

ENVIRONMENTAL ASSESSMENT

PROPOSED FUNDING TO CONTROL OR ERADICATE PURPLE
LOOSESTRIFE (*Lythrum salicaria*) UTILIZING SELECT MANUAL
REMOVAL AND THE APPLICATION OF THE HERBICIDE

TRUCKEE AND CARSON RIVER BASINS, WESTERN NEVADA

Prepared by
Damian K. Higgins

for
U.S. Fish and Wildlife Service
Region 1
Portland, Oregon

Approved: _____



Acting Geographic

Interior Basins Ecoregion, U.S. Fish and Wildlife Service

TABLE OF CONTENTS

1.0	PURPOSE FOR THE PROPOSED ACTION	5
2.0	NEED FOR TAKING ACTION	5
3.0	ALTERNATIVES INCLUDING THE PROPOSED ACTION	6
3.1	ALTERNATIVES CONSIDERED .	6
	3.1.1 ALTERNATIVE A .	6
	3.1.2 ALTERNATIVE B .	6
	3.1.3 ALTERNATIVE C .	7
	3.1.4 ALTERNATIVE D .	7
3.2	ALTERNATIVES REMOVED FROM CONSIDERATION .	7
	3.2.1 ALTERNATIVE E .	7
3.3	SUMMARY OF ACTIONS BY ALTERNATIVES .	9
4.0	AFFECTED ENVIRONMENT .	10
4.1	GEOGRAPHIC SETTING .	10
	4.1.1 TRUCKEE RIVER DRAINAGE .	10
	4.1.2 LAHONTAN VALLEY .	10
4.2	SURFACE WATER RESOURCES .	11
	4.1.1 LOWER TRUCKEE RIVER .	11
	4.1.2 LAHONTAN VALLEY .	11
4.3	BIOLOGICAL RESOURCES .	12
	4.3.1 WETLAND AREAS .	12
	4.3.2 FISH .	12
	4.3.2.1 TRUCKEE RIVER BASIN .	12
	4.3.2.2 CARSON RIVER BASIN .	13
	4.3.3 BIRDS .	13
	4.3.4 MAMMALS .	14
	4.3.5 THREATENED AND ENDANGERED SPECIES .	14
	4.3.5.1 CUI-UI .	14
	4.3.5.2 LAHONTAN CUTTHROAT TROUT .	14
	4.3.5.3 BALD EAGLE .	14
	4.3.5.4 PEREGRINE FALCON .	15
	4.3.6 SPECIES OF CONCERN .	15
	4.3.6.1 MAMMALS .	15

4.3.6.2	BIR.DS	15
4.3.6.3	REPTILES	15
4.4	RECREATIONAL RESOURCES	16
4.5	ECONOMIC RESOURCES	16
4.5.1	RECREATION-RELATED	16
4.5.2	AGRICULTORE-RELATED	16
4.6	CULTURAL RESOURCES	17
5.0	ENVIRONMENTAL CONSEQUENCES	17
5.1	SURFACE WATER IMPACTS	17
5.1.1	ALTERNATIVE A.....	17
5.1.2	ALTERNATIVE B	18
5.1.3	ALTERNATIVEC	18
5.1.4	ALTERNATIVE D	18
5.2	BIOLOGICAL IMPACTS	19
5.2.1	ALTERNATIVE A	19
5.2.2	ALTERNATIVE B	19
5.2.3	ALTERNATIVE C.....	20
5.2.4	ALTERNATIVE D	20
5.3	THREATENED AND ENDANGERED SPECIES	21
5.3.1	ALTERNATIVE A	21
5.3.2	ALTERNATIVEB	21
5.3.3	ALTERNATIVE C.....	21
5.3.4	ALTERNATIVE D	21
5.4	RECREATIONAL IMPACTS	21
5.4.1	ALTERNATIVES A AND B .	21
5.4.2	ALTERNATIVE C.....	22
5.4.3	ALTERNATIVE D.....	22
5.5	ECONOMIC IMPACTS	22
5.5.1	ALTERNATIVE A.....	22
5.5.2	ALTERNATIVE B	23
5.5.3	ALTERNATIVE C	23
5.5.4	ALTERNATIVE D	23
5.5.5	OTHER CONCERNS.....	23
5.6	CULTURAL IMPACTS	24
5.6.1	ALTERNATIVE A	24

5.6.2	ALTERNATIVE B	24
5.6.3	ALTERNATIVE C	24
5.6.4	ALTERNATIVE D	24
5.7	SUMMARY OF ENVIRONMENTAL CONSEQUENCES	25
6.0	CUMULATIVE IMPACTS	26
6.1	INTRODUCTION	26
6.2	WEED CONTROL-RELATED ACTIVITIES	27
6.2.1	TRACY POWER PLANT RIVER RESTORATION PROJECT..	27
6.2.2	NRCS TALL WHITETOP CONTROL ON THE LOWER CARSON RIVER	27
6.3	COMPARATIVE EVALUATION	28
6.4	CUMULATIVE IMPACTS AND TRENDS	28
7.0	COMPLIANCE, CONSULTATION, AND COORDINATION	28
7.1	CONSULTATION AND COORDINATION EFFORTS	28
7.2	PERTINENT LEGISLATION AND REGULATIONS	29
8.0	REFERENCES	30
9.0	APPENDICES	32
	APPENDIX 1: BIOLOGY OF PURPLE LOOSESTRIFE	32
	APPENDIX 2: SECTION 7 CONSULTATION	34
	APPENDIX 3: RODEO® DIRECTIONS FOR USE	41
	APPENDIX 4: MSDS SHEET FOR RODEO®	49
10.0	ATTACHMENTS	S3
	ATTACHMENT 1: MAP OF THE PROPOSED ACTION AREA	S3
	2: MAP OF SPARKS AND ORR DITCH	S4
	3: MAP OF WETLAND AREAS AT STILLWATER NATIONAL WILDLIFE REFUGE	SS

1.0 Purpose for the Proposed Action

The Fish and Wildlife Service (Service) proposes to provide funds and technical assistance to State and local agencies to reduce and control or eradicate purple loosestrife (*Lythrum salicaria*) (hereafter PLS), an introduced weed, in riparian and wetland habitats within the Truckee and Carson River basins of northern Nevada. The Service would provide technical assistance for the application of the herbicide Rodeo® through a cooperative agreement with Federal and State agencies. The objective of the proposed action is to determine the extent of PLS in the Truckee and Carson River drainages and eradicate those populations to reduce future impacts to riparian and wetland areas of western Nevada. The intent of this proposed project is to prevent the spread of PLS to avert further degradation of fish and wildlife habitat.

The criteria of the selected alternative should be effective in controlling PLS, be cost-efficient, have known positive environmental and social consequences, should not harm other organisms or the environment, and be consistent with Service missions and directives.

2.0 Need for Taking Action

Purple loosestrife is an emergent aquatic perennial plant of Eurasian origin. Since its introduction to the United States in the 1800s, this noxious weed has escaped cultivation in many regions of the United States (Thompson et al. 1987), invading wet meadows, pasture wetlands, marshes, stream and river banks, lake shores, irrigation and drainage ditches (Thompson et al. 1987). PLS impedes water flow, displaces native vegetation, and creates monocultures of little value as wildlife habitat. When conditions are appropriate, a small isolated cluster of PLS can spread and cover a wetland in a single growing season. A summary of the biology of PLS may be found in Appendix 1.

Until recently, occurrence of PLS in Nevada was limited to a few isolated populations, primarily along the Truckee River near Wadsworth and the Sparks Ditch. Reconnaissance work done in the Truckee and Carson drainages in 1997 suggested that PLS was in early stages of infestation and its dispersion was possibly promoted by the flood of January, 1997. In the aftermath of the 1997 floods, small pockets of PLS have been observed in new locations, including the Truckee Canal, Orr Ditch, minor ditches in Reno and Fernley, and at several new sites on the Truckee River around and downstream from Wadsworth. While not yet verified, PLS may also be present in various locations in the Lahontan Valley and along the lower Carson River, particularly downstream from Lahontan Reservoir. The Nevada Division of Agriculture is currently mapping the full extent of PLS in the Truckee and Carson River Basins. As presently known, the PLS in Sparks Ditch consisting of patches of the weed along a 2-mile section of the ditch and fairly continuous distribution along a half-mile stretch at the south end of Spanish Springs Valley, is the largest infestation in western Nevada (see Attachment 2).

The invasion of PLS into a wetland system results in suppression of the native community and alters the structure, function, and productivity of wetland habitats (Thompson et al. 1987). PLS

displaces wildlife-supporting native vegetation such as cattails (*Typhus* spp.) and bulrushes (*Scirpus* spp.) and can eliminate nesting sites for waterfowl, open water for breeding, and spawning habitat for fish. The establishment and spread of PLS represents a serious threat to fish and wildlife resources in western Nevada, which includes 4 species listed as threatened or endangered under the Endangered Species Act.

The control of this invasive weed is needed in order to protect wetland habitats that various wildlife species depend on in this arid climate. Control efforts are most critical and successful in the earliest stages of infestation when the scope of infestation is limited to pioneer populations. The key to efficient and successful control is to locate and identify potential weed infestations and treat current populations to prevent their spread. To implement a successful control effort, techniques such as inventory, monitoring, and assessment of PLS are necessary to limit aggressive establishment, seed production, and detrimental spread to clean areas. Therefore, any action considered under this document will contain those techniques as part of any control effort.

3.0 Alternatives Including the Proposed Action

3.1 Alternatives Considered

3.1.1 Alternative A. No Action

Under this alternative, the Service would not provide funds or technical assistance for the control of PLS infestations in the Truckee and Carson River Basins. This alternative would produce one of two results: 1) involved agencies would have to seek alternate funding for PLS control efforts or, 2) no control efforts would be conducted due to lack of funding. Without funding or technical assistance from the Service, PLS would likely continue to increase and spread to important wetland and agricultural areas in western Nevada and impact fish and wildlife resources.

3.1.2 Alternative B. Manual Removal

Under this alternative, the Service would provide funding and technical assistance for as-year control program of PLS infestations by digging or pulling all PLS plants manually within infested drainages. Removal would be conducted by personnel from various agencies and/or utilizing volunteer services and other social programs such as gardeners associations, "Warriors", juvenile services, and inmate crews. After removal of infestations are complete, involved agencies would monitor treated areas for any PLS regrowth and manually remove those plants again if necessary. Given the time and resources available, implementation of this alternative would be difficult to accomplish within a short time period.

3.1.3 Alternative C. Application

Under this alternative, the Service would provide funding and technical assistance for a 5-year control program utilizing applications of the glyphosate-based herbicide Rodeo®. Rodeo® would be applied by pesticide-certified operators during the peak blooming season for PLS. Methods of application would involve using low pressure (hand) backpack sprayers in areas where purple loosestrife density is low to moderate. In areas of high density \leq 50 feet from an access road, application would be done by a pickup-mounted 25 gallon pump sprayer. All other dense areas would be applied by backpack sprayer. The manufacturer's recommended application rate would be followed (see Appendix 3) to avoid possible harmful effects to wildlife, fish, and aquatic invertebrates. After applications of Rodeo® are completed, personnel from cooperative agencies would monitor effectiveness and survey any other areas for potential PLS infestation and re-apply if necessary.

3.1.4 Alternative D. Select Manual Removal and Application (Proposed Action)

Under this alternative, the Service would provide funding and technical assistance for a 5-year control program combining applications of the glyphosate-based herbicide and manual removal of PLS plants. This alternative would use the same methodology as stated under Alternatives B and C; however, methodology for Alternative B would be modified to meet concerns regarding regeneration effects from manual removal. Uprooting the plant by hand and ensuring all vegetative parts are removed can eliminate PLS (Malecki et al. 1993). However, stands containing only a few individual plants may be adequately controlled by hand pulling (Rawinski 1982). Therefore, manual removal under this alternative would be conducted on individual plants or small, isolated infestations where complete removal of plants can be accomplished by hand.

3.2 Alternatives Removed from Consideration

3.2.1 Alternative E. Biological Control

Alternative D consists of providing funding for the implementation of a biological control program that uses insects that exclusively feed on PLS. Research has found three insects- a weevil (*Hylobius transversovittatus*) and two leafbeetles (*Galerucella californiensis* and *G. pusilla*), and a flower-eating beetle- that are very host-specific and damaging to PLS (Blossey and Schroeder 1989, Blossey and Schroeder 1991, Kok and McAvoy 1990). These three European insects, including two others that feed on PLS seeds and flowers (*Nanophyes mamoratus* and *N. breves*), have been approved for release in the U.S. to control PLS.

No consistent methodology for the introduction of insects to new environments is available. Therefore, applicability of this alternative would be determined based on a list of criteria

determining "acceptability for study sites" in controlling PLS as defined by Hight and Drea (1991). These criteria are that the site: 1) be in the climatic regions of the northern United States to avoid more southern limits where the introduced insects might not survive, 2) be in a marsh or wetland that does not have standing water from May through September to facilitate development of the insects, 3) have a dense, well-established PLS more than 2 ha in extent, 4) have neighboring stands of the plant within a kilometer to reduce isolation and permit the spread of the insect out of the release site after establishment, 5) not be subject to chemical applications or cultural control methods (e.g. burning, mowing, water level manipulation, etc.), 6) be free from major environmental changes (flooding, grazing, commercial development, camping), be relatively isolated from human activity but reasonably accessible, and 7) be available to the project for a seven- to ten-year period.

The biological control agents would be released in field cages to observe behavior, reproduction, and survival in PLS habitat. Based on results from the field cages, the agents would be released in undisturbed habitats that contain extensive infestations of PLS. After release, evaluation of the efficacy of the introduced agents, including any impacts to native biota, would be conducted. Biological control does not eradicate or contain PLS but reduces its numbers to a balance with other vegetation (Mullin et al. 1993). Reductions of PLS from the biocontrol agents would be beneficial to wetland and riparian productivity but only as a supplement with other control efforts because biological controls stress weeds or reduce their capacity to produce seeds, but do not kill the target plants (Sheley et al. 1995). The deliberate and complex nature of a biocontrol program requires 10 or more years before results can be observed in the field (Thompson et al. 1987). Under field conditions, all proposed insects attack and develop exclusively on PLS; however, they do not suppress seed production in a sufficient degree to prevent further spread and recolonization (Schroeder 1990).

Additionally, portions of the criteria listed by Hight and Drea that do not meet standards for a feasible study site include: 1) climate of the basins could negatively affect insect survival due to high summer temperatures, 2) current level of infestations would make spread and establishment of insects difficult to accomplish, 3) standing water is a common occurrence among wetland areas from May to September that could affect insect development, 4) the basins are not isolated from human activity which could impact insect populations, and 5) the time-frame needed for a results to occur is not applicable for Service resources.

Therefore, based on the information presented, this alternative was eliminated from consideration because the prospect of implementing a successful biological control program within the basins is unlikely.

3.3 Summary of Actions by Alternatives

Table 1 Summary of Actions by Alternatives

ALTERNATIVE	ACTION
A. No Action	The Service would not participate in funding the control of PLS infestations in the Truckee and Carson River Basins. PLS control would have to be achieved from alternate funding. PLS would likely continue to increase and spread to important wetland and agricultural areas in western Nevada.
B. Funding of manual removal	Provide funding for removing PLS infestations within drainages by digging or pulling plants manually. This would be achieved using resources from various volunteer and social service organizations as well as involved agencies.
C. Funding of the application of the herbicide Rodeo®	Provide funding for the application of Rodeo® to PLS in wetland and riparian areas. Application would be managed by pesticide-certified operators under the direction of involved agencies during peak flowering of PLS.
D. Funding for select manual removal and application of the herbicide Rodeo® (proposed Action)	Provide funding for a utilizing a combination of Rodeo® application and manual removal of PLS. Manual removal would be conducted on individual plants or small areas where complete removal of plants are likely.

4.0 Affected Environment

The immediate affected environment of the proposed alternatives would consist of riparian and wetland areas on lands administered by the Service as well as other Federal, State, private, and Tribal lands contained within the Truckee and Carson River Basins (see Attachment 1). Decisions regarding control at specific sites would be determined on a site-by-site basis by Service, State, University, and other Federal personnel. Control efforts will be applied to all areas that contain PLS in the Truckee and Carson River Basins including any ditches located therein. Descriptions of the various components of the affected environment within the area of the proposed action follows.

4.1 Geographic Setting

For purposes of describing the existing environment, the affected area is divided into two geographical areas: Truckee River Drainage and Lahontan Valley.

4.1.1 Truckee River Drainage

The Truckee River begins on the western shore of Lake Tahoe near Tahoe City, California, and traverses approximately 119 miles to its terminus at Pyramid Lake in Nevada. The portion of the Truckee River drainage which is affected by the proposed action involves the river beginning at the mouth of the Truckee River Canyon near Verdi, Nevada, and includes all associated drainages extending to Pyramid Lake. Downstream from Verdi the river enters an area called Truckee Meadows of which the western and northern sections are occupied by the incorporated cities of Reno and Sparks. This area is 4,500 to 4,300 feet in elevation and is poorly drained. Truckee Meadows lies in the valley formed between the Carson Range of the Sierra Nevada on the west and the Pah Rah and Virginia Ranges on the east. Drainages of particular concern within the area are Sparks Ditch, Orr Ditch, Steamboat Creek, Boynton Slough, miscellaneous ditches around the Reno/Sparks area, and the Truckee Canal. There are several valleys north of Reno which are considered to be in the affected area; these are Sun Valley, Lemmon Valley, and Spanish Springs Valley. These valleys are separated by hills and ridges but are all in close proximity to each other and to Reno. Below the Vista Reef, an igneous dike which is the river's outlet from Truckee Meadows, the river enters the lower Truckee River Canyon and flows eastward to Wadsworth where it emerges into a valley and flows north through the Pyramid Lake Paiute Indian Reservation to Pyramid Lake. Precipitation is minimal (7 inches or less) on the valley floors and in regions east of Reno.

4.1.2 Lahontan Valley

The Lahontan Valley is the hydrologic basin of the lower Carson River that includes Lahontan Reservoir and extends to the Carson Sink. The area includes the city of Fallon (population 7,060) and the Fallon Paiute-Shoshone Indian Reservation and Colony (population 970).

Lahontan Reservoir, Carson River, and canals and regulating reservoirs associated with the Carson Division of the Newlands Project represent the major water resources in the area. Lahontan Valley is a broad alluvial basin encompassing approximately 2,000 square miles of nearly flat terrain with altitudes ranging from 3,900 to 4,100 feet above sea level. Precipitation averages about 5 inches per year.

4.2 Surface Water Resources

4.2.1 Lower Truckee River

The river basin has no outlet to the sea. Diversions from the Truckee River within the affected area include: 1) Municipal and industrial supply and irrigation water for the urban and agricultural communities in the Truckee Meadows; 2) irrigation and industrial supply in the lower Truckee River Canyon for use within the Basin; and 3) an inter-basin transfer of water at Derby Dam that diverts water from the Truckee River system into the Truckee Canal and transports water to Lahontan Reservoir on the Carson River system. Downstream from Derby Dam water is diverted for irrigation and livestock watering purposes. The last major structure on the mainstem of the Truckee River is the Marble Bluff Dam that diverts water to the Pyramid Lake Fishway that allows fish from Pyramid Lake to enter the Truckee River for spawning purposes.

4.2.2 Lahontan Valley

Lahontan Reservoir holds water for use in the Truckee-Carson Irrigation District in Fallon, Nevada. Water released for agricultural use or spilled for precautionary flood storage is routed through the Fallon agricultural area. Water flows about a mile downstream from Lahontan Reservoir and is diverted at the Carson River Diversion Dam to the northeast via the _____ canal and southeast via the _____ canal. From these two canals, secondary canals branch off to deliver water to an extensive system of lateral canals that distribute water through numerous head gates for flood irrigation of fields.

About 350 miles of open drains route irrigation return flow and shallow _____ seepage to the Carson River wetlands at Stillwater National Wildlife Refuge (NWR), and Carson Lake. The Carson River passes through the town of Fallon and terminates at the Carson Sink, a nearly barren, flat, salt-encrusted playa occupying approximately 400 square miles on the northern boundary of Stillwater NWR. Any remaining water from the Carson River is infiltrated or mostly evaporated at the Carson Sink.

4.3 Biological Resources

4.3.1 Wetland Areas

Wetlands are among the fastest disappearing natural ecosystems in the United States, (Mitsch and Gosselink 1986). The Great Basin includes over 75 watersheds, most draining to a terminal lake or desert playa. The dependency on water by humans and wildlife suggests wetlands have greater importance in the Great Basin than wetlands in regions with greater precipitation. Great Basin wetlands have always been very small and restricted due to the function of the arid climate.

Wetland areas in the Basins which would be affected by the proposed action would be all riparian habitats that border the Truckee and Carson River and connected drainages, marshes, and streams that are more ephemeral in nature. Examples of such areas are Steamboat Slough, Boynton Slough, Orr Ditch, Steamboat Ditch, Truckee Canal, V Canal, T Canal, and other associated ditches in the Newlands Project. Other affected wetland areas defined as palustrine and lacustrine by Cowardin et al (1979) include miscellaneous pockets in lower Truckee valley between Wadsworth and Nixon, Spanish Springs, Lemmon Valley, Hidden Valley, and Sun Valley. Carson Sink and Stillwater National Wildlife Refuge are also areas that are included (see Attachment 3).

Wetland areas of the Truckee and Carson River Basins are essential elements of fish and wildlife habitat in the Great Basin and are crucial in nutrient cycling and energy flow between trophic levels. Wetlands and riparian areas of western Nevada are important to many species of fish and wildlife for food, habitat, and support of the food chain. Wetland vegetation provides nesting material and sites for numerous birds and mammals. The importance of plant productivity is reflected in the relatively high carrying capacity of wetlands for certain species (Office of Technology Assessment 1984). PLS encroachment would produce monocultures that adversely affect fish and wildlife resources and their wetland habitat. Through the control of PLS, impacts to wetland productivity and diversity would be minimized. Therefore, a goal of controlling the invasion of PLS is the increase of wetland quantity and quality for the improvement of fish and wildlife resources.

4.3.2 Fish

4.3.2.1 Truckee River Basin

Native species occurring in the affected area of the Truckee River basin include Cui-ui (*Chasmistes cujus*), Lahontan cutthroat trout (*Salmo clarkii henshawi*), Lahontan red shiner (*Richardsonius egregius*), speckled dace (*Rhinichthys osculus*), Tahoe sucker (*Catostomus tahoensis*), mountain sucker (*Catostomus platyrhynchus*), and tui chub (*Gila bicolor*) -

Non-native fish species occurring within the proposed action area of the Truckee River basin

include rainbow trout (*Salmo gairdneri*), brown trout (*Salmo trutta*), carp (*Cyprinus carpio*), largemouth bass (*Micropterus salmoides*), green sunfish (*Lepomis cyanellis*), black crappie (*Pomoxis nigromaculatus*), mosquitofish (*Gambusia affinis*), channel catfish (*Ictalurus punctatus*), brown bullhead (*Ictalurus nebulosus*), and fathead minnow (*Pimephales promelas*).

4.3.1.2 Carson River Basin

Native species occurring in the affected area of the Carson River basin include tui chub, Lahontan red shiner, speckled dace, Lahontan mountain sucker (*Pantosteus lahontan*), and Tahoe sucker.

Non-native species occurring within the proposed action area of the Carson River basin include white bass (*Morone chrysops*), channel catfish, white catfish (*Ictalurus catus*), walleye (*Stizostedion vitreum vitreum*), striped bass (*Morone saxatilis*), largemouth bass, white crappie (*Pomoxis annularis*), yellow perch (*Percanflavescens*), Sacramento blackfish (*Orthodon microlepidotus*), fathead minnow, and mosquitofish.

4.3.3 Birds

The wetlands of the Truckee and Carson River basins support a wide diversity of migratory and wetland-dependent birds and serve as one of the most important sites on the Pacific flyway because they provide habitat within one of the most xeric portions of North America.

The common species of waterfowl that traditionally use wetland habitat within the affected area include northern pintail (*Anas acuta*), green-winged teal (*Anas crecca*), cinnamon teal (*Anas cyanoptera*), gadwall (*Anas strepera*), mallard (*Anas platyrhynchos*), northern shoveler (*Anas clypeata*), American widgeon (*Anas americana*), canvasback (*Aythya valisineria*), and redhead (*Aythya americana*).

Shorebird species commonly seen within the affected area include long-billed dowitcher (*Limnodromus scolopaceus*), American avocet (*Recurvirostra americana*), black-necked stilt (*Himantopus mexicanus*), common snipe (*Gallinago gallinago*), Wilson's phalarope (*Phalaropus tricolor*), red-necked phalarope (*Phalaropus lobatus*) and killdeer (*Charadrius vociferous*).

There are substantial numbers of colony nesting and other marsh birds that and nest within the affected area. These species include white-faced ibis (*Plegadis chihi*), black-crowned night heron (*Nycticorax nycticorax*), great egret (*Casmerodius albus*), snowy (*Egretta thula*), cattle egret (*Bubulcus ibis*), great blue heron (*Ardea herodias*), double-crested cormorant (*Phalacrocorax auritus*), eared grebe (*Podiceps nigricollis*), Western (*Aechmophorus occidentalis*), Clark's grebe (*Aechmophorus clarkii*), pied-billed (*Podilymbus podiceps*), Forster's tern (*Sterna forsteri*), and California (*Larus californicus*).

There are several passerine species which occupy the wetland and riparian areas of the affected

area. Examples of species that are associated or depend on wetland and riparian areas within the affected area include western wood pewee (*Contopus sordidulus*), house wren (*Troglodytes aedon*), yellow warbler (*Dendroica petechia*), MacGillivray's warbler (*Oporornis tolmiei*), Bewick's wren (*Thryomanes bewickii*), black-headed grosbeak (*Pheucticus melanocephalus*), northern oriole (*Ictarus galbula*), and yellow-headed cowbird (*Xanthocephalus xanthocephalus*).

Wetland-dependent raptors found in the affected area include bald eagle (*Haliaeetus leucocephalus*), northern harrier (*Circus cyaneus*), peregrine falcon (*Falco peregrinus*), osprey (*Pandion haliaetus*), and short-eared owl (*Asio flammeus*).

4.3.4 Mammals

Mammals are found throughout the affected area with the largest numbers occurring within the upland habitats. However, several mammal species are dependent on wetland and riparian habitats within the affected area. These species include beaver (*Castor canadensis*), muskrat (*Ondatra zibethica*), raccoon (*Procyon lotor*), Nutria (*Myocastor coypus*), and other small rodents such as Western harvest mouse (*Reithrodontomys megalotis*), and long-tailed voles (*Microtus longicaudus*).

4.3.5 Threatened and Endangered Species

There are four Federally listed species that occur within the proposed action area. Following is a description of each species and their habitats within the affected area:

4.3.4.1 Cui-ui

This fish is a lake sucker endemic to Pyramid Lake and the lower reaches of the Truckee River. The total adult population is estimated to be in excess of 1 million (Heki, pers. comm.). Cui-ui spawn in the lower Truckee River during the spring and early summer months. Critical habitat for the cui-ui has not been designated.

4.3.4.2 Lahontan cutthroat trout (LCT)

This fish is an inland subspecies of cutthroat trout endemic to the physiographic Lahontan basin of northern Nevada, eastern California, and southern Oregon. Small populations have been introduced at various locations along the mainstem of the Truckee River and in headwater streams of the Carson River. A small number of LCT spawn in the lower Truckee River during the spring and early summer months. Critical habitat for the LCT has not been designated.

4.3.4.3 Bald eagles

This species overwinters and occasionally nests in western Nevada. Up to 70 wintering bald eagles have been recorded in Lahontan Valley. Timber Lake, north of Fallon, is the primary

historic winter roost site, while other areas, including Indian Lakes, S-line and Harmon regulating reservoirs, are commonly frequented. During Summer 1997, a pair of bald eagles nested on an island of Lahontan Reservoir. The single eaglet produced apparently fell from the nest and drowned. One pair nested again in 1998 and have successfully reared one eaglet. There is no critical habitat for bald eagles in Nevada.

4.3.4.4 Peregrine falcons

Adult males, females, and juvenile birds are sighted at Carson Lake and Stillwater National Wildlife Refuge, usually during the period February through November. In the past, birds have been presumed to be nesting near Carson Lake; however, nesting has not been verified. There is no critical habitat for peregrine falcons in Nevada.

4.3.6 Species of Concern

Species of concern are rare or sensitive species for which data on biological vulnerability and threats are incomplete. Further biological research and field study are needed to resolve the conservation status of these taxa. Following is a list of species of concern within the affected area:

4.3.6.1 Mammals

Pygmy rabbit	<i>Brachylagus idahoensis</i>
Spotted bat	<i>Euderma maculatum</i>
Small-footed myotis	<i>Myotis ciliolabrum</i>
Long-eared myotis	<i>Myotis evotis</i>
Fringed myotis	<i>Myotis thysanodes</i>
Long-legged myotis	<i>Myotis volans</i>
Yuma myotis	<i>Myotis yumanensis</i>
Pale Townsend's big-eared bat	<i>Plecotus townsendii pallescens</i>
Pacific Townsend's big-eared bat	<i>Plecotus townsendii townsendii</i>

4.3.6.2 Birds

Northern goshawk	<i>Accipiter gentilis</i>
Western burrowing owl	<i>Athene cunicularia hypugea</i>
Black tern	<i>Chlidonias niger</i>
Least bittern	<i>Ixobrychus exilis hesperis</i>
White-faced ibis	<i>Plegadis chihi</i>

4.3.6.3 Reptile

Northwestern pond turtle	<i>Clemmys marmorata marmorata</i>
--------------------------	------------------------------------

4.4 Recreational Resources

Wetland habitats in the Truckee and Carson River Basins, including those administered by the U.S. Fish and Wildlife Service at Stillwater National Wildlife Refuge (see Attachment 3), provide excellent outdoor recreational opportunities for fishing, hunting, and other activities.

The Truckee River Basin is a popular site for outdoor activities and has designated beneficial uses by the State for boating, aesthetics, recreation, and body contact sports. Some of the most popular uses are rafting, fishing, bird-watching, and hunting.

Most outdoor recreation in the Lahontan Valley portion of the Carson River Basin occurs on public lands that are under the jurisdiction of the Bureau of Land Management, Reclamation, Nevada State Parks, or the Service. Wetland Areas offer waterfowl hunting, bird-watching, and sight-seeing. Some fishing occurs when water conditions are conducive to maintaining fish populations.

4.5 Economic Resources

4.5.1 Recreation-Related

Wildlife-associated recreation continues to be very important to the western Nevada's economy. The Water Rights Acquisition for Lahontan Valley Wetlands EIS (U.S. Fish and Wildlife Service 1996) adjusted recreation expenditures in Lahontan Valley wetlands and determined total 1992 averages for hunting, fishing, and general categories at \$174,392. There are no data to quantify recreation expenditures along the Truckee and Carson Rivers. However, these areas provide important recreation for fishing, hunting, and bird-watching opportunities and contribute to the overall economy of western Nevada.

4.5.2 Agriculture-Related

Cattle ranching and dairy production are the primary agricultural activities in the basins. Alfalfa is the dominant crop with some small grains also grown in the area. Alfalfa is suitable for utilization in the growers operations (Schank and Matley 1994). Livestock operators in Lahontan Valley depend on rangeland grazing, private pasture lands, and feedlots to feed livestock. Many of these livestock operations rely on irrigated farmland for feed and pasture during winter. The Service estimated economic activity from alfalfa production in the middle Carson River corridor and Fernley areas was valued at approximately \$1.99 million annually (U.S. Fish and Wildlife Service 1996).

4.6 Cultural Resources

Human habitation of the Great Basin spans at least the last 10,000 years. Within that time range the Carson and Truckee Rivers and their associated lakes have increased and receded. Access to water was always an important consideration that influenced settlement patterns. Food resources, including fish, waterfowl, and plants are especially prevalent at the lakes and marshes. Seasonal variability of food resources required the native inhabitants to move between riverine, desert, and mountain environments. Archaeological sites and ethnographic studies provide supporting evidence for the wide ranging use of the environment by native Primary residences or village sites are usually positioned in low elevation, lacustrine settings, such as lakeshores, lake terraces, or river terraces. Desert environment site types include temporary hunting or seed gathering camps and lithic reduction stations. Rockshelters, quarries, and temporary camps are found in high elevation locations (Bard et al. 1981; Raven 1990; Zeanah et al. 1995).

The pattern of seasonally exploiting a variety of resources across a variety of landscapes was disrupted by the arrival of Euroamerican settlers in the Lahontan Valley in the 1850s and 1860s. The impact on the Carson Desert region came in the early 1900s when the Newlands Reclamation Project changed the water use and settlement patterns (pendleton et al. 1982). Major features of the Newlands Project are the Derby Dam on the Truckee River and Lahontan Dam on the Carson River. The Newlands project was designed to provide irrigation water and encourage farmers to move to the Lahontan Valley. While the Newlands project irrigation system has not been entirely successful, it did succeed in drawing farmers into the area (Bard et al. 1981). The communities of Reno-Sparks, Wadsworth, Fernley, and Fallon substantially during the twentieth century. Fallon's development is especially linked with the Newlands Reclamation Project.

Archaeological evidence of prehistoric land use in the project area includes tool-making materials, grinding tools, habitation sites, burial sites, and sites of religious significance. Historical sites within the project include buildings and structures associated with the Newlands Reclamation Project (canals, dams, drains), homesteads associated with the initial period of settlement, and urban development. Homestead sites may include standing buildings and archaeological remains.

5.0 Environmental Consequences

5.1 Surface Water Impacts

5.1.1 Alternative A

The results from not taking action will cause a reduced potential for successful PLS control within the initial stages of infestation. PLS can completely clog ditches (Mullin et al. 1993). As a result, surface discharge characteristics are anticipated to change from infestation in canals,

ditches, and other drainages. Lack of successful control would lead to alterations of vegetation cover and adversely impact flood storage capacities of several hydrologic portions of the basins; therefore, the impact to flood storage capacities would lead to alterations of the 100-year flood plain. Additionally, infestation of PLS would displace native vegetation that is effective in bank stabilization. As a result, water quality is expected to decrease with increased erosion.

5.1.2 Alternative B

Initial attempts at removal in 1997 proved to be difficult due to extensive root systems. Incomplete removal of the plant and its roots would lead to regeneration from root-stocks, and disturbance of the plant at particular stages of growth would increase seed dispersal and promote further spread to other areas (see Appendix 1). Manual removal of dense PLS stands is expected to have effects similar to the no action alternative discussed above due to potential regeneration of root-crowns and promotion of spread from seed dispersal. Effects from this alternative to surface waters would not be demonstrated initially due to plant removals; however, regeneration and establishment of PLS after removal in dense areas is expected to occur within three to five years post-treatment. Therefore, funding for this alternative is expected to adversely impact surface water characteristics, increase erosion that affects water quality, and reduce flood storage capacities.

5.1.3 Alternative C

This alternative is expected to reduce and or eliminate PLS within affected drainages. Herbicides offer a selective technique for reducing PLS levels, eradicating pioneer colonies of the plant, and restoring wetland communities (Nelson et al. 1995). The reduction of PLS in areas that are currently heavily impacted will increase drainage potential and flood capacity and re-establish native vegetation that decreases erosion. Additionally, glyphosate, the active ingredient in Rodeo[®], becomes inactive in the soil due to adsorption and very little if any leaching occurs (World Health Organization 1994). Therefore, no impacts to water quality and quantity are expected.

5.1.4 Alternative D

Combining chemical application of Rodeo[®] with complete removal of individual PLS plants is expected to produce effective results in control or eradication and provide better flexibility for its management. The effects to surface water resources from implementing this alternative are expected to be similar to Alternative C.

5.2 Biological Impacts

5.2.1 Alternative A

If alternate funding could be obtained by involved agencies for PLS control, it is expected that a reduced potential for successful PLS control in the Basins would occur due to limited funding sources. In addition, any control efforts conducted without technical assistance from the Service may have the potential to negatively affect fish and wildlife resources.

If no control efforts were to be conducted, PLS would continue to increase and spread to important wetland and agricultural areas in western Nevada. Impacts would lead to the reduction and alteration of wetlands with the replacement of monotypic stands of PLS that would adversely affect biological productivity and habitat diversity. These reductions will lead to cascading effects on other various biological components: 1) reduced food and nesting habitat for migratory waterfowl and songbirds, 2) reduced forage areas for mammals such as beaver, racoon, and muskrat, and 3) reduced spawning habitat for fish. Wetland habitats are essential to waterfowl in the Pacific Flyway. Alterations of these key areas would necessitate major changes in flyway patterns, and waterbirds would migrate to other areas where competition for food with other resident birds would increase.

5.2.2 Alternative B

By providing funding for manual removal of PLS, reductions of PLS impacts in wetland areas would be expected. Such sites are usually along stream borders or very narrow wetland edges where extensive mudflats are available for colonization on a large scale. As colonization expands and stem densities increase, removal by hand pulling soon becomes labor intensive and costly.

Reconnaissance work in 1997 discovered high density areas of PLS in the Sparks and Orr Ditch. In these high density areas, removal of PLS would cause disturbance to surrounding soil and provide an environment for establishment of other noxious weeds such as whitetop (*Lepidium latifolium*). This alternative would not be effective in areas with large infestations and would require extensive manual labor and time to remove infestations. The amount of manpower and time required to implement this alternative would be extensive and difficult in order to obtain a successful effort.

PLS would be controlled initially; however, manual removal of extensive PLS populations would likely result in re-infestation within two years based on previous information from studies on PLS biology (Bodmer 1928, Gilbert and Lee 1980). Re-infestation is expected to produce reductions in productivity and diversity of wetland and riparian areas similar to the no action alternative. Long-term control and eradication would not be achieved from this alternative unless combined with other applications under appropriate conditions.

5.2.3 Alternative C

The funding of PLS control through chemical application of Rodeo® is expected to reduce the impact of PLS to aquatic areas infested on both small and large scales and has the potential for successful control within a short time frame. Rawinski (1982) found that a glyphosate herbicide, when applied during peak bloom, resulted in 99% control and led to natural establishment of desirable native vegetation. The reduction of PLS would increase biological productivity and improve wetland quality and quantity.

As with any chemical application, there is concern over the effect of Rodeo to the biota in the environment. is effective at relatively low concentrations and has low potential for bioaccumulation (Thompson et al. 1987). was selected because data obtained from previous studies indicate low toxicity to invertebrates, fish and birds. is the only herbicide approved by the Service for use in aquatic habitats. has been used in aquatic habitats to control PLS in other studies and has been utilized by the Service for cattail control at Moapa National Wildlife Refuge, Clark County, Nevada (habitat for the endangered Moapa dace), and salt cedar control at Ash Meadows National Wildlife Refuge, Nye County, Nevada (habitat for the endangered Ash Meadows pupfish, Ash Meadows naucorid, and 3 threatened plants). Nevada Division of Wildlife has also used to control cattails at Kirch Wildlife Management Area (habitat for the endangered White River Spinedace).

The overall result expected from Alternative C is the reduction and potential elimination of PLS within wetland and riparian areas. With this reduction or elimination of PLS; waterfowl breeding areas will increase due to more open water areas, more open water areas will lead to an increase in fish habitat, passerines will benefit from an increase in native vegetation, and muskrat habitat will increase from cattail establishment in former PLS areas. The overall expected result is the promotion of fish and wildlife resources and long-term restoration of wetland habitats.

5.2.4 Alternative D

The implementation of this alternative is expected to produce effective results in control or eradication and provide better flexibility its management. However, there is a concern regarding soil disturbance from manual removal of selected plants and the potential to promote establishment of other exotic weeds. The total areas of PLS available for complete manual removal based on mapping conducted in 1997 are small. Therefore, contribution of soil disturbance to establishment of other exotic weeds is minimal when compared to the total area currently occupied by other exotic weeds. The impacts to biological resources from this alternative are expected to be minimum and implementation would produce effects similar to Alternative C.

5.3 Threatened and Endangered Species

5.3.1 Alternative A

The effect to threatened and endangered species from taking no action is expected to be negative. Disruption of productivity will alter food chain dynamics leading to overall reduction in the ability to support T&E species. Resource availability for bald eagles and falcons (e.g., passerines and rodents) would be reduced. In addition, attributes of PLS allow it to outcompete and even eliminate other plant species in wetland habitats (Malecki et al. 1993). Native cover essential for thermoregulation of water within tolerance ranges of cui-ui and lahontan cutthroat trout in spawning areas of the rivers would be reduced and negatively impact those populations.

5.3.2 Alternative B

This alternative is expected to have the same effects as no action due to the inability to control extensive and dense PLS populations in the long-term.

5.3.3 Alternative C

The application of Rodeo to PLS is not likely have an adverse effect on endangered or threatened species (see Section 7 consultation, Appendix 2). The expected positive impact from reducing PLS by Rodeo application will be beneficial for improving habitat characteristics of the four listed species occurring in the proposed action area. Rodeo[®] has been used for cattail control at Kirch Wildlife Management Area, Nye County, Nevada (habitat for the endangered White River spinedace), and Moapa National Wildlife Refuge, Clark County, Nevada (habitat for the endangered Moapa dace), without any adverse effects. Although Rodeo[®] has not been demonstrated to have adverse effects on fish when used according to label directions, control applications will occur outside of the spawning period for cui-ui and LeT. Application rates and other technical information can be found in Appendix 3 and 4.

5.3.4 Alternative D

This alternative is expected to have the same effects as Alternative C and provide better flexibility to control PLS populations versus chemical application alone.

5.4 Recreational Impacts

5.4.1 Alternatives A and B

Any degradation of wetlands by the invasion of PLS negatively impacts outdoor recreational

activities such as waterfowl hunting, fishing, and **bird-watching**. These impacts are derived PLS by reducing species diversity and abundance, replacing quality habitat, and reducing biodiversity of the flora and fauna of the basins. In addition, the propensity for PLS to clog waterways could directly impact boating and swimming in the Basins. The effectiveness of controlling PLS would directly correlate with positive impacts to recreational activities. With that in mind, Alternative A and the inability of Alternative B to control extensive areas of PLS in the long-term would impact recreational opportunities.

5.4.2 Alternative C

The reduction or elimination of PLS from effective control or eradication under Alternative C would have positive impacts on recreational opportunities in the future by maintaining habitat quantity of wetland and riparian areas and increasing diversity. The increase in open water areas would allow increased waterfowl hunting and boating opportunities. Reductions in PLS along banks would allow easier access for fishermen. The increase of wetland and riparian diversity would improve the aesthetics of the affected areas and allow improved opportunities for camping.

5.4.3 Alternative D

The reduction of PLS from this alternative would increase recreational opportunities in the proposed area by reducing impacts to resources. This alternative is expected to have the same effects as Alternative C and provide better flexibility to control PLS populations compared to only applying

5.5 Economic Impacts

5.5.1 Alternative A

The expenditures from recreational opportunities could be influenced by PLS if no action is taken by the Service and the plant's colonization of wetlands changes the biology so that wildlife is no longer attracted. Where PLS is especially expansive, there may be indirect negative effects on local economies. This is because a reduction of vegetative diversity would result in a loss of wildlife diversity leading to decreased hunting, fishing, and wildlife viewing opportunities.

Invasion of PLS into ditches, irrigation canals, and agricultural fields could pose a threat to farmers by limiting water supplies (Sheley et al. 1995). In western states, PLS establishment in irrigation systems has impeded the flow of water and generated substantial concern (Malecki et al. 1993). The majority of irrigation canals within the Lahontan Valley are un-lined (or not concreted). Establishment of PLS within canals would impede water flow and control efforts would have to be conducted to remove this impact. Without control, decreased alfalfa

production, displacement of herbaceous cover for grazing, and efforts at PLS removal by fanners and ranchers would cause a negative impact on the agricultural economy of Lahontan Valley and the Truckee River corridor. These results would lead to increasing costs of production. Additionally, PLS is successful as a pasture invader due to its' lower palatability compared to native forages (Thompson et al. 1987). The establishment of PLS could lead to a decrease of carrying capacity on rangelands within riparian areas and likely impact cattle and sheep operations.

5.5.2 Alternative B

Controlling PLS invasion through exclusive hand pulling would be beneficial in the short-term. However, effects from soil disturbance in dense areas, incomplete removal, and potential seed dispersal from removal efforts would have negative impacts in the long-term and compound the ability to control PLS. Lack of long-term successful control would lead to increases of PLS infestations. Results of increased infestation would have an impact on the economy of the proposed area comparable to the no action alternative. Examples of long-term effects leading to a negative impact include: 1) reduced hunting and fishing expenditures, 2) reduced expenditures from bird-watchers due to poor quality of wetland habitat, 3) increased costs in ranching due to reduced carrying capacity, 4) increased production costs of alfalfa due to decreased yield in irrigated fields with PLS.

5.5.3 Alternative C

Application of Rodeo[®] to control PLS is expected to not have an effect on economics of the area. The control or eradication of PLS would remove the threats that PLS would present to wildlife and agriculture related revenues associated with habitat diversity and water availability.

5.5.4 Alternative D

This alternative would provide better flexibility to control PLS populations and be more effective versus exclusive chemical application. The results from implementing this alternative on the economy are expected to be the same as Alternative C.

5.5.5 Other Economic Concerns

Historically, PLS has been widely used in the horticulture industry as an ornamental plant. Nurseries within Nevada have sold PLS or its cultivars in the past. However, general public awareness of the detrimental qualities of PLS have greatly reduced its popularity as an ornamental in recent years. In addition, certain cultivars serve as an acceptable substitute. One such substitute in Nevada is "Morden Pink" (Johnson 1992). Implementation of the proposed actions are not expected to have any effect on the horticulture industry in western Nevada.

5.6 Cultural Impacts

5.6.1 Alternative A

No effects to cultural resources are anticipated under Alternative A.

5.6.2 Alternative B

Removing PLS by digging or pulling by hand are anticipated to have minimal effects on cultural resources. No effects to cultural resources are anticipated if the hand removal is within ditches, canals, or recently modified surfaces. No effect to the Newlands Reclamation Project features or standing buildings is anticipated. Hand removal along stream borders or wetland edges may effect surface manifestations of archaeological sites, but the extent of this effect is not known. Identification of cultural resources along stream borders and wetland edges is recommended and consultation with the State Historic Preservation Office (SHPO) prior to implementation.

5.6.3 Alternative C

Application of the herbicide Rodeo by backpack-mounted or truck-mounted spray is a non-surface disturbing action, and no effects to cultural resources are anticipated. Truck-mounted spraying will be accomplished from existing roads adjacent to the spray zone. Pedestrian spraying will be used in areas where truck spraying is unsuitable.

5.6.4 Alternative D

Minimal effects to cultural resources are anticipated under Alternative D. As stated previously under Alternative B, removal of PLS along stream borders or wetland edges may effect surface manifestations of archaeological sites, but the extent of this effect is not known. Identification of cultural resources along stream borders and wetland edges and consultation with the SHPO is recommended prior to implementation.

5.7 Summary of Environmental Consequences

Table 1. Summary of Impacts By Environmental Topic By Alternative

ENVIRONMENTAL TOPICS	ALTERNATIVES			
	A	B	C	D
	No Action	Manual Removal	Rodeo [®] Application	Select Manual Removal &
Water Quantity & Quality	1 (*)	1 (*)	4 (*)	4 (*)
Wetland Habitat	1	1	5	5
Fish & Wildlife Habitat	1	1	4	4
Threatened & Endangered Species	1	1	3	3
Recreation	1	1	4	4
Economy	1	1	3	3
Cultural Resources	3	2	3	2

(*)Value scale: 1= large impact; 2= slight impact; 3= no impact; 4= slight positive impact;
5= large positive impact

Table 2. Summary of Impacts By Alternative (*)

ENVIRONMENTAL TOPICS	ALTERNATIVES			
	A	B	C	D
	No Action	Manual Removal	Rodeo [⊕] Application	Select Manual Removal & Rodeo [⊕]
Water Quantity & Quality	0(**)	0(**)	+3 (**)	+3 (**)
Wetland Habitat	0	0	+4	+4
Fish & Wildlife Habitat	0	0	+3	+3
Threatened and Endangered Species	0	0	+2	+2
Recreation	0	0	+3	+3
Economy	0	0	+2	+2
Cultural Resources	0	-1	0	-1

(*) Data from Table 2: Impact values compared to No Action Alternative

(**) Value scale: (-) = negative impact

(0) = no change in impact

(+) = positive impact

(1-5) = indicates change in impact value as compared to Alternative A

6.0 Cumulative Impacts

6.1 Introduction

Cumulative impacts refer to two or more single effects which are considerable or which compound or magnify other environmental impacts. The single effects could be changes resulting from an individual project or a number of separate projects. The cumulative impact from several projects is the alteration in the environment which results in the incremental impact of the project when added to other closely related projects conducted in the past, present, and future.

Cumulative impacts can result from relatively minor projects but collectively significant projects taking place over time.

This cumulative impact assessment utilizes information gathered on existing or future weed control projects within the project area that could have an impact on the same resources addressed in the PLS control program. The assessment first presents summaries of proposed programs identified through agency consultation and persons knowledgeable about weed control within northern Nevada. The program summaries are followed by a comparative analysis which identifies resources that are most likely to be affected by weed control programs.

6.2 Weed Control-Related Activities

The proposed programs identified for the cumulative impacts analysis include the following current or proposed Federal, State, and local programs in which information is available.

NRCS Tracy Power Plant River Restoration Project

NRCS Tall Whitetop Control on the Lower Carson River

These two projects are described, in turn, as follows:

6.2.1 Tracy Power Plant River Restoration Project

The Washoe-Storey County Conservation District and Sierra Pacific Power Company (SPPCo.) are cooperating to initiate a program aimed at controlling tall whitetop (*Lepidium latifolium*) at the Tracy Station facility. The project area lies on a floodplain terrace and channel embankment along the south side of the Truckee River and encompasses 115,000 square feet. Removal of whitetop would be done using a combination of mowing, burning, and application of Weedar 64® with a wick applicator. Mowing and burning of tall whitetop would be conducted in the early spring by Nevada Division of Forestry (NDF) personnel followed by application of the herbicide by SPPCo. In mid-summer and early-fall tall, whitetop would be monitored and herbicide would be spot-applied as needed. In late fall, tall whitetop would be mowed and burned once again by NDF personnel. The expected time line for completing this project is two years beginning in 1997 and ending in 1998. The goal of this project is to revegetate the south embankment of the Truckee River to reduce erosion and improve water quality and wildlife habitat. Information gathered from this project is expected to have implications in a programmatic control plan for tall whitetop along the Truckee River corridor. An informal Section 7 consultation was conducted by the Service in 1997, and the project was found to not likely adversely affect any threatened or endangered species.

6.2.2 NRCS Tall Whitetop Control on the Lower Carson River

The Lahontan Conservation District and the Churchill County Mosquito Abatement District are cooperating to initiate a program to eradicate tall whitetop for ten miles along the Carson River from Lahontan Dam downstream. Removal of tall whitetop will be done with the application of the herbicide Weedar 64®. Application of the herbicide would be done by an all-terrain vehicle in portions of the dry river channel during the spring before releases from Lahontan Reservoir begin. Applications would begin two feet above the high water mark and extend as far as 40 feet from

each bank. Areas below the water mark would be treated using a wick application method. The time line for conducting this is expected to encompass two years beginning in 1998 and concluding in 1999. No concerns were addressed by NRCS regarding environmental impacts from implementation of the

6.3 Comparative Evaluation

Comparative analysis, which identifies resources potentially affected by PLS control that appear to be potentially impacted by the two other weed control activities, was not available due to lack of comparable environmental information. However, these projects were considered based upon general familiarity with the project areas and the kinds of effects these projects may have on the environment.

6.4 Cumulative Impacts and Trends

A comparative evaluation does not find any resources that would be adversely affected by the two projects. Reasons for finding no adverse effects are: 1) projects described are limited in scope and time (2 years), 2) projects are limited in available data to draw conclusions about impacts to specific environmental resources, and 3) impacts to threatened and endangered species were found by the Service to not likely to be adverse in one project that uses the same herbicide as in the other project.

7.0 Compliance, Consultation, and Coordination

7.1 Consultation and Coordination Efforts

The propensity of PLS for rapid spread and invasion into riparian and wetland areas prompted the formation of a Federal-State-University working named the Purple Loosestrife Control Steering Committee (Committee). The goal was to develop a program to eradicate the weed from western Nevada while it is still fairly restricted in distribution. The consensus of this Committee was that failure to begin controlling PLS now will result in continued spread and infestation of PLS, with consequent declines in diversity and quality of riparian and wetland wildlife habitat in western Nevada. Control of PLS in western Nevada is envisioned as a multi-year effort, involving Federal, State, Tribal and local governments, and other concerned entities. Following is a list of members of the Committee as well as others who provided technical assistance and consultation during the process of this document:

Janet Bair, Botanist, Endangered Species, Ecological Services Division, U.S. Fish and Wildlife Service, U.S. Department of the Interior, Reno, Nevada.

John O'Brien, Programs Coordinator, Division of Agriculture, Department of Business and Industry, State of Nevada, Reno, Nevada.

Stephanie Byers, Fish & Wildlife Biologist, Endangered Species, Ecological Services Division, U.S. Fish and Wildlife Service, U.S. Department of the Interior, Reno, Nevada.

Sue Donaldson, Water Quality Education Specialist, U.S. Department of Agriculture Cooperative Extension, University of Nevada at Reno, Reno, Nevada.

MaryJo Elpers, Supervisor, Federal Activities, Ecological Services Division, U.S. Fish and Wildlife Service, U.S. Department of the Interior, Reno, Nevada.

Marcy Haworth, Fish & Wildlife Biologist, Federal Activities, Ecological Services Division, U.S. Fish and Wildlife Service, U.S. Department of the Interior, Reno, Nevada.

Wayne Johnson, Integrated Pest Management Specialist, U.S. Department of Agriculture Cooperative Extension, University of Nevada at Reno, Reno, Nevada.

Jeff Knight, Entomologist, Division of Department of Business and Industry, State of Nevada, Reno, Nevada.

Debra Palmquist, Mathematical Statistician, Agricultural Research Service, U.S. Department of Agriculture, Reno, Nevada.

Lou Ann Spuelda, Historical Archeologist, Division of Refuges Operations Support, U.S. Fish and Wildlife Service, U.S. Department of the Interior, Portland, Oregon.

Sherm Swanson, Ph.D., Renewable Resources Center, University of Nevada at Reno, Reno, Nevada.

Stanley N. Wiemeyer, Supervisor, Environmental Contaminants, Ecological Services Division, U.S. Fish and Wildlife Service, U.S. Department of the Interior, Reno, Nevada.

7.2 Pertinent Legislation and Regulations Addressed

National Environmental Policy Act (NEPA)

Endangered Species Act (ESA)

Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)

National Historic Preservation Act

8.0 References

- Bard, James C., Colin I. Busby, and John M. Findlay. 1981. Cultural Resources Overview of the Carson & Humboldt Sinks, Nevada. Cultural Resource Series No.2, Bureau of Land Management, Carson City, Nevada.
- Blossey, B. And O. Schroeder. 1989. Second annual report: study and screening of potential biological control agents of purple loosestrife (*Lythrum salicaria* L.). European station, Commonwealth-International Institute of Biological Control, Delmont, Switzerland. 31pp.
- Blossey, B. And O. Schroeder. 1991. Final report: study and screening of potential biological control agents of purple loosestrife (*Lythrum salicaria* L.). European station, Commonwealth-International Institute of Biological Control, Delmont, Switzerland. 41pp.
- Bodmer, H. 1928. Beitrage zur anatomie und physiologie von *Lythrum salicaria* L. Beih. Bot. Zbl. 45: 1-58.
- Fowler, C. S. 1992. **In the Shadow of Fox Peak: An Ethnography of the Cattail-Eater Northern Paiute People of Stillwater Marsh.** U.S. Department of the Interior, Fish and Wildlife Service, Region 1, Stillwater National Wildlife Refuge. Cultural Resource Series No. 5. U.S. Government Printing Office, Washington, D.C.
- Gilbert, N. and S.B. Lee. 1980. Two perils of plant population dynamics. *Oecologia* 46:283-284.
- Heki, Lisa. 1998. Oral communication. Fisheries Supervisor. U.S. Fish and Wildlife Service. Nevada Fish and Wildlife Office, Reno, Nevada.
- Hight, S.D. and J.I. Drea, Jr. 1991. Prospects for a classical biological control project against purple loosestrife (*Lythrum salicaria* L.). *Natural Areas Journal* 11(3):151-157
- Kok, L.T. and T.J. McAvoy. 1990. Second report. Quarantine screening of phytophagous insects for the biological control of *Lythrum salicaria*. Virginia Polytechnic Institute & State University, Blacksburg, Virginia, 27pp.
- Malecki, R.A., B. Blossey, S.D. Hight, D. Schroeder, L.T. Kok, and J.R. Coulson. 1993. Biological control of purple loosestrife. *Bioscience* 43(10):680-686.
- Mitsch, W.J. and J.G. Gosselink. 1986. *Wetlands.* Van Nostrand Reinhold Co., New York. 539 pp.
- Mullin, B.H., D. Zamora, and P.K. Fay. 1993. Purple loosestrife: a new weed threat to wetlands in Montana. Montana State University Extension Service Publication EB 70. 9pp.
- Nelson, L.S., K.D. Getsinger, and I.E. Freeman. 1995. Selective control of purple loosestrife

with triclopyr. U.S. Army Corps of Engineers. Wetlands Research Program Technical Report WRP-SM-4

Office of Technology Assessment. 1984. Wetlands: their use and regulation. Congress of the United States. Publ. OTA-O-206. Washington DC. 208pp.

Pendleton, Lorann, S.A., A.R. McLane, and D.H. Thomas. 1982. Cultural Resource Overview, Carson City District, West Central Nevada Cultural Resource Series No.5, Part 1. Bureau of Land Management, Reno, Nevada.

Raven, Christopher. 1990. Prehistoric Human Geography in the Carson Desert: Part II: Archaeological Field Tests of Model Predictions. Cultural Resource Series, Number 4, U.S. Fish and Wildlife Service, Region 1, Portland, Oregon.

Rawinski, T.J. 1982. The ecology and management of purple loosestrife (*Lythrum salicaria* L.) in central New York. M.S. thesis, Cornell University, Ithaca, N.Y. 88pp.

Schank and Matley. 1994. "Why is alfalfa the most popular crop?" Newlands News Vol. 1, Issue 5. Newlands Water Protective Association, Fallon, Nevada.

Shelley, R.L., B.H. Mullin, and P.K. Fay. 1995. Riparian weed management. Montana State University Extension Service, publication EB 137. 9pp.

Thompson, D.Q., R.L. Stuckey, and E.B. Thompson. 1987. Spread, impact, and control of purple loosestrife in North American wetlands. Fish and Wildlife Research 2. United States Department of the Interior, U.S. Fish and Wildlife Service. 55pp.

U.S. Fish and Wildlife Service. 1996. Final Environmental Impact Statement: Water rights acquisition for Lahontan Valley wetlands. U.S. Department of the Interior, Portland, Oregon.

Welling, C.H. and R.L. Becker. 1992. Life history and taxonomic status of purple loosestrife in Minnesota: implications for management and regulation of this exotic plant. Minnesota Department of Natural Resources, Special Publication 146. 16pp.

World Health Organization, United Nations Environment Programme, International Labour Organization. 1994. Glyphosate. Environmental Health Criteria #159. Geneva, Switzerland.

Zeanah, D.W., J.A. Carter, D.P. Dugas, R.G. Elston, and J.E. Hammett. 1995. An Optimal Foraging Model of Hunter-Gatherer Land Use in the Carson Desert. Prepared by Intermountain Research, Silver City, Nevada. Prepared for U.S. Fish and Wildlife Service and U.S. Department of the Navy.

9.0 Appendices

Appendix 1. Biology of Purple Loosestrife

Purple loosestrife (*Lythrum salicaria*) is a perennial wetland plant native to Eurasia. Its introduction into North America probably occurred in the early 1800's via ship ballast and became popular as a medicinal herb and ornamental plant. Infestation of native habitat has been increasing at an exponential rate since 1880 (Thompson et al. 1987). The plant is now established in the 48 contiguous states with greatest concentrations in the Great Lakes Region, New England, and the mid-Atlantic Coast.

Throughout the world there are 35 species of *Lythrum*. Twelve are recognized as occurring in the United States with 3 described as exotic (including purple loosestrife). In addition, numerous cultivars have been propagated by the horticulture industry which can sexually and asexually reproduce. These cultivars contribute to the spread and diversity of the plant in the wild (Welling and Becker 1992).

Thompson et al. (1987) described the optimum habitats for purple loosestrife in the eastern and central U.S. as "freshwater marshes, open stream margins, and alluvial floodplain." Light intensity is critical to the growth of the plant with optimum vigor at 100 percent light and reduced production at light levels < 50 percent (i.e., shaded sites). Purple loosestrife is commonly associated with cattails (*Typha* spp.), reed canarygrass (*Phalaris arundinacea*), and other moist soil-plants.

Purple loosestrife grows from 1.5 to 6 feet high with individual plants reaching wide as 5 feet at the top. Up to 30 to 50 stems can emerge from a single root-stock. The leaves are opposite and lanceolate with large reddish-purple flowerheads occurring in the axils of the upper leaves from late June to early September. In early fall the leaves briefly and dramatically change to a bright red color lasting up to 10 days. Throughout the winter the senescent stems of the plant remain standing.

Mature plants can produce 1,000 seed capsules per stem with an average of 90 minuscule seeds per capsule, for about 2.7 million seeds annually per plant (Thompson et al. 1987). It has been estimated that a one-acre stand can produce up to 24 billion seeds. Seed dispersal seems to occur mainly by water movement although wind dispersal may move seeds several yards from the parent plant. Animals and humans may also spread the seed as well as the propagules. The plant appears not capable of spreading by rhizomatous growth.

Although mature plants can endure for years on dry sites, seedlings become established only on moist soils. Establishment can occur on a variety of substrates (e.g., gravel, sand, clay, detritus) and with a wide range of pH (4.0 to 9.1). However, the optimal substrate appears to be organic and alluvial soils with a pH in the neutral to slightly acidic range (Thompson et al. 1987). Disturbed sites are **especially** susceptible to establishment of purple loosestrife.

Seed germination occurs within temperatures of 59 to 68 degrees F. Establishment of seedlings occurs in late spring and early summer after over-wintering. After 20 days of growth the seedling

is about 1.5 inches tall, the lateral and secondary roots are developed, and the first leaves appear. Little is known about the longevity of individual plants. However, stands are known to persist for several decades with no reduction in vigor (Thompson et al. 1987). Stands can become extensive, essentially converting diverse wetland communities to monocultures of loosestrife communities.

Reductions in native plant biomass commonly exceeds 50 % in affected wetland communities and common to find affected wetlands that have been 100% colonized by the plant. Predator/prey relationships have changed due to alterations in food and cover from loosestrife infestations. These alterations in food and cover have resulted in the reduction of vertebrate species in those wetlands. Important wildlife-dependent species such as cattails (*Typha* spp.), sedges (*Carex* spp.), and bulrushes (*Scirpus* spp.), are commonly out competed by purple loosestrife (Thompson et al. 1987). The reduction of plant diversity also impacts the invertebrate composition, reducing food diversity for many species of fish and wildlife. Plant and animal species that are currently endangered, threatened, or declining are especially vulnerable to the impacts of this highly competitive plant.

Invasions of purple loosestrife occur more frequently in areas where the soil is disturbed. Therefore, regulatory agencies such as the U.S. Fish and Wildlife Service, U.S. Army Corps of Engineers, and the Environmental Protection Agency have addressed the issue by requiring mitigation plans to have some form of purple loosestrife control measure included.

The only known economic benefits of the plant are as a nectar source, and an ornamental (see section 5.3.5). Impacts to these economic values are expected to be minor. Currently, 34 states have noxious weed laws. Of those, 15 states have purple loosestrife listed as a noxious weed (see below). This law usually prevents the sale and distribution of the plant in those respective states.

List of states in which purple loosestrife has noxious weed status.

Arkansas
California
Iowa
Idaho
Indiana
Minnesota
Missouri
Montana
North Carolina*
North Dakota*
Ohio
Oregon
South Dakota
Washington*

(* regulations apply to designated areas within the state)

Appendix 2. ESA Section 7 Consultation

INTRA-SERVICE SECTION 7 BIOLOGICAL EVALUATION FORM

Originating Person: Janet Bair
Telephone Number: (702) 784-5227
Date: October 2, 1997

I. Region, Ecoregion, Office

U.S. Fish and Wildlife Service, Region 1
Interior Basin Ecoregion
Nevada State Office, Reno, Nevada

II. Service Activity

Purple loosestrife control in the Truckee and Carson River Basins - Fall 1997

III. Pertinent Species and Habitat

A. Listed species and / or their critical habitat within the action area:

Cui-ui (*Chasmistes cujus*) is a lake sucker endemic to Pyramid Lake and the lower reaches of the Truckee River. The total population of this fish is estimated to be several million, with an estimated adult population of about 700,000. Cui-ui spawn in the lower Truckee River during the spring and early summer months. Critical habitat for the cui-ui has not been designated.

Lahontan cutthroat trout (LCT) (*Oncorhynchus clarki henshawi*) is an inland subspecies of cutthroat trout endemic to the physiographic Lahontan basin of Northern Nevada, eastern California, and southern Oregon. Small populations have been introduced at various locations along the mainstem of the Truckee and in headwater streams of the Carson River. A small number of LCT spawn in the lower Truckee River during the spring and early summer months. Critical habitat for the LCT has not been designated.

Bald eagles (*Haliaeetus leucocephalus*) overwinter and occasionally nest in western Nevada. Up to 70 wintering bald eagles have been recorded in Lahontan Valley. Timber Lake, north of Fallon, is the primary historic winter roost site, while other areas, including Indian Lakes, S-line and Harmon regulating reservoirs, are commonly frequented. During Summer 1997, a pair of bald eagles nested on an island of Lahontan Reservoir. The single eaglet produced apparently fell from the nest and drowned. There is no critical habitat for bald eagles in Nevada.

Peregrine falcons (*Falco peregrinus anatum*), including adult males, females, and juvenile birds, are regularly sighted at Carson Lake and Stillwater National Wildlife

Refuge, usually during the period February through November. In the past, birds have been presumed to be nesting near Carson Lake, however, nesting has not been verified. There is no critical habitat for peregrine falcons in Nevada.

B. Proposed species and / or proposed critical habitat within the action area

None

C. Candidate species within the action area:

None

IV. Geographic area or station name and action

Truckee and Carson River Basins (see attached map)

V. Description of proposed action

Purple loosestrife (*Lythrum salicaria*) is an emergent aquatic perennial plant of Eurasian origin. Since its introduction to the United States in the 1800s, this noxious weed has escaped cultivation in many regions of the United States, invading wet meadows, pasture wetlands, marshes, stream and river banks, lake shores, irrigation ditches, and drainage ditches. Purple loosestrife impedes water flow, displaces native vegetation, and creates monocultures of little value as wildlife habitat. When conditions are appropriate, a small isolated cluster of purple loosestrife can spread and cover a wetland in a single growing season.

Until recently, occurrence of purple loosestrife in Nevada was limited to a few isolated populations, primarily, the Truckee River near Wadsworth, and along the Sparks Ditch. In the aftermath of the 1997 floods, small pockets of purple loosestrife have been observed in new locations, including the Truckee Canal, Orr Ditch, in minor ditches in Reno and Fernley, and at several new locations on the Truckee River, around and below Wadsworth. While not yet verified, purple loosestrife may also be present in various locations in the Lahontan Valley, and along the lower Carson River, particularly below Lahontan Reservoir. Nevada Division of Agriculture is currently mapping the full extent of purple loosestrife in the Truckee and Carson River Basins. As presently known, the purple loosestrife in Sparks Ditch is the largest infestation in western Nevada, consisting of patches of the weed along a 2-mile section of the ditch, and fairly continuous distribution along a half-mile stretch at the south end of Spanish Springs Valley.

The propensity of purple loosestrife for rapid spread and invasion into riparian and wetland areas has prompted formation of a Federal-State-University working group to develop a plan to eradicate the weed from western Nevada, while it is still fairly restricted in distribution. The consensus of this group is that failure to begin controlling purple loosestrife now will result in continued spread and infestation of purple loosestrife, with consequent declines in extent and quality of riparian and wetland wildlife habitat in

western Nevada. Eradication of purple loosestrife in western Nevada is envisioned as a multi-year effort, involving Federal, State, Tribal and local governments and other concerned entities, and may ultimately include a variety of eradication methods, including mechanical removal, chemical application, or introduction of biocontrol agents.

This proposed action consists of application of the herbicide Rodeo, the only Service-approved herbicide for aquatic habitats, to purple loosestrife growing in small pockets on the Truckee and Carson Rivers, as well as in associated creeks, canals, drains, and ditches in the Truckee Meadows and Lahontan Valley. Best results on purple loosestrife are achieved when application of Rodeo is made during summer or fall months, when plants are beyond flowering stage, but before a killing frost. This proposed action is limited to applications which can be completed in Fall 1997, prior to the first killing frost. Future applications of Rodeo to purple loosestrife will be considered in a programmatic biological opinion for a multi-year purple loosestrife eradication program. This programmatic biological opinion may include consideration of mechanical control or biocontrol, if either of these methods is determined necessary for long-term control of purple loosestrife.

Because mapping is still in progress, total area of treatment is currently unknown. Priority areas for treatment are the small patches of purple loosestrife on the Truckee Canal, Orr Ditch, minor ditches in Fernley, Reno, and Sparks, and in Lahontan Valley, and along the Truckee and Carson Rivers. The objective of treating these first is to control or eradicate the weed in newly colonized areas. The Sparks Ditch is last priority for this year's treatment program.

Rodeo will be applied by wick, wipe, or low pressure (hand) spray application. The manufacturer's recommended application rate will be followed (see attached information sheets) to avoid possible harmful effects to wildlife, fish, and aquatic invertebrates.

VI. Determination of effects

A. Explanation of effects of the actions on species and critical habitats:

No adverse effects to cui-ui, LCT, bald eagles, or peregrine falcons are expected. When used according to label directions, glyphosate, the active ingredient in Rodeo, has not been shown to cause carcinogenicity, birth defects, mutagenic effects, neurotoxic effects, or reproductive toxicity.

The results of acute toxicity tests to fish, birds, mammals, and invertebrates demonstrated that Rodeo or technical glyphosate is relatively nontoxic:

96 hr LC50 - Rodeo:

Carp -- >10,000 mg/l
Trout -- >1,000 mg/l
Daphnia magna -- 930 mg/l
Bluegill-- 1,000 mg/l

Acute oral LD50 - Rodeo:

Rat -- >5,000 mg/kg

Acute oral LD50 - glyphosate:

Bobwhite -- >3,850 mg/kg

Rat -- 4,300-5,600 mg/kg

8-day dietary LC50 - glyphosate:

Bobwhite -- >4,640 ppm

Duck -- >4,640 ppm

Japanese quail -- >5,000 ppm

48-hour LD50 - glyphosate:

Honeybee -- > 100 ug/bee

These concentrations of Rodeo or glyphosate are far in excess of what fish or invertebrates would be exposed to in water, or what birds, mammals, or invertebrates would be exposed to through ingestion, when Rodeo is used according to label directions.

Tests on laboratory animals demonstrated that adverse effects on eyes and skin were relatively minor and completely reversible. Glyphosate does not turn into vapor or gas, and inhalation is extremely unlikely when the product is used according to label directions. Thus the likelihood of vapor inhalation and redistribution by air movement is very low.

Long-term toxicological studies on laboratory animals demonstrate that glyphosate does not cause birth defects, or reproductive problems. Mutagenicity and

genotoxicology assays showed that glyphosate does not result in gene mutations, chromosome aberrations, or DNA damage.

Glyphosate has also been shown not to bioaccumulate in animal tissues. Glyphosate is poorly absorbed when ingested, and any absorbed glyphosate is rapidly eliminated, resulting in minimal tissue retention. Feeding studies with chickens, cows, and pigs have shown extremely low to no residues in meat and fat following repetitive exposure. Residues have been reported in wild animals, including voles, chipmunks, hares, and moose, feeding in treated areas. A series of bioaccumulation studies conducted to determine if glyphosate concentrated in the edible portions of fish and marine organisms determined that glyphosate did not accumulate.

Studies on the environmental fate of glyphosate showed no significant adverse

effects to the environment following exposure to the herbicide. Glyphosate degrades rapidly in soils, with breakdown occurring by nonnal soil microbial degradation. Studies also show that glyphosate does not accumulate in soils or the environment after repeated applications over several years or after repeated applications in a single year. Soil tests have shown that glyphosate binds tightly to soil particles. Results of laboratory and field studies demonstrate that is it highly unlikely that glyphosate will move into groundwater. Finally, residue studies have shown that the amount of parent herbicide or its metabolites remaining on plants when the herbicide is applied under nonnal use conditions is negligible.

Rodeo has been used for cattail control at Kirch Wildlife Management Area, Nye County, Nevada (habitat for the endangered White River spinedace), and Moapa National Wildlife Refuge, Clark County, Nevada (habitat for the endangered moapa dace), without any adverse effects. Additionally, though Rodeo has not been demonstrated to have adverse effects on fish when used according to label directions, control applications will occur outside of the spawning period for cui-ui and LeT.

Based on the results of the various studies discussed in this section, we conclude that application of Rodeo to purple loosestrife in the project area, is not likely to adversely effect cui-ui, LCT, bald eagles, or peregrine falcons. This conclusion includes consideration of the event of chemical exposure of eagles or falcons through over spray. However, actions will be taken to reduce or eliminate any adverse effects, including such worst case scenarios (see below).

B. Explanation of actions to be implemented to reduce or eliminate adverse effects:

All manufacturer's recommendations will be followed in applying the herbicide Rodeo to purple loosestrife. Personnel applying the chemicals will be trained and experienced, or will be trained and closely supervised by experienced individuals. To avoid the consequences of over spray onto native plant species or onto water surfaces, spraying activities will not be conducted on windy days, or will be ceased if windy conditions arise. To reduce or eliminate the risk of herbicide spill into waters or on to soils, chemicals will be mixed away from water's edge, and on a plastic tarp.

VII. Effect determination and response requested: [*optional]

A. Listed species / critical habitat:

<u>Determination</u>		<u>Response requested</u>
No effect (Species: _____)	_____	_*Concurrence
Is not likely to adversely affect: Species: (Cui-ui, LCT, bald eagle, peregrine falcon)	_____	Concurrence *Fonnal consultation
Is likely to adversely affect (Species: _____)	_____	Fonnal consultation

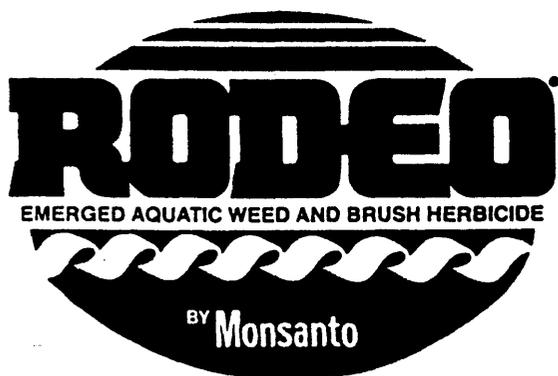
B. Proposed species / proposed critical habitat: N/A

<u>Determination</u>		<u>Response requested</u>
No effect (Species: _____)	_____	_*Concurrence
Is not likely to adversely affect (Species: _____)	_____	Concurrence
Is likely to adversely affect (Species: _____)	_____	Infonnal conference
Is likely to jeopardize / adverse modification of critical habitat (Species: _____)	_____	Conference

C. Candidate species: N/A

<u>Detennination</u>		<u>Response requested</u>
No effect (Species: _____)	_____	_*Concurrence
Is not likely to adversely affect (Species: _____)	_____	Concurrence
Is likely to adversely affect (Species: _____)	_____	Infonnalconference
Is likely to jeopardize (Species: _____)	_____	Conference

This sample label is current as of February 15, 1995. The product descriptions and recommendations provided in this sample label are for background information only. Always refer to the label on the product before using Monsanto or any other agricultural product.



Complete Directions for Use in Aquatic and Other Noncrop Sites.

EPA Reg. No. 524-343

AVOID CONTACT WITH FOLIAGE, GREEN STEMS, EXPOSED NONWOODY ROOTS, OR FRUIT OF CROPS, DESIRABLE PLANTS AND TREES. SINCE SEVERE INJURY OR DESTRUCTION MAY RESULT.

RODEO is a registered trademark of Monsanto Company.

1995-1

21061TI/CG

Read the entire label before using this product.

Use only according to label instructions.

Read "LIMIT OF WARRANTY AND LIABILITY" before buying or using. If terms are not acceptable, return at once unopened.

REFORMULATION IS PROHIBITED. SEE INDIVIDUAL CONTAINER LABEL FOR REPACKAGING LIMITATIONS.

LIMIT OF WARRANTY AND LIABILITY

This Company warrants that this product conforms to the chemical description on the label and is reasonably fit for the purposes set forth in the Complete Directions for Use label booklet ("Directions") when used in accordance with those Directions under the conditions described therein. NO OTHER EXPRESS WARRANTY OR IMPLIED WARRANTY OF FITNESS FOR PARTICULAR PURPOSE OR MERCHANTABILITY OR ANY OTHER EXPRESS OR IMPLIED WARRANTY IS MADE. This warranty is also subject to the conditions and limitations stated hereon.

Buyer and all users shall promptly notify this Company of any claims whether based in contract, negligence, strict liability, other tort or otherwise.

Buyer and all users are responsible for all loss or damage from use or handling which results from conditions beyond the control of this Company, including, but not limited to, incompatibility with products other than those set forth in the Directions, application to or contact with desirable vegetation, unusual weather, weather conditions which are outside the range considered normal at the application site and for the time period when the product is applied, as well as weather conditions which are outside the application ranges set forth in the Directions, application in any manner not explicitly set forth in the Directions, moisture conditions outside the moisture range specified in the Directions, or the presence of products other than those set forth in the Directions in or on the soil or treated vegetation.

THE EXCLUSIVE REMEDY OF THE USER OR BUYER, AND THE LIMIT OF THE LIABILITY OF THIS COMPANY OR ANY OTHER SELLER FOR ANY AND ALL LOSSES, INJURIES OR DAMAGES RESULTING FROM THE USE OR HANDLING OF THIS PRODUCT (INCLUDING CLAIMS BASED IN CONTRACT, NEGLIGENCE, STRICT LIABILITY, OTHER TORT OR OTHERWISE) SHALL BE THE PURCHASE PRICE PAID BY THE USER OR BUYER FOR THE QUANTITY OF THIS PRODUCT INVOLVED, OR, AT THE ELECTION OF THIS COMPANY OR ANY OTHER SELLER, THE REPLACEMENT OF SUCH QUANTITY, OR, IF NOT ACQUIRED BY PURCHASE, REPLACEMENT OF SUCH QUANTITY. IN NO EVENT SHALL THIS COMPANY OR ANY OTHER SELLER BE LIABLE FOR ANY INCIDENTAL, CONSEQUENTIAL, OR SPECIAL DAMAGES.

Buyer and all users are deemed to have accepted the terms of this LIMIT OF WARRANTY AND LIABILITY which may not be varied by any verbal or written agreement.

PRECAUTIONARY STATEMENTS

Hazards to Humans and Domestic Animals

Keep out of reach of children.

CAUTION!

HARMFUL IF INHALED.

Avoid breathing vapors or spray mist.

Remove contaminated clothing and wash clothing before reuse.

Wash thoroughly with soap and water after handling.

FIRST AID: IF INHALED, remove individual to fresh air. Seek medical attention if breathing difficulty develops.

In case of an emergency involving this product.
Call Collect. day or night. (314) 694-4000.

Environmental Hazards

Do not contaminate water when disposing of equipment washwaters. Treatment of aquatic weeds can result in oxygen depletion or loss due to decomposition of dead plants. This oxygen loss can cause fish suffocation.

In case of: SPILL or LEAK, soak up and remove to a landfill.

Physical or Chemical Hazards

Spray solutions of this product should be mixed, stored and applied using only stainless steel, aluminum, fiberglass, plastic and plastic-lined steel containers.

DO NOT MIX. STORE OR APPLY THIS PRODUCT OR SPRAY SOLUTIONS OF THIS PRODUCT IN GALVANIZED STEEL OR UNLINED STEEL (EXCEPT STAINLESS STEEL CONTAINERS OR SPRAY TANKS). This product or spray solutions of this product react with such containers and tanks to produce hydrogen gas which may form a highly combustible gas mixture. This gas mixture could flash or explode, causing serious personal injury, if ignited by open flame, spark, welder's torch, lighted cigarette or other ignition source.

ACTIVE INGREDIENT:

*Glyphosate, N-(phosphonomethyl)glycine, 53.8%
in the form of its isopropylamine salt

INERT INGREDIENTS: 46.2%
100.0%

*Contains 648 grams per litre or 5.4 pounds per U.S. gallon of the active ingredient, glyphosate, in the form of its isopropylamine salt. Equivalent to 480 grams per litre or 4 pounds per U.S. gallon of the acid, glyphosate.

DIRECTIONS FOR USE

It is a violation of federal law to use this product in any manner inconsistent with its labeling.

For more product information, call toll-free 1-800-332-3111.

Storage and Disposal

Do not contaminate water, foodstuffs, feed or seed by storage or disposal.

See container label for STORAGE AND DISPOSAL instructions.

This product, a water-soluble liquid, mixes readily with water and nonionic surfactant to be applied as a foliar spray for the control or destruction of many herbaceous and woody plants.

This product moves through the plant from the point of foliage contact to and into the root system. Visible effects on most annual weeds occur within 2 to 4 days but on most perennial brush species may not occur for 7 days or more. Extremely cool or cloudy weather following treatment may slow the activity of this product and delay visual effects of control. Visible effects are a gradual wilting and yellowing of the plant which advances to complete browning of above-ground growth and deterioration of underground plant parts.

Unless otherwise directed on this label, delay application until vegetation has emerged and reached the stages described for control of such vegetation under the "Weeds Controlled" section of this label.

Unemerged plants arising from unattached underground rhizomes or root stocks of perennials or brush will not be affected by the spray and will continue to grow. For this reason best control of most perennial weeds or brush is obtained when treatment is made at late growth stages approaching maturity.

Always use the higher rate of this product per acre within the recommended vegetation is heavy or dense.

Do not treat weeds or brush under poor growing conditions such as drought stress, disease or insect damage, as reduced control may result. Reduced results may also occur when treating weeds or brush heavily covered with dust.

Reduced control may result when applications are made to any weed or brush species that have been mowed, grazed or cut, and have not been allowed to regrow to the recommended stage for treatment.

Rainfall or irrigation occurring within 6 hours after application may reduce effectiveness. Heavy rainfall or irrigation within 2 hours after application may wash the product off the foliage and a repeat treatment may be required.

When this product comes in contact with soil (on the soil surface or as suspended soil sediment in water) it is bound to soil particles. Under recommended use situations, once this product is bound to soil particles, it is not available for plant uptake and will not harm off-site vegetation where roots grow into the treatment area or if the soil is transported off-site. Under recommended use conditions, the strong affinity of this product to soil particles prevents this product from leaching out of the soil profile and entering ground water. The affinity between this product and soil particles remains until this product is degraded, which is primarily a biological degradation process carried out under both aerobic and anaerobic conditions by soil microflora.

This product does not provide residual weed control. For subsequent residual weed control, follow a label-approved herbicide program. Read and carefully observe the cautionary statements and all other information appearing on the labels of all herbicides used.

Buyer and all users are responsible for all loss or damage in connection with the use or handling of mixtures of this product or other materials that are not expressly recommended in this label. Mixing this product with herbicides or other materials not recommended in this label may result in reduced performance.

ATTENTION

AVOID DRIFT. **EXTREME CARE MUST BE USED WHEN APPLYING THIS PRODUCT TO PREVENT INJURY TO DESIRABLE PLANTS AND CROPS.**

Do not allow the herbicide solution to mist, drip, drift or splash onto desirable vegetation since minute quantities of this product can cause severe damage or destruction to the crop, plants or other areas on which treatment was not intended. The likelihood of plant or crop injury occurring from the use of this product is greatest when winds are gusty or in excess of 5 miles per hour or when other conditions, including lesser wind velocities, will allow spray drift to occur. When spraying, avoid combinations of pressure and nozzle type that will result in splatter or fine particles (mist) which are likely to drift. AVOID APPLYING AT EXCESSIVE SPEED OR PRESSURE.

NOTE: Use of this product in any manner not consistent with this label may result in injury to persons, animals or crops, or other unintended consequences. When not in use, keep container closed to prevent spills and contamination.

APPLY THESE SPRAY SOLUTIONS IN PROPERLY MAINTAINED AND CALIBRATED EQUIPMENT CAPABLE OF DELIVERING DESIRED VOLUMES. HAND-GUN APPLICATIONS SHOULD BE PROPERLY DIRECTED TO AVOID SPRAYING DESIRABLE PLANTS. NOTE: REDUCED RESULTS MAY OCCUR IF WATER CONTAINING SOIL IS USED, such as WATER FROM PONDS AND UNLINED DITCHES.

MIXING

This product mixes readily with water. Mix spray solutions of this product as follows: fill the mixing or spray tank with the required amount of water while adding the required amount of this product (see Directions for Use- and "Weeds Controlled" sections of this label). Near the end of the filling process, add the required surfactant and mix well. Remove hose from tank immediately after filling to avoid siphoning back into the water source. During mixing and application, foaming of the spray solution may occur. To prevent or minimize foam, avoid the use of mechanical agitators, place the filling hose below the surface of the spray solution, terminate by-pass and return lines at the bottom of the tank and if needed use an approved anti-foam or defoaming agent.

Keep by-pass line on or near bottom of tank to minimize foaming. Screen size in nozzle or line strainers should be no finer than 50 mesh. Carefully select correct nozzle to avoid spraying a fine mist. For best results with conventional ground application equipment, use flat fan nozzles. Check for even distribution of spray droplets.

When using this product, mix 2 or more Quarts of a nonionic surfactant per 100 gallons of spray solution. Use a nonionic surfactant labeled for use with herbicides. The surfactant must contain 50 percent or more active ingredient.

Always read and follow the manufacturer's surfactant label recommendations for best results.

These surfactants should not be used in excess of 1 quart per acre when making broadcast applications.

Colorants or marking dyes approved for use with herbicides may be added to spray mixtures of this product. Colorants or dyes used in spray solutions of this product may reduce performance, especially at lower rates or dilutions. Use colorants or dyes according to the manufacturer's label recommendations.

Clean sprayer and parts immediately after using this product by thoroughly flushing with water and dispose of rinsate according to labeled use or disposal instructions.

Carefully observe all cautionary statements and other information appearing in the surfactant label.

AERIAL EQUIPMENT

See the supplemental label for use of this product by air in California.

Use the recommended rates at this product and surfactant in 3 to 20 gallons of water per acre as a broadcast spray, unless otherwise specified. See the "Weeds Controlled" section of this label for specific rates. Aerial applications of this product may only be made as specifically recommended in this label.

AVOID DRIFT - DO NOT APPLY DURING INVERSION CONDITIONS. WHEN WINDS ARE GUSTY OR UNDER ANY OTHER CONDITION WHICH WILL ALLOW DRIFT. DRIFT MAY CAUSE DAMAGE TO ANY VEGETATION CONTACTED TO WHICH TREATMENT IS NOT INTENDED. TO PREVENT INJURY TO ADJACENT DESIRABLE VEGETATION, APPROPRIATE BUFFER ZONES MUST BE MAINTAINED.

Coarse sprays are less likely to drift; therefore, do not use nozzles or nozzle configurations which dispense spray as fine spray droplets. Do not angle nozzles forward into the airstream and do not increase spray volume by increasing nozzle pressure.

Drift control additives may be used. When a drift control additive is used, read and carefully observe the cautionary statements and all other information appearing in the additive label.

Ensure uniform application—To avoid streaked, uneven or overlapped application, use appropriate marking devices.

Thoroughly wash aircraft, especially landing gear, after each day of spraying to remove residues of this product accumulated during spraying or from spills. **PROLONGED EXPOSURE OF THIS PRODUCT TO UNCOATED STEEL SURFACES MAY RESULT IN CORROSION AND POSSIBLE FAILURE OF THE PART. LANDING GEAR ARE MOST SUSCEPTIBLE.** The maintenance of an organic coating (paint) which meets aerospace specification MIL-C-38413 may prevent corrosion.

BOOM EQUIPMENT

for control of weed or brush species listed in this label using conventional boom equipment—Use the recommended rates of this product and surfactant in 3 to 30 gallons of water per acre as a broadcast spray, unless otherwise specified. See the "Weeds Controlled" section of this label for specific rates. As density of vegetation increases, spray volume should be increased within the recommended range to ensure complete coverage. Carefully select correct nozzle to avoid spraying a fine mist for best results with ground application equipment, use flat fan nozzles. Check for even distribution of spray droplets.

HAND-HELD and HIGH-VOLUME EQUIPMENT

Use Coarse Sprays and,

for control of weeds listed in this label using knapsack sprayers or high-volume spraying equipment utilizing handguns or other suitable nozzle arrangements—Prepare a 3/4 to 2 percent solution of this product in water, add a nonionic surfactant and apply to foliage of vegetation to be controlled. For specific rates of application and instructions for control of various annual and perennial weeds, see the "Weeds Controlled" section in this label.

Applications should be made on a spray-to-wet basis. Spray coverage should be uniform and complete. Do not spray to point of runoff.

This product may be used as a 5 to 8 percent solution for low-volume directed sprays for spot treatment of trees and brush. It is most effective in areas where there is a low density of undesirable trees or brush. If a straight stream nozzle is used, start the application at the top of the targeted vegetation and spray from top to bottom in a lateral zig-zag motion. Ensure that at least 50 percent of the leaves are contacted by the spray solution. For flat fan and cone nozzles and with hand-directed mist blowers, mist the application over the foliage of the targeted vegetation. Small, open-branched trees need only be treated from one side. If the foliage is thick or there are multiple root sprouts, applications must be made from several sides to ensure adequate spray coverage.

Prepare the desired volume of spray solution by mixing the amount of this product in water, shown in the following table:

Spray Solution

DESIRED VOLUME	AMOUNT OF RODEO					
	3/4%	1%	1 1/4%	1 1/2%	5%	8%
1 gallon	101.	101.	101.	201.	601.	10 1/2 oz.
25 gallons	1 1/2 pt.	1 qt.	1 1/4 qt.	1 1/2 qt.	5 qt.	2 gal.
100 gallons	3qt.	1 gal.	1 1/4 gal.	1 1/2 gal.	5 gal.	8 gal.

2 tablespoons = 1 ounce

For use in knapsack sprayers, it is suggested that the recommended amount of this product be mixed with water in a larger container. Fill sprayer with the mixed solution and add the correct amount of surfactant.

ANNUAL WEEDS

Apply to actively growing annual grasses and broadleaf weeds.

Allow at least 3 days after application before disturbing treated vegetation. After this period the weeds may be mowed, tilled or burned. See "Directions for Use," "General Information" and "Mixing and Application Instructions" for labeled uses and specific application instructions.

Broadcast Application—Use 1 1/2 pints of this product per acre plus 2 or more quarts of a nonionic surfactant per 100 gallons of spray solution if weeds are less than 6 inches tall. If weeds are greater than 6 inches tall, use 2 1/2 pints of this product per acre plus 2 or more quarts of an approved nonionic surfactant per 100 pions of spray solution.

Hand-Held, High-Volume Application—Use a 3/4 percent solution of this product in water plus 2 or more quarts of a nonionic surfactant per 100 pions of spray solution and apply to foliage of vegetation to be controlled.

When applied as directed under the conditions described in this label, this product plus nonionic surfactant WILL CONTROL the following ANNUAL WEEDS:

Balsamapple** <i>Momordica charantia</i>	Foxtail <i>Setaria spp.</i>
Barley <i>Hordeum vulgare</i>	Foxtail, Carolina <i>Alopecurus carolinianus</i>
Barlyardgrass <i>Echinochloa crus-galli</i>	Groundsel, common <i>Senecio vulgaris</i>
Bassia, fivehook <i>Sassia hyssopifolia</i>	Horseweed/Marestail <i>Conyza canadensis</i>
Bluegrass, annual <i>Poa annua</i>	Kochia <i>Kochia scoparia</i>
Bluegrass, bulbous <i>Poa bulbosa</i>	Lambsquarters, common <i>Chenopodium album</i>
Brome <i>Sromus spp.</i>	Lettuce, prickly <i>Lactuca scariola</i>
Buttercup <i>Ranunculus spp.</i>	Morningglory <i>Ipomoea spp.</i>
Cheat <i>Sromus secalinus</i>	Mustard, blue <i>Chorispora tenella</i>
Chickweed, mouseear <i>Cerastium vulgatum</i>	Mustard, tansy <i>Descurainia pinnata</i>
Cocklebur <i>Xanthum strumarium</i>	Mustard, tumble <i>Sisymbrium altissimum</i>
Com. volunteer <i>Zea mays</i>	Mustard, wild <i>Sinapis arvensis</i>
Crabgrass <i>Digitaria spp.</i>	Oats, wild <i>Avena fatua</i>
Owaridandelion <i>Krigia cespitosa</i>	Panicum <i>Panicum spp.</i>
Falseflax, smallseed <i>Camelina microcarpa</i>	Pennycress, field <i>Thlaspi arvense</i>
Fiddleneck <i>Amsinckia spp.</i>	Pigweed, redroot <i>Amaranthus retroflexus</i>
Flaxleaf fleabane <i>Conyza bonariensis</i>	Pigweed, smooth <i>Amaranthus hybridus</i>
Fleabane <i>Engeron spp.</i>	Ragweed, common <i>Ambrosia artemisiifolia</i>

Ragweed, giant <i>Ambrosia trifida</i>	Sowthistle, annual <i>Sonchus oleraceus</i>
Rocket, London <i>Sisymbrium irio</i>	Spanishneedles* <i>Sidens bipinnata</i>
Rye <i>Secale cereale</i>	Stinkgrass <i>Eragrostis cilianensis</i>
Ryegrass, Italian* <i>Lolium multiflorum</i>	Sunflower <i>Helianthus annuus</i>
Sandbur, field <i>Cenchrus spp.</i>	Thistle, Russian <i>Salsola kali</i>
Shanercan. <i>Sorghum bicolor</i>	Spurry, umbrell <i>Holosteum umbellatum</i>
Shepherdspurs. <i>Capsella bursa-pastoris</i>	Velvetleaf <i>Abutilon theophrasti</i>
Signalgrass, broadleaf <i>Tracharia platyphylla</i>	Wheat <i>Triticum aestivum</i>
Smartweed, Pennsylvania <i>Polygonum pennsylvanicum</i>	Witchgrass <i>Panicum capillar,</i>

• Apply 3 pints of this product per acre.

•• Apply with hand-held equipment only.

Annual weeds will generally continue to terminate from seed throughout the growing season. Repeat treatments will be necessary to control later germinating weeds.

PERENNIAL WEEDS

Apply this product as follows to control or destroy most vigorously growing perennial weeds. Unless otherwise directed, allow at least 7 days after application before disturbine vegetation.

Add 2 or more quarts of a nonionic surfactant per 100 gallons of spray solution to the rates of this product given in this list. See the "General Information: Directions for Use" and "Mixing and Application" sections in this label for specific uses and application instructions.

NOTE: If weeds have been mowed or tilled, do not treat until regrowth has reached the recommended stages. Fall treatments must be applied before a killing frost

Repeat treatments may be necessary to control weeds regenerating from underground parts or seed.

When applied as recommended under the conditions described, this product plus surfactant WILL CONTROL the following PERENNIAL WEEDS:

Alfalfa <i>Medicago sativa</i>	Cogongrass <i>Imperata cylindrica</i>
Alligatorweed* <i>Alternanthera philoxeroides</i>	Cordgrass <i>Spartina spp.</i>
Anisa/Fennel <i>Foeniculum vulgare</i>	Cutgrass, giant* <i>Zizaniopsis miliacea</i>
Artichoke, Jerusalem <i>Helianthus tuberosus</i>	Dallisgrass <i>Paspalum dilatatum</i>
Bahiagrass <i>Paspalum notatum</i>	Dandelion <i>Taraxacum officinale</i>
Bermudagrass <i>Cynodon dactylon</i>	Dock, curly <i>Rumex crispus</i>
Bindweed, field <i>Convolvulus alVensis</i>	Dogbane, hemp <i>Apocynum cannabinum</i>
Bluegrass, Kentucky <i>Poa pratensis</i>	fescue <i>Festuca spp.</i>
Blueweed, Texas <i>Helianthus ciliaris</i>	Fescue, tall <i>Festuca arundinacea</i>
Brackenferm <i>Pteridium spp.</i>	Guineagrass <i>Panicum maximum</i>
Bromegrass, smooth <i>Bromus inermis</i>	Hemlock, poison <i>Conium maculatum</i>
Canarygrass, reed <i>Phalaris arundinacea</i>	Horsenettle <i>Solanum carolinense</i>
Canail <i>Typha spp.</i>	Horseradish <i>Ammoracla rusticana</i>
Clover, red <i>Triticum pratense</i>	Ice Plant <i>Mesembryanthemum crystallinum</i>
Clover, white <i>Trifolium repens</i>	Johnsongrass <i>Sorghum halepense</i>

Kikuyugrass
Pennisetum clandestinum

Knapweed
Centaurea repens

Lantana
Lantana camara

Lespedeza: common, serices
Lespedeza striata
Lespedeza cuneata

Loosestrife, purple
Lythrum salicaria

Lotus, American
Nelumbo lutea

Maidencane
Panicum hematomon

Milkweed
Asclepias spp.

Muhly, wir. stem
Muhlenbergia frondosa

Mullein, common
Verbascum thapsus

Napiergrass
Pennisetum purpureum

Nightshade, silverleaf
Solanum elaeagnifolium

Nutsedge: purple, yellow
Cyperus rotundus
Cyperus esculentus

Orchardgrass
Dactylis glomerata

Pampasgrass
Cortaderia jubata

Paragrass
Bracharia mutica

Phragmites**
Phragmites spp.

-Part/Jai control.

**Partial control in southeastern states. See specific recommendations below.

Alligatorweed—Apply 6 pints of this product per acre as a broadcast spray or as a 1 1/4 percent solution with hand-held equipment to provide partial control of alligatorweed. Apply when most of the target plants are in bloom. Repeat applications will be required to maintain such control.

Bermudagrass—Apply 7 1/2 pints of this product per acre as a broadcast spray or as a 1 1/2 percent solution with hand-held equipment. Apply when target plants are actively growing and when seed heads appear.

Bindweed, field/Silverleaf Nightshade/Texas Blueweed—Apply 6 to 7 1/2 pints of this product per acre as a broadcast spray west of the Mississippi River and 4 1/2 to 6 pints of this product per acre east of the Mississippi River. With hand-held equipment, use a 1 1/2 percent solution. Apply when target plants are actively growing and are at or beyond full bloom. For silverleaf nightshade, best results can be obtained when application is made after berries are formed. Do not treat when weeds are under drought stress. New leaf development indicates active growth. For best results apply in late summer or fall.

Brackenfern—Apply 4 1/2 to 6 pints of this product per acre as a broadcast spray or as a 3/4 to 1 percent solution with hand-held equipment. Apply to fully expanded fronds which are at least 18 inches long.

Cattail—Apply 4 1/2 to 6 pints of this product per acre as a broadcast spray or as a 3/4 percent solution with hand-held equipment. Apply when target plants are actively growing and are at or beyond the early-to-full bloom stage of growth. Best results are achieved when application is made during the summer or fall months.

Cogongrass—Apply 4 1/2 to 7 1/2 pints of this product per acre as a broadcast spray. Apply when cogongrass is at least 18 inches tall and actively growing in late summer or fall. Allow 7 or more days after application before tillage or mowing. Due to uneven stages of growth and the dense nature of vegetation preventing good spray coverage, repeat treatments may be necessary to maintain control.

Cordgrass—Apply 4 1/2 to 7 1/2 pints of this product per acre as a broadcast spray or as a 1 to 2 percent solution with hand-held equipment. Schedule applications in order to allow 6 hours before treated plants are covered by tide-water. The presence of debris and silt on the cordgrass plants will reduce per-

Quackgrass
Agropyron repens

Reed, giant
Arundo donax

Ryegrass, perennial
Lolium perenne

Smartweed, swamp
Polygonum caccineum

Spatterdock
Nuphar luteum

Starthistle, yellow
Centaurea solstitialis

Sweet potato, wild-
Ipomoea pandurata

Thistle, artichoke
Cynara carlinunculus

Thistle, Canada
Cirsium arvense

Timothy
Phytum pratense

Torpedograss*
Panicum repens

Tules, common
Scirpus acutus

Yasaygrass
Paspalum urvillei

Velvetgrass
Hokus spp.

Waterhyacinth
Eichornia crassipes

Waterlettuce
Pistia stratiotes

Waterprimrose
Ludwigia spp.

Wheatgrass, eastern
Agropyron smithii;

formance. It may be necessary to wash targeted plants prior to application to improve uptake of this product into the plant.

Cutgrass, giant—Apply 6 pints of this product per acre as a broadcast spray or as a 1 percent solution with hand-held equipment to provide partial control of giant cutgrass. Repeat applications will be required to maintain such control, especially where vegetation is partially submerged in water. Allow for substantial regrowth to the 1 to 10-leaf stage prior to retreatment.

Dogbane, hemp/Knapweed/Horseradish—Apply 6 pints of this product per acre as a broadcast spray or as a 1 1/2 percent solution with hand-held equipment. Apply when target plants are actively growing and most have reached the late bud-to-flower stage of growth. For best results, apply in late summer or fall.

Fescue, tall—Apply 4 1/2 pints of this product per acre as a broadcast spray or as a 1 percent solution with hand-held equipment. Apply when target plants are actively growing and most have reached the boot-to-head stage of growth. When applied prior to the boot stage, less desirable control may be obtained.

Guineagrass—Apply 4 1/2 pints of this product per acre as a broadcast spray or as a 3/4 percent solution with hand-held equipment. Apply when target plants are actively growing and when most have reached at least the 7-leaf stage of growth.

Johnsongrass/Bluegrass, Kentucky/Bromegrass, smooth/Canarygrass, reed/Orchardgrass/Ryegrass, perennial/Timothy/Wheatgrass, western—Apply 3 to 4 1/2 pints of this product per acre as a broadcast spray or a 3/4 percent solution with hand-held equipment. Apply when target plants are actively growing and most have reached the boot-to-head stage of growth. When applied prior to the boot stage, less desirable control may be obtained. In the fall, apply before plants have turned brown.

Lantana—Apply this product as a 3/4 to 1 percent solution with hand-held equipment. Apply to actively growing lantana at or beyond the bloom stage of growth. Use the higher application rate for plants that have reached the woody stage of growth.

Loosestrife, purple—Apply 4 pints of this product per acre as a broadcast spray or as a 1 to 1 1/2 percent solution using hand-held equipment. Treat when plants are actively growing at or beyond the bloom stage of growth. Best results are achieved when application is made during summer or fall months. Fall treatments must be applied before a killing frost.

Lotus, American—Apply 4 pints of this product per acre as a broadcast spray or as a 3/4 percent solution with hand-held equipment. Treat when plants are actively growing at or beyond the bloom stage of growth. Best results are achieved when application is made during summer or fall months. Fall treatments must be applied before a killing frost. Repeat treatment may be necessary to control regrowth from underground parts and seeds.

Maidencane/Paragrass—Apply 6 pints of this product per acre as a broadcast spray or as a 3/4 percent solution with hand-held equipment. Repeat treatments will be required, especially to vegetation partially submerged in water. Under these conditions, allow for regrowth to the 7 to 10-leaf stage prior to retreatment.

Milkweed, common—Apply 4 1/2 pints of this product per acre as a broadcast spray or as a 1 1/2 percent solution with hand-held equipment. Apply when target plants are actively growing and most have reached the late bud-to-flower stage of growth.

Nutsedge: purple, yellow—Apply 4 1/2 pints of this product per acre as a broadcast spray, or as a 3/4 percent solution with hand-held equipment to control existing nutsedge plants and immature nutlets attached to treated plants. Apply when target plants are in flower or when new nutlets can be found at rhizome tips. Nutlets which have not germinated will not be controlled and may germinate following treatment. Repeat treatments will be required for long-term control.

Pampasgrass—Apply a 1 1/2 percent solution of this product with hand-held equipment when plants are actively growing.

Phragmites—For partial control of phragmites in Florida and the counties of other states bordering the Gulf of Mexico, apply 7 1/2 pints per acre as a broadcast spray or apply a 1 1/2 percent solution with hand-held equipment. In other areas of the U.S., apply 4 to 6 pints per acre as a broadcast spray or apply a 3/4 percent solution with hand-held equipment for partial control. For best results, treat during late summer or fall months when plants are actively growing and in full bloom. Due to the dense nature of the vegetation, which may prevent good spray coverage and uneven stages of growth, repeat treatments may be necessary to maintain control. Visual control symptoms will be slow to develop.

Quackgrass/Kikuyugrass/Muhly, wirestem—Apply 3 to 4 1/2 pints of this product per acre as a broadcast spray or as a 3/4 percent solution with hand-held equipment when most quackgrass or wirestem muhly is at least 8 inches in height (3 to 4-leaf stage of growth) and actively growing. Allow 3 or more days after application before tillage.

Reed, **giant/ice** plant—For control of giant reed and ice plant, apply a 1 1/2 percent solution of this product with hand-held equipment when plants are actively growing. For giant reed, best results are obtained when applications are made in late summer to fall.

Spatterdock—Apply 6 pints of this product per acre as a broadcast spray or as a 3/4 percent solution with hand-held equipment. Apply when most plants are in full bloom. For best results, apply during the summer or fall months.

Sweet potato, wild—Apply this product as a 1 1/2 percent solution using hand-held equipment. Apply to actively growing weeds that are at or beyond the bloom stage of growth. Repeat applications will be required. Allow the plant to reach the recommended stage of growth before retreatment.

Thistle: **Canada**, artichoke—Apply 3 to 4 1/2 pints of this product per acre as a broadcast spray or as a 1 1/2 percent solution with hand-held equipment for Canada thistle. To control artichoke thistle, apply a 2 percent solution as a spray-to-wet application. Apply when target plants are actively growing and are at or beyond the bud stage of growth.

Torpedograss—Apply 6 to 7 1/2 pints of this product per acre as a broadcast spray or as a 3/4 to 1 1/2 percent solution with hand-held equipment to provide partial control of torpedograss. Use the lower rates under terrestrial conditions, and the higher rates under partially submerged or a floating mat condition. Repeat treatments will be required to maintain such control.

Tules, **common**—Apply this product as a 1 1/2 percent solution with hand-held equipment Apply to actively growing plants at or beyond the seedhead stage of growth. After application, visual symptoms will be slow to appear and may not occur for 3 or more weeks.

Waterhyacinth—Apply 5 to 6 pints of this product per acre as a broadcast spray or apply a 3/4 to 1 percent solution with hand-held equipment Apply when target plants are actively growing and at or beyond the early bloom stage of growth. After application, visual symptoms may require 3 or more weeks to appear with complete necrosis and decomposition usually occurring within 60 to 90 days. Use the higher rates when more rapid visual effects are desired.

Waterlettuce—For control, apply a 3/4 to 1 percent solution of this product with hand-held equipment to actively growing plants. Use higher rates where infestations are heavy. Best results are obtained from mid-summer through winter applications. Spring applications may require retreatment.

Waterprimrose—Apply this product as a 3/4 percent solution using hand-held equipment Apply to plants that are actively growing at or beyond the bloom stage of growth, but before fall color changes occur. Thorough coverage is necessary for best control.

Other perennials listed on this label—Apply 4 1/2 to 7 1/2 pints of this product per acre as a broadcast spray or as a 3/4 to 1 1/2 percent solution with hand-held equipment Apply when target plants are actively growing and most have reached early head or early bud stage of growth.

WOODY BRUSH AND TREES

When applied as recommended under the conditions described, this product plus surfactant CONTROLS or PARTIALLY CONTROLS the following woody brush plants and trees:

Alder	Chamise
<i>Alnus</i> spp.	<i>Adenostoma fasciculatum</i>
Ash*	Cherry:
<i>Fraxinus</i> spp.	Bitter
Aspen , quakini	<i>Prunus emarginata</i>
<i>Populus tremuloides</i>	Black
Bearclover , Beannat	<i>Prunus serotina</i>
<i>Chamaebatia foliolosa</i>	Pin
Birch	<i>Prunus pensylvanica</i>
<i>Betula</i> spp.	Coyote brush
Blackberry	<i>Baccharis consanguinea</i>
<i>Rubus</i> spp.	Creeper, Virginia*
Broom:	<i>Parthenocissus quinquefolia</i>
french	Dewberry
<i>Cytisus monspessulanus</i>	<i>Rubus trivialis</i>
Scotch	Dogwood
<i>Cytisus scopaeus</i>	<i>Cornus</i> spp.
Buckwheat , California*	Elderberry
<i>Eriogonum fasciculatum</i>	<i>Sambucus</i> spp.
Cascara*	Elm*
<i>Rhamnus purshiana</i>	<i>Ulmus</i> spp.
Catsclaw*	Eucalyptus, bluegum
<i>AcaCia greggii</i>	<i>Eucalyptus globulus</i>
Ceanothus	Hasardia*
<i>Ceanothus</i> spp.	<i>Haplopappus squamosus</i>

Hawthorn	<i>Prunus</i>
<i>Crataegus</i> spp.	<i>P. unius</i> spp.
Hazel	Raspberry
<i>Corylus</i> spp.	<i>Rubus</i> spp.
Hickory	Redbud, eastern
<i>Carya</i> spp.	<i>Cercis canadensis</i>
Holly, Florida; Brazilian Peppertree	Rose , multiflora
<i>Schinus t. rebinthifolius</i>	<i>Rosa multiflora</i>
Honeysuckle	Russian-olive
<i>Lonker</i> , spp.	<i>Elaeagnus angustifolia</i>
Hornbeam , American	Sage : black, white
<i>Capinus caroliniana</i>	<i>Salvia</i> spp.
Kudzu	Sagebrush , California
<i>Puerana lobata</i>	<i>Artemisia californica</i>
Locust , black*	Salmonberry
<i>Robinia pseudoacacia</i>	<i>Rubus spectabilis</i>
Manzanita	Salt cedar*
<i>Arctostaphylos</i> spp.	<i>Tamarix</i> spp.
Maple:	Saltbush , Sea myrtle
Red**	<i>Baccharis halimifolia</i>
<i>Acer rubrum</i>	Sassafras
Sugar	<i>Sassafras albidum</i>
<i>Acer saccharum</i>	Sourwood*
Yine*	<i>Oxydendrum arboreum</i>
<i>Acer circinatum</i>	Sumac:
Monkey flowe"	Poison*
<i>Mimulus guttatus</i>	<i>Rhus vernix</i>
Oak:	Smooth*
Black*	<i>Rhus glabra</i>
<i>Quercus velutina</i>	Winged*
Northern pine	<i>Rhus copallina</i>
<i>Quercus palustris</i>	Sweet gum
Post	<i>Liquidambar styraciflua</i>
<i>Quercus stellata</i>	Swordfern*
Red	<i>Polystichum munitum</i>
<i>Quercus rubra</i>	Tallowtree , Chinese
Southern red	<i>Sapim sebiferum</i>
<i>Quercus falcata</i>	Thimbleberry
White*	<i>Rubus parviflorus</i>
<i>Quercus alba</i>	Tobacco, tree
Penimmon*	<i>Nicotiana glauca</i>
<i>Diospyros</i> spp.	Trumpet creeper
Poison Ivy	<i>Campsis radicans</i>
<i>Rhus radicans</i>	Waxmyrtle , southern*
Poison Oak	<i>Myrica carifera</i>
<i>Rhus toxicodendron</i>	Willow
Poplar , yellow*	<i>Salix</i> spp.
<i>Liriodendron tulipifera</i>	

*Partial control

**See below for control or partial control instruction.

NOTE: If brush has been mowed or tilled or trees have been cut, do not treat until regrowth has reached the recommended stage of growth.

Apply the recommended rate of this product plus 2 or more quarts of a nonionic surfactant per 100 pllons of spray solution when plants are actively growing and, unless otherwise directed, after full-leaf expansion. Use the higher rate for larger plants and/or dense areas of growth. On vines, use the higher rate for plants that have reached the woody stage of growth. Best results are obtained when application is made in late summer or fall after fruit formation.

In arid areas, best results are obtained when application is made in the spring or early summer when brush species are at high moisture content and are flowering. Ensure thorough coverage when using hand-held equipment. Symptoms may not appear prior to frost or senescence with far treatments.

Allow 7 or more days after application before tillage, mowing or removal. Repeat treatments may be necessary to control plants regenerating from underground parts or seed. Some autumn colors on undesirable deciduous species are acceptable provided no major leaf drop has occurred. Reduced performance may result if fall treatments are made following a frost.

See the "Directions for Use" and "Mixing and Application Instructions" sections in this label for labeled use and specific application instructions.

Applied as a 5 to 8 percent solution as a directed application as described in the "HAND-HELD AND HIGH-VOLUME EQUIPMENT" section, this product will control or partially control all species listed in this section of this label. Use the

Apply the product as follows to control or partially control the following woody brush and trees

Alder/Blackberry/Dewberry/Honeysuckle/Oak, Post/Raspberry—For control, apply 4 1/2 to 6 pints per acre as a broadcast spray or as a 3/4 to 1 1/4 percent solution with hand-held equipment.

Aspen, Quaking/Hawthorn/Trumpet creeper—For control, apply 3 to 4 1/4 pints of this product per acre as a broadcast spray or as a 3/4 to 1 1/4 percent solution with hand-held equipment.

Birch/Elderberry/Juniper/Salmonberry/Thimbleberry—For control, apply 3 pints per acre of this product as a broadcast spray or as a 3/4 percent solution with hand-held equipment.

Broom: French, Scotch—For control, apply a 1/4 to 1 1/2 percent solution with hand-held equipment.

Buckwheat, California/Hasardia/Monkey Flower! Tobacco, Tree—For partial control of these species, apply a 3/4 to 1 1/2 percent solution of this product as a foliar spray with hand-held equipment. Thorough coverage of foliage is necessary for best results.

Catsclaw—For partial control, apply a 1/4 to 1 1/2 percent solution with hand-held equipment when at least 50 percent of the new leaves are fully developed.

Cherry: Bitter, Black, Pin/Oak, Southern Red/Sweet Gum/Prunus—For control, apply 3 to 7 1/2 pints of this product per acre as a broadcast spray or as a 1 to 1 1/2 percent solution with hand-held equipment.

Coyote brush—For control, apply a 1 1/4 to 1 1/2 percent solution with hand-held equipment when at least 50 percent of the new leaves are fully developed.

Dogwood/Hickory/Salt cedar—For partial control, apply a 1 to 2 percent solution of this product with hand-held equipment or 6 to 7 1/2 pints per acre as a broadcast spray.

Eucalyptus, bluegum—For control of eucalyptus (esprouts), apply a 1 1/2 percent solution of this product with hand-held equipment when resprouts are 6 to 12-feet tall. Ensure complete coverage. Apply when plants are actively growing. Avoid application to drought-stressed plants.

Holly, Florida/Waxmyrtle, southern—For partial control, apply this product as a 1 1/2 percent solution with hand-held equipment.

Kudzu—For control, apply 6 pints of this product per acre as a broadcast spray or as a 1 1/2 percent solution with hand-held equipment. Repeat applications will be required to maintain control.

Maple, Red—For control, apply as a 3/4 to 1 1/4 percent solution with hand-held equipment when leaves are fully developed. For partial control, apply 2 to 7 1/2 pints of this product per acre as a broadcast spray.

Maple, Sugar/Oak, Northern Pin, Red—For control, apply as a 3/4 to 1 1/4 percent solution with hand-held equipment when at least 50 percent of the new leaves are fully developed.

Poison ivy/Poison Oak—For control, apply 6 to 7 1/2 pints of this product per acre as a broadcast spray or as a 1 1/2 percent solution with hand-held equipment. Repeat applications may be required to maintain control. Fall treatments must be applied before leaves lose green color.

Rose, multiflora—For control, apply 3 pints of this product per acre as a broadcast spray or as a 3/4 percent solution with hand-held equipment. Treatments should be made prior to leaf deterioration by leaf-feeding insects.

Sage, black/Sagebrush, California/Chamise/Tallowtree, Chinese—For control of these species, apply a 3/4 percent solution of this product as a foliar spray with hand-held equipment. Thorough coverage of foliage is necessary for best results.

Saltbush, Sea myrtle—For control, apply this product as a 1 percent solution with hand-held equipment.

Willow—For control, apply 4 1/2 pints of this product per acre as a broadcast spray or as a 3/4 percent solution with hand-held equipment.

Other woody brush and trees listed in this label—For partial control, apply 3 to 7 1/2 pints of this product per acre as a broadcast spray or as a 3/4 to 1 1/2 percent solution with hand-held equipment.

When applied as directed and under the conditions described in the "Weeds Controlled" section in this label, this product will control or partially control the labeled weeds growing in the following industrial, recreational and public areas or other similar aquatic and terrestrial sites.

Aquatic Sites—This product may be applied to emerged weeds in all bodies of fresh and brackish water which may be flowing, nonflowing or transient. This includes lakes, rivers, streams, ponds, estuaries, rice levees, seeps, irrigation

and drainage ditches, canals, reservoirs, wastewater treatment facilities, wildlife habitat restoration and management areas, and similar sites.

If aquatic sites are present in the noncrop area and are part of the intended treatment, read and observe the following directions:

This product does not control plants which are completely submerged or have a majority of their foliage under water.

There is no restriction on the use of treated water for irrigation, recreation or domestic purposes.

Consult local state fish and game agency and water control authorities before applying this product to public water. Permits may be required to treat such water.

NOTE: Do not apply this product within 1/2 mile up-stream of an active potable water intake in flowing water (i.e., river, stream, etc.) or within 1/2 mile of an active potable water intake in a standing body of water such as lake, pond or reservoir. To make aquatic applications around and within 1/2 mile of active potable water intakes, the water intake must be turned off for a minimum period of 48 hours after the application. The water intake may be turned on prior to 48 hours if the glyphosate level in the intake water is below 0.7 part per million as determined by laboratory analysis. These aquatic applications may be made ONLY in those cases where there are alternative water sources or holding ponds which would permit the turning off of an active potable water intake for a minimum period of 48 hours after the applications.

For treatments after drawdown of water or in dry ditches, allow 7 or more days after treatment before reintroduction of water to achieve maximum weed control. Apply this product within 1 day after drawdown to ensure application to actively growing weeds.

Floating mats of vegetation may require retreatment. Avoid wash-off of sprayed foliage by spray boat or recreational boat backwash or by rainfall within 6 hours of application. Do not re-treat within 24 hours following the initial treatment.

Applications made to moving bodies of water must be made while traveling upstream to prevent concentration of this herbicide in water. When making any bankside applications, do not overlap more than 1 foot into open water. Do not spray in bodies of water where weeds do not exist. The maximum application rate of 7 1/2 pints per acre must not be exceeded in any single broadcast application that is being made over water.

When emerged infestations require treatment of the total surface area of impounded water, treating the area in strips may avoid oxygen depletion due to decaying vegetation. Oxygen depletion may result in fish kill.

Other Noncrop-Type Sites—This product may be used to control the listed weeds in terrestrial noncrop sites and/or in aquatic sites within these areas.

Airports	Petroleum Tank Farms
Golf Courses	Pipeline, Power, Telephone & Utility Rights-of-Way
Habitat Restoration & Management Areas	Pump and Installations
Highways & Roadsides	Railroads
Industrial Plant Sites	Schools
Lumberyards	Storage Areas
Parking Areas	Similar Sites
Parks	

WILDLIFE HABITAT RESTORATION AND MANAGEMENT AREAS

This product is recommended for the restoration and/or maintenance of native habitat and in wildlife management areas.

Habitat Restoration and Maintenance—When applied as directed, exotic and other undesirable vegetation may be controlled in habitat management areas. Applications may be made to allow recovery of native plant species, to open up water to attract waterfowl, and for similar broad-spectrum vegetation control requirements in habitat management areas. Spot treatments may be made to selectively remove unwanted plants for habitat enhancement. For spot treatments, care should be exercised to keep spray off of desirable plants.

Wildlife Food Plots—This product may be used as a site preparation treatment prior to planting wildlife food plots. Apply as directed to control vegetation in the plot area. Any wildlife food species may be planted after applying this product, or native species may be allowed to reforest the area. If tillage is needed to prepare a seedbed, wait 7 days after applying this product before tilling to allow for maximum effectiveness.

WIPER APPLICATIONS

For Wick or wiper applications, mix 1 gallon of this product with 2 gallons of clean water to make a 33 percent solution. Addition of a nonionic surfactant at a rate of 10 percent by volume of total herbicide solution is recommended.

Wiper applications can be used to control or suppress annual and perennial weeds listed on this label. In heavy weed stands, a double application in opposite directions may improve results. See the "Weeds Controlled" section in this label for recommended timing, growth stage and other instructions for achieving optimum results

CUT STUMP APPLICATION

Woody vegetation may be controlled by treating freshly cut stumps of trees and resprouts with this product. Apply this product using suitable equipment to ensure coverage of the entire cambium. Cut vegetation close to the soil surface. Apply a 50 to 100 percent solution of this product to freshly cut surface immediately after cutting. Delay in applying this product may result in reduced performance. For best results, trees should be cut during periods of active growth and full leaf expansion.

When used according to directions for cut stump application, this product will CONTROL, PARTIALLY CONTROL or SUPPRESS most woody brush and tree species, some of which are listed below:

Alder	Poplar*
<i>Alnus spp.</i>	<i>Populus spp.</i>
Coyote brush*	Reed, giant
<i>Baccharis consanguinea</i>	<i>Arundo donax</i>
Dogwood*	Salt cedar
<i>Cornus spp.</i>	<i>Tamarix spp.</i>
Eucalyptus	Sweet gum*
<i>Eucalyptus spp.</i>	<i>Liquidambar styraciflua</i>
Hickory*	Sycamore*
<i>Carya spp.</i>	<i>Platanus «eidentalis</i>
Madrone	Tan oak
<i>Albutus menziesii</i>	<i>Lithocarpus densiflorus</i>
Maple*	Willow
<i>Acer spp.</i>	<i>Salix spp.</i>
Oak	
<i>Quercus spp.</i>	

*This product is not approved for this use on these species in the state of California.

INJECTION AND FRILL APPLICATIONS

Woody vegetation may be controlled by injection or frill application of this product. Apply this product using suitable equipment which must penetrate into living tissue. Apply the equivalent of 1 ml of this product per 2 to 3 inches of trunk diameter. This is best achieved by applying a 25 to 100 percent concentration of this product either to a continuous frill around the tree or as cuts evenly spaced around the tree below all branches. As tree diameter increases in size, better results are achieved by applying dilute material to a continuous frill or more closely spaced cuttings. Avoid application techniques that allow runoff to occur from frill or cut areas in species that exude sap freely after frills or cutting. In species such as these, make a frill or cut at an oblique angle so as to produce a cupping effect and use undiluted material. For best results, applications should be made during periods of active growth and full leaf expansion.

This treatment WILL CONTROL the following woody species:

Oak	Sweet gum
<i>Quercus spp.</i>	<i>Liquidambar styraciflua</i>
Poplar	Sycamore
<i>Populus spp.</i>	<i>Platanus «cidentalis</i>

This treatment WILL SUPPRESS the following woody species:

Black gum*	Hickory
<i>Nyssa sylvatica</i>	<i>Carya spp.</i>
Dogwood	Maple, red
<i>Cornus spp.</i>	<i>Acer rubrum</i>

*This product is not approved for this use on this species in the state of California.

RELEASE OF BERMUDAGRASS OR BAHIAGRASS ON NONCROP SITES

RELEASE OF DORMANT BERMUDAGRASS AND BAHIAGRASS

When applied as directed, this product will provide control or suppression of many winter annual weeds and tall fescue for effective release of dormant bermudagrass or bahiagrass. Make applications to dormant bermudagrass or bahiagrass.

For best results on winter annuals, treat when weeds are in an early growth stage (below 6 inches in height) after most have germinated. For best results on tall fescue, treat when fescue is in or beyond the 4 to 6-leaf stage.

WEEDS CONTROLLED

Rate recommendations for control or suppression of winter annuals and tall fescue are listed below.

Apply the recommended rates of this product in 10 to 25 gallons of water per acre plus 2 quarts nonionic surfactant per 100 gallons of total spray volume.

WEEDS CONTROLLED OR SUPPRESSED*

NOTE: C=Control
S=Suppression

WEED SPECIES	RODEO- FLUID QZ/ACRE					
	&	9	12	18	24	48
Barfey, little <i>Hordeum pusillum</i>	S	C	C	C	C	C
Bedstraw, catchweed <i>Galium aparine</i>	S	C	C	C	C	C
Bluegrass, annual <i>Poa annua</i>	S	C	C	C	C	C
Chervil <i>Chaerophyllum tainturieri</i>	S	C	C	C	C	C
Chickweed, common <i>Stellaria media</i>	S	C	C	C	C	C
Clover, crimson <i>Trifolium incarnatum</i>	■	S	S	C	C	C
Clover, large hop <i>Trifolium campestre</i>	■	S	S	C	C	C
Speedwell, com <i>Veronica arvensis</i>	S	C	C	C	C	C
Fescue, tall <i>Festuca arundinacea</i>	■	■	■	■	S	S
Geranium, Carolina <i>Geranium carolinianum</i>			S	S	C	C
Henbit <i>Lamium amplexicaule</i>	■	S	C	C	C	C
Ryegrass, Italian <i>Lolium multiflorum</i>			S	C	C	C
Vetch, common <i>Vicia sativa</i>			S	C	C	C

*These rates apply only to sites where an established competitive turf is present.

RELEASE OF ACTIVELY GROWING BERMUDAGRASS

NOTE: USE ONLY ON SITES WHERE BAHIAGRASS OR BERMUDAGRASS ARE DESIRED FOR GROUND COVER AND SOME TEMPORARY INJURY OR YELLOWING OF THE GRASSES CAN BE TOLERATED.

When applied as directed, this product will aid in the release of bermudagrass by providing control of annual species listed in the "Weeds Controlled" section in this label, and suppression or partial control of certain perennial weeds.

For control or suppression of those annual species listed in this label, use 3/4 to 2 1/4 pints of this product as a broadcast spray in 10 to 25 gallons of spray solution per acre, plus 2 quarts of a nonionic surfactant per 100 gallons of total spray volume. Use the lower rate when treating annual weeds below 6 inches in height (or length of runner in annual vines). Use the higher rate as size of plants increases or as they approach flower or seedhead formation.

Use the higher rate for partial control or longer-term suppression of the non-growing perennial species. Use lower rates for shorter-term suppression of growth.

Bahiagrass	Johnsongrass*
Dallisgrass	Trumpet creeper*
Fescue (tall)	Vaseygrass

*Suppression at the higher rate only.

•..Johnsongrass is controlled at the higher rate.

Use only on well-established bermudagrass. Bermudagrass injury may result from the treatment but regrowth will occur under moist conditions. Repeat applications in the same season are not recommended, since severe injury may result.

BAHIAGRASS SEEDHEAD AND VEGETATIVE SUPPRESSION

When applied as directed in the "Noncrop Sites" section in this label, this product will provide significant inhibition of seedhead emergence and will suppress vegetative growth for a period of approximately 45 days with single applications and approximately 120 days with sequential applications.

Apply this product 1 to 2 weeks after full green-up of bahiagrass or after the bahiagrass has been mowed to a uniform height of 3 to 4 inches. Applications must be made prior to seedhead emergence. Apply 5 fluid ounces per acre of this product, plus 2 quarts of an approved nonionic surfactant per 100 gallons of total spray volume in 10 to 25 gallons of water per acre.

Sequential applications of this product plus nonionic surfactant may be made at approximately 45-day intervals to extend the period of seedhead and vegetative growth suppression. For continued vegetative growth suppression, sequential applications must be made prior to seedhead emergence.

Apply no more than 2 sequential applications per year. As a first sequential application, apply 3 fluid ounces of this product per acre plus nonionic surfactant. A second sequential application of 2 to 3 fluid ounces per acre plus nonionic surfactant may be made approximately 45 days after the last application.

ANNUAL GRASS GROWTH SUPPRESSION

For growth suppression of some annual grasses, such as annual ryegrass, wild barley and wild oats growing in coarse turf on roadsides or other industrial areas, apply 3 to 4 ounces of this product in 10 to 40 gallons of spray solution per acre. Mix 2 quarts of a nonionic surfactant per 100 gallons of spray solution. Applications should be made when annual grasses are actively growing and before the seedheads are in the boot stage of development. Treatments made after seedhead emergence may cause injury to the desired grasses.

Product is protected by U.S. Patent No. 4,405,531. Other patents are pending. No license granted under any non-U.S. patent(s).

EPA Reg. No. 524-343

In case of an emergency involving this product,
Call Collect, day or night, (314) 694-4000.

©MONSANTO COMPANY 1995

1995-1

21061TI-IICG

MONSANTO COMPANY
AGRICULTURAL PRODUCTS
ST. LOUIS, MISSOURI, 63167 U.S.A.

MONSANTO PRODUCT NAME
RODEO® Herbicide

MONSANTO COMPANY
800 N. LINDBERGH BLVD.
ST. LOUIS, MO 63167
Emergency Phone No. (Call Collect) 314-694-4000
DATE PREPARED: JANUARY, 1990

PRODUCT IDENTIFICATION

EPA Reg. No.: 524-343
 Synonyms: None.
 Chemical Name: Not Applicable. Formulated Product
 Active Ingredient: Glyphosate, N-phosphonomethylglycine. in the form of the isopropylamine salt **53.5%**
 Inert Ingredients: 46.5%
 100.00/0
 Contains 648 grams per liter or 5.4 pounds of the isopropylamine salt of N-(phosphonomethyl) glycine per U.S. gallon. Equivalent to 480 grams per liter or 4 pounds per U.S. gallon of the acid, glyphosate.

CAS Reg. No. : Not Applicable. Formulated Product
 CAS Reg. No. Active Ingredient: 1071-83-6
 DOT Proper Shipping Name: Not Applicable
 DOT Hazard Class/ID No.: Not Applicable
 DOT Label: Not Applicable
 Reportable Quantity (RQ)
 Under U.S. CERCLA: Not Applicable
 U.S. Surface Freight Classification: Weed Killing Compound. N.O.I.B.N.

SARA Hazard Notification

Hazard Categories Under Criteria of SARA Title III Rules (40 CFR Part 370): Not Applicable

Section 313 Toxic Chemical(s): Not Applicable

Hazardous Chemical(s) Under OSHA Hazard Communication Standard: Not Applicable

WARNING STATEMENTS

Keep out of reach of children
CAUTION!
 MAY CAUSE EYE IRRITATION
 MAY BE HARMFUL IF INHALED

PRECAUTIONARY MEASURES

Avoid contact with eyes, skin or clothing.
 Avoid breathing vapors or spray mist.
 Wash thoroughly with soap and water after handling.
 Do not contaminate water when disposing of equipment wash waters.
 Treatment of aquatic weeds can result in oxygen depletion or loss due to decomposition of dead plants. This oxygen loss can cause fish suffocation.

EMERGENCY AND FIRST AID PROCEDURES

FIRST AID:

IF IN EYES: Flush with plenty of water for at least 15 minutes. Get medical attention if symptoms persist.

IF ON SKIN: Flush with water. Wash clothing before reuse.

IF INHALED: Remove individual to fresh air. Seek medical attention if breathing difficulty develops.

OCCUPATIONAL CONTROL PROCEDURES

EYE PROTECTION: **RODEO** herbicide does not present significant eye irritation or eye toxicity requiring protection. Avoid eye contact as good industrial practice.

SKIN PROTECTION: does not present skin concern requiring special protection.

RESPIRATORY PROTECTION: Respiratory protection should not be required for normal use and During abnormal circumstances where possible exposure to heavy mists may occur, prudence would dictate use of appropriate respirator to minimize exposure. respirator use specified by **NIOSH/MSHA** or the manufacturer must be observed.

VENTILATION: No special precautions recommended.

AIRBORNE EXPOSURE LIMITS:

Product: **RODEO** Herbicide - 100% by wt.
OSHA PEL/TWA and ACGIH TLV/TWA/STEL: None established

FIRE PROTECTION INFORMATION

Flash Point: > 200°F Method: Tag Closed Cup

Extinguishing Media: Water spray, foam, dry chemical or CO₂ or any Class B agent

Special Fire Fighting Procedures: Fire and others who may be exposed to mist or products of combustion should wear a breathing apparatus and full clothing. Equipment should be thoroughly cleaned after use.

Unusual Fire and Explosion Hazards: None.

REACTIVITY DATA

Stability: Stable for at least 5 years under normal conditions of warehouse storage. Heated facilities are not required.

Incompatibility: Spray solutions of this product should be mixed, stored and applied only in **stainless** steel, aluminum, fiberglass, and plastic-lined containers.

DO NOT STORE OR APPLY THIS PRODUCT OR SPRAY SOLUTIONS OF THIS PRODUCT IN GALVANIZED OR UNLINED STEEL (EXCEPT STAINLESS STEEL) CONTAINERS OR SPRAY TANKS. This product or spray solutions of this product react with such containers and tanks to produce hydrogen gas which may form a highly combustible gas mixture. This could flash or explode, causing serious personal injury, if ignited by open flame, welder's torch, cigarette or other ignition source.

Hazardous Decomposition Products: None known.

Hazardous Polymerization: Does not occur. This product can react with caustic (basic) materials to liberate heat. This is not a polymerization but rather a chemical neutralization reaction.

HEALTH EFFECTS SUMMARY

The following information on human and results of scientific investigations reviewed by health professionals for hazard evaluation of RODEO herbicide and development of Precautionary Statements and Occupational Control Procedure, recommended in this document.

EFFECTS OF EXPOSURE

Inhalation and dermal contact are expected to be the primary routes of occupational exposure to RODEO herbicide. Occupational exposure to this material has not been reported to cause significant adverse health effects. On the basis of available information, exposure to RODEO is not expected to produce significant adverse human health effects when recommended safety precautions are followed.

TOXICOLOGICAL DATA

Data from laboratory studies, conducted by Monsanto with RODEO herbicide are summarized below:

Oral - Nontoxic (Rat LD₅₀ - >5,000 mg/kg)
Dermal - Nontoxic (Rabbit LD₅₀ - >5,000 mg/kg)
Inhalation - No More Than Toxic (Rat 4-hr LC₅₀ - >1.3 highest atmospheric concentration achievable in this study.)
Eye Irritation - Nonirritating (Rabbit, 0.01110.0)
Skin Irritation - Practically Nonirritating (Rabbit, 24-hr exposure, 0.118.0)

In repeat dosing studies fed RODEO herbicide slight body weight changes. Following repeat skin exposure (3-weeks) to RODEO, skin irritation was the only effect in rabbits. No skin allergy was observed in guinea following repeated skin exposure. Information is available on glyphosate, active herbicidal ingredient of which has been tested in mutagenicity, teratogenicity, reproductive, acute, subchronic and chronic toxicity studies.

PHYSICAL DATA

Appearance: Colorless solution
Odor: Essentially odorless
pH: 4.8-4.8
Specific Gravity (Water = 1): 1.22 - 1.25

NOTE: These physical data are typical values based on material tested but may vary from sample to sample. Typical values should not be construed as a guaranteed analysis of any specific lot or as specification items.

SPILL, LEAK & DISPOSAL INFORMATION

SPILL/LEAK:

Observe all protection and safety precautions when cleaning up spills - See Occupational Control Procedures.

Liquid spills on floor or other impervious surfaces should be contained or diked, and should be absorbed with kelp, bentonite or other absorbent clays. Collect contaminated absorbent, place in plastic-lined metal drum and dispose of in accordance with instructions under DISPOSAL. Thoroughly scrub floor or other surfaces with a strong industrial type detergent and rinse with water.

Liquid spills that soak into the ground should be dug up, placed in plastic-lined metal drums and disposed of in accordance with instructions under DISPOSAL.

Leaking containers should be separated from non-leakers and either container or its contents transferred to a drum or other non-leaking container and disposed of in accordance with instructions provided under DISPOSAL. Any recovered spilled liquid should be collected and disposed of.

Do not contaminate water, foodstuffs, seed or feed by storage or disposal.

DISPOSAL:

Wastes resulting from the use of this product that cannot be used or chemically reprocessed should be disposed of in a landfill approved for pesticide disposal or in accordance with applicable Federal, State and local procedures.

Empty container retains vapor and product residue. Observe all labeled safeguards until container is cleaned, reconditioned or destroyed.

Do not reuse container. Return emptied container per the Monsanto container return program. If not returned, triple rinse container, then puncture and dispose of in a certified landfill.

SPILL, LEAK & DISPOSAL INFORMATION (Continued)

STORAGE:

STORE ABOVE 10°F (-12°C) TO KEEP FROM CRYSTALLIZING.

Crystals will settle to the bottom. If allowed to crystallize, place in a warm room at 68°F (20°C) for several days to redissolve and mix well before using.

ENVIRONMENTAL EFFECTS

ENVIRONMENTAL TOXICITY INFORMATION:

96-hr LC ₅₀ , Bluegill:	>1,000	Practically Nontoxic
96-hr LC ₅₀ , Trout:	>1,000 mg/l	Practically Nontoxic
96-hr TL ₅₀ , Carp:	>10,000 ppm	Practically Nontoxic
48-hr EC ₅₀ , D. pulex:	930 mg/l	Practically Nontoxic
Oral 10% GOI:	5,700	Practically Nontoxic

Brahman-cross heifers were given RODEO herbicide, by gavage, at daily dosages of 0, 540, 830, 1290 and 2000 mg/kg for 7 consecutive days. Clinical signs of toxicity, including loss of weight and death (1290 and 2000 mg/kg) were observed at 830 mg/kg or above. The no-effect level was considered to be 540 mg/kg/day.

For toxicity information on Glyphosate, the active herbicidal ingredient of RODEO, refer to the Glyphosate Material Safety Data Sheet

DATE: January, 1990

SUPERSEDES: August, 1989

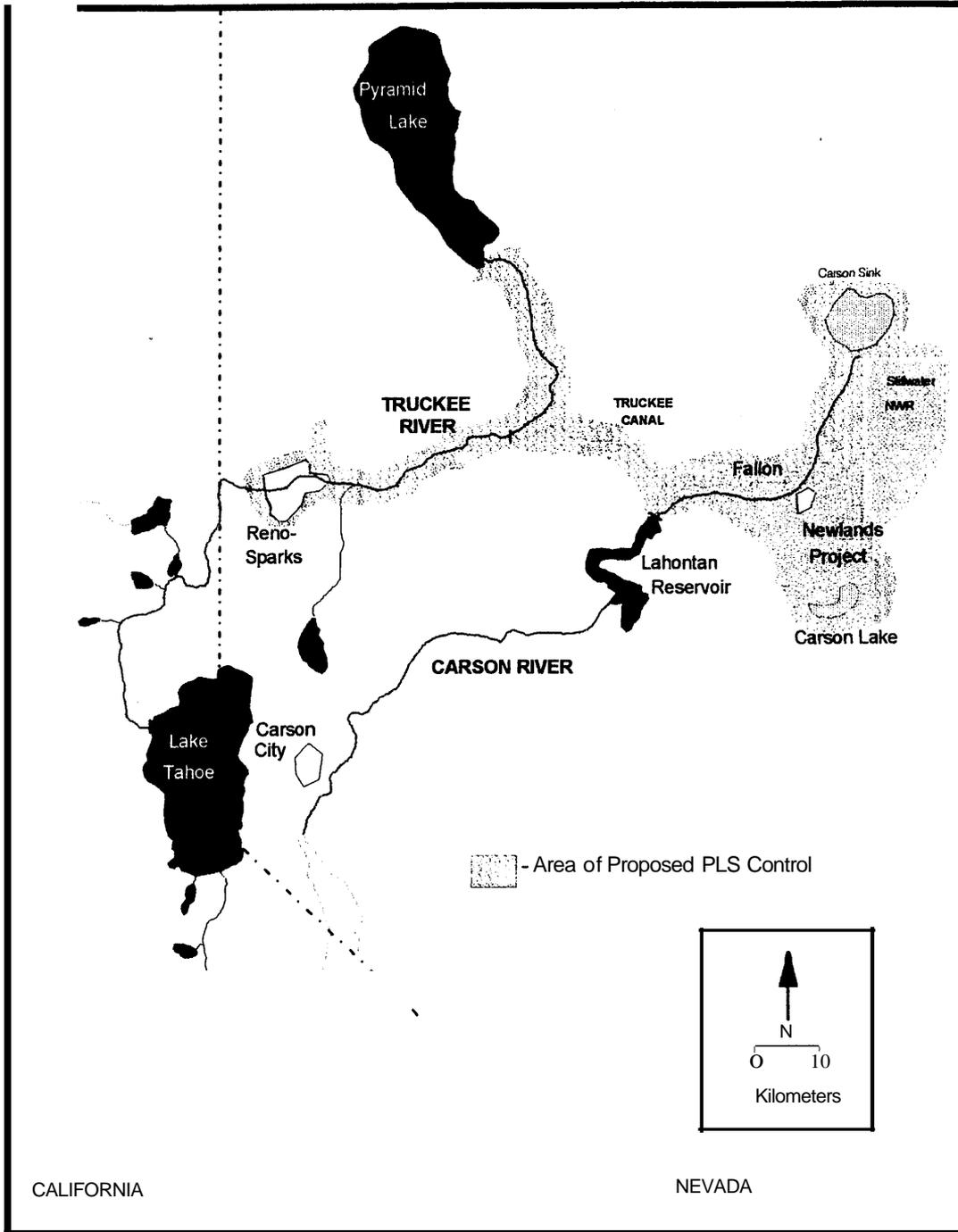
MSDS NUMBER: 500010153

FOR ADDITIONAL NON-EMERGENCY INFORMATION, CALL: 314-694-4000

Although the information and recommendations set forth herein (hereinafter-Information-) are presented in good faith and believed to be correct as of the date hereof, Monsanto Company makes no warranty as to the completeness or accuracy thereof. Information is supplied upon the condition that the persons receiving same will make their own determination as to its suitability for their purposes prior to use. In no event will Monsanto Company be responsible for damages of any nature whatsoever resulting from the use of or reliance upon Information. NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESS OR IMPLIED, OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR OF ANY OTHER NATURE ARE MADE HEREUNDER WITH RESPECT TO INFORMATION OR THE PRODUCT TO WHICH INFORMATION REFERS.

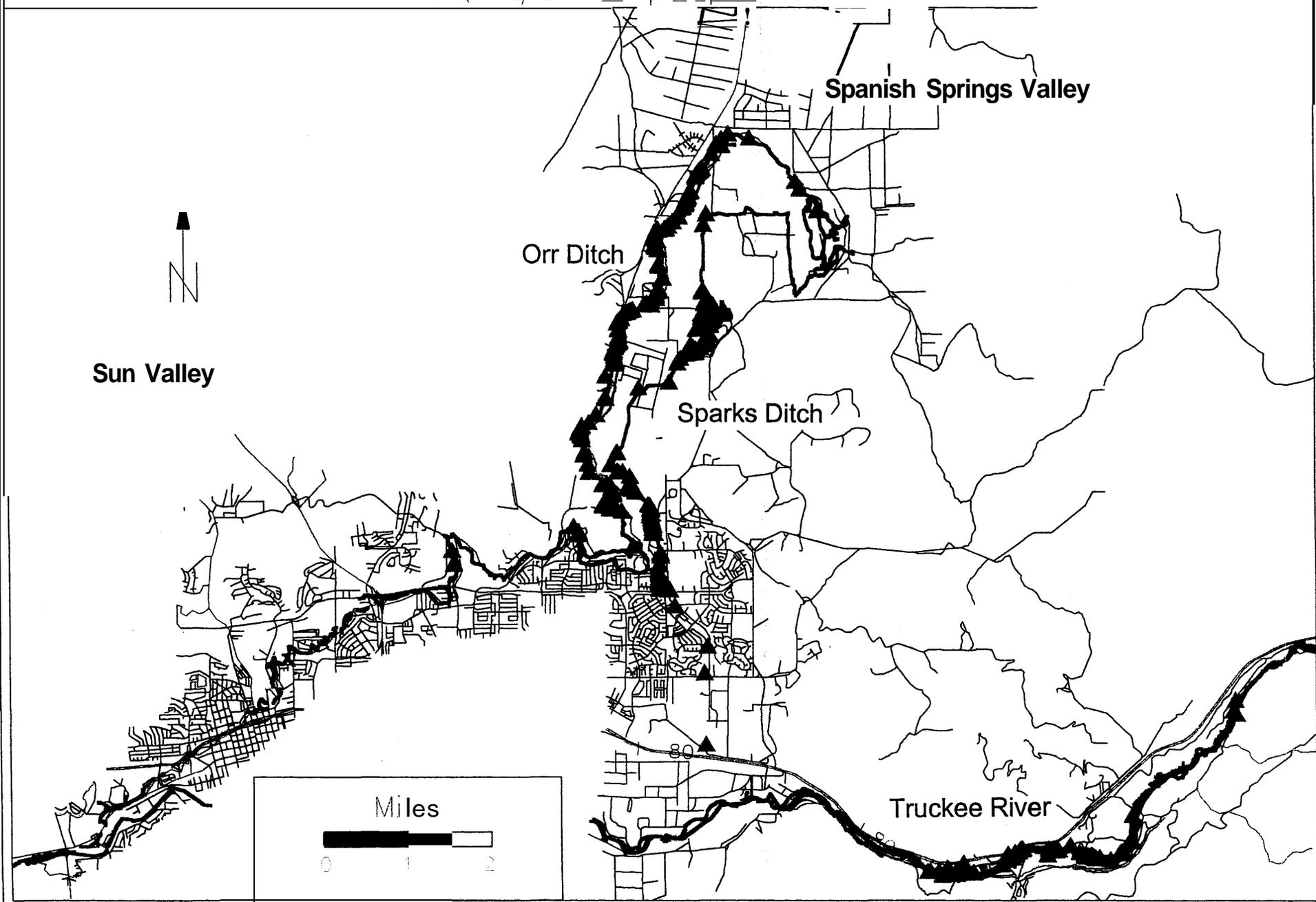
10.0 Attachments

Attachment 1. Map of the Proposed Action Area: Truckee and Carson River Basins.



Purple Loosetrife Locations Fall 1997 Survey

red triangles = purple loosetrife



Attachment 3. Map of Wetland Areas at Stillwater National Wildlife Refuge Near Fallon, Nevada.

