 a large flood event took place on the Salmon River and elsewhere in the region. Impacts particularly in the South Fork of the Salmon River included loss of pool depth and frequency, as well as heavy scouring of the flood plain and loss of the riparian vegetation. The hydrologic characteristics of the watershed are defined by climate and topography. Precipitation within the Salmon River Watershed varies from over 80 inches in upper Wooley Creek to less than 40 inches along the South Fork. Intense, localized summer showers occur frequently, and have been associated with soil erosion and debris torrents.

Anadromous salmonid habitat is extensive in the basin, distributed among tributaries of Wooley Creek, North Fork, South Fork and Main Stem Salmon River. It holds the best habitat for anadromous fish in the Klamath National Forest (KNF-LMP 1994) and is the largest cold water contributor in the Klamath Basin. There are both summer and winter runs of native Klamath Province Steelhead. A smaller run of Coho salmon is also present. **The basin provides habitat for the largest wild run of spring chinook salmon in the entire Klamath River system; it is possibly the largest remaining wild spring chinook run left in California [West, 1991].** Klamath River Spring Chinook are currently listed by the Forest Service as a “sensitive” species due to their imperilled condition.

The Salmon River watershed is home to many wildlife species such as: fishers, northern spotted owl, wolverine, and more recently elk. There is a large portion of the Salmon River that is designated as Late Succession Reserve. It is known for having rich botanical diversity, boasting one of the most diverse coniferous stands on the planet. The recent trend of frequent large fires will make it difficult to maintain late-successional habitat or grow early-seral stands to late-successional habitat.

It is estimated that 98.7% of the land base is National Forest lands, with the remaining 1.3% in other ownership (private, state and county). The federal management of the Salmon River is broken up into two National Forests- the Klamath and the Six Rivers, creating management inconsistencies. The Karuk Tribe of California's Ancestral Territory occupies 60% of the subbasin. Several thousand acres of public lands are reserved as mining claims in accord with the 1872 Mining Law which entitles the claimant to mineral rights. Over forty-five percent of the subbasin is in federally designated wilderness.

B) Increased Human Movement and Watershed Disturbance

Transporting of plants (seeds, roots, cuttings etc.) is a key factor that significantly increases the rate of spread of noxious weeds. Since the entry of the European industrial extraction, movement of people and tools in and out of the subbasin has increased substantially. Transporting people and materials regionally, nationally, and internationally has radically increased the spread of several different species of invasive non-native plants.

Large episodic disturbance on the landscape and in the watershed is a natural process. The rate of disturbance is affected by various influencing factors - weather, geology, vegetation, etc.. Disturbance forces such as fires, floods, and landslides set up a rate of sediment that is discharged into the hydrologic system. Since the entry of European culture there has been a significant alteration of the disturbance patterns in the Salmon River, due largely to resource extraction and export activities. The rate of sediment discharging into the Salmon River is thought to be increasing because of recent human caused activities. Vegetative habitat has been affected by more recent (last 160 years) human activities. It should be noted that disturbance is integral to the spread of noxious plant species. Bare ground and reduced shade are often among the conditions most conducive to the establishment of these more aggressive non-natives. Once established they often out-compete the native species.

Some of the key resource uses and disturbances in the past 20 years are associated with logging, recreation (boating, hunting, fishing, hiking, and packing), grazing, mining, road-building and maintenance, restoration and residential use. All of these practices pose a risk for the introduction and spread of noxious weeds. People and equipment coming from areas infected with invasive weeds outside the Salmon River also offer a high potential for the introduction and spread of invasives. Resource-use practices which disturb the soil and negatively impact native vegetation communities create habitat conditions that are more conducive to the establishment of invasive weed species. As weeds become more prevalent in the region, their potential for spreading also increases.

The following pages provide an overview of nine key factors associated with the recent increase in management and export of natural resources and their relationship to how we, as humans, are increasing the rate of disturbance in the Salmon River subbasin and effecting the spread of noxious weeds.

1- RESIDENTIAL

There are approximately 250 people that currently reside within the subbasin. Residences are

dispersed throughout the subbasin with concentrations located in, or near, the towns of Sawyers Bar, Cecilville, Somes Bar and Forks of Salmon. In addition the community is made up of several outlying small neighborhoods and isolated forest residencies. Several species of invasive weeds occupy private land in the Salmon River. Some populations have moved from federal to private and some from private to federal. Noxious weeds do not recognize land boundaries. Residents travel inside and outside the watershed, making them a possible agent for movement of weeds. An excellent opportunity exists to involve residents in the SRRC's Adopt-a-Site Program.

2- WATERWAYS - FLOODS

The 1997 New Years flood and other floods have been responsible for scouring many miles of riparian habitat and have caused many acres of disturbance. Active landslides and road failure were also a result of this storm. These high water events are thought to have both provided prime noxious weed habitat and moved noxious weed seeds and plant materials downstream to establish new populations. The movement of Spotted Knapweed from Kelly's Bar on the North Fork is an example of the response of noxious weeds to floods.

3- MINING

In the late 1800's several large gold mines and mining towns were carved into the watershed, of which only 4 towns remain today. Major channel modification occurred in many areas, particularly in the upper South Fork of the Salmon River. Between 1870 and 1950 over 15 million cubic yards of sediment were washed off the mostly riparian hillsides with water cannons and sent down the river. The area disturbed by hydraulic mining activities includes an estimated 1,220 acres of land. Many large tailing piles still exist today, limiting riparian function. Native vegetation has had a difficult time re-establishing itself in many of these disturbed sites, offering optimal habitat for invasive plants. The dramatic increase in movement of people and non-native weeds in and out of the Salmon River subbasin is partially due to mining activities.

Currently there is a small amount of hardrock and placer mining occurring in the Salmon River. Importing equipment is of concern because most mining areas (Nevada, Montana, Idaho, etc) are heavily infested with various species of noxious weeds. The earth moving equipment particularly has a high risk of exposure and transport. Opportunities exist to work with mining entities to help prevent and control prioritized species of weeds.

4- FIRE MANAGEMENT

Catastrophic fires in this area are known to denude riparian and upslope areas, which increases water temperatures and sediment production. Several homes also burned in recent major wildfire events. With the interruption of the natural fire cycles, which have an estimated 12 year return interval in many areas, the fuel load caused by dying trees and denser understories will burn and cause uncontrollable crown fires. Without any remedial measures, this is a condition that gets worse as time goes on.

The Salmon River watershed is one of the highest risk fire areas on the Klamath National Forest. It has a high natural frequency of lightning occurrence. It is estimated that 44% of the Salmon River Subbasin has burned since 1911, and 29% has burned since 1977. Intensive fire control activities have taken place during the wildfires in 1972, 1977, 1987, 1994, 1999 and in other years. These federally led actions included large numbers of people and equipment being brought to the Salmon

River to fight the wildfires, which burned tens of thousands of acres at a time. Many of these fire forces were from states such as Montana and Idaho, where several species of noxious weeds occupy thousands if not millions of acres. Few prevention measures have been taken for stopping the distribution of invasive. Fire suppression activities include making large systems of fire breaks, which remove vegetative cover and expose raw mineral soils, often times with the use of a bulldozer. Between the fire camps, suppression activities, the denuding nature of the fire, and in particular backfires caused by humans, wildfire and response are highly likely to cause introduction and spread of invasive plants and undesirable pathogens to the Salmon River.

Post wildfire activities, including fire rehabilitation and fire salvage, also pose a significant threat to the spread of noxious weeds. During either of these activities more people and equipment are brought in and moved around the subbasin, which increases the incidence of noxious weed spread and makes the control of these invasives more difficult. The spread of invasive plants is facilitated through various fire rehabilitation activities, such as: the use of infected hay and seed for erosion control; using infected rock to upgrade and stabilize roads; and the use of water from infected water sources for road dust abatement.

An excellent opportunity exists through the National Fire Plan to develop cooperation from the fire management agencies, regulating agencies, native American Tribes, private landowners, community members and others, to support the Salmon River Noxious Weed Control Program.

5- LOGGING

The earliest timber harvest on the Salmon River occurred in conjunction with mining and homestead activities. Clearcutting of mature timber stands on public land did not begin until the 1950's. By 1974, there were about 7,500 acres of harvested public land in the watershed, and by 1989, there were about 30,000 acres. In several logged areas where little or no fuels treatment occurred, catastrophic fires have rampaged over the landscape, increasing erosion and water temperatures. The 1989 figures include about 18,000 acres of harvested land burned by the fires of 1977 and 1987. Many thousands of acres logged through salvage and green prescription still have received little or no fuels reduction. Several thousand acres are currently in plantation. These densely stocked plantations have a high likelihood of being consumed by wildfire before reaching maturity. They also increase the chance for stand replacing fires in larger stands on steeper grounds (Salmon River Sediment Analysis - USFS -De la Fuente1994).

The alteration of the older more stable native vegetation patterns due to logging has opened the canopy, disturbed the soils, reduced native competition, brought non-native plant species to the Salmon River and moved species within the subbasin itself. A number of logging practices and mitigation measures have increased the spread of noxious weeds in Salmon River. These practices include the movement of equipment and personnel who carry noxious weeds in and out of the subbasin, the use of contaminated water in water trucks for dust abatement on roads, the use of contaminated straw for erosion control, and road maintenance and upgrade using contaminated imported rock and soil (Personal Communication - Ecotech 2000).

Equipment operators and others involved in logging, including the management agencies, should be enlisted to cooperate and help support the Salmon River Noxious Weed Program.

6- ROADS

Access to the Salmon River is a limiting factor to resource managers who must drive two or more hours to get to many areas in the Subbasin. There are two high summits to go over on the access routes, preventing seasonal access. The main Salmon River road is mostly a one-lane road with turnouts carved into the steep cliffs of the river corridor. Limited access and recent down-sizing in the federal government, makes management activities difficult and sometimes prohibitive.

Roads are an on-going source of sediment to the river by surface erosion and landslides. It was not until 1892 that a wagon road was cut through the 50 mile stretch of wilderness from Etna to Forks of Salmon. The road from Forks of Salmon to Somes Bar was established in 1925. More substantial development did not take place until the Work Progress Administration projects were underway in the 1930's. By 1944, there were about 188 miles of roads; by 1989 the miles of roads on federal lands had increased to 762, or 3,639 acres. It is estimated that more than 90% of the human caused sediment in the subbasin is associated with roads (Salmon River Sediment Analysis-USFS 1994).

Roads are a key vector for the introduction and spread of invasive plant species. There are only 3 primary access roads to the entire Salmon River on which weeds are transported in or out of the subbasin. Road building, maintenance, upgrading, and decommissioning all provide high opportunities to introduce and spread noxious weeds in the Salmon River subbasin.

The main road managers in the Salmon River are the: United States Forest Service - KNF and Six Rivers; Siskiyou County; and private landowners. All of the entities have been performing road assessment and planning activities. An excellent opportunity exists for these stakeholders to work together and support the Salmon River Noxious Weed Control Program. Certain infected roads should be identified and road closures made where appropriate.

7- GRAZING -

The keeping of domestic livestock has been a local cultural practice in the Salmon River for over 100 years. When mining was more active in the mid to late 1800's and early 1900's, livestock used various areas of the Salmon River for range purposes. Cows and horses were the dominant species. Several thousand head were present in an average year. Much of the meat was sold and/or used locally. Both subsistence and commercial use was practiced. This use lulled with the reduction in community size. During the Depression Era and the World War there was an increase in livestock use. Since the 1950's there has been a slow decline in livestock in the subbasin. Historic grazing practices significantly altered vegetative patterns in many areas. Many non-native grasses and other plants established themselves (Mainstem Ecosystem Analysis - USFS 1995). Livestock management has been responsible for some movement of non-native plant species. Imported animal feed, use of trails, animal seed transport, and ground disturbance are associated with the spread of noxious weeds. There are currently a limited number of horse and cattle range allotments in the Salmon River, and a cooperative approach specific to range animals for preventing noxious weed spread is needed. An excellent opportunity exists to work with permittees, managers, residents and others to develop cooperation and support for the Salmon River Noxious Weed Control Program.

8 - TRAILS - HIKING/PACKING

There is a significant amount of trail use in the Salmon River Subbasin. Trails are key vectors for the spread of invasives. Trailheads are therefore key places to prevent the establishment of noxious weeds. Campgrounds are also areas of high potential for establishment and/or movement of noxious weeds. An excellent opportunity exists to work with hikers, horse packers, backpackers, researchers, managers, residents and others to develop cooperation and support for the Salmon River Noxious Weed Control Program.

9- BOATING

There is a significant amount of river and stream use in the Salmon River Subbasin. The river and streams are key vectors. Rivers and streams are key places to prevent noxious weeds from establishing. River access, boat put-ins and outs, swimming areas, research access points, and campgrounds are also areas of high potential movement and/or establishment of noxious weeds. An excellent opportunity exists to work with River users - boaters, fishers, swimmers, researchers, floaters, campers, managers, residents and others to develop cooperation and support for the Salmon River Noxious Weed Control Program.

III) Noxious Weeds- Definitions, Problems , and Spread

A- Definition - What is a noxious weed?

The Federal Noxious Weed Act of 1974 defines a noxious weed as,

any living stage (including, but not limited to, seeds and reproductive parts) of any parasitic or other plant, of a kind or subdivision of a kind, which is of foreign origin, is new or not widely prevalent in the United States, and can directly or indirectly injure crops, other useful plants, livestock, poultry, or other interests of agriculture, including irrigation, or navigation, or the fish, or wildlife resources of the United States, or the public health.

B- Potential Degradation of Ecosystem Health

We know that various invasive plants are invading hundreds if not thousands of acres in the subbasin. Most of these acres are on disturbed lands. This is a problem that is plaguing biodiversity throughout the world. In California alone it is estimated that over 1045 exotic plant species are present. It is thought that about 315 of these species exists in the 19,700 square kilometer Klamath Region.

The ecological impacts of these species can be broadly lumped into the following categories: (1) alteration of natural disturbance regimes, (2) alteration of substrate stability and geomorphology, (3) alteration and simplification of the food web, (4) direct competition with native species, (5) rapid preemption of resources following disturbance by persistent perennials, and (6) alteration of soil chemistry and chemical processes. We are particularly concerned with invasive weeds

that directly out compete native species and then persist thereafter in a more or less mono-specific stand, and those plants that alter the processes that sustain native species. Such species affect local and regional biodiversity and ecosystem services such as water and topsoil retention, successful pollination, promoting natural fire regimes, insuring adequate riparian habitat conditions for fisheries and wildlife resources, among others.

Noxious weeds decrease ecosystem health along rivers, streams and in forests. These aggressive alien plants colonize disturbed areas and prevent the pioneering and succession of native plants. This will result in slower, if any, recovery of disturbed habitat. Retarding the recovery of disturbance in a watershed will increase the sediment budget and result in further degradation of anadromous salmonids.

These plant invasions may lower water tables, prevent recovery of disturbed riparian habitat, decrease food available to wildlife, or alter other important ecological processes and resources (Melgoza et al. 1990), affecting food webs (Harty 1986) and leading to endangerment of native species (Parenti and Guerrant 1991, Flather et al. 1994).

Certain weeds, such as Scotch Broom, which are highly flammable, can increase the potential for high intensity or uncontrollable wildfire incidences. Several of these more invasive non-native species, once established, are known to increase fuel loading and the spread of wildfire.

Chemical pesticides are a standard weapon used by the agricultural community to combat noxious weeds. It has been well documented that many of the pesticides used by these interests are acutely toxic to anadromous salmonids, and also cause important sub-lethal effects. These include increased stress, altered swimming ability, disruption of schooling behavior, and changes in migration patterns. Pesticides also can disrupt the immune system of anadromous fish, mimic or block important sex hormones and indirectly affect fish by interfering with their food supply or habitat. Preventing the need for pesticide use, through alternative methods of weed control, will provide protection to both steelhead and salmon runs in the Salmon River subbasin.

C- The Spread of Noxious Weeds

1. Invasion of Western Wildlands

Invasive species infest 4,600 acres of new land daily (Westbrooks, 1998). Scotch Broom, Spotted Knapweed, Star Thistle and hundreds of other non-native plants have spread along human transportation routes and other disturbed areas to invade millions of acres in the West (BLM 1995; BLM 1996). Noxious weeds are fast becoming a focus for land managers, agricultural interests, communities, and the general public. Star Thistle occupies over 18 million acres of land in California, and Knapweed has taken over a similar amount of acreage throughout Montana, Idaho, Washington and neighboring states. Canada is also reporting massive areas of infestation. Most of the areas affected are associated with lands used for agriculture and grazing. Various agricultural agencies have been actively battling these plants for years to improve crop output. Herbicide use has often been the tool of choice for controlling these unwanted plants. Very few management areas in the country are successfully controlling the more tenacious species of invasive plants at the watershed level. Noxious weeds capitalize on land disturbance

which is an integral aspect of land management and use.

Progressively, many species of noxious weeds have been moving into some of the more biologically intact wild areas, such as the Salmon River. There is a strong concern among managers, scientists, and naturalists that these plants will take over large expanses of wild areas, particularly in areas where large land disturbance is frequent and a substantial amount of human movement is occurring.

2. Weeds in the Salmon River Subbasin

In recent years weeds have begun to rigorously establish themselves in the Salmon River, primarily in disturbed areas of the watershed. The limited access to the Salmon River has kept the invasion of noxious weeds at a moderately controllable level. There is concern that these weeds will displace native plant communities and the recovery of disturbed areas will be hampered, possibly increasing the sediment budget (Community Restoration Plan 1999-SRRC). Because there are several invasive species of plants currently present in this subbasin, it is imperative that a species prioritization scheme be developed which assesses the various characteristics and impacts of each species.

This strategy incorporates such a prioritization scheme, in order to target the worst problems. Some of the weeds that are known to currently exist include Star Thistle (Yellow and Malta), Mustard (Marlahan and hedge), Knapweed (Spotted, Diffuse and Meadow), Broom (Scotch and Spanish), Himalayan Blackberry, Sweet Pea, Sweet Clover, Teasel, Punctureweed and Fennel. A Noxious Weed Species Prioritization Matrix has been developed by the SRRC, to identify which plants to target first. A list of invasive plants not currently present in the Salmon River, but found in close proximity to the subbasin and having a high likelihood of entry, was developed. This list includes Leafy Spurge, Scotch Thistle, Musk Thistle, Dalmatian Toadflax, Whitetop or Hoary Cress, Rush Skeleton Weed, Italian Thistle and others (see Appendix 2).

Vectors are routes by which invasive weeds travel. Some of the key vectors in the Salmon River include roads, trails and waterways (ditches, streams, and rivers). Some of the key agents for movement are associated with residences, resource use and management. Wildlife also plays a role in their movement. Vectors which overlap (trailheads, river access, etc.) are some of the areas of highest concern.

A goal of the SRRC is to complete a vector analysis for each site where noxious weeds occur. This analysis includes an investigation as to how the plant arrived and a rating for its potential to spread from the site.

3. Species of Highlighted Concern - Knapweed

The US Forest Service and the California Department of Agriculture has identified an outbreak of Spotted Knapweed (*Centaurea maculosa*) on several river bars in the Salmon River Subbasin. The entry may have come from firefighter equipment that came from Montana and Idaho during the 1994 Specimen Fire, or an earlier fire. Spotted Knapweed has been initially inventoried on

the Salmon River by the state and has been noted as the second largest outbreak in California. It has been identified that this plant and other noxious weed species in the Salmon River subbasin are at a controllable level if an intensive effort is made immediately. Siskiyou County Department of Agriculture is promoting the use of chemical herbicides, in infested areas, if no other method is available. Many infested areas are located adjacent to the river.

To date, the SRRC has worked with the USFS, the SCDA and others in planning and eradication efforts to eliminate this problem through manual control methods before it explodes. It is recognized that manual control methods will offer less risk to the aquatic ecosystem.

Over 140 spotted and/or diffuse knapweed sites have been located, on over 30 miles of riverine riparian areas; along roadsides, in fire burned upslope habitats, and areas utilized for logging in the past (landings, plantations, etc.) The majority of the knapweed sites are located within the river corridor (500 feet on each side) on the North Fork and Main Stem of the Salmon River. Most of the plants in this area are located on sandy/rocky river bars often where little other vegetation is growing. It is presumed that the high water of 1997 covered most of the river bars and washed away a significant amount of spotted knapweed seeds from infested locations. Plants located in the river corridor are mostly found growing in the area between the low water and high water line of 1997. A few sites have been found along the road sides with limited populations.

IV) PRESCRIBED ACTIONS

This section outlines specific goals and actions that the SRRC has developed through experience, training, and interaction, for implementing a program to prevent, control, and eradicate prioritized noxious weed species in the Salmon River subbasin and to recover and protect healthy native plant communities.

These actions are not weighted for prioritization by their order. Each Prescribed Action includes a Discussion providing some background information related to past and current activities. Each Prescribed Action also includes a Strategy section which outlines what specific actions should be taken.

GOAL 1 - COOPERATION AND COORDINATION

Discussion

This goal is important to expand cooperation and coordination between landowners, residents (part and full-time), tribes, county, state and federal government agencies, resource users, academic institutions (local schools, universities, etc), researchers, experts, environmental protection and resource use organizations, various special interest groups, and other involved groups. Developing management agreements to share resources often increases effectiveness and efficiency. The SRRC is participating in the Siskiyou County Weed Management Area Group (SCWMAG). There is a need to create a Salmon River Subbasin Weed Management Area Group that ties into the SCWMAG. The Salmon River Group should update and implement cooperative noxious weed control and native plant recovery plans as ways to work together in a

more effective approach for controlling noxious weeds and maintaining and restoring health to the native plant community.

The SRRC has enlisted cooperation and support, in part through education and outreach, from stakeholders and other entities both from within and outside the Salmon River community. The SRRC has utilized a series of planning tools to promote coordination and cooperation. The SRRC's Noxious Weed Management Plan and 1999 Spotted Knapweed Action Plan (Action Plan) identify a series of activities which the SRRC staff has utilized to increase coordination and cooperation. As part of the 1999 Action Plan the SRRC developed a guide to increasing cooperation from management and resource users. The plan emphasizes the use of non-chemical methods to control noxious weeds and in particular spotted knapweed in the Salmon River subbasin. The SRRC utilized Memorandums of Understandings, cooperative agreements, cost/share agreements, volunteer agreements and other devices to promote coordination and cooperation between stakeholders. Staff attended conferences and provided presentations, posters, and handouts to increase cooperation and coordination on this project.

The SRRC organized community response by enlisting community members to participate in its planned activities. Increasing support from the community was used as a centerpiece for accomplishing its goals and objectives for 1999. The SRRC coordinated several events to increase awareness and cooperation for its effort to control spotted knapweed. The SRRC has promoted a formal Salmon River Noxious Weed Management Group that includes many stakeholders and other supporters to focus on controlling noxious weeds and primarily spotted knapweed in the Salmon River subbasin over time.

The SRRC utilized various community members to lead different areas of coordination. Each area of work identified in the 1999 Spotted Weed Knapweed Action Plan had a specific coordinator to accomplish, track and report on their respective activities. Regular SRRC Noxious Weed Control committee meetings were held throughout the year to plan and coordinate activities between the coordinators and other participants. The SRRC provided an overall Spotted Knapweed project leader to lead coordination and to increase cooperation.

There is a need to expand our awareness of noxious weeds and enlist support and cooperation from the Salmon River community, resource users, tribes, agencies, funders, and other entities interested in the Salmon River and/or noxious weed control.

There is a need to develop cooperation and support from the various stakeholders (Local, Regional, National) - the Salmon River community, resource-users (boater, packers, residents, loggers, etc), managers, regulators, lawmakers, funders, affected organizations and the general public. There is a strong need to develop an annual Cooperative Strategy which targets the highest priority areas that are at the most risk. A prioritized strategy is needed for annual and out-year actions; An Annual Action Plan (Work Plan) for each Prioritized Species is needed.

Strategies

1) Initiate and continue regional, county-wide, and subbasin level stakeholder coordination meetings.

- 2) Develop standard procedures for inter-stakeholder data collection, storage, management, and exchange. Work with all stakeholders to develop consensus on data standards.
- 3) Organize and participate in local, county, regional, state, national, and inter-national workshops and conferences that are attended by the various stakeholder groups involved in noxious weed management.
- 4) Coordinate with various entities that utilize a non-chemical approach to controlling noxious weeds.
- 5) Interact with the California Exotic Pest Plant Council, California Native Plant Society, and others involved in controlling native plants and promoting healthy native plant communities.
- 6) Develop cooperative procedures for stakeholders to develop Integrated Weed Management studies.
- 7) Develop and support stakeholder training courses in prevention, education, inventory, monitoring, non-chemical treatment, and other control measures with improved opportunities for field level participation.
- 8) Coordinate control of local prioritized noxious weeds with all stakeholders. Prepare treatment plans by species.
- 9) Create a formal Salmon River Noxious Weed Control and Native Plant Restoration Group that includes many stakeholders and other supporters to focus on controlling noxious weeds and restore native plant communities in the Salmon River subbasin in the short and long term
- 10) Continue to utilize various community members to lead different areas of coordination. Each area of work identified in each Species Action Plan should have a specific coordinator to accomplish, track and report on their respective activities. Regular SRRC Noxious Weed Control committee meetings should continue to be held throughout the year to plan and coordinate activities between the coordinators and other participants. The SRRC should provide an overall Program leader to lead coordination and to increase cooperation.
- 11) Promote the adopt-a site community program on private and public lands such as residences, access routes, agricultural areas, campgrounds, river access, trailheads, roads, etc. In this Program stakeholders inventory areas (if needed), safely clear sites of plants, monitor and report information to the SRRC, using SRRC tracking forms. The participant provides progress reports regularly and assistance is provided if needed.
- 12) Develop Cooperative Agreement and/or Memorandum of Understanding (MOU) between numerous stakeholders.
- 13) Enlist management and regulatory entities and consultants to help develop any permits needed for control of prioritized noxious weed in the subbasin.
- 14) Prepare and administer Environmental Assessments, Cooperative Agreements, Contracts, and MOUs
- 15) Coordinate project and Program development and cooperatively seek funding, when feasible, to secure adequate support needed to coordinate and implement these activities

GOAL 2 - PLANNING

Discussion

Noxious weed management, and a recovered native plant community inhabiting disturbed sites, are an integral part of ecosystem-based management. The SRRC can act consistently with its mission and work towards the long and short term goals identified in the SRRC's -Community

Restoration Plan (CRP -2001). Integrating noxious weed management into all aspects of land and resource planning, management and use, will contribute to prevention and control of noxious weeds, as well as the recovery of desirable native plant communities in the disturbed sites.

This Strategy should also receive direction from many sources, such as various tribal, federal, state, county and community land and/or resource management plans, policies, and permits; including but not limited to the:

- 1 - Federal and State Noxious Weed Acts
- 2 - Presidential Executive Order #13112
- 3 - Northwest Forest Plan and FEMAT (1994)
- 4- Klamath National and Six Rivers Forests' Land and Resource Management Plans (1994)
- 5- Klamath Basin Fisheries Restoration Plan (1991)
- 6- Siskiyou County Weed Management Area - Memorandum of Understanding
- 7- Karuk tribe Management Plan for Ancestral Territory , resolutions, documents, permits, or communications
- 8 - Yurok, Hoopa, or Klamath Tribal management plans
- 9 - Salmon River Community Action Plans (CAP)
- 10 - Land and Resource Management Plans on Private Lands
- 11 - Federal Ecosystem/Watershed Assessments
- 12- Local Experiential Knowledge
- 13 - Scientific Experts and Information related to Salmon River noxious weed management
- 14 - Salmon River Knapweed Project Environmental Assessment and Decision Notice
- 15 -Northen Province of Region 5 Forest Service Strategy for Noxious Weed Control
16. -North Coast Regional Water Quality Control Board Basin Plan
17. - Salmon River Community Restoration Program/Plan (CRP, 2001)
18. - Salmon River Subbasin Restoration Strategy (2002)

Because noxious weed awareness and response is such a new management activity, many managers at various levels have not adequately considered noxious weeds in resource use, landscape and/or other ecosystem type analysis. Several of the above mentioned documents “fail to consider the potential effect of the proposed action on noxious weeds. Some forest plans are silent on noxious weeds, or direction is weak. There remains inconsistent manual direction for noxious weeds in the various resource areas” (Stemming the Invasive Tides- USFS 1999).

Taking guidance from the CRP and other directives, the SRRC staff developed a strategy to control spotted knapweed in more detail for 1999, for the next 5 years, and beyond. The SRRC utilized various sources of information including: Internet, universities, publications, experts, and managers to help guide the development of the Spotted Knapweed Action Plan for 1999. The 1999 strategy included many draft elements for the Salmon River Noxious Weed Control Program. A Noxious Weed Species Rating Matrix was developed to prioritize existing weeds and those most threatening to enter the Salmon River (see Appendix 2). Various priority noxious weeds have received draft Action Plans and annual Activity Calendars (see Appendix 5). Various prescriptions and mitigative measures were also developed for various species.

There is a lack of organized cooperative leadership in the Salmon River subbasin currently. The SRRC is trying to attain better cooperation with the KNF, SCDA and others in the WMA. The SRRC needs a recognized coordinator(s) and the Salmon River Noxious Weed Management and Native Plant Recovery Program needs a cooperative group of many stakeholders to guide and review the local efforts.

Effective control cannot take place unless well designed plans, strategies, and analyses are developed that incorporate an aggressive approach in areas such as education, cooperation and coordination, prevention, inventory tracking, mapping, groundwork, monitoring, adaptive management and research, reporting, and fund-raising.

There are key areas for which the SRRC, et al should increase protection.

These areas have a significant importance to the Salmon River ecosystem, such as: wilderness, trailheads to wilderness, riparian areas, wetlands, unstable areas, residences, residential access roads, high value and use recreational areas, and others. There should be heightened concern for sites potentially infected with undesirable prioritized noxious weeds, such as water sources, rock sources and storage, restoration sites, roads, waterways, trails, and administrative sites.

Controlling noxious weeds cannot be accomplished through eliminating existing populations only. Spotted knapweed is an opportunistic species which out-competes native plants in response to soil disturbance. Noxious weeds will be reduced when the amount of disturbance is reduced and/or mitigation measures are in place which take into consideration the threat of invasives when creating disturbance. The ultimate goal is to revegetate disturbed sites.

Strategies

- 1) Develop a long range noxious weed management plan and strategy to rehabilitate the native plant communities throughout the Salmon River subbasin with multi-stakeholder involvement. Update it annually and formally adopt a revision. Seek technical assistance when needed. Include various view points and stakeholder information in the direction. Take into account planning needs for each of the 13 Goals. Develop effectiveness targets for each prioritized species.
- 2) Take into consideration direction found in various noxious resource management plans, tribal plans, community and landowner plans as well as other pertinent information, knowledge and direction.
- 3) Create and update annually, or as necessary, a Noxious Weed Risk Rating Matrix to prioritize species to control.
- 4) Develop strategy to recover disturbed sites where noxious weeds are present with desirable native plants.
- 5) Develop a comprehensive Plan to Manage Spotted and Diffuse Knapweed and other priority species for the immediate future (5 to 10 years) and for the Long Range (50 Years);
- 6) Develop an Annual Action Calendar and Plan for each prioritized species to identify various noxious weed control activities; weekly planning sessions (SRRC Committee), monthly Cooperating Stakeholders Planning Session, Pre-season and Post-Season Planning and Evaluation Sessions with the cooperators.

7) Develop a short and long term funding strategy to develop and maintain activities associated with each of the 13 Goals, when needed.

GOAL 3 - EDUCATION AND OUTREACH

Discussion

Increasing stakeholder awareness will help the SRRC and other federal, state, tribal, and county managers, and the public, to better understand why short and long term management of invasive plants is necessary. Knowledge of the impacts of noxious weeds to the Salmon River's natural diversity of aquatic, terrestrial, and human ecosystem is needed. All participating stakeholders involved with noxious weed control and native plant recovery, need proper training in the correct methods associated with these activities. Educating the next generation of stakeholders, including land managers, is critical for the long term success of a noxious weed control program.

Knowing where and how invasive plant species are spread is critical in preventing the expansion of weeds into new territories. Recognizing that weed seeds spread through land and resource management, resource use, residential use, road management, and natural spreading agents such as birds or deer is essential to knowing how to prevent the spread of various noxious weeds. Learning about where existing populations are is critical. Relaying this information to all stakeholders will greatly improve cooperation and support for the Salmon River Noxious Weed Program.

Strategies

- 1) Develop training programs and provide workshops and field trips for all stakeholders, including private, public and tribal resource management personnel. The SRRC should design and conduct these activities in cooperation with the other stakeholders. Information provided would include the identification of various prioritized species of weeds currently present or with a high potential for introduction; how weeds affect the Salmon River ecosystem; how weeds spread to an area and potential for movement; how to locate, treat, track, and monitor existing noxious weed populations; how to deal with various weed species at different life stages; how resource use and management activities affect the spread of noxious weeds; why a non-chemical approach is important; how and why various resource use and management activities may be or are affected by noxious weeds; and how stakeholders can get involved in the Salmon River Noxious Non-Chemical Weed Control Program.
- 2) Develop and implement outreach plans to improve stakeholder understanding of the need and techniques to control various prioritized species of noxious weeds. These plans should include all stakeholders in the outreach effort.
- 3) Provide a center to house noxious weed activities and information at the Salmon River Restoration Watershed Center.
- 4) Develop and distribute various educational materials including: newsletters, brochures, handouts, and posters associated with the non-chemical noxious weed management program on the Salmon River.
- 5) Provide presentation and poster board sessions to various stakeholder entities and at local, county, state, regional, national and international forums.

- 6) Develop and maintain a Salmon River website associated with the Salmon River Non-Chemical Noxious Weed Control Program.
- 7) Develop a recognition program for land managers (private, public and tribal) who practice good weed management stewardship.
- 8) Develop cooperative education and awareness programs with active stakeholders, including weed management area and watershed restoration groups, to integrate resource users, legislators/politicians, visitors and others in preventing, locating, and removing various prioritized species of noxious weeds.
- 9) Involve academia in various educational opportunities.
- 10) Include weed control in school curriculum at various academic levels.
- 11) Develop interpretive signs at trailheads, river access, campgrounds, post offices, stores, watershed entry points on roads, and other areas of high human frequency in the Salmon River subbasin.
- 12) Educate stakeholders on techniques needed to bring back desirable native plant communities.
- 13) Utilize various educational methods to reach out to the community, resource users, managing agencies, tribes, legislators, restoration and environmental organization, potential supporters, and the general public.
- 14) Increase awareness and educate potential and existing funders.
- 15) Attend various forums, conferences and other educational activities at the local, regional, national, and international level.

GOAL 4 - PREVENTING THE SPREAD

Discussion

Prevention, early detection, rapid response, and thorough and persistent treatment with the management tool most accepted in the local area, are the most practical, economical, and effective means of weed management where noxious weeds have more recently been introduced and are still at a potentially controllable level. Prevention is one of the Council's highest priority activities in managing prioritized noxious weeds. Prevention is best accomplished by enlisting full cooperation from stakeholders to ensure that new species of weeds are not introduced into the Salmon River and that existing targeted weed populations in the subbasin do not spread.

A) There are 3 significant ways by which noxious weeds spread at the subbasin level.

These include:

- 1) **INSIDE-IN** - One way the plants can spread is by moving around within the subbasin.
- 2) **OUTSIDE- IN** - A second way for spread is when new plants/seeds come into the subbasin from the outside world.

- 3) INSIDE-OUT - A third way for spread to occur is for the plants/seeds in the Salmon River subbasin to spread into the outlying areas (Scott Valley, Orleans, and beyond)

B) There are 3 Key Vectors on which noxious weeds most frequently travel in the Salmon River subbasin. These are:

- 1) Roads
- 2) Trails
- 3) Waterways

C) There are several sources and activities responsible for spreading noxious weeds on the 3 key vectors in the Salmon River subbasin. Some common methods of movement into, inside of, and out of the Salmon River subbasin include:

- 1) Use of contaminated seed, feed grain, hay, or straw used for livestock
- 2) Movement of contaminated equipment, livestock or personnel over uncontaminated lands (Logging, mining, fire response, recreation, residential).
- 3) Use of contaminated rock, gravel, road-fill, top soil, and water on uncontaminated lands.

- 4) Contaminated mulch (straw, hay, chips, etc) used in soil stabilization for watershed restoration
- 5) Movement of sand and rock in road maintenance, improvement, repair, or obliteration
- 6) Transport of water from contaminated water fill sites for dust control and other uses.
- 7) Movement by animals (fur, forage/excrement, range, etc.) domestic and wild.

Strategies

A) General Movement (3 ways)

- 1) Use maps/inventory to locate plants inside and outside the subbasin and use vector assessment to focus on preventing source spread from known sites.
- 2) Develop an understanding of prioritized noxious weed life histories as well as specific characteristics which allow them to spread so well and ultimately take over various habitats and move into, within, and out of the subbasin.
- 3) Delineate highest priority areas for prevention. High priority areas are usually lands that are relatively free of weeds with high to moderate ecological risk of weed invasion. Lands in this category with especially high values merit an even higher priority.
- 4) Implement an approach that utilizes early detection, rapid response, thorough and persistent treatment, native plant recovery, and use of appropriate tools for each situation.

- 5) Utilize various methods to promote the prevention of the spread and entrance of prioritized species; to identify how the noxious weeds arrived at a location; and to what degree they are likely to spread in or around the Salmon River subbasin.
- 6) Identify and document newly introduced weed species in formerly uninfested areas. This can be greatly enhanced by enlisting all stakeholders to learn to identify, properly treat, document, and report weed populations.

B) Vectors .

- 1) Identify and locate key vectors on a map and on the ground.
- 2) Identify vectors of noxious weed movement into, within, and out of the Salmon River.
- 3) Identify when and how each species flowers, develops seed, and how seed is dispersed. Make available life history information specific to each species in a useful form.
- 4) Perform a vector analysis for all known noxious weed populations which assesses how the population could have arrived at the specific site, how it could move in the future, where it could move to, and how likely the known populations are to move.
- 5) Identify where vectors cross or overlap, such as trailhead, trail crosses waterway, and river access from road.

C) Sources and Activities conducive to noxious weed spread

- 1) Use education and cooperation to identify, reduce and prevent the spread of prioritized noxious weeds, such as spotted knapweed, in the Salmon River subbasin. Develop guidelines to reduce the spread and/or effectively treat populations.
- 2) Prevention activities should be promoted on private(P), county (C), state (S) and federal (F) lands by landowners and/or land managers.
- 3) Identify and contain noxious weed populations at all proposed work/use sites.
- 4) Review and modify all resource use and management activities on public lands (USFS, State, and County) for their potential to spread weeds or create conditions that are conducive to weed establishment. This includes evaluating the potential for noxious weed invasion or spread in all NEPA or CEQA analysis. The following table lists some examples of these activities:
- 5) Block access to areas contaminated with priority noxious weeds. Quarantine measures should be developed.
- 6) Develop policies designed to ensure that all seed, seed mixtures, hays, grains, and straws are free of weed seeds.
- 7) Develop contract clauses to insure that only certified and tested seed mixtures are used to revegetate.

MOVING AGENT	PREVENTION ACTIVITY
Road Construction, Repair, Upgrade, or Obliteration	Use weed free equipment and gravel, rock, sand and fill. Identify and contain noxious weed populations at all proposed work/use sites. Post monitor activities and locations to detect new populations.
Recreation Facility Maintenance and Recreation Management	Weed free recreation sites (Ex: campgrounds and trails, boater access and swimming areas, bicycling areas, fishing and hunting use areas). Identify and contain noxious weed populations at all proposed work/use sites prior to activity. Post monitor activities and locations to detect new populations.
Wilderness Management	Weed free trails and trailheads, provide educational materials to packers and hikers for noxious weed identification and management. Use weed free hay and feed. Identify and contain noxious weed populations at all proposed work/use sites prior to activity. Post monitor activities and locations to detect new populations.
Wildlife/Fisheries	Incorporate weed prevention measures into habitat improvement projects. Identify and contain noxious weed populations at all proposed work/use sites prior to activity. Post monitor activities and locations to detect new populations
Livestock Management	Minimize livestock movement of weed seeds and other vegetative parts. Identify and contain noxious weed populations at all proposed work/use sites prior to activity. Post monitor activities and locations to detect new populations.
Phone-line, culvert, and pipeline installation	Use weed free equipment and clean equipment after use. Identify and contain noxious weed populations at all proposed work/use sites prior to activity. Post monitor activities and locations to detect new populations.
Timber and Vegetation Management	Ensure that weed free prevention is built into timber and vegetation management project design. Use and maintain weed free equipment. Minimize and/or eliminate the creation of sites and conditions suitable for weed establishment or spread. Identify and contain noxious weed populations at all proposed work/use sites prior to activity. Post monitor activities and locations to detect new populations.

Minerals Management	Include weed prevention and management in mining plans. Use and maintain weed free equipment. Identify and contain noxious weed populations at all proposed work/use sites prior to activity. Post monitor activities and locations to detect new populations.
Lands	Include assessment for weed control in land tenure adjustments, special use permits, and right of ways. Post monitor activities and locations to detect new populations.
Water	Include weed prevention for all activities that utilize and access water (fire tankers, road water trucks, etc). Identify and contain noxious weed populations at all proposed work/use sites prior to activity. Post monitor activities and locations to detect new populations.
Fire	Include prevention measures in all fire suppression and fuels reduction activities. Identify and contain noxious weed populations at all proposed work/use sites prior to activity. Post monitor activities and locations to detect new populations.

D) Develop Cooperation

- 1.) Enlist and develop strong support for this program from the community, managers, academia, resource users, and others.
- 2.) Develop a Weed Prevention Schedule for the Salmon River. This should provide a summary of who is responsible for what activities and when they will occur and a second which provides more in depth details.
- 3.) Develop various precautionary measures to reduce the likelihood of spread during spotted knapweed control activities.
- 4.) Monitor and Manage disturbance (natural and human caused) and create management mitigations to reduce and prevent the spread of noxious weeds.
- 5.) Secure various interactions between all of the stakeholders.
- 6.) Develop guidelines to reduce the spread of noxious weeds by resource users, managers, residents and others.
- 7.) Develop cooperative weed prevention programs with suppliers and users of sand, gravel, rock, top soil, seed, hay, straw, water, and any other materials that may transport the seed and vegetative matter of invasive species, including nurseries that grow and sell ornamental plants.

E) Utilize Education

- 1.) Utilize information sources, such as the Internet, to learn about other noxious weed programs and their experience and findings.

2.) Develop and implement a day, week, month, field season, and/or year devoted to preventing the spread of all species of noxious weeds and/or a target species.

GOAL 5 - INVENTORY AND MAPPING

Discussion

Early detection, treatment and containment of invaders is an extremely effective method of weed management. Baseline information important to decision making for management strategies includes:

- 1) Noxious weed species;
- 2) Location of infestation;
- 3) Size of area infested;
- 4) Density of plants;
- 5) General plant community and environmental conditions: e.g., soil conditions, exposure, level of disturbance;
- 7) Current land use activities;
- 8) Past noxious weed control activities and results (Partners Against Weeds - BLM 1996)

Accurate and useful inventory of all prioritized noxious weeds in the Salmon River subbasin is one of the SRRC's most urgent needs in regards to managing noxious weeds. The effects of noxious weeds on ecosystem health and noxious weed treatment effectiveness evaluation requires solid information to formulate management actions that will effectively address the impacts of noxious weeds on natural resources, residential use, management, economic and subsistence activities. Periodic, systematic, and thorough inventories followed by prompt treatment of prioritized sites will better ensure that new invaders do not become established "mother sites" and begin to develop satellite sites that spread. An inventory can help identify which areas in the subbasin and surrounding lands are contaminated and which areas are weed free. This information can be compiled in a series of map layers and in a comprehensive data base. All vectors and areas of special concern should be inventoried and mapped.

Coordinated crews, agency personnel, individuals participating in the SRRC's Adopt-a-site and Drivers That Care Programs were responsible for finding and tracking populations at all of the known or suspected sites. Several community members and resource users, such as boaters and packers were enlisted to help in locating a number of populations. The SRRC has incorporated a noxious weed survey into extensive road survey work throughout the Salmon River subbasin. The North Fork, Main Stem, and Upper South Fork Watersheds have inventories for spotted and diffuse knapweed. A few adjunct populations were located. In the Upper South Fork Watershed, the SRRC Roads Crew completed a presence/absence inventory for spotted, diffuse and meadow knapweed, star thistle, broom, and Marlahan mustard. The Godfrey Ranch Landowners Association has also completed a first pass inventory for noxious weeds in the O'Farrel and Negro Watersheds. The entire Salmon River subbasin should be extensively inventoried.

Preliminary maps that identify the location of all known sites have been created for all known prioritized noxious weeds populations. These maps should be refined and updated. This information is shared with cooperators.

Information describing and tracking key areas to increase protection for and of areas with high or low risk of spread and ability to control has been developed.

Strategies

- 1) In addition to conducting survey activities devoted to noxious weed detection, inventory for new populations should be incorporated into all field management and resource use activities (Ex: road surveys, fisheries surveys, hunting, fishing, etc.).
- 2) Use special flagging which is designated only for noxious weed population identification.
- 3) Use “rock ducks” to locate specific populations on the ground.
- 4) Use GPS and GIS tools when available.
- 5) Create an experienced team to perform inventory and mapping activities.
- 6) Locate areas and measures appropriate for quarantine.

GOAL 6 - TRACKING

Discussion

The SRRC has utilized various tools to track noxious weed activities in the Salmon River subbasin. Site Folders have been developed for each site where spotted knapweed was located. The Site Folders included:

- a) Information to help locate a site - topographic maps and aerial photographs;
- b) Tracking forms to capture population size, plant development stages, number of plants at each site, volunteer involvement, method of treatment, number of plants before and after treatment;
- c) Site description - GPS or hand drawn map and descriptive text.

The SRRC’s goal has been to track management activities at all sites where prioritized noxious weeds are known or suspected. Tracking is used to develop strategies at the daily, weekly, monthly, and yearly level. This tracking information is closely tied to the inventory and mapping activities.

Strategies

- 1) Develop an effective tracking system which identifies the management of every plant, juvenile or adult - seeded or not.
- 2) Identify potential vectors for spread and track areas.
- 3) Track all information related to person hours involved in the various aspects of prioritized noxious weed management in the Salmon River.
- 4) Develop and update a data base of current activities as each site receives treatment and as the site file folders and/or reach files are turned in and compiled.
- 5) Create an experienced team to perform tracking activities
- 6) Identify and track all treatment activities on a site by site basis to allow cooperators to develop a more efficient daily, weekly, monthly, and annual strategy.
- 7) When tracking work at a particular site describe what the status of the site is after treatment - incomplete, cleared, or complete to determine immediacy and type of next treatment.

GOAL 7 - GROUNDWORK METHODS

Discussion

A groundwork strategy is needed for each prioritized noxious weed species. The approach should be one that a) isolates, contains, reduces and ultimately eliminates all of the larger, older, main populations in the long term, and b) contains, reduces and eliminates all satellite populations in the short term.

Each site needs to be visited and treated enough times throughout the year to insure that no plants seed at the site. It is not effective to allow the seedbank to expand. The SRRC uses the premise that in almost all cases a site cannot be considered to have been contained in a particular year unless it has had at least 3 visits in the season - early, mid, and late. This premise depends on each species life history.

More thorough treatment occurs when more than one person manages a site, if adequately coordinated. It is easy for one set of eyes to be limited, seeing the same thing and missing the same plants. The more sets of eyes looking, the more thorough and effective.

More effective control occurs with an approach to groundwork that incorporates the various strategies outlined in these Goals. The use of inventory, maps, tracking and planning tools are all essential for a successful groundwork effort. All sites need to be adequately marked on the ground for future management.

The SRRC has relied largely on mobilizing and coordinating community volunteer workdays throughout each season since 1994. All work on the ground, including SRRC, USFS, and Siskiyou County efforts, should be carried out utilizing non-chemical methods. Groundwork methods should be prescribed to control all populations of known prioritized noxious weed populations in the subbasin. The work should be planned and scheduled regularly throughout the field year.

Year round ground work is needed. The SRRC has found that various ground work applications are effective at different times of the year, including winter. Perennial plants hiding in deciduous vegetation is easier to spot in the winter.

Include integrated non-chemical weed management in groundwork methods such :

1) MANUAL

- Digging
- Pulling

2) CULTURAL

- Burning - broad cast , spot, and burn pulled plants
- Collecting

3) MULCHING

- Plastic
- Chips
- Corn Gluten
- Brush

4) BIOLOGICAL

- Bugs
- More aggressive vegetation animals/livestock

5) SEED BANK MANAGEMENT

- Summer short watering
- Mulch

6) EQUIPMENT USE TIMING AND HYGIENE

- Wash
- Brush
- Compressed Air
- Only use local equipment

Strategies

- 1) Survey all sites where prioritized noxious weeds are known or suspected to exist.
- 2) Contain known sites (prevent seeding).
- 3) Reduce all known populations.
- 4) Eliminate several populations of known sites.
- 5) Frequently re-visit all known sites to remove survivors or new sprouts.
- 6) Track all groundwork information on maps, site folders, reach files, and tracking data base.
- 7) Clear all prioritized weeds from known sites when possible or appropriate.
- 8) For bi-annuals clear both juveniles and adult plants early in the field season.
- 9) If large numbers of juveniles persist at known population sites by mid to late season, hold off on digging juveniles and focus on eliminating potential seeding adult plants.
- 10) Use the most effective and safest tools.
- 11) Train participants in safety skills necessary for safe groundwork.
- 12) Learn to identify various prioritized species at various life stages, and apply the appropriate groundwork technique.
- 13) Learn and practice sanitation measures to prevent the spread after site treatment.
- 14) Hold regular cooperative strategy meetings to outline groundwork and promote efficiency.
- 15) Do site visits earlier in the year and switch to reaches and zones in the mid season to pick up stragglers and unknown populations.
- 16) Each stakeholder should identify the sites that they will take the lead responsibility for.
- 17) Utilize paid crews, volunteer workdays, adopt-a-site, and driver that care programs to initiate groundwork.

- 18) Incorporate locating and treating spotted knapweed as a bi-product of many of SRRC's other projects (road surveys, fish counts).

GOAL 8 - ADAPTIVE MANAGEMENT TECHNIQUES AND RESEARCH

Discussion

Adaptive management is a process that is essential to improving effective noxious weed control in the Salmon River. Through an adaptive management approach the SRRC has developed an on-going list of Observations and Recommendations (see Appendix 7). The O&R's are to better understand and improve the various elements or Goals of the Salmon River Noxious Weed Control Program. Some of the SRRC adaptive management techniques to date for managing spotted knapweed include:

Goal 1 - Cooperation and Coordination

- 1998 - Create the Drivers that Care Program
- 1999 - Create Adopt-a Site Program
- 2000 - enlisted support from fisheries and other resource interests
- 2002 - Created Salmon River Subbasin Weed Management Group

Goal 2 - Planning

- 1998 - Held weekly groundwork planning meeting
- 1999 - Developed annual action plan structure
- 2000 - Draft Subbasin Restoration Strategy targets noxious weed management
- 2001 - Developed Draft Salmon River Noxious Weed Program Strategy
- 2002 - Finalize Draft Noxious Weed Program Strategy
- 2003 - Implemented and Updated

Goal 3 - Education and Outreach

- Expansion of Support for Effort
- 1997 - SRRC core group learn about knapweed in November.
- 1998 - Increase awareness and enlist volunteer support from local community and schools.
- 1999 - Increase awareness and enlist resource users (boaters, packers, and hikers); Posters, brochures, and handouts.
- 2000 - Reach out and increase awareness and enlist resource managers- road graders, Americorp personnel, Yreka Homeless shelter.
- 2001 - Increase awareness and enlist USFS Fire Crew, equipment operators, academia. Involve PHD's in Salmon River control program, and attend and provide poster session/presentation at the International Knapweed Conference and at the Klamath Basin Fish and Water Symposium. Put SRRC noxious weed info on the Web.
- 2002- CalEPPC Conference presentation

Goal 4 - Preventing the Spread

- 1998 - Clean clothing.

- 1999 - close off infected roads and trails.
- 2000 - Prevent livestock, vehicles, and the general public from entering infected sites.
- 2001 - Develop vector analysis - Identify ways in which knapweed is entering, moving around within, and leaving the Salmon River.

Goal 5 - Inventory and Mapping

- 1999 - Create maps of knapweed locations.
- 2000 - Perform presence/absence surveys of knapweed on the Mainstem and North Fork watersheds.
- 2000 - Use GPS/GIS equipment to inventory sites on map.
- 2001 - Perform inventories for presence and absence of all prioritized noxious weeds with estimated populations on all roads in Upper South Fork Watershed.

Goal 6 - Tracking

- 1997 - develop population estimates for knapweed plants dug > 10; > 100; 1,000>; 10,000.
- 1998 - Learn that we need to be more accurate. Count every plant dug at every site and track all site and treatment information.
- 2001 - Include vector analysis
- 2002 - Develop improved tracking form
- 2003 - Utilize database format completely compatible with USFS records.

Goal 7 - Groundwork Methods

Plant Disposal

- 1998 - Put whole plants into garbage bags.
- 1999 - Only need to bag flower and/or seed heads in heavy duty garbage bag.
- 2000 - Reduce bagging - Only need double/triple gallon size zip lock bags for seed heads- early stages of flowering are not likely to form viable seeds if picked.
- 2001 - Break all plants and separate crown from root, place remains on rock to dry.

Tools

- 1998 - Pull and dig with dandelion forks.
- 1999 - Pulled plants resprouted - dig only with dandelion forks and small crow bars.
- 2000 - Dig all of root out - use crow bars and digging bars (loosen rocks where deep roots grow).
- 2001 - Discover “alignment” bar with point on one end. This tool and digging bar are preferred.
- 2003 - Work with local welders to develop alignment bar with curved handle

Field Season

- 1999 - Groundwork needs to start as early in the year as possible, avoid waiting for the plants to head-up or flower.
- 2001 - Groundwork in the winter offers better visibility for knapweed plants, particularly in deciduous vegetation.

New ground techniques

- 1998 - Try propane torches on seedlings.
- 1999 - Use of plastic mulch.
- 2000 - Use of woven plastic mulch mats as a mulch.
- 2003 - Use wood chips (fuels reduction byproduct) as mulch

Goal 9 - Revegetation

- 2000 - Plant native plants to replace the noxious weeds at the sites.
- 2001 - Collect, grow and plant native grass plugs.
- 2002 - Cut and Plant Willows.
- 2003 - Harvest lupin and buck lotus seeds to propagate

Goal 10 - Monitoring

- 1998 - Monitor with pictures.
- 1999 - Set up monitoring sites to assess effectiveness of one manual treatment; Count each knapweed treated at each site.
- 2000 - Set up potential effectiveness criteria for manual treatment effectiveness - assess, a) plant density and frequency, b) containment, and c) spread from known site. Create Knapweed Project Criteria for Determining Effectiveness.
- 2001 - Set up plots to determine plant life history and response to digging. Learn that both juveniles and adults can flower in any given year.
- 2002 - Review Criteria and amend as needed

Goal 11 - Evaluation and Recommendations

- 1999 - Develop Observations and Recommendations process.
- 2000 - Hold annual Evaluation and Awards Dinner.

Strategies

- 1) Continue to make O&R's and develop adaptive management techniques in all areas of noxious weed control.
- 2) 2002 Water the seed bank in the summer for a period until seeds sprout, then turn off the water and the seedlings die.
- 3) 2002 - Develop a set of customized tools to choose from.

GOAL 9 - REVEGETATION

Discussion

It is well accepted in the scientific community that the only way to effectively control and eventually eliminate noxious weeds from disturbed sites is to recover the sites with the appropriate native vegetation. As has been mentioned, noxious weeds are a product predominantly due to human disturbance and human transport. There are several forms of disturbance, both human caused and natural, that need to be treated. Each noxious weed site needs an assessment of what native plants are present and which native plants are desired to best promote native vegetative recovery.

Strategies

- 1) Perform an assessment at each site to determine which native plants are present and which native plants are desired to best promote native vegetative recovery.
- 2) Promote existing native plants at all sites.
- 3) Re-establish native vegetation on all disturbed soil from construction, reconstruction and maintenance activities associated with roads and various resource use practices.
- 4) Collect native plant parts for various species needed at different sites.
- 5) Enlist botanical experts to assist in identifying desired native plant species, and to identify appropriate propagation techniques.

GOAL 10 - MONITORING

Discussion

Various forms of monitoring have taken place since 1994. The SRRC has been monitoring several prioritized noxious weed species sites in the subbasin. These include: broom, star thistle, knapweed, and mustard. Some of these monitoring activities include:

- 1998 - Begin monitoring with pictures
- 1999 - Set up monitoring sites to assess effectiveness of manual treatment
- 2000 - Set up potential effectiveness criteria for manual treatment effectiveness - assess- a) plant density and frequency, b) containment, and c) spread from known site
- 2001 - Perform follow up monitoring activities at the 2000 effectiveness plots. Manual methods met USFS Criteria “a” by reducing plants by over 70%; but did not meet USFS Criteria “b” and had a total of over 250 seeding plants. and there is some question about meeting USFS Criteria “c”.

The US Forest Service developed an Environmental Assessment for Controlling Knapweed in the Salmon River Ranger District (EA) in 2000. This EA was adopted in 2001 and outlined a potential scheme for monitoring and determining the effectiveness of manual non-chemical control. The EA laid out 3 Criteria for control. Failure to meet any one of these 3 Criteria points is supposed to determine that manual non-chemical methods are failing to effectively control

knapweed in the Salmon River Ranger District. The SRRC should work with the USFS to evaluate and improve the criteria for determining effectiveness, as described in the EA.

In addition to annual monitoring, the SRRC has developed a series of tracking tools (see tracking) to assist in monitoring. Treatment records for each site create a composite of information that help the SRRC monitor both site and program progress and results.

Strategies

- 1) Continue to perform monitoring efforts at each site using various tracking and tools.
- 2) Evaluate and improve existing USFS Criteria for determining effectiveness.
- 3) Develop new methods for monitoring all prioritized noxious weed species and treatment effectiveness.
- 4) Monitor other noxious weed control efforts outside of the Salmon River (Siskiyou County, California, and beyond) to identify noxious weed presence and to determine treatment effectiveness.
- 5) Improve methods to monitor for effectiveness at the site and at the program level.
- 6) Share and/or publish monitoring results. Store in data base and place locations on map.
- 7) Monitor for native plant recovery effectiveness.
- 8) Monitor sites regularly throughout the field year to determine site conditions.
- 9) Seek additional experts to assist in monitoring and improving criteria.
- 10) Monitor resource use, restoration, and management actions to determine if these actions are increasing or reducing the spread of noxious weeds. Look at federal, state, county, tribal, and private land projects.
- 11) Monitor prevention measures to determine effectiveness.

GOAL 11 - EVALUATION AND RECOMMENDATIONS

Discussion

The Salmon River Noxious Weed Control Program has various methods to perform evaluation and make recommendations. These include:

- a. Ongoing Observations and Recommendation
- b. Newsletter publications
- c. Assessing monitoring results
- d. Field Review

These activities take place at various times of the year.

Strategies

- 1) Review grounds regularly throughout the field year to determine site conditions.
- 2) Increase the number of partners participating in the evaluation process.
- 3) Include academia and other experts in the evaluation.
- 4) Utilize evaluation and recommendations for adaptive management purposes to improve techniques and results.
- 5) Evaluation and recommendations should be widely distributed.
- 6) Secure additional funding and/or support for this activity.

- 7) Evaluate the effectiveness of mitigation measures to control noxious weeds on various actions, including resource use, management, and restoration on all lands throughout the Salmon River subbasin.
- 8) Evaluate and make recommendations for prescribed prevention measures.

GOAL 12 - REPORTING

Discussion

The SRRC has developed regular progress Reports and creates an Annual Report which describes activities and results. These Reports are submitted to various partners and to funders. Information derived from these Reports is included in the SRRC’s brochures, newsletters, web site, publications, interviews, and presentations. The SRRC promotes and/or attends meetings focused on the Salmon River and the Siskiyou County Weed Management Area.

Strategies

- 1) Continue to perform existing Reporting activities.
- 2) Distribute reports on a broader scale.
- 3) Secure additional funding and/or support for this activity.

GOAL 13 - FUNDING/SUPPORT- Costs

Discussion

To effectively control spotted knapweed and other noxious weeds in the Salmon River, broad scale support is needed. Due to the Salmon River community’s indication that they will not participate in a knapweed control program which utilizes chemical herbicides as a tool, it is not likely that control, let alone elimination, will occur if chemicals are used. Without the community’s involvement only limited control can be accomplished.

The SRRC sought monetary support from several sources. These funds were requested for non-chemical treatment, and would help increase the SRRC’s ability to control spotted knapweed and other noxious weeds in the Salmon River subbasin. Listed below are funding sources to which the SRRC submitted proposals.

Grantee Name	Project Name	Time Period	Amount	Funded
CA F&G	Noxious Weed Management Program	July 1, 98 - June 30, 99	\$13,964.50	No
*NFWF	Salmon River Knapweed Integrated Pest Management	June 15, 99 - June 23, 99	\$10,000.00	Yes
*CA F&G	Noxious Weed Management Program	June 1, 00 - March 31, 02	\$20,784.94	Yes

NFWF	Salmon River Knapweed Integrated Pest Management	March 1, 00- Jan. 1, 01	\$10,000.00	No
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Amount of Cost-Share contributed by SRRC:

*NFWF- value @ \$20,000.00 / USFS portion was \$10,000 with Cost Share of SRRC at \$20,000

*CAF&G- value @ \$27,258.04

Cost Analysis

There is a Cost Analysis in the EA. The EA identifies that a maximum total of 30 acres will be treated each year. This analysis indicates that Alternative 1, which claims to be able to eradicate Knapweed in 5 years, will cost a total of approximately \$45,000 for 5 years of treatment over an area of 30 acres. This total is derived from the EA which estimates the chemical treatment methods to cost an average of \$300 an acre. The manual non-chemical treatment methods are identified in the EA as costing approximately \$15,000 an acre. The total cost of treating 30 acres a year using the manual non-chemical treatment, based on the estimates made in the EA that it would take 12 years, is approximately \$5,400,000. The total cost of treating 30 acres a year using the chemical herbicide treatment, based on the estimates made in the EA that it would take 5 years and if herbicides are needed each year, is approximately \$45,000. The SRRC questions both of these rationales due to its knowledge of manual treatment costs, many of which hardly exist for the SRRC due to its large volunteer work force. The herbicide assessment does not factor in several incidental costs, such as: water monitoring, tool management, cost of using a boat to transport workers across the river, disposal of herbicide containers, cost of spill and others .

Strategies

- 1) Attain funding and support to increase the SRRC's ability to manage noxious weeds.
- 2) Continue to expand volunteer effort.
- 3) Enlist more stakeholder involvement.
- 4) Attain support from more experts.
- 5) Increase community involvement.
- 6) Refine the cost analysis for various treatment to reflect actual costs to date.

V) REFERENCES (to be completed)

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- Harty. 1986.
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- Klamath National Forest Land and Resource Management Plan. 1994
- North West Forest Plan. 1994.
- Melgoza, et al. 1990.
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- Salmon River Restoration Council. Noxious Weed Management Plan.
- Salmon River Restoration Council. Spotted Knapweed Action Plan. 1999.
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- SRCAP. 2001.
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- USFS. Stemming the Invasive Tides. 1999.
- USFS. Mainstem Ecosystem Analysis. 1995.
- West. 1991.
- Westbrooks. 1998.

VI) APPENDICES

- 1) SRRC Organizational Overview
- 2) Past Noxious Weed Management on the Salmon River
- 3) Noxious Weed Species Rating Matrix
- 4) Project Evaluation Criteria for Determining Effectiveness
- 5) Species Action Plan Calendars (see species map list below)
- 6) Additional Sources and Prevention Measures
- 7) Observation and Recommendations
- 8) Species Maps
 - a) Knapweed (Spotted, Diffuse and Meadow)
 - b) Star Thistle (Yellow and Malta)
 - c) Mustard (Dyer's Woad and Hedge)
 - d) Broom (Scotch and Spanish)
 - e) Whitetop
 - f) Italian Thistle
 - g) Tree of Heaven
 - h) Other (Teasel, Water Hemlock, etc)
- 9) Siskiyou County Weed Management Area Memorandum of Understanding
- 10) USFS/SCDA/Council Cooperative Agreement 2002