Montana Department of Fish, Wildlife and Parks

Region Four

DRAFT

NOXIOUS WEED MANAGEMENT PLAN

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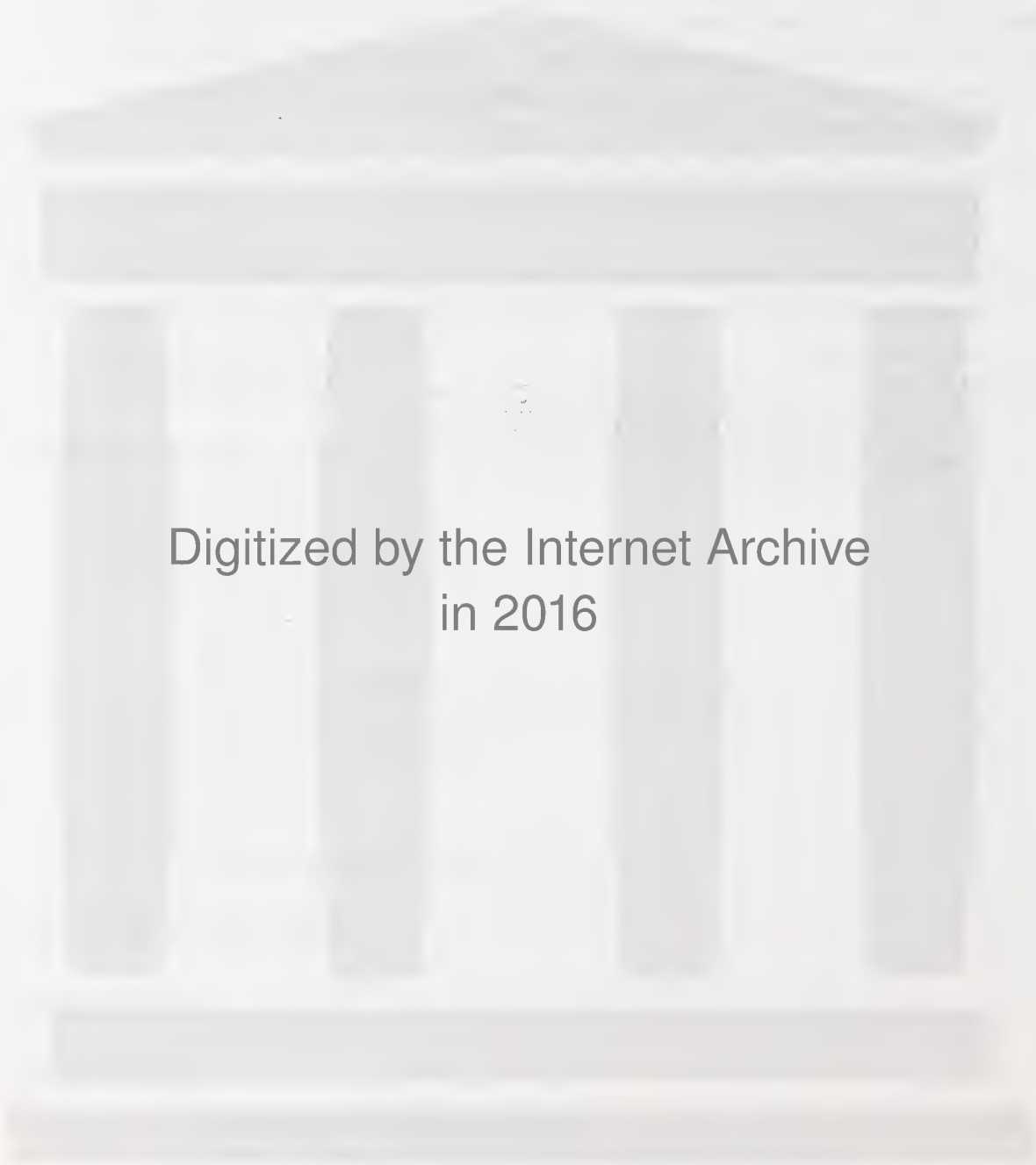

EXECUTIVE SUMMARY

INTRODUCTION

The Montana Department of Fish, Wildlife, and Parks (FWP) in north-central Montana (Region 4) is concerned about the impact of noxious weeds on biological diversity, soil and water resources, and agricultural production. This draft plan summarizes weed related issues and identifies management methods for 4 state parks (SP), 1 state park program, 50 fishing access sites (FAS), and 7 wildlife management areas (WMA) administered by the Region 4, FWP. The plan emphasizes an ecological approach using integrated weed management methods which considers site conditions and prescribes education, prevention, and cultural, mechanical/manual, biological and chemical weed management practices. Management objectives, site specific weed plans, control techniques, and monitoring programs are identified.

Partnerships with County Weed District programs are essential to the achievement of both the FWP and County Plans. All County Weed Districts within Region 4 have been asked for input into this plan.

GOALS

The goals of this draft plan are to:

- Comply with existing noxious weed control laws.
- Maintain healthy, weed resistant plant communities that meet management objectives for each site type.
- Reduce the impact of weeds on biological communities and soil and water resources.
- Manage noxious weed infestations without significant adverse environmental effects.
- Reduce impacts on other lands from weed infestations on FWP lands.

EXISTING WEED CONDITIONS

Most sites administered by FWP in Region 4 have been invaded by noxious weeds. Canada thistle, leafy spurge, and spotted knapweed infest the greatest acreage. Other weeds of concern include dalmation toadflax, purple loosestrife, sulfur cinquefoil, whitetop, Russian knapweed, yellow mignonette and black knapweed. Total area infested with noxious weeds on Region 4, FWP managed lands is 1411 acres. The close proximity of FWP sites to water and roads, and frequent visitation by people and vehicles increases the susceptibility of these sites to weed invasion.

PAST WEED CONTROL EFFORTS

Past weed control efforts in FWP Region 4 have included mowing, hand cutting, pulling, biological control, rehabilitation of disturbed areas, and herbicide applications. All sites have had some type of weed control effort.

SITE CONDITIONS

Site conditions vary in precipitation amounts, soils, amount of surface water, depth to groundwater and other important factors. The local climate is dry and cold with an annual precipitation of 13-15 inches on most sites. Most sites include surface water (streams or lakes) and also may have shallow groundwater underlying at least a portion of the area. Riparian vegetation occurs along rivers, streams, and lake shores, bunchgrass/shrub vegetation types characterize terraces and foothill slopes, and dry forest types are on high elevation hills and mountains.

Most sites are utilized by recreationists, with use concentrated to relatively small areas. These high use areas need special management of resources and visitors in order to achieve the weed management goals of this plan. Most of the state parks and fishing access sites receive intensive recreational use, with less use in WMAs.

WEED MANAGEMENT METHODS

Weed management methods include public education, prevention, and cultural, mechanical/manual, biological and chemical methods. The goal of weed management is to establish and maintain healthy, weed resistant plant communities. **Education**

programs involving FWP employees, volunteers, and the general public is the key to implementing a viable weed management program. **Prevention** techniques involve public education on identification of new invading species, and a diligent monitoring program to eliminate new weed species before they become well established. **Cultural** weed control methods help improve and maintain healthy, vigorous, desirable plants which can resist pest invasion. Cultural control also seeks to minimize soil disturbance so weeds have less opportunity to become established. **Mechanical/manual** techniques physically remove undesirable plants or plant parts, especially seed heads by hand pulling, mowing, or tillage. **Chemical** weed control methods use herbicides to remove weeds and improve native plant communities. **Biological** control consist of releasing organisms (insects, pathogens, or grazing animals) which attack the weed. The goal of biological control is to reduce the density of weeds so that they are not a major component of the plant community.

MANAGEMENT ACTIONS

The FWP Region 4 weed management plan emphasizes an ecological approach using integrated weed management (IWM). Weed management is a complex task and requires complex solutions with the flexibility to change as new information is gathered, new management methods become available, and new weed problems arise.

WEED MANAGEMENT STRATEGIES FOR EACH WEED

Objectives and strategies for individual weed species are defined within five classes: prevention, eradication, contain/control, contain/reduce, and limited management.

SITE-SPECIFIC WEED MANAGEMENT PLANS

Noxious weed inventories have been conducted on all state parks, state park program lands, wildlife management areas, and most fishing access sites. This information, in combination with management objectives and environmental conditions were used to develop site specific management plans.

Additional information provided in this plan includes treatment of species of special concern, monitoring, record-keeping, contracted services, notification, emergency spill response and education.

1.1 INTRODUCTION

The Montana Department of Fish, Wildlife and Parks (FWP) in north-central Montana (Region 4) is concerned about the rapid spread of noxious weeds and resulting impacts to biological communities, soil and water resources, and agricultural production. The Department proposes to implement ecologically based weed management programs and comply with Montana's County Noxious Weed Control Act.

This draft plan summarizes the noxious weed situation, weed management concerns, and identifies weed management methods for about 105,867acres including state parks, wildlife management acres, and fishing access sites in north-central Montana. An Integrated Weed Management (IWM) approach which considers site conditions, and prescribes education, prevention, and mechanical/manual, biological, and chemical weed management practices will be implemented to manage noxious weeds.

Integrated Weed Management is a systems approach to management of undesirable plants. IWM is defined in the Federal Noxious Weed Act as "a system for the planning and implementation of a program, using an interdisciplinary approach, to select a method for containing or controlling an undesirable plant species or group of species using all available methods".

1.2 GOALS

The goals of this draft weed management plan are to:

- Comply with existing noxious weed control laws.
- Maintain healthy, weed resistant plant communities that meet management objectives for each site type.
- Reduce the impact of weeds on biological communities and soil and water resources.
- Manage noxious weed infestations without significant adverse environmental effects.
- Reduce impacts on other lands from weed infestations on FWP lands.

1.3 FWP REGION 4 GENERAL SITE CONDITIONS

This plan encompasses 4 state parks (SP), 1 state park program, 50 fishing access sites (FAS), 7 wildlife management areas (WMA), and Region 4 headquarters (Table 1-1). Elevations range from approximately 2700 to 6000 feet. Annual precipitation is from 13

to 20 inches on most sites, but ranges as high as 30 to 35 inches at high elevations along the western portion of the Region. Soils of the Region can be divided into 3 major categories: (1) coarse to fine textured soils formed on glacial till plains north of the Missouri River; (2) medium to coarse textured soils formed on low terraces, alluvial fans, and floodplains associated with major perennial streams; and (3) coarse to fine textured soils on foothills, terraces, and glacial moraines, and steeply sloping, thin soils weathered from bedrock within the western and southwestern portion of the Region.

Surface water in the form of perennial rivers, streams, lakes, and ponds are present on most site types. In general, FAS have the highest percentage of land occupied by either surface water or shallow groundwater. Vegetation types vary among the various site types. Region 4 headquarters and Giant Springs Heritage SP supports seeded turf species on high public use areas, native bunchgrasses and shrub species on river terraces, and riparian vegetation along the river. Most fishing access sites have riparian vegetation adjacent to the water and some sites have been seeded to non-native grass species following construction of public facilities. Wildlife management areas and state parks support a diverse variety of vegetation types including aquatic species, lowland marshes, alpine meadows and forests, bunchgrass uplands, and dry forests. A wide variety of terrestrial and aquatic wildlife use these areas.

Table 1-1. Lands managed by FWP Region 4.

Name of Site	Type of Site	Approximate Location	County	Acres
Region Four Headquarters	Admin.	1 Mi. NE of Great Falls	Cascade	3
Ackley Lake	SP	8 Mi. E. of Hobson	Judith Basin	160
Giant Springs	SP	1 Mi. NE. of Great Falls	Cascade	282
Sluice Boxes	SP	15 Mi. S. of Belt	Cascade	1,454
Ulm Pishkun	SP	20 Mi. W. of Great Falls	Cascade	170
Smith River [1]	SP Program	Camp Baker 27 Mi. NW. of White Sulphur Springs	Meagher, Cascade	1,119
Beartooth	WMA	15 Mi. SE of Wolf Creek	Lewis & Clark, Cascade	32,083

[1] The Smith River State Park Program is a unique approach to river management. FWP owns 1,119 acres of lands intermixed with private and Federal lands. FWP is the primary management agency from Camp Baker to Eden Bridge a distance of 61 miles. Eden Bridge is located approximately 15 Mi SE of Ulm.

Name of Site	Type of Site	Approximate Location	County	Acres
Blackleaf	WMA	15 Mi. W. of Bynum	Teton	10,398
Ear Mountain	WMA	20 Mi. W. of Chouteau	Teton	3,047
Freezeout Lake	WMA	5 Mi. N. of Fairfield	Teton	12,384
Judith River	WMA	11 Mi. SW. of Utica	Judith Basin	7,298
Smith River	WMA	15 Mi. NW. of White Sulphur Springs	Meagher	3,527
Sun River	WMA	25 Mi. W. of Augusta	Lewis & Clark	29,799
Arod Lakes [2]	FAS	17 Mi. NW. of Chouteau	Teton	20
Bean Lake	FAS	10 Mi. SW. of Augusta	Lewis & Clark	16
Bearpaw Reservoir	FAS	15 Mi. S of Havre	Hill	185
Big Bend	FAS	8 Mi. SW of Great Falls	Cascade	17
Big Casino [3]	FAS	1 Mi. S. of Lewistown	Fergus	25
Brewery Flats	FAS	3 Mi. S. of Lewistown	Fergus	23
Burleigh [4]	FAS	5 Mi. S of Lewistown	Fergus	69
Bynum Reservoir	FAS	6 Mi. W of Bynum	Teton	76
Carroll Trail	FAS	2 Mi. N of Lewistown	Fergus	46
Carter Ferry	FAS	15 Mi. NE of Great Falls	Chouteau	20
Carter Pond - Lower	FAS	6 Mi. N of Lewistown	Fergus	6
Carter Pond - Upper	FAS	7 Mi. N of Lewistown	Fergus	5
Craig	FAS	In Craig	Lewis & Clark	3
Dunes	FAS	2 Mi. SW of Ulm	Cascade	61
Durand Reservoir [5]	FAS	10 Mi. E. of White	Meagher	10

[2] Arod Lakes FAS is managed in cooperation with the US Fish and Wildlife Service. In general USFWS handles lands and weeds, however FWP maintains the right of ways for fishing access and has responsiblities for weed management on those right of ways.

[3] Big Casino Reservoir is managed by the City of Lewistown. While FWP owns the land the City is responsible for all weed management.

[4] Burleigh FAS is managed as a conservation easement. All weed management is the responsibility of the landowner.

[5] Durand FAS is FWP lands ajacent to DNRC developments. FWP lands do not have access to the reservoir nor have any development.

Name of Site	Type of Site	Approximate Location	County	Acres
Eagle Island [6]	FAS	6 Mi. NE of Craig	Cascade	22
Eden Bridge	FAS	15 S of Ulm	Cascade	5
Eureka Reservoir	FAS	8 Mi. NW of Chouteau	Teton	40
Faber Reservoir	FAS	25 Mi. S of Chinook	Blaine	50
Fitzpatrick Lake	FAS	16 Mi. W of Sunburst	Toole	5
Fort Shaw	FAS	1 Mi. N of Fort Shaw	Cascade	3
Fresno Reservoir	FAS	15 Mi. NW of Havre	Blaine	2677
Hruska	FAS	5 Mi. NW of Lewistown	Fergus	46
Kentucky Island [7]	FAS		Cascade	1
Loma Bridge	FAS	2 mi. S of Loma	Chouteau	6
Lower Smith River	FAS	2 Mi. E of Ulm	Cascade	4
Martinsdale Reservoir	FAS	2 Mi. SE of Martinsdale	Meagher	26
Mid Canon	FAS	5 Mi. NE of Craig	Cascade	9
Missouri Recreation Road [8] (13 sites)	FAS	Missouri River & Little Prickley Pear Creek between Helena and Cascade	Lewis and Clark, Cascade	36+**
Nilan Reservoir	FAS	8 Mi W of Augusta	Lewis & Clark	12
Pelican Point	FAS	5 Mi. S of Cascade	Cascade	96

[5] Durand FAS is FWP lands ajacent to DNRC developments. FWP lands do not have access to the reservoir nor have any development.

[6] Eagle Island is an undeveloped island in the Missouri River. It is not accessable except via the river.

[7] Kentucky Island is an undeveloped island in the Missouri River. It is not accessable except via the river.

[8] Missouri River Recreation Road consists of sites along the Missouri river and Little Prickley Pear Creek which have been leased by FWP from the Montana Department of Transportation (MDT). In 1995 a property transfer was initiated which formally transfers these and other MDT sites to FWP. Since the acreages will change from existing conditions FWP hesitates to state acreages which will be included in the weed management plan. Once the sites have been finalized FWP will initiate site by site plans identical to those of other inventoried FWP sites. The land transfer is expected to be complete by spring of 1997.

Name of Site	Type of Site	Approximate Location	County	Acres
Pishkun Reservoir	FAS	20 Mi. SW of Chouteau	Teton	20
Selkirk	FAS	5 miles E of Martinsdale	Wheatland	256
Trish Island [9]	FAS		Cascade	16
Truly	FAS	5 Mi SE of Ulm	Cascade	10
Ulm Bridge	FAS	1/2 Mi. E of Ulm	Cascade	163
White Bear [10]	FAS	2 Mi. SW of Great Falls	Cascade	41
Willow Creek Reservoir	FAS	7 Mi. N of Augusta	Lewis & Clark	7
Wing Dam [11]	FAS	12 Mi. SW of Ulm	Cascade	10
			Total Acreage	**105,867**

1.4 HISTORY OF NOXIOUS WEEDS

Noxious weeds were introduced into Montana in the early 1900's either as contaminates in feed or seed products, or for their perceived value to man. Since their introduction, they have spread rapidly to infest an estimated 8 million acres in the state (Lacey, 1989). These invasive non-native plants use water, nutrients, and sunlight that would normally be utilized by native species or crop plants.

The impact of weeds on biological communities, ecosystem processes, and the agricultural economy is well documented in Montana. Studies have shown that the replacement of native bunchgrasses with tap-root weeds such as spotted knapweed can increase surface water runoff and soil erosion by 56% and 192% respectively (Lacey et al, 1989). This influences water quality in streams and rivers, and ultimately impacts the productive potential of the land. Weeds have been shown to influence wildlife by reducing forage, modifying habitat structure - such as changing grassland to a forb-dominated community, or changing species interactions within the ecosystem (Belcher and Wilson, 1989; Bedunah, 1992; Trammell and Butler, 1995; Thompson, 1996). Non-native plants also threaten biological diversity of native plant communities by

[9] Trish Island is an undeveloped island in the Missouri River. It is not accessable except via the river.

[10] White Bear is currently undeveloped except that it is fenced.

[11] Wing Dam currently is undeveloped and has no formal public access.

displacing native species (Tyser & Key, 1988) and can threaten the survival of rare and sensitive plants (Lesica, 1991).

The cost of spotted knapweed and leafy spurge to Montana's economy is substantial. Bioeconomic models were used to evaluate the economic impact of these weeds on grazing land and wildland values. Total impact from spotted knapweed infestations were estimated at $42 million, which could support 518 full time jobs in the state (Hirsch and Leitch, 1996). If all vulnerable lands in the state were infested with spotted knapweed (34 million acres), the cost to Montana's livestock industry alone would be $155 million (Bucher, 1984). The impact of leafy spurge to Montana's economy was estimated at $18.6 million (Leitch et.al., 1994).

The Montana County Noxious Weed Management Act defines a "noxious weed" as any exotic plant species established or that may be introduced in the state which may render land unsuitable for agriculture, forestry, livestock, wildlife, or other beneficial uses. There are 15 weeds that have been designated statewide "noxious weeds" (Table 1-2). These weeds are categorized based on their distribution and acreage in Montana. Category 1 includes species that are currently established and generally widespread; Category 2 are weeds that are recently introduced and/or rapidly spreading; and Category 3 includes weeds that are either not in the state but are serious problems in adjoining states, or infest very small acreage.

Table 1-2: State designated noxious weeds.

Category 1:
- Canada thistle (*Cirsium arvense*)
- Field bindweed (*Convolvulus arvensis*)
- Whitetop (*Cardaria draba*)
- Leafy spurge (*Euphorbia esula*)
- Russian kanpweed (*Centaurea repens*)
- Spotted knapweed (*Centaurea maculosa*)
- Diffuse knapweed (*Centaurea diffusa*)
- Dalmation toadflax (*Linaria dalmatica*)
- St. Johnswort (*Hypericum perforaturm*)
- Sulfur cinquefoil (*Potentilla recta*)

Category 2:
- Dyers woad (*Isatis tinctoria*)
- Purple loosestrife (*Lythrum salicaria,* L. *virgatum*)

Category 3:
- Yellow starthistle (**Centaurea solstitialis**)
- Common crupina (*Crupina vulgaris*)
- Rush skeletonweed (*Chondrilla juncea*)

In addition to the state list, several counties within Region 4 have designated additional noxious weeds within the county (Table 1-3). Management of both state and county designated noxious weeds will be addressed by FWP in the management plan.

Table 1-3: County designated noxious weeds

Houndstongue (*Cynoglossum officinale*) Chouteau, Meagher
Showy milkweed (*Asclepias syriaca*) Chouteau
Poison hemlock (*Conium maculatum*) Chouteau
Burdock (*Articum minus*) Chouteau, Meagher
Musk thistle (*Cardus nutans*) Chouteau, Meagher
Scotch thistle (*Onopordum acanthium*) Chouteau
Perennial sowthistle (*Sonchus arvensis*) Chouteau
Scentless chamomile (*Matricaria perforata*) Chouteau
Wild licorice (*Glycyrrhiza lepidota*) Chouteau
Yellow toadflax (*Linaria vulgaris*) Meagher
Common tansy (*Tanacetum vulgare* L.) Meagher
Yellow mignonette (*Raseda lutea*) Judith Basin
Baby's breath (*Gypsophila paniculata*) Chouteau
Oxeye daisy (*Chrysanthemum leucanthemum*) Chouteau

Recent inventories conducted by Region 4, FWP indicate that most FAS, SP's, and WMA are infested at some level with weeds. The most common species include spotted knapweed, leafy spurge, Canada thistle, burdock, and houndstongue. Other noxious weeds that occur with less frequency are Russian knapweed, sulfur cinquefoil, field bindweed, whitetop, purple loosestrife, and dalmation toadflax. Maps showing the species and location of weed species on lands managed FWP are on file with Region 4 Headquarters, FWP in Great Falls.

Weed densities at FWP sites range from scattered individual plants to nearly complete coverage of sites. Infested sites include parking areas, boat ramps, roadsides, stream banks, lake shores, and relatively undisturbed areas. The close proximity of many FWP sites to water and roads, and frequent use by people and vehicles, greatly increases the susceptibility of these sites to invasion. The potential for these sites to be infested by newly invading species (Category 3 noxious weeds) is very high.

1.5 WEED MANAGEMENT PRACTICES

Weed management efforts have been on-going within Region 4, FWP on most sites. Management techniques included mowing, weed whipping, hand pulling, biological control, reseeding disturbed sites, and herbicide applications. FWP has cooperative

agreements for management of sites with County Weed Districts and private contractors. In addition, FWP maintenance personnel are managing weeds on some of the sites. Region 4 expenditures for noxious weed control in 1996 were about $17,000.

The Region has worked cooperatively with federal agencies and county weed districts on biological control projects. There are 121 sites within the Smith River State Park Program, FAS, and WMA where biological control agents have been released. Agents include *Aphthona nigriscutis, A. flava, A. cypparissiae, A. czwalinae,* and *A. lacertosa* and *Spurgia esula* on leafy spurge and *Calophasia lunula* and *Gymnetron antirrhini* on dalmation toadflax . Other biocontrol agents established on FWP lands in Region 4 include *Urophora affinis* and *Urophora quadrifasciata* on spotted knapweed and *Rhinocyllus conicus* on musk thistle. Biocontrol insectaries have also been established on FAS that can be used for collection and redistribution. In addition to insect releases, livestock grazing is implemented within WMA's to help maintain healthy plant communities that are more resistant to weed invasion.

Manual and mechanical methods of weed control are utilized on many sites. Volunteers and FWP employees have been used successfully as part of an IWM program on knapweed and leafy spurge in Sluice Boxes State Park. Mowing and weed whipping are also used to manage vegetation at other state parks and high public use sites.

Herbicides are used to manage vegetation on all site types as part of an IWM approach. Noxious weeds such as leafy spurge, the knapweeds, dalmation toadflax, sulfur cinquefoil, and new invading species receive priority for treatment on most sites. Herbicide applications are made by FWP maintenance personnel, or contracted to commercial applicators or County Weed Districts. In several cases, cooperative efforts have been made with neighboring landowners to coordinate weed management efforts. FWP Region 4 currently has 2 licensed pesticide applicators employed in weed management.

1.6 REGULATIONS AND AGENCY GUIDANCE

Montana has recognized the damaging effects of weeds in laws and regulations such as the Montana Weed Control Act. Individual county weed control districts in Region 4 have adopted their own local weed management plans. Other state and federal regulations affect weed control programs such as the Montana Pesticides Control Act.

State and local laws require landowners to control noxious weeds. However, in some cases these regulations are not strictly enforced. The Montana Noxious Weed Control

Act (Title 7, Chapter 22 Section 7-22-2101 through 7-22-2153 and rules 4.5.201 through .5.103) requires control of specific weeds:

> *"It is unlawful for any person to permit any noxious weed to propagate or go to seed on his land, except that any person who adheres to the noxious weed management program of his district or who has entered into and is in compliance with a noxious weed management agreement is considered to be in compliance with this section" (7-22-2116 MCA).*

FWP has general policies which concern weed management including the department's vision statement:

> *"to provide for the stewardship of the fish, wildlife, parks and recreational resources of Montana, while contributing to the quality of life for present and future generations"*

FWP also has developed specific weed management policies. A 1983 statewide weed control management plan established the objective:

> *"to prevent, to the extent feasible, the reproduction and distribution of environmentally undesirable plant species throughout department land or from department lands onto other lands"*

The statewide plan provides guidance for considering weed control which emphasizes conditions and control efforts on adjacent lands, noxious list status and available resources. Appendix A lists laws and regulations related to weed control in Montana.

In keeping with the above laws and policies FWP Region Four is committed to cooperation with County Weed Control Districts in order to manage listed noxious weeds on FWP sites within these districts.

2.0 THE TOOLS OF WEED MANAGEMENT

A variety of treatments or techniques are available for management of noxious weeds. These include education, prevention, early detection, timely management (biological, manual/mechanical, chemical, or cultural control) and site rehabilitation. The selection of a managment method is influenced by land management objectives; effectiveness of the management technique on the target species; environmental factors; land use; economics; and the size of the weed infestation (Lacey, 1991). An IWM approach utilizing a variety of techniques is critical for managing weed infestations. The following section describes various weed management methods.

2.1 EDUCATION

Educating the public and FWP personnel on weed identification, impacts of weeds on natural communities and ecosystems, and early detection of new invader species is the key for managing noxious weeds on FWP lands. Educational efforts targeting the public should emphasize what weeds are a concern and why they are a threat.

The support of the public is critical to implementing an IWM program. For example, volunteer organizations and individuals may be the only cost-effective way to conduct viable hand-pulling programs on noxious weeds that occur within environmentally sensitive sites. Biological methods need public sector funding support for research and releases. Public education must continue on herbicide as an important component of an integrated approach for managing noxious weeds.

Educational programs can consist of training programs for FWP employees and volunteer groups. FWP currently cooperates with the Smith River Coordinated River Management Group to provide signs listing noxious weeds, their appearance and characteristics. Preventative measures for sportsmen, river recreationists, trail users, and the general public, would help raise awareness and support for weed control efforts both locally and statewide.

2.2 PREVENTION

Preventing the spread of weeds by seed or vegetative propagules is the first line of defense in developing weed management programs. Minimizing soil disturbance and maintaining healthy, vigorous vegetation will reduce weed invasion. Factors which affect plant competition with weed establishment and spread such as over-grazing,

construction activities, traffic, burrowing animal activity and other soil disturbances should be minimized. Construction activities must be planned to minimize soil disturbance and provide for revegetation as quickly as possible. Topsoil, gravel and sand sources, mulch, and seed should be certified free of noxious weeds.

2.3 CULTURAL METHODS

Cultural weed management methods enhance the growth of desired vegetation that should help to slow weed invasion. The use of irrigation, fertilization, plant competition, smother crops, and crop rotation and allelopathy are methods often most suited to cropland agriculture. Maintaining native or desirable native vegetation in a healthy condition and minimizing soil disturbance are beneficial for slowing spread of noxious weeds into recreation and wildland sites. Since weeds have an ecological advantage on disturbed, compacted, and/or trampled sites, implementation of traffic controls may reduce weed invasion and spread. On some forest sites, improving brush and tree canopy cover can reduce spotted knapweed density and slow invasion. Fertilization and reseeding with competitive, adapted species may also be necessary when rehabilitating a site.

Irrigation can be used to manage some weeds however its application on FWP sites is limited. Spotted knapweed is adapted to dry site conditions and may be reduced by applying irrigation water. Irrigation can be used to help establish vigorous stands of desirable plants quickly and encourage root development thus providing increased competition for noxious weeds. Irrigation may also stimulate the growth of some species such as leafy spurge, so it must be used with consideration of weed species and site specific conditions.

2.4 MANUAL AND MECHANICAL METHODS

The use of manual methods to eliminate weeds can be effective on small infestations that are not well established, or on intensively managed sites such as seeded turf. Hand pulling, hoeing, tilling, mulches, burning and mowing are all commonly used methods. Physical and mechanical methods are labor intensive and may not be effective on deep-rooted perennial weeds. Hand pulling and hoeing is most effective in areas where there is a limited weed infestation and soil types allow for complete removal of plant material. Spotted knapweed is being effectively managed along Belt Creek where infestations occur in coarse textured soil near water and the infestation are relatively small. Hand pulling is not recommended in high density infestations where native vegetation is not present to occupy the open "niche" formed when the weed is removed.

Tilling is generally limited to cropland situations. Canada thistle has been effectively controlled when tilled every 21 days over the period of a growing season. Some weeds such as rush skeletonweed cannot be controlled with tillage.

Mulches can be effective against some annual and biennial weeds, but are not effective against many perennials. Mulching with plant materials, landscaping fabric and other substances can reduce weed infestations on small areas if installed and maintained properly. Mulching may also improve soil conditions such as aeration, water and nutrient holding capacity and infiltration.

Burning may be used prior to herbicide applications to remove decadent vegetation that could interfere with herbicide uptake and translocation. Burning should be properly timed to minimize damage to non-target species. The use of burning as a weed management tool is limited because of the danger that the fire may spread beyond the control site. There are no perennial noxious weeds established on FWP lands that can be seriously injured by burning alone.

Mowing is a common tool used to improve appearances but does not eliminate the weed. Mowing can reduce seed production especially in annual weeds, such as mustards, that produce only one crop of seed. Timing and frequency of mowing varies with each weed species. For example, seed production in spotted knapweed can be greatly reduced by mowing at the late bud to initial bloom stage of growth. Although mowing can reduce seed production in some perennial weeds, most of the species can produce seeds to a limited extent below mower height. Mowing height is an important part of weed control. Low mowing heights favor weed germination and growth by exposing the soil to more sunlight and stressing the mowed vegetation. Mowing heights of 4-6 inches or more should be used where possible. Mowing, especially early in the season, may harm native grasses. Where native grasses, especially bluebunch wheatgrass, are an important component of the plant community, mowing should be delayed until grasses mature.

When plant communities are completely disturbed by construction or are entirely dominated by weeds, complete revegetation is required. Revegetation of weedy areas requires significant initial expense to eliminate existing weeds, prepare a seedbed, and establish seeded species, but results are usually dramatic. In radically disturbed areas, it is essential to revegetate as quickly as possible. Only certified seed free of noxious weeds, weed free topsoil, and mulches will be used in reseeding projects.

2.5 BIOLOGICAL CONTROL METHODS

Biological control involves the use of living organisms, such as insects, pathogens, or grazing animals, to control a weed infestation. Biological control attempts to recreate a balance of plant species with predators. Since noxious weeds are not native to the area in which they are a problem, they have few established natural predators. Before introducing new biocontrol agents into this country the agent's host-specificity must be tested. These biocontrol agents are tested against a wide variety of plant species under "eat-or-starve" conditions to ensure that their impact is confined to a narrow range of plant species and preferably only the weed of concern. Biocontrol methods generally suppress weed populations, but will not contain or eradicate them. It is most effective on dense weed infestations that occupy large acreage's.

A list of biological weed control agents and their current status is presented in Appendix B. These biological agents include moths, flies, nematodes, beetles, gallflies, weevils and fungi which are either released or being screened for release on 14 exotic weeds in Montana. Region 4 FWP has worked cooperatively with federal agencies and county weed districts on biological control projects.

Biological control is not a "quick fix" but should be an integral part of an IWM program. FWP will continue to encourage research on biological control and will participate in providing sites for insectaries, and assisting with collection and release of agents whenever possible.

Grazing, using sheep and goats, is an effective tool for managing leafy spurge and possibly other weed species. Careful monitoring of grazing animals, target weeds and non-target plants is required to evaluate success and prevent unplanned damage of desirable vegetation. Heavy, short duration grazing by sheep can significantly reduce seed production on leafy spurge and spotted knapweed in the short term and has many of the same effects as mowing. Grazing has an advantage in some areas because sheep are more mobile, and able to reach areas unsuitable for mowing. A disadvantage is that fencing and human labor costs are high and not many areas are suitable for using grazing animals.

2.6 CHEMICAL METHODS

Herbicides are a valuable tool for managing noxious weeds, however, it is important to understand the effects and limitations of these products. Herbicides are categorized as selective or non-selective based on their ability to control certain kinds of plants.

Selective herbicides will control either broadleaf or grass plants depending on the product selected. For example, 2,4-D and Tordon 22K (picloram) are selective herbicides that will control certain broadleaf plants such as knapweed, but will not harm grasses at recommended application rates. An example of a non-selective herbicide is Roundup (glyphosate) which will kill both grasses and broadleaf plants. Herbicides are also selective based on the rate used. Spotted knapweed generally is controlled using a lower herbicide application rate (1 pint of Tordon 22K) than for leafy spurge (2 quarts of Tordon 22K per acre). The rate used will affect the potential impact on non-target broadleaf species.

Herbicides that are proposed for use on FWP managed lands in Region 4 include Tordon 22K (picloram), Banvel (dicamba), 2,4-D, Transline (clopyralid), Curtail (clopyralid + 2,4-D), Escort (metsulfuron), Krenite (fosamine), Roundup (glyphosate), and Rodeo (glyphosate). Research has shown that these herbicides provide the most effective control on weeds found on FWP lands. In addition to the active ingredients which are shown after each herbicide name, herbicide formulations also include inert materials, such as carriers and surfactants. With the exception of Roundup and Rodeo, the other herbicides listed above are selective for broadleaf plants, allowing grasses to continue to grow.

Properly used, herbicides are effective against most noxious weeds. Variation in effectiveness occurs due to weed biology, plant growth stage, application rates, condition of the application equipment, and environmental conditions such as temperature, soil moisture, and precipitation.

Human health risks associated with herbicides used for noxious weed control have been documented in "Analysis of Human Health Risks of USDA Forest Service Use of Herbicides to Control Noxious Weeds in the Northern Region" (Monnig 1986). Conclusions in this report indicate that even when consideration is given to mixing errors and a variety of accident scenarios (e.g. spills, leaks, etc.) the "no observable effect levels" (NOEL) for human health are not exceeded. Health impacts to the general public are related either to direct contact with herbicides through spray drift, spills, and sprayed vegetation or to indirect contact through consumption of contaminated water, vegetables, fish, and grazing animals. The most serious human health risk is to herbicide applicators. However, worker doses are likely to be below the Acceptable Daily Intake (ADI) if reasonable safety precautions on the herbicide label are used. The risk of herbicide applications to applicators and the general public are addressed in the Environmental Assessment

There is the possibility of idiosyncratic responses such as hypersensitivity on the part of a small percentage of the population. These persons are generally aware of their sensitivities since they are typically triggered by a variety of natural and synthetic compounds. Placing signs in high public use areas during and following herbicide

applications, and not allowing chemically sensitive persons (volunteers or FWP employees) to work with herbicides should limit exposure.

Concern about environmental effects of herbicides include potential contamination of ground and surface waters, and effects on wildlife and non-target plants. Only herbicides with an aquatic label, such as Rodeo and formulations of 2,4-D will be used within 10 feet of surface water or high water table areas. Environmental concerns will be more fully discussed in the Environmental Assessment for this plan.

2.61 LEGAL CONCERNS

Debate continues in the medical and biological communities over the human health and environmental effects of herbicides. Herbicides registered for use by the EPA are carefully tested by the manufacturer to determine human health, safety and environmental effects. Landowners and applicators can minimize liability and risk associated with using herbicides by developing and following integrated weed management plans which include personnel training, proper use and storage, and public notification.

2.62 PESTICIDE STORAGE, HANDLING, USE AND DISPOSAL

Accidental spills during storage, handling, use and disposal can cause environmental problems if not addressed property. When herbicides are applied according to label directions to plants and soils they degrade relatively quickly and seldom penetrate deeply in soil. Most herbicides are broken down and absorbed in the surface 18 inches of soil. However, when high herbicide concentrations are spilled, the capacity of the soil to hold and degrade it is exceeded. This is a special concern at FWP properties due to proximity to surface and groundwater and due to special concerns over fish, wildlife, and human impacts. FWP will establish a spill response plan coordinated between appropriate departments and outside organizations.

2.63 HERBICIDE LABELS

Herbicide labels are an important component of herbicide use and safety. Labels are booklet format documents supplied with each container of product. The label contains detailed information to support four important goals of the regulation process for herbicide use including Identification, Protection of Health and the Environment, Special Practices and Legal Requirements. Herbicide labels are legal documents and are an integral part of a weed management program. Appendix C details the components of herbicide labels and their use.

2.64 APPLICATOR LICENSES AND RECORDS

Applicators of restricted use herbicides, such as Tordon 22K, and all commercial applicators are certified by the state government. To obtain a license the applicator must take training courses and pass an exam for the specific type of pest problems that

they will be treating. In order to retain that license the applicator must earn re-certification credits in government approved courses.

The law also requires that the applicator make and retain records of their use of herbicides. The application records must be submitted to the state department of agriculture on a five year basis (ARM 4.10.207). These records must be made available to state investigative officers at any time. All aspects of applicator licensing, re-certification training, and record keeping regulations administered by the state government are in turn supervised by the EPA.

3.0 MANAGEMENT GUIDELINES FOR NOXIOUS WEEDS ON FAS, SP, AND WMA IN REGION 4, FWP

This draft Weed Management Plan is an ecological approach for managing noxious weeds using integrated weed management strategies. Management of noxious weeds will be based on the use, goals, and objectives for each site type, and the weed species and acreage infested.

Noxious weeds were prioritized in "classes" based on their ecological and economic impact, and abundance and presence on FWP managed lands. Weeds may be in more than one "class" depending on managment objectives for the site, county weed district goals, and acreage infested. Weed species include those on the state noxious weed list and other species of concern designated by counties and FWP. Table 3-1 indicates noxious weed species in each class. Management for various classes of weeds are as follows:

- **Prevent - Class 1 Weeds:** Includes those weeds not found on FWP lands but are threatening to invade. Objective is to prevent the establishment of noxious weeds through education, early detection, use of weed seed free materials, and minimizing disturbance.
- **Eradicate - Class 2 Weeds:** Includes noxious weeds that infest small acreage on a limited number of sites. Objective is to eliminate the noxious weed from FWP sites. Eradication efforts will continue as long as the weed is present.
- **Contain/control - Class 3 Weeds:** Includes noxious weeds that are common and may infest relatively large acreage, but have serious ecological and economic impacts. Objective is to prevent seed production to the extent possible and reduce weed coverage through aggressive long-term efforts. Eradicate new infestation of these weeds where possible.
- **Contain/reduce - Class 4 Weeds:** Weeds that occur on most FWP lands and are widespread in Montana, but have less ecological and economic impact than Class 3 weeds. Objective is to prevent weed spread beyond present infestation and gradually reduce the size of the infestation. Infestations on roads, other areas where vehicles park or pass, and property boundaries would be managed to stop weed spread. Canada thistle and field bindweed may move to Class 3 if infestations occur near cropland.
- **Limited management - Class 5 Weeds:** Noxious and nuisance weeds that are common on FWP lands and in Montana. These weeds may impact recreational use or aesthetics of a site, but do not have serious ecological or economic impacts. Objective is to manage infestations only in areas where they threaten to impact the use of other lands, impair recreational use, or conflict with management objectives for the site.

Table 3-1. Weed species, acreage infested, and general management strategies for noxious weeds on FWP Region 4 lands.

Prevent Class 1 Common Name	Scientific Name	Acreage Infested on FWP land
Common crupina[2]	Crupina vulgaris	0
Dyers woad[2]	Isatis tinctoria	0
Eurasian water milfoil	Myriophyllum spicatum	0
St. Johnswort[2]	Hypericum perforatum	0
Rush Skeleton weed[2]	Condrilla juncea	0
Yellow starthistle[2]	Centaurea solstitalis	0
Scentless chamomile	Matricaria perforata	0
Eradicate **Class 2** **Common Name**	**Scientific Name**	**Acreage Infested on FWP land**
Black knapweed	Centaurea nigra	<0.1
Sulphur cinguefoil[2]	Potentilla recta	0.4
Purple loosestrife[2]	Lythrum salicaria & L. virgatum	2
Contain/Control **Class - 3** **Common Name**	**Scientific Name**	**Acreage Infested on FWP land**
Leafy spurge[2]	Euphorbia esula	275
Russian knapweed[2]	Centaurea repens	<1
Spotted knapweed[2]	Centaurea maculosa	includes diffuse knap. acreage 315
Dalmation toadflax[2]	Linaria dalmatica	70
Diffuse knapweed[2]	Centauria diffusa	occurs in association with spotted knapweed
Yellow mignonette[1]	Raseda lutea	50
Whitetop[2]	Cardaria draba	213
Contain/Reduce **Class 4**		
Common Name	**Scientific Name**	**Acreage Infested on FWP land**
Canada thistle[2]	Cirsium arvense	395

Field bindweed[2]	Convolvulus arvensis	11
Musk thistle[1]	Caruus nutans	present - no acres calculated
Limited Management Class 5 Common Name	Scientific Name	Acreage Infested on FWP land
Houndstongue[1]	Cynoglossum officinale	26
Oxeye daisy[1]	Chrysanthemum leucanthemum	present on Belt Creek - no acreage calculated
Bull thistle	Cirsium vulgare	5
Burdock[1]	Articum minus	72
TOTAL ACREAGE INFESTED		1411

1 County designated noxious weeds

2 State designated noxious weeds

3.1 WEED MANAGEMENT METHODS

Weed management would include a combination of public education and prevention, and cultural, mechanical and manual, biological, and chemical methods. A discussion of each method used on Region 4 FWP managed land follows.

3.11 EDUCATION

Educating the public and FWP personnel on weed identification, impacts of weeds on natural communities and ecosystems, and early detection of new invader species is the key to managing noxious weeds on FWP lands. Annual or biannual training programs will be held for volunteers and FWP employees. FWP employees involved with management of lands will be encouraged to attend state and regional weed conferences and training programs.

Cooperative projects between FWP, federal and other state agencies, and county weed districts will be initiated to promote weed awareness in high recreational use areas such as the Smith River. Bulletins and other weed awareness materials may be developed for sportsmen, river recreationists, trail users, and the general public, to help raise awareness and support for weed control efforts.

3.12 PREVENTION

The invasion of new weed species will be prevented by training volunteers and FWP employees about noxious weeds, and increasing general public awareness about

noxious weeds. FWP sites will be monitored annually for new invading species by either FWP employees or contractors hired to manage noxious weeds. New invading species (Class 1 weeds) that are found established on FWP managed lands will be reported immediately to FWP Region 4 Headquarters, County Weed Districts, and Montana Department of Agriculture.

Soil disturbance will be minimized during construction activities and revegetation of the site will be accomplished as quickly as possible. Topsoil, gravel and sand sources, mulch, and seed will be free of noxious weed seeds or propagules. Seeding mixtures will be selected that will resist noxious weed invasion. Soil disturbance will also be minimized by limiting or restricting vehicles.

3.13 CULTURAL

Cultural weed management methods such as irrigation and plant competition are limited on most FWP sites. These methods will be used on high public use areas such as Giant Spring Heritage State Park and Region 4 Headquarters. Fertilization may be used on some sites to enhance the growth of desired vegetation, especially when rehabilitating a site. Enhancing brush and tree canopy may have a limited application on some sites to reduce susceptibility to spotted knapweed.

3.14 MECHANICAL AND MANUAL

Hand pulling will continue to be an important management tool on small infestations of tap-rooted weed species. Noxious weeds that are most effectively controlled with hand pulling or hoeing include spotted and diffuse knapweed, yellow starthistle, dyers woad, burdock, houndstongue, and musk thistle. Noxious weeds with deep, rhizominous root systems such as leafy spurge and Canada thistle cannot be controlled by hand pulling, but removal of the upper portion of the plant can eliminate seed production. Sensitive sites along rivers, creeks, and other surface water areas are high priority for manual removal of weeds. Sites that have high densities of noxious weeds may receive an initial herbicide treatment to reduce densities followed by long-term maintenance with hand pulling. Volunteer groups and FWP personnel will be utilized to hand pull weeds in high risk areas.

Tilling is generally limited to cropland situations and during rehabilitation of sites following construction. Most tap-rooted weeds and Canada thistle can be controlled with tillage. However, tillage may spread weeds such as leafy spurge, rush skeletonweed, and whitetop.

The use of mulches and mowing for managing noxious weeds will be limited to high public use areas such as Giant Spring Heritage State Park and Region 4 Headquarters. Mowing may occur on a limited bases in other state parks and fishing access sites to reduce seed production of noxious weeds and improve access to recreational areas. Mowing of noxious weeds will be timed to have the greatest impact on seed production. Where native bunchgrasses, especially bluebunch wheatgrass and rough

fescue, are an important component of the plant community, mowing will be delayed until grasses mature or another management method used.

3.15 BIOLOGICAL

Biological control will be an integral part of the weed management program on Region 4, FWP lands. The Region will continue to foster cooperative working relationships with federal agencies and county weed districts on biological control projects. Biocontrol agents currently released and/or established on FWP sites include: *Urophora affinis* and *Urophora quadrifasciata* on spotted knapweed; *Rhinocyllus conicus* on musk thistle; *Aphthona nigriscutis, A. flava, A. cypparissiae, A. czwalinae,* and *A. lacertosa* and *Spurgia esula* on leafy spurge and *Calophasia lunula* and *Gymnetron antirrhini* on dalmation toadflax . Status of these insects will continue to be monitored and new insects and pathogens obtained and released as soon as they are available. Region 4, FWP will continue to provide sites as needed for insectaries or biocontrol research. High-intensity, short-duration livestock grazing is utilized to help maintain healthy plant communities on many WMA's.

3.16 CHEMICAL

Herbicides proposed for use within FWP Region 4 are as follows: Roundup (glyphosate), Rodeo (glyphosate with aquatic label), Tordon 22K (picloram), 2,4-D, Transline (clopyralid), Curtail (2,4-D + clopyralid), Krenite (fosamine), Banvel (dicamba), and Escort (metsulfuron). These products are the most effective herbicides for control of noxious weeds present on FWP managed lands, and have been registered by the E.P.A. and approved for use in Montana. With the exception of Roundup and Rodeo, herbicides listed above are selective for broadleaf plants, allowing grasses to continue to grow. Appendix C contains material safety data sheets (MSDS) for these herbicides, and current herbicide labels will remain on file with FWP and/or contract applicators. Other herbicides, approved for use by the EPA and licensed for use in Montana, may be considered in the future. New chemicals proposed for use will be reviewed by FWP resource staff before approval.

Herbicides will be applied according to label directions within site specific constraints required by this plan. Herbicide applications will be made only by persons licensed in the State of Montana or under their direct supervision. This licensed applicator will be a FWP employee or a person contracted by FWP to conduct weed management activities.

The decision to use herbicides on a site will depend on the management objective for that site, season, weed species, weed growth stage, topography, expected cost, equipment limitations, and potential environmental impacts. Aquatic labeled herbicides, and selective hand application methods will be used to mitigate impacts on sensitive sites. Herbicide application rates will be based on the lowest rate possible to control the species. This will reduce potential impact to non-target desirable vegetation

and decrease the length of time the herbicide will remain active in the environment. Recommended herbicides for various weeds are described in the Montana Weed Control Guide.

Vehicle-mounted sprayers (hand guns, booms) will be used primarily along roadways and in off-road areas which are readily accessible by vehicle. Vehicle use will be restricted where soil or vegetation may be significantly disturbed. Examples of restrictive conditions include moist, compactable soil, steep slopes, and riparian areas. Applications using boom type spray equipment will only be used where weeds are sufficiently concentrated. Hand gun application will be used for spot treatment of weeds in vehicle accessible areas. Under both hand gun and boom methods, chemicals will be applied in a manner that gives the best coverage with the least amount of drift.

Hand applications will be made with backpack sprayers and wick applicators. Backpack sprayers and wick applicators will be used on small or scattered patches in rough terrain or environmentally sensitive areas. Contact systematic herbicides, such as glyphosate, will be used to treat individual plants and for seedbed preparation.

Precautions for herbicide use will include:

- Herbicide applications will not be conducted when wind velocities exceed 10 mph.
- During application periods, weather conditions and temperature will be measured hourly by applicators.
- Calibration checks will be conducted at the beginning of the spray season and periodically throughout the season to ensure that equipment is functioning correctly.
- Label requirements will be followed for all herbicide applications. Further precautions may be determined to be necessary during the pre-treatment reviews.
- The herbicides Tordon, Curtail, Transline, Banvel, and Escort will not be applied within 10 feet of surface water or on shallow groundwater sites.
- Aquatic labeled herbicides such as Krenite, Rodeo, and formulations of 2,4-D may be used within 10 feet of surface and shallow groundwater areas.
- All contract herbicide applications will be made by a licensed applicator.

The herbicide program will be evaluated annually as part of the overall weed monitoring and evaluation program.

3.2 SITE SPECIFIC MANAGEMENT PLANS

This plan includes information concerning site characteristics, weed distribution and acreage, and proposed weed management strategies for lands administered by Region

4, FWP. Budget, equipment and manpower limitations require prioritizing sites for weed control efforts. Weed management efforts may not be necessary on all sites in all years. FWP sites will be prioritized based upon the following factors:

- Weed species and acreage present on a site.
- Management objectives for the site and potential impacts of weeds on those objectives.
- Potential for the weed(s) to spread on FWP property.
- Potential for the weed(s) to spread beyond FWP property.
- Public concern over weeds or weed management efforts.
- Existing local weed management projects that include FWP lands.
- Intensity of public use.
- Availability of volunteer labor.
- Budgets.

Land managed by Region 4, FWP will be grouped into three categories to site plans. These include: (1) Fishing access sites; (2) state parks and state park programs; and (3) wildlife management areas. Education and prevention are key components of the integrated weed management effort on all FWP lands although they are not discussed under management alternatives for individual weed species.

3.21: FISHING ACCESS SITES

There are 50 fishing access sites (FAS) within Region 4 that encompass 4180 acres of land. These sites are adjacent to major rivers including the Missouri, Smith, Marias, Sun, Milk, and Teton. Sites also occur on major reservoirs and lakes within the Region.

Fishing access sites are managed by FWP to provide public access to recreational opportunities, and services such as restrooms, picnic sites, and parking. Based on these goals, weed management strategies for FAS are as follows.

- Manage existing noxious weed infestations in high-use public areas to reduce impacts on recreationists, and stop weeds from spreading to other lands.
- Reduce disturbance by restricting vehicles to specific sites.
- Rehabilitate disturbed sites to reduce the potential for weed invasion.

Monitor sites annually to prevent establishment of new invading weed species. Noxious weeds are present on all but one of the fishing access sites. Total area infested with noxious and nuisance weeds is 608 acres or about 14% of the total acreage (Table 3-2). Canada thistle and leafy spurge combined infest 416 acres and occur in 68% and 40% of the FAS respectively. Spotted and diffuse knapweed were found on half of the FAS, but infest only 14 acres. Dalmation toadflax, Russian knapweed, sulfur cinquefoil, whitetop, and purple loosestrife are other weed species of special concern. Houndstongue and burdock are on many of sites, but will receive only limited management.

Table 3-2. Total acres, number of weed-infested acres, cover values, and proposed control methods for fishing access sites in Region 4 FWP.

Site Num.	Site Name	County	Total Acres	Weeds Present[1]	Infest Acres	Weed Cover	Manual Mech.[2]	Bio	Chem	IWM	Weed Management Goals
1	Arod Lakes	Teton	20				FWS responsible for weed mgt.				
2	Bean Lake	L&C	16	CT	10	M		X	X	X	contain/reduce
				SC	T	L			X	X	eradicate
				BD	T	L	X		X	X	limited management
				HT	T	L	X		X	X	limited management
3	Bearpaw Reservoir	Hill	185	CT	6	M		X	X	X	contain/reduce
				WT	T	L			X	X	eradicate
				SK	T	L			X	X	eradicate
				BD	T	L	X		X	X	limited management
4	Big Bend	Cascade	17	LS	T	L			X	X	contain/control
				CT	14	L		X	X	X	contain/reduce
				FBW	9	M			X	X	contain/reduce
				HT	15	L	X		X	X	limited management
5	Big Casino	Fergus	25				City of Lewistown responsible for weed mgt.				
6	Brewery Flats	Fergus	23	LS	1	L		X	X	X	contain/control
				CT	11	L		X	X	X	contain/reduce
				SK	<0.5	L	X		X	X	eradicate
				HT	T	L	X		X	X	limited management
7	Burleigh	Fergus	69	CT	<0.5	L			X	X	contain/reduce
				SK	T	L	X		X	X	eradicate
				HT	T	L	X		X	X	limited management
8	Bynum Reservoir	Teton	76	CT	30	M		X	X	X	contain/reduce
				SK	<0.5	L	X		X	X	eradicate
9	Camp Baker	Meagher	50	CT	3	L	X	X	X	X	contain/reduce
				SC	T	L			X	X	eradicate
				HT	T	L	X		X	X	limited management
10	Carroll Trail	Fergus	46	LS	2	M		X	X	X	contain/control
				CT	40	M		X	X	X	contain/reduce
				SK	2	H			X	X	contain/control
				FBW	1	L			X	X	contain/reduce
				BD	10	M	X			X	limited management

Table 3-2. Total acres, number of weed-infested acres, cover values, and proposed control methods for fishing access sites in Region 4 FWP.

Site Num.	Site Name	County	Total Acres	Weeds Present[1]	Infest Acres	Weed Cover	Manual Mech.[2]	Bio	Chem	IWM	Weed Management Goals
11	Carter Ferry	Chouteau	20	LS	5	M		X	X	X	contain/control
				CT	1	L		X	X	X	contain/reduce
				SK	<0.5	L	X		X	X	eradicate
				FBW	T	L			X	X	contain/reduce
12	Carter Pond - Lower	Fergus	6	HT	T	L	X		X	X	limited management
13	Carter Pond- Upper	Fergus	5	CT	1	L			X	X	contain/reduce
				HT	T	L	X		X	X	limited management
14	Dunes	Cascade	61	LS	30	H		X[3]	X	X	contain/reduce
				CT	6	M		X	X	X	contain/reduce
				BD	T	L	X		X	X	limited management
15	Durand Reservoir	Meagher	10				FWP land not accessible or developed				
16	Eagle Island	Cascade	22	LS	22	H		X		X	contain/reduce
				PL	?	L			X	X	eradicate
17	Eden Bridge	Cascade	5	LS	1	M	X		X	X	contain/control
				HT	T	L	X		X	X	limited management
				BD	T	L					limited management
				CT	1	M	X		X	X	contain/reduce
18	Eureka Reservoir	Teton	40	SK	<0.5	L	X		X	X	eradicate
				CT	14	M		X	X	X	contain/reduce
				HT	T	L	X		X	X	limited management
19	Faber Reservoir	Blaine	50							X	prevent/monitor
20	Fitzpatrick Lake	Toole	5	UNK							inventory
21	Fort Shaw	Cascade	3	LS	<0.5	M			X	X	contain/control
				RK	<1	L			X	X	contain/control
				CT	2	L			X	X	contain/reduce
22	Fresno Reservoir	Blaine	2677	CT	1	M			X	X	contain/reduce
23	Hruska	Fergus	46	LS	2	M		X	X	X	contain/control
				CT	12	M		X	X	X	contain/reduce
				SC	T	L			X	X	eradicate
				SK	<0.5	L	X		X	X	eradicate
				HT	<0.5	L	X			X	limited management
24	Kentucky Island	Cascade	1	UNK							inventory

Table 3-2. Total acres, number of weed-infested acres, cover values, and proposed control methods for fishing access sites in Region 4 FWP.

Site Num.	Site Name	County	Total Acres	Weeds Present[1]	Infest Acres	Weed Cover	Manual Mech.[2]	Bio	Chem	IWM	Weed Management Goals
25	Loma Bridge	Chouteau	6	LS	1	M		X[3]	X	X	contain/control
				SK	1	M	X		X	X	eradicate
				CT	T	L	X		X	X	contain/control
				MT	T	L	X		X	X	eradicate
				BD	T	L	X		X	X	limited management
26	Lower Smith River	Cascade	4	CT	2	M			X	X	contain/reduce
				LS	1	M		X	X	X	contain/control
				BD	<0.5	M	X		X	X	limited management
				HT	4	L	X			X	limited management
27	Martinsdale Reservoir	Meagher	26	CT	1	M				X	contain/reduce
				HT	T	L	X		X	X	limited management
				SK	1	L	X		X	X	eradicate
28	Mid Canon	Cascade	9	LS	5	M		X	X	X	contain/control
	Missouri River Rec Road Sites 29-40										contain/reduce
29	Craig	L&C	2.5	CT	T	L			X	X	contain/reduce
				SK	T	L	X		X	X	eradicate
				BD	T	L	X			X	limited management
30	Dearborn	L&C	3	CT	T	L			X	X	contain/reduce
				HT	T	L	X			X	limited management
31	Hardy Bridge	Cascade	15	DT	7	M	X	X[3]	X	X	contain/control
				CT	T	L	X			X	contain/reduce
				SK	T	L	X		X	X	eradicate
				HT	T	L	X			X	limited management
32	Lichen Cliff	L&C		SK	T	L	X		X	X	eradicate
				CT	T	L			X	X	contain/reduce
				BD	T	L	X			X	limited management
				HT	T	L	X			X	limited management
33	Mountain Palace	Cascade		CT	T	L			X	X	contain/reduce
				SK	T	L	X		X	X	eradicate
				DT	T	L	X		X	X	eradicate

Table 3-2. Total acres, number of weed-infested acres, cover values, and proposed control methods for fishing access sites in Region 4 FWP.

Site Num.	Site Name	County	Total Acres	Weeds Present[1]	Infest Acres	Weed Cover	Manual Mech.[2]	Bio	Chem	IWM	Weed Management Goals
34	Prewett Creek	Cascade	3	DT	<0.5	L	X			X	contain/control
				LS	T	L	X			X	contain/control
				SK	T	L	X			X	contain/control
				HT	T	L	X			X	limited management
35	Little Prickly Pear	L&C		SK	T	L	X		X	X	eradicate
36	Spite Hill	L&C	13	SK	2	L	X		X	X	contain/control
				CT	T	L			X	X	contain/reduce
				HT	T	L	X			X	limited management
37	Stickney Creek	L&C		CT	T	L			X	X	contain/reduce
				SK	T	L			X	X	eradicate
				HT	T	L	X			X	limited management
38	Table Rock Pulloff	L&C		SK	T	L	X		X	X	eradicate
				HT	T	L	X		X	X	limited management
39	Wolf Creek Bridge	L&C		CT	T	L			X	X	contain/reduce
				SK	T	L	X		X	X	eradicate
				HT	T	L	X		X	X	limited management
				BD	T	L	X		X	X	limited management
40	Cascade Bridge	Cascade		LS	T	L			X	X	contain/control
				SK	T	L	X		X	X	contain/control
				CT	T	L			X	X	contain/reduce
				HT	T	L	X		X	X	limited management
41	Nilan Reservoir	L&C	12	CT	1	M			X	X	contain/reduce
				SK	1	L	X		X	X	eradicate
				HT	<0.5	L	X			X	limited management
42	Pelican Point	Cascade	96	LS	3	M		X	X	X	contain/control
				DT	62	M	X	X	X	X	contain/reduce
				SK	3	L	X		X	X	contain/control
				FBW	1	L			X	X	contain/reduce
				HT	T	L	X		X	X	limited management
				CT	<0.5	L			X	X	contain/reduce
	Island Adjacent to Pelican Point			PL	<1	L			X	X	eradicate

Table 3-2. Total acres, number of weed-infested acres, cover values, and proposed control methods for fishing access sites in Region 4 FWP.

Site Num.	Site Name	County	Total Acres	Weeds Present[1]	Infest Acres	Weed Cover	Manual Mech.[2]	Bio	Chem	IWM	Weed Management Goals
43	Pishkun Reservoir	Teton	20	SK	T	L	X		X	X	eradicate
				CT	<0.5	L			X	X	contain/reduce
44	Selkirk	Meagher	256	CT	80	M		X	X	X	contain/reduce
				LS	2	M		X	X	X	contain/control
				WT	1	L			X	X	eradicate
				BD	60	L	X		X	X	limited management
				HT	T	L	X		X	X	limited management
45	Trish Island	Cascade	16	UNK							inventory
46	Truly	Cascade	10	LS	1	M		X	X	X	contain/control
47	Ulm Bridge	Cascade	163	LS	73	H		X[3]	X	X	contain/reduce
				SK	T	L	X		X	X	eradicate
				HT	1	L	X		X	X	limited management
				CT	2	M			X	X	contain/reduce
				BD	1	L	X		X	X	limited management
48	White Bear'	Cascade	41	LS	20	H		X	X	X	contain/control
				CT	5	M		X	X	X	contain/reduce
				HT	1	L	X		X	X	limited management
49	Willow Creek Reservoir	L&C	7	LS	T	L			X	X	eradicate
				SC	T	L			X	X	eradicate
				HT	T	L	X		X	X	limited management
				CT	1	L			X	X	contain/reduce
50	Wing Dam	Cascade	10	SK	T		FWP land not accessible or developed				
	TOTAL ACRES		4180		608						

[1] LS = leafy spurge, CT=Canada thistle, SK= spotted knap, RK = Russian knapweed, DT=dalmation toadflax, UNK=unknown SC=sulfur cinquefoil, BD=burock, HT=houndstongue, PL=purple loosestrife, FBW= field bindweed, WT=white top

[2] Manual and mechanical methods include hand pulling, mowing, cultivation

[3] Biocontrol agents are released & established at these sites

Vegetation on FAS is comprised of native and non-native plants. Introduced grass species include timothy, smooth brome, orchardgrass, Kentucky bluegrass, reed canarygrass and others. Riparian vegetation consisting of willows, black and narrowleaf cottonwood, aspen, dogwood, hawthorne, alder, and chokecherry are present on many sites especially along rivers. Shrubs include woods rose, currant, sumac, yucca, rabbitbrush, and sagebrush. Sedges, wiregrass, rushes, cattails and other moist site species may also be present. There are no known threatened, endangered, or plant species that occur on FAS areas.

Fishing access sites are used intensively by the public and therefore are highly susceptible to weed invasion. In addition, many of these sites have a history of disturbance because of their location along rivers, and near lakes and reservoirs.

Weed management goals for existing weed infestations within FAS are outlined in Table 3-2. The various management methods selected were based on research regarding the effectiveness of the method in controlling each species. For example, release of biological control agents is not a viable alternative on many sites due to the lack of available agents on a weed, low levels of control achieved by certain agents, and the relatively small acreage infested on the site. Integrating herbicides with manual methods such as hand pulling is proposed for many sites. Environmental concerns for various IWM methods within FAS are addressed in the Environmental Assessment.

3.22: STATE PARKS AND STATE PARK PROGRAM LANDS

There are 4 state parks (SP) and 1 state park program (SPP) that encompass 3188 acres of land managed by Region 4, FWP. The largest parks are Sluice Boxes State Park located along Belt Creek and the Smith River State Park Program which encompass 1454 acres and 1069 acres respectively. FWP is the primary management agency along the Smith River from Camp Baker to Eden Bridge, a distance of 61 miles. Noxious weeds infest 221 acres or about 7% of the total land acreage within state parks. Canada thistle, leafy spurge, and spotted and diffuse knapweed occupy the greatest acreage. Other weeds of concern are dalmation toadflax, purple loosestrife, sulfur cinquefoil, black knapweed, scentless chamomile, oxeye daisy, and white top (Table 3-3)

Management goals for State Parks (including State Park Program lands) are to provide continued recreational opportunities while minimizing conflicts with other lands, and providing protection to the areas natural resources. Based on these objectives, weed management strategies for state park lands are as follows:

- Manage existing noxious weed infestations to protect recreational values, biological diversity, and soil and water resources.
- Manage weeds to minimize potential conflicts with adjoining landowners.
- Minimize potential for infesting other lands.

- Reduce disturbance by restricting vehicles and recreationists to designated parking areas and trails.
- Educate recreationists about non-native invasive plants.
- Monitor sites annually to prevent establishment of new invading weed species.

The degree of public use in state parks varies from very intensive at Giant Springs and Heritage State Park Complex, to limited use at Ulm Pishkin. However, because of recreational activities, the susceptibility of these sites to weed invasion remains high.

ACKLEY LAKE STATE PARK

Vegetation within state parks vary depending on the location of the park. Ackley Lake State Park is mainly introduced grasses of smooth brome, timothy, and bluegrass. Riparian vegetation includes willows, cottonwoods, and emerged aquatics consisting of cattails, reeds, wiregrass, and sedges around the lake shore. Private lands surrounding Ackley Lake are mainly irrigated and dryland cultivated crops. There are no threatened, endangered, or sensitive plant species present at Ackley Lake.

Canada thistle is the most prevalent weed at Ackley Lake and occupies 72 acres or 45% of the total acreage owned by FWP. Spotted knapweed infests 3 acres and scattered plants of houndstongue are present. Management of Canada thistle at Ackley Lake will be more aggressive than at other sites because of the potential impact of the weed on adjoining private cropland. Proposed management strategies are outlined in Table 3-3.

GIANT SPRINGS AND HERITAGE STATE PARK COMPLEX

This state park complex is located near Great Falls adjacent to Region 4 Headquarters. The area includes picnic sites, trails, a fish hatchery, and other public facilities. Public use of the area is very high.

Vegetation within high public use areas include seeded turf and ornamental tree, shrub, and forbs on about 23 acres of the park. Native bunchgrass including bluebunch wheatgrass, june grass, and Idaho fescue occur on terraces and hill slopes in association with tree and shrub species, and riparian vegetation is adjacent to the Missouri River. White four o'clock (*Mirabilis albida*) was located on the Missouri River bluffs on two sites within the Park. This species has not been documented before in Montana and is currently being considered for addition to the Montana Plant Species of Special Concern list.

Noxious weed infest about 85 acres or about 30% of the park complex. Spotted knapweed and Canada thistle are the two most widespread weeds occurring within the park. Other species of concern include purple loosestrife, leafy spurge, whitetop, and dalmation toadflax. Proposed weed management activities include the use of mowing, hand pulling, mulching, and the use of herbicides (Table 3-3).

Table 3-3. Total acres, number of weed-infested acres, cover values, and proposed control methods for state parks and state park program lands in Region 4 FWP.

Site Name	County	Total Acres	Weeds Present[1]	Infest Acres	Weed Cover	Manual Mech.[2]	Bio	Chem	IWM	Weed Management Goals
Ackley Lake State Park	Fergus	160	CT	72	M		X	X	X	contain/reduce
			SK	5	M	X		X	X	contain/control
			HT	T	L	X		X	X	limited management
Giant Springs & Heritage State Park Complex Includes Region 4 Hdq	Cascade	285	CT	29	M	X	X	X	X	contain/reduce
			WT	1	L			X	X	contain/control
			PL	1	L	X		X	X	eradicate
			SK	53	M	X		X	X	contain/control
			LS	1	L			X	X	contain/control
			DT	T	L	X		X	X	eradicate
			BD	T	L	X		X	X	limited management
			HT	T	L	X		X	X	limited management
Sluice Boxes State Park	Cascade	1454	SK/DK	5	M	X		X	X	contain/control
			DT	0.3	L	X		X	X	eradicate
			LS	T	L	X		X	X	eradicate
			OXD	P	M	X			X	limited management
			BKW	T	L	X		X	X	eradicate
Ulm Pishkun State Park	Cascade	170	LS	5	M		X	X	X	contain/control
			CT	<1	L			X	X	contain/control
			MT	T	L	X		X	X	contain/control
Smith River State Park Program[4]	Meagher Cascade									
FWP land		1069	LS	45	M	X	X[3]	X	X	contain/reduce
Private land infested within corridor			LS	1276	M					
BLM land infested within corridor			LS	0						
National forest land infested within corridor			LS	222	M					
State land infested within corridor			LS	8	M					
TOTAL ACRES		3138		221						

[1] LS = leafy spurge, CT=Canada thistle, SK= spotted knap, DK = diffuse knapweed, DT=dalmation toadflax, BKW=black knapweed, BD=burock, HT=houndstongue, OXD= oxeye daisy, WT=white top

[2] Manual and mechanical methods include hand pulling, mowing, tillage.

[3] Biocontrol agents are released & established at these sites

[4] FWP manages recreational use of the Smith River and a portion of the boat camps.

ULM PISHKIN STATE PARK

Ulm Pishkin State Park is located 12 miles south of Great Falls. Recreational use is limited at this time, however construction activities are planned for a visitor center which will greatly increase visitor use.

Native vegetation is mainly bunchgrasses with scattered shrubs, yucca, and sagebrush. Leafy spurge occurs on 9 acres of the park and is found almost entirely below the crest of the plateau. Canada thistle and musk thistle are the only other noxious weeds found within the park. Leafy spurge should be aggressively managed with biological agents and herbicides to prevent spread.

SLUICE BOXES STATE PARK

Sluice Boxes State Park is the largest state park in the Region encompassing 1454 acres and about 8 miles of Belt Creek from Logging Creek Bridge to Riceville Bridge. Recreational use includes fishing, hiking, and floating. Historical disturbance along Belt Creek from mining activities and a railroad has been high, however the remainder of the park is relatively undisturbed.

The park supports a diverse native plant community consisting of riparian species along Belt Creek, bunchgrass hill slopes, and douglas-fir, and ponderosa pine wooded hills. Non-native species including smooth brome, timothy, and ornamental tree and shrub species are present within the creek corridor. There are no plant species of special concern listed in this Park by the Montana Natural Heritage Program.

Spotted knapweed and diffuse knapweed infest about 5 acres on FWP lands within the river corridor, with larger infestations present on adjacent private land. There were two small infestations of leafy spurge, and three small infestations of dalmation toadflax adjacent to the river. In addition, one plant of black knapweed was located along Belt Creek in Section 10, T16N, R6E. Scentless chamomile has been identified at the town of Nyhart (upstream from the Park) and below the Park on Belt Creek. This area must be closely monitored to prevent the introduction and spread of both black knapweed and scentless chamomile. An inventory is needed to determine if noxious weeds occur on foothill slopes and tributaries to Belt Creek.

Oxeye daisy and hoary alyssum are also present within the river corridor. Although these species are not on the state noxious weed list, oxeye daisy is listed as a noxious weed by Chouteau County Weed District, which is downstream from the Park. Oxeye daisy is naturalized the entire length of the river, and hoary alyssum is present at the Riceville Bridge, and along a mile section of the river just upstream from Riceville Bridge.

Current FW&P management along Belt Creek includes hand pulling and limited herbicide applications to control state-listed noxious weeds. Herbicides have been

applied on heavily infested knapweed sites near the Riceville Bridge and in Section 10, T16N, R6E. The majority of infested areas occur on sites where access is limited to hiking or floating.

Management of most existing noxious weed infestations should be possible with a diligent hand-pulling program. Plants will be pulled just prior to flowering (mid July). If plants are pulled during or following the flower stage, they will be physically removed from the site to prevent seed dispersal. If possible, infested sites will be monitored again in August, and weeds remaining from the initial pull removed. Sites where weeds are well established will be monitored for a minimum of 8 years.

Leafy spurge occurs within two small infestations immediately adjacent to the river. Hand pulling of the plants will eliminate seed production, but will not stop lateral spread by roots. Sites must be pulled every 3 weeks during the growing season to prevent seed production.

Cascade County Weed District was contracted to control several dense infestations of knapweed in Sec 10, T16N, R3E with herbicides. There has been a significant reduction in weed density on treated sites, and it should be possible to manage these ares with a hand-pulling program in the future. Two additional knapweed infestations in Sec. 3, T16N, R3E were treated with herbicides in fall of 1996.

Leafy spurge will be closely monitored to determine if hand pulling is providing adequate control of seed. These small infestations may be eradicated with applications of Krenite S herbicide at the rate of 1.5 gallons per acre or wick applied applications of Rodeo.

The effectiveness of both the hand-pulling and herbicide program will be monitored annually to determine if changes in management are necessary. If knapweed densities increase on pulled sites it may be necessary to apply a herbicide treatment to reduce weed density, and follow-up with a hand pulling program. Management goals will focus on containment and density reduction of weed infestations, and elimination of seed production.

SMITH RIVER STATE PARK PROGRAM

A detailed report on historical and proposed weed management activities within the Smith River corridor, including the State Park Program, is on file with Region 4, FWP. Following is a summary of proposed management for leafy spurge with emphasis on FWP managed lands.

Leafy spurge is established the entire length of the Smith River from Camp Baker to Eden Bridge. Most infestations from Camp Baker to Tenderfoot Creek range in size from several plants to less than 0.10 acre. Infestations below Tenderfoot Creek are large and occupy most river banks, terraces, and open foothill slopes. Total acreage infested

with leafy spurge within the river corridor from Camp Baker to Eden Bridge is 1551 acres. There were 45 acres of leafy spurge infesting FWP owned lands.

Musk and Canada thistle were the only other noxious weed observed within the river corridor. Infestations are small, and confined to isolated sites on the canyon slopes. Because of the small number of infestations, and presence of the biocontrol agent *Rhinocyllus conicus* on musk thistle, these infestations were not included in the GIS data base. USFS has reported spotted knapweed infestations up Deep Creek and Tenderfoot Creek, however, the weed was not observed along the Smith River.

PROPOSED MANAGEMENT:

Management priorities for leafy spurge on lands within and adjacent to the Smith River corridor are as follows:

- Initiate a prevention strategy to maintain the area free of other noxious weeds listed on the state noxious weed list. Annual or biannual inventories should be conducted along the river with the specific objective to monitor for noxious weed invasion. High recreational use makes this area susceptible to invasion.
- Organize a management team comprised of county, federal, state, and private individuals to develop goals and objectives for weed management within the entire Smith River corridor.
- Contain leafy spurge within the river corridor by initiating containment and suppression programs on leafy spurge infestations.
- Control and eradicate leafy spurge where possible along the river and tributaries between Camp Baker and Tenderfoot Creek.
- Expand release of biological control agents. County weed districts should be involved with all release of bioagents; additional contacts include USFS, APHIS, ARS, UM, and MSU.
- Inventories should be conducted on uplands adjacent to the river corridor and on stream tributaries flowing into the Smith River to determine the extent of leafy spurge infestations. This information is vital to maintaining containment and control programs within the river corridor, and will ultimately affect the success of the program.
- Develop educational and awareness brochures, displays, etc. on noxious weeds for recreational users.

A cooperative weed management approach between private, state, and federal land owners within the Smith River corridor is currently being developed. The following proposed weed management options are for boat camps located adjacent to the river.

1. Physical Methods:

a. Hand pulling: This method will control leafy spurge seed production and may eliminate young seedling plants, but will not stop lateral spread of leafy spurge roots. Plants must be pulled prior to seed ripening (mid to late June). Pulling may

be necessary every three to four weeks from mid-June through the remainder of the growing season to stop seed production.
b. Mowing: Mowing will reduce seed production if repeated every three to four weeks during the growing season. It will not provide long-term control of the plant or stop lateral spread by roots.

2. Chemical Methods: Herbicide treatments will provide more long-term control of leafy spurge than either hand removal or mowing. Newly established infestations should be treated as soon as possible to prevent seed production and spread of the weed. Treat an extra 15 feet around patches to control spreading roots and seedlings.

Herbicide options within 10 feet of water and on shallow groundwater sites:

- 2,4-D formulations labeled for use near water: Apply at 1 qt/ac at true flower stage (mid/late June); will stop seed production; annual applications necessary.
- Krenite S @ 1.5 to 2 gallons/acre: apply at true flower stage; control best on coarse textured soils; control may be inconsistent on some sites.
- Rodeo @ 1.5 to 2 pints/acre: apply from mid-July to mid-September (seed dispersal stage) for best results apply with a non-ionic surfactant approved for use near aquatic sites. This treatment is non-selective to other vegetation, and is most suited to gravel sites with little grass cover or applied selectively to leafy spurge with a wick applicator.

Herbicide options above 10 feet of the river.

- Tordon @ 1 qt/ac: Most effective herbicide for control of leafy spurge. Apply at true flower growth stage (mid June). Follow-up treatments with Tordon @ 1pt/acre + 2,4-D @ 1 qt/ac for three consecutive years.
- Sites where access is difficult: Apply Tordon @ 2 qt/ac with a follow-up treatment the next year with Tordon @ 1 qt/ac.

Biological Control: A total of 116 releases of biocontrol agents have been made since 1991 along the Smith River. Status of sites is shown in Appendix D. A cooperative effort to obtain, release, and monitor establishment of biological control agents will continue between FWP, USFS, State Universities, USDA APHIS, and County Weed Districts.

Management Options for Leafy Spurge within FWP Boat Camps:

Camp Baker to Tenderfoot Creek

Leafy spurge can be contained and controlled along this section of the river with an aggressive management effort.

1. Upper and Lower Spring Creek BC: No noxious weeds present on site

2. In-lieu: Approximately 0.15 acre infested with leafy spurge. Proposed treatment with Tordon @ 1 qt/acre up to 10 ft from the river and Krenite S @ 2 gal/ac or wick applied Rodeo to within 10 feet of the river.
3. Indian Springs BC: Small infestations of leafy spurge - treat as described for In-lieu BC based on site conditions.
4. Rock Garden BC: No spurge noted within boat camp. Small infestations adjacent to river near boat camp should be treated with herbicides as described for In-Lieu BC.
5. Mouth of Rock Creek BC: Several small infestations of leafy spurge near water. Treat with either Rodeo or Krenite based on site conditions.
6. Scotty Allans Black Canyon BC: no infestations noted directly in camp.
7. Dry Canyon BC: no infestations noted directly in camp.

Boat Camps from Tenderfoot Creek to Eden Bridge

Boat camps located downstream from Tenderfoot Creek have moderate to severe infestations of leafy spurge. These sites serve as a source of contamination to other areas as leafy spurge seed will become trapped in recreational equipment and moved from the site. Although seed production could be stopped on these sites by annual herbicide applications or mowing, the cost would be extremely high. In addition, leafy spurge infests most of the river banks between boat camps, thus opportunity to transport spurge propagules downstream remains certain even if the boat camps are treated. Releases of biological control agents is a high priority within most camps to reduce seed production. *Aphthona nigriscutis, A. lacertosa, A. czwalinae, A. flava, Obera erythrocephala* and other insects as they become available should be established on all camps. Limited herbicide applications on leafy spurge infestations at several camps should help reduce spread of the weed.

1. Canyon Depth BC: Release biological control agents & monitor establishment.
2. Two Creek BC: Establishment of *A. nigriscutis* (APNI) documented in 1996. Additional releases of APNI made in 1996. .Potential for limited treatment of small satellite infestations with Tordon 22K at 1 qt/acre to prevent leafy spurge movement into timbered areas and steep slopes.
3. Sheep Wagon BC: Release of APNI by USFS in 1991; no record of establishment. Release additional biological control agents & monitor establishment.
4. Cow Coulee BC: Release biological control agents & monitor establishment.
5. Sunset Cliff BC: Release biological control agents & monitor establishment.
6. County Line BC: Release of APNI by FWP in 1995; no record of establishment. Release additional biological control agents & monitor establishment. One small satellite infestation of leafy spurge on southwest facing slope that could be treated with Tordon 22K at 1 qt/ac to prevent movement into non-infested sites.
7. Bear Gulch BC: Releases of APNI by USFS in 1991 and FWP in 95; no record of establishment. Release additional biological control agents & monitor establishment. This site is adjacent to G. Andersons who are actively managing

leafy spurge. A limited herbicide program within Tordon 22K at 1 qt/ac or Krenite (depending on site conditions) to maintain a buffer along the fenceline and a weed free corridor along the access road would support Andersons control efforts.

8. Trout Creek BC: Release biological control agents & monitor establishment.
9. Crows Foot BC: Release biological control agents & monitor establishment.
10. Table Rock BC: USFS APNI release in 1991; no record of establishment. Release additional biological control agents & monitor establishment.
11. Fraunhofer BC: Release biological control agents & monitor establishment. Small satellite infestations of leafy spurge on southwest facing slope (NE of boat camp) that could be treated with Tordon 22K at 1 qt/ac to prevent movement into non-infested sites.
12. Upper Parker Flat BC: USFS release of APNI in 1991; no record of establishment. Release additional biological control agents & monitor establishment.
13. Parker Flat BC: Release biological control agents & monitor establishment.
14. Paradise Bend BC: BLM release of APLA in 1995, no record of establishment. Release additional biological control agents & monitor establishment. Small satellite infestations of leafy spurge on west facing slope (N of boat camp) that could be treated with Tordon 22K at 1 qt/ac to prevent movement into non-infested sites.
15. Staigmiller BC: Release biological control agents & monitor establishment.
16. Merganser Bend BC: Leafy spurge not present within camp sites but adjacent to takeout. Release biological control agents & monitor establishment.
17. Ridge Top BC: Release biological control agents & monitor establishment.
18. Black Butte BC: Limited spurge adjacent to river.
19. Givens Gulch BC: APNI release in 1995, establishment documented in 1996. Monitor site and establish other insect species.
20. Rattlesnake BC: APNI released in 1995, no establishment recorded in 1996. New release of APLA in 1996 on southwest facing hillslope. Release additional biological control agents & monitor establishment.

3.23: WILDLIFE MANAGEMENT AREAS

There are 7 wildlife management areas (WMA) that encompass 98,536 acres or 93% of the total land managed by FWP Region 4. These include: Sun River, Blackleaf, Ear Mountain, Smith River, Freezout Lake, Judith River, and Beartooth WMA. In general, WMA's differ from other FWP sites by having less intensive public use, and management goals with a high priority on protection and enhancement of plant and animal diversity, and improving wildlife habitat.

Noxious weeds infest 580 acres or about 0.5% of the total land area within the 7 WMA. Spotted knapweed infests the greatest acreage and is present in all WMA. Other weed species of special concern include leafy spurge, purple loosestrife, Canada thistle,

yellow mignonette, and whitetop. Although present weed infestation levels are relatively low within most WMA's, these areas remain highly susceptible to invasion of weeds such as leafy spurge and the knapweeds. Weed infested acres and cover values for each WMA are shown in Table 3-4.

The Montana Natural Heritage Program listed threatened, endangered, and sensitive species present within WMA's. These include both plant and wildlife species listed in Appendix E. Potential impacts of the proposed treatment methods should have no significant direct effects on wildlife species (reference E.A.). Protection of habitat from noxious weed invasion should be positive. There are no federally listed plant species present within the WMA's, however, Blackleaf and Ear Mountain have state-designated sensitive plants. Accurate location and descriptions of the sensitive plants listed within Blackleaf and Ear Mountain WMA will be obtained to determine if they occur within proposed treatment areas. Weed management methods will be utilized that will not impact sensitive species if they occur within infestations of noxious weeds.

There are 6 WMA's that manage for big game animals including elk, mule deer, bighorn sheep, and bear. They include the Sun River, Backleaf, Ear Mountain, Smith River, Judith River, and Beartooth Game Ranges. These areas were combined for discussion of weed management strategies since they are similar in terrain, vegetation types, wildlife species, and management goals and objectives. Freezout Lake is managed for waterfowl and upland game birds and will be discussed separately.

BIG GAME WILDLIFE MANAGEMENT AREAS

The 6 Big Game Ranges support diverse wildlife and plant populations. Major wildlife species include grizzly bear, black bear, deer, elk, and bighorn sheep. Plant communities include douglas fir, ponderosa pine and lodgepole pine on steep hill and mountain slopes. Native grass species consist of rough fescue, bluebunch wheatgrass, and Idaho fescue on foothills and terraces. Riparian areas along creeks, ponds, and moist sites are occupied by cottonwoods, aspens, willow, chokecherry, rose, dogwood, alder, and associated sedges and carex species. Seeded species in historically cultivated sites include timothy, orchardgrass, smooth brome, and alfalfa. Game ranges are bound by either US Forest Service or private lands that are used mainly for livestock grazing.

Management goals for Big Game Ranges are to maintain healthy, diverse native plant communities that provide forage and habitat for wildlife, protect native plant and animal species, and provide recreational opportunities for hunters and the general public. Based on these goals, weed management strategies are as follows:

- Manage existing noxious weed infestations to protect native plant diversity, soil and water resources, and wildlife habitat values.
- Prioritize noxious weed species for management based on their impact on native plant communities and wildlife habitat

- Reduce disturbance by restricting vehicles to designated roads and trails.
- Protect adjoining lands from weed invasion.
- Educate recreationists about non-native invasive plants.
- Prevent the establishment of new invading weed species, and stop the spread of existing species by closely monitoring high risk areas such as parking areas, trails, and roads.

Noxious weed priorities for WMA's are based on the potential for the weed to impact plant and animal diversity, and wildlife habitat. The highest priority weeds include Class 1 weeds not present within the WMA, and leafy spurge, yellow mignonette, spotted and diffuse knapweed, and whitetop. Management of musk thistle on the Beartooth Game Range will consist of containment and gradual reduction of existing infestations. Nuisance weeds such as houndstongue and burdock are present within several WMA's but will receive only limited management on most areas.

FWP has been managing noxious weeds within WMA since the mid 1940's. Since 1986 there has been increased emphasis to contain and control noxious weeds such as spotted knapweed, whitetop, and leafy spurge. Mowing along road edges, herbicides, and release of biological control agents have been utilize to manage noxious weeds over the last 10 years. All weed management activities are conducted by FWP staff. There are 5 licensed applicators with the FWP-WMA staff.

Livestock grazing occurs on Blackleaf, Beartooth, Ear Mountain, Smith River, and Judith River WMA's. The major objective with grazing animals is to remove decadent vegetation enhancing forage quality for wildlife thus reducing wildlife pressure on adjacent private lands. Grazing is either a 3 pasture rest rotation system, or high-intensity, short duration grazing using electric fences to confine livestock to specific areas. The use of livestock to maintain healthy plant communities should help reduce invasion by noxious weeds. Spread of noxious weed seeds by livestock will be minimized by treating infestations prior to grazing with livestock or restricting livestock entry on weed infested areas during seed dispersal.

Prevention, public education, and aggressive management of priority noxious weeds will continue within the WMA's. The Beartooth Game Range supports the highest concentration of spotted knapweed on FWP managed lands. The wildfire in 1990, and susceptibility of open canopy, bunchgrass hillslopes to weed invasion, has greatly accelerated the spread of knapweed. An aggressive management approach, including additional financial and manpower support, will be necessary to contain the spread and control present knapweed infestations. Management goals for individual species within each WMA are shown in Table 3-4.

Table 3-4. Total acres, number of weed-infested acres, cover values, and proposed control methods for wildlife management areas in Region 4 FWP.

Site Name	County	Total Acres	Weeds Present[1]	Infest Acres	Weed Cover	Manual Mech.[2]	Bio	Chem	IWM	Weed Management Goals
Sun River	L&C	29,799	LS	0.5	M			X	X	contain/control
			SK	10	M	X		X	X	contain/control
			HT	2	L	X		X	X	limited management
Blackleaf	Teton	10,398	SK	2	M	X		X	X	contain/control
			LS	1	L		X[3]	X	X	eradicate
Ear Mountain	Teton	3,047	SK	1	M	X		X	X	contain/control
			LS	0.1	L			X	X	eradicate
Smith River	Meagher	3,527	LS	5	M		X[3]	X	X	contain/control
			SK	2	M	X		X	X	contain/control
Freezeout Lake	Teton	12,384	SK	2	M	X		X	X	contain/control
			LS	0.5	L			X	X	contain/control
			BT	5	M	X		X	X	limited management
			CT	50	H	X	X	X	X	contain/reduce
			WT	1	M			X	X	contain/control
			PL	<0.1	L	X		X	X	eradicate
Judith River	Judith Basin	7,298	SK	0.5	L	X		X	X	eradicate
			LS	3	M			X	X	contain/control
			DK	0.5	L	X		X	X	eradicate
			WT	100	H	X		X	X	conain/reduce
			YM	50	M			X	X	contain/control
Beartooth	L&C Cascade	32,083	SK	228	M	X		X	X	contain/control
			WT	110	M			X	X	contain/control
			LS	6	M			X	X	contain/control
			CT	P	M		X	X	X	conain/reduce
			BD	P		X		X	X	conain/reduce
			MT	P		X	X	X	X	conain/reduce
			FBW	P				X	X	conain/reduce
TOTAL ACRES		98,536		580						

[1] LS = leafy spurge, CT=Canada thistle, SK= spotted knap, YM= yellow mignonette, BT=bull thistle, WT=white top BD=burock, HT=houndstongue, PL=purple loosestrife, FBW= field bindweed, MK=musk thistle

[2] Manual and mechanical methods include hand pulling, mowing, cultivation

[3] Biocontrol agents released at this site.

FREEZOUT LAKE

Freezout Lake WMA occupies 12,384 acres in Teton County between the towns of Fairfield and Chouteau along US Hwy 89. The WMA is located in the lower portion of a glacial lake bed adjacent to the Fairfield Bench, and is surrounded by private lands. Approximately half of the private land is irrigated cropland and the other half is native short grass prairie. Management goals for Freezout Lake are to maximize production of waterfowl and upland game birds, and provide opportunity for public hunting and other forms of outdoor recreation.

Vegetation consists of submerged and emerged aquatic vegetation including bullrush and cattails. Grasslands occupy about 52% of the WMA and are mainly blue gramma and western wheatgrass. Greasewood plant communities are on 39% of the WMA and include grasses such as foxtail barley, saltgrass, sandberg bluegrass and western wheatgrass. A portion of the WMA remains in small grain fields which serve as food sources for waterfowl and upland birds. There are no threatened, endangered, or sensitive plant species located within this area.

Noxious weeds infest about 60 acres with Canada thistle occupying the greatest acreage. Management objectives for noxious weeds within Freezout Lake WMA include:

- Manage existing noxious weed infestations to protect waterfowl and upland game bird habitat.
- Reduce disturbance by restricting vehicles and recreationist to designated roads and trails.
- Protect adjoining lands (both cropland and rangeland) from weed invasion.
- Educate recreationists about non-native invasive plants.
- Eradicate purple loosestrife from established areas and closely monitor sites to prevent re-establishment loosestrife, and invasion by new species.

Management of Canada thistle will be more aggressive within this WMA than on most other sites because of the weeds potential impact to adjoining privately owned cropland. Table 3-4 summarizes management goals for individual weed species present on Freezout Lake WMA. On site inspection is necessary prior to herbicide application to determine the presence of shallow groundwater sites. Herbicides selected will be those registered for use on shallow groundwater or near surface water areas.

3.31 THREATENED, ENDANGERED AND SENSITIVE SPECIES CONCERNS

Regional land management agencies and conservation organizations have developed listing for threatened, endangered and sensitive (TES) plant and animal species. Some of these species fall under the criteria of the federal endangered species act. Most have been listed in Montana due to concerns about the relative small size of known populations. The goal of this weed management plan includes the preservation of TES

species on FWP sites in Region 4. Individual sites will be surveyed by the Montana Natural Heritage Program as budgets allow with sites having known populations of TES or sensitive species close by having first priority for survey work.

Region 4 FWP sites occupy environmental conditions ranging from the aquatic zone and moist forest types of dry forest types and grasslands. Initial evaluations of the potential for TES species are usually based on their known distributions and habitats. These habitat surveys are used as the basis of field inventories to determine if TES species are present. Appendix F indicates reported occurrences of TES species at or near FWP sites in Region 4 (Montana Natural Heritage Program).

TES species may include both plants and animals. A list of potential species should be compiled based on environmental and site conditions to use as an inventory guide.

3.32 MONITORING AND RECORD KEEPING

A monitoring program will be used to document the effectiveness of weed management activities. Each site will be photo documented from standard photo points. Data on weeds and other values will be collected before weed control treatment and annually for 1 - 2 years to evaluate effectiveness. When possible, plots will be established, photographed, measured and re-measured to document target reductions in weed coverage and impacts on non-target species. Appendix F discusses monitoring methods for use in Region 4. FWP will prioritize FAS, SP's, and WMS's for monitoring.

State herbicide use law and regulation requires that the applicator make and retain daily records of their herbicide use. Every 5th year, a summary of that years application records must be submitted to the State Department of Agriculture. Daily application records must be kept for 2 years, and made available to state investigative officers at any time following a herbicide use complaint. All aspects of applicator licensing, re-certification training, and record keeping regulations administered by the state government are in-turn supervised by the United States Environmental Protection Agency. FWP will have responsibility for fulfilling these requirements when herbicides are applied by FWP personnel. Contractors will be responsible for filing in respect to contracted services and to provide FWP with copies of all reporting documents.

3.33 CONTRACTED SERVICES

Weed management activities, especially herbicide applications may be contracted when FWP personnel and equipment are not available. Contractors must be licensed and knowledgeable concerning the specific weeds to be treated and chemicals to be used. Contractors should be familiar with all components of this weed management plan especially those regarding safety and emergency response. Contractors must be provided with clear information including maps of zones to be treated.

Contractors must be supervised on a regular basis to insure compliance with contract specifications. Continuous supervision should be exercised in sensitive zones or in relation to expressed public concern.

At a minimum, contractors should keep detailed records concerning applications including the time and date of all applications, chemicals used, amounts, mixing notes (amount of chemical + amount of water), public contacts, weather and other pertinent information. This record-keeping requirement can be coordinated with other pesticide use reporting requirements.

3.34 NOTIFICATION

Public notification regarding weed management activities will be a continuing part of the FWP program. This program will include:

- Annual public notice through press releases to newspaper, radio and television sources concerning weed awareness and management activities. If media do not provide this information to the public, FWP will consider paid advertising.

- On high public use areas within FAS and developed sites within Giant Springs Heritage State Park and Region 4 Headquarters, FWP or its contractor will post highly visible signs prior to and during herbicide applications. Signs will remain on the site for a minimum of 48 hours. FWP will provide signs to contractors (Appendix G). Signs shall include the application date, herbicide used, principal target weeds, the FWP or specific contractor contact for further information. Signs will be posted at the property entrance and near areas of concentrated human use.

3.35 PESTICIDE SPILL EMERGENCY RESPONSE

Appendix H contains an emergency response plan for pesticide spill incidents. This plan should be carried with all applicators including both FWP and contract personnel. Contract requirements should include discussion of and adherence to these procedures in case of pesticide emergencies.

4.0 SUMMARY

This plan establishes an ecological approach to managing noxious weed using integrated weed management in FWP Region 4. The plan provides weed management as required by state law and FWP policy while protecting important resources including water quality, aquatic and terrestrial habitat, species diversity and human health.

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APPENDICES

APPENDIX A

APPENDIX A. LAWS AND REGULATIONS RELATED TO WEED CONTROL IN MONTANA

State and federal laws, policies, and programs that will affect FWP Region 4 activities include:

- Creating a VISION for the Future of Montana's Department of Fish, Wildlife & Parks (1992)
- Weed Control Program for Lands Managed by the Montana Department of Fish, Wildlife and Parks (1983)
- Montana Pesticide Control Act (80-8-801 et seq., MCA)
- Montana Weed Control Act (80-7-701 et seq., MCA)
- Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA). This law, administered by the Environmental Protection Agency, provides for the registration of pesticides, certification of applicators to apply restricted use pesticides and enforcement of pesticide regulations.
- Montana Noxious Weed Trust Fund Act of 1985 (80-7-801 eq seq., MCA) as amended 1991 and Rules
- Montana Water Quality Act (75-5-101 et seq., MCA)
- Montana Agricultural Chemical Ground Water Protection Act of 1989 (80-15-100 et seq., MCA)
- Montana Environmental Policy Act (MEPA, 75-1-101 et seq., MCA)
- Montana House Bill 512 -FAS Stream Bank Restoration and Weed Control Act 1995.

APPENDIX B

APPENDIX B.

MONTANA *Biological Weed Control Agents*

Prepared by Montana Biological Weed Control Committee - 4/96

SPOTTED KNAPWEED

Species	Type	Part Attacked	Notes on Bio Control Agent
Urophora affinis	Fly	Seed head	Released in 1973; well established in Montana.
U. quadrifasciata	Fly	Seed head	Moved into U.S. from Canada; well established in Montana. Cleared in 1988.
Metzneria paucipunctella	Fly	Seed head	Does not winter well in Montana except for areas with adequate snow cover. Generally not recommended for Montana.
Agapeta zoegana	Moth	Root	Established at a number of sites. Rearing program being conducted at Western Montana Agricultural Research Center. (Story)
Cyphocleonus achates	Weevil	Root	Distribution limited; research sites established. Plans for redistribution in 1995 through AES (Jim Story). Released in 1988. Causing some plant mortality.
Pelochrista medullana	Moth	Root	Finding very few insects in Europe. Released in 1984. Small colony established in 1995 by MAES (Story).
Chaetorellia acrolophi	Fly	Seed head	Introduced into U.S. in small numbers by ARS (Mayer) and MAES (Story). Released in 1992. Established in small numbers (Story). ARS unable to confirm establishment on their project (Mayer).
Terellia virens	Fly	Seed head	Introduced in the U.S. by ARS and AES. Released in 1992. Established in small numbers (Story). Established through ARS project not confirmed (Mayer).
Bangasternus fausti	Weevil	Seed head	Introduced in the U.S. by ARS (Mayer) and MAES (Story). Established in small numbers by ARS and APHIS.
Larinus minutus	Weevil	Seed head	Established at limited sites by ARS (Mayer).
Larinus obtusus	Weevil	Seed head	Released in 1993. Established in small numbers by MAES (Story). Released by ARS in 1995 (Mayer).
Pterolonche inspersa	Moth	Root	Introduced by MAES (Story). Did not establish. No further releases planned. Released in 1988.

SPOTTED KNAPWEED (continued)

Sclerotinia sclerotiorum	Fungus	Crown	Considerable research has been done by MAES (Dave Sands). Working on a formulating process. Native fungus. Causing plant mortality in insect rearing cages. Field research planned for 1996 by MAES (Story).
Fusarium avenaceum	Fungus	Root	Root/seed pathogen was first found in Europe. Isolates of this organism indigenous to Montana and are more pathogenic to knapweed than the one from Austria. MAES (Strobel).

DIFFUSE KNAPWEED

Aceria centaureae	Mite	Leaves	Cleared for quarantine. MAES (Littlefield).
Bangasternus fausti	Weevil	Seed head	Introduced - Established in small number by ARS (Mayer) and APHIS. Released in 1990.
Metzneria paucipunctella	Moth	Seed head	Does not winter well in Montana unless there is snow cover. Not recommended for Montana.
Pelochrista medullana	Moth	Root	Introduced in small numbers; status unknown. Difficult to find in Europe. Research by MAES (Story). Released in 1984.
Pterolonche inspersa	Moth	Root	Introduced in small numbers by ARS (Mayer). Released in 1986. Establishment not confirmed.
Puccinia jaceae	Fungus	Leaves	Found in Washington, Idaho, Montana, Oregon and British Columbia.
Sclerotinia sclerotiorum	Fungus	Crown	Research being done by MAES (Sands).
Sphenoptera jugoslavica	Beetle	Roots	Established in Lewis & Clark County. Released in 1981.
Urophora affinis	Fly	Seed head	Established in Montana. Released in 1973.
Urophora quadrifasciata	Fly	Seed head	Established in Montana. Cleared in 1988.
Aceria thessalonicae	Gall Mite	Rosette, stems	Host testing being done (Littlefield).
Agrobacterium tumefaciens	Bacteria	Crown	New discovery; being researched by ARS (Caesar).
Larinus minutus	Beetle	Seed head	Introduced in Montana by ARS (Mayer). Established at several sites. Established in Oregon by APHIS.

RUSSIAN KNAPWEED

Alternaria sp.	Fungus	Leaves	Research in progress by ARS. Problem of few spores.
Puccinia acroptili	Fungus	Leaves	Widely distributed; not considered effective. Not recommended for biological control.
Sclerotinia sclerotiorum	Fungus	Leaves	Being researched by MAES (Sands).
Subanguina picridis	Nematode	Leaves, stem	Established at several sites. ARS (Rees and Mayer). Released in 1984. Nematodary set up in 1994 by ARS.
Rhizoctonia sp.	Fungus	Root	Being researched by ARS (Caesar).

LEAFY SPURGE

Aphthona abdominalis	Flea beetle	Roots, leaves	ARS research project (Spencer). Released 1993. Released by APHIS (Richard) & ARS (Spencer & Rees). Numbers very small.
Aphthona chinchihi	Flea beetle	Roots, leaves	Not cleared. Being researched by ARS (Rees). & AES. Petition prepared. Additional host testing being done.
Aphthona cyparissiae	Flea beetle	Roots, leaves	First released in 1987. More difficult to establish. Under study by ARS (Rees & Spencer). Some releases by APHIS.
Aphthona czwalinae	Flea beetle	Roots, leaves	Research sites by ARS (Rees). Some releases by APHIS. Slow to build up numbers. Released in 1987.
Aphthona flava	Flea beetle	Roots, leaves	Released in 1985. Established in Gallatin, Park and Stillwater Counties. ARS (Rees).
Aphthona lacertosa	Flea beetle	Roots, leaves	Cleared and approved. Likes higher moisture sites. Established at several sites by ARS (Spencer) and APHIS. Released in 1992.
Aphthona nigriscutis	Flea beetle	Roots, leaves	Cleared and approved. Established by ARS and APHIS at a number of sites. Released in 1989.
Aphthona ovata	Flea beetle	Roots, leaves	Some screening work completed. Broad host range. Not recommended for biological control.
Aphthona seriata	Flea beetle	Roots, leaves	Not cleared. Testing being done for approval by ARS. Petition in preparation.
Aphthona venustula	Flea beetle	Roots, leaves	Some screening completed. Broad host range. Not recommended for biological control.

LEAFY SPURGE (continued)

Chamaesphecia astatiformis	Moth	Roots	Some screening completed. Broad host . Not recommended for biological control.
Chamaesphecia crassicornis	Moth	Roots	IIBC - screening and testing. Not cleared. Petition submited to TAG by ARS (Spencer).
Chamaesphecia hungarica	Moth	Roots	Approved for field release - ARS (Rees & Spencer). Released 1993.
Oberea erythrocephala	Beetle	Stem, roots	Established near Columbus; moved well; good collection in June 1993; other established sites but moving slowly.
Oberea donceeli	Beetle	Stem, roots	Being screeded by IIBC.
Pegomya curticornis	Fly	Stems	ARS submitted; back to APHIS; TAG; now released in three Canadian provinces; EA submitted to APHIS. Taxonomic problems.
P. euphorbiae	Fly	Stems	Canada doesn't feel it's worthwhile - ARS.
Hyles euphorbiae	Moth	Leaves	Cyclical population; field predation by rodents. Well established in Missoula and Gallatin Counties. High profile - low impact.
Lobesia euphorbiana	Moth	Leaves	Report to TAG; released in three Canadian provinces; EA submitted. Recalled by ARS (Spencer).
Minoa murinata	Moth	Leaves	Petition for approval withdrawn. Wide host range. Not recommended for biological control. Recalled by ARS (Spencer).
Oncochila simplex	Plant bug	Leaves	Wide host range. Host testing continuing.
Oxicesta geographica	Moth	Leaves	In quarantine. Being tested by ARS & MAES (Littlefield). Has wider host range. May not be recommended.
Simyra dentinosa	Moth	Leaves	Wide host range. Not recommended for biological control.
Dasieura nr. capsulae	Fly	Seed head	Approved and cleared. No insects available for field work. 80% of population in Europe parasitized. A gall forming fly. Not a high priority.
Eurytoma euphorbiae	Fly	Seed head	Not cleared. Insects not available.
Spurgia esulae	Fly	Seed head	Cleared and released in 1985.. Established at a few sites by ARS (Rees).
Spurgia capitigena	Fly	Seed head	Cleared for quarantine. ARS & AES (Littlefield) testing. EA for release being prepared. Petition being written (ARS).

LEAFY SPURGE (continued)

Rhizoctonia solani	Fungus	Roots	Being researched by ARS (Caesar). Promising in combination with Fusarium.
Agrobacterium	Fungus	Crown	Being researched by ARS (Caesar).
Uromyces spp.	Fungus (rust)		Not sure anything being done now; couldn't get consistent results. Dropped by IIBC, ARS.
Fusarium sp.	Fungus	Roots	Being researched by ARS (Caesar).
Phyllocoptes nevadensis	Mite	Leaves, buds	Host specificity testing in quarantine. MAES (Littlefield). Damaging to cypress spurge. Limited or no damage to leafy spurge. Project has been dropped.

MUSK THISTLE

Cassida rubiginosa	Beetle	Leaves	Wide host range. Not recommended for biological control.
Cheilosia corydon	Fly	Stems, roots	Approved and released in 1990. ARS research from Italy. This species may need to go to a warmer climate. Difficult to develop synchrony. ARS has released in Oregon. Establishment not confirmed.
Psylloides chalcomera	Beetles	Leaves	Not cleared. Petition written and submitted by ARS (Rees, Campobasso, et al).
Rhinocyllus conicus	Weevil	Seed heads, stems	Well distributed in Montana. Released in 1969.
Trichosirocalus horridus	Weevil	Meristem	Cleared and approved. Some sites have been established ARS (Rees) and AES (Littlefield).
Urophora solstitalis	Fly	Seed heads	Cleared for field release. To be released in 1996 by ARS (Rees and Mayer).

TOADFLAX, Yellow and Dalmation

Calophasia lunula	Moth	Leaves	Established in Missoula County. Releases made at a number of sites. MAES (Nowierski) conducting rearing programs.
Eteobalea serratella	Moth	Root	Approved for Canada. Approval pending for United States. Project of MAES (Nowierski).
Eteobalea intermediela	Moth	Root	Approved for Canada. Approval pending for United States. Project of MAES (Nowierski).
Gymnetron antirrhini	Weevil	Seed head	Well established on yellow toadflax in Canada. Approval pending for United States. Project of MAES (Nowierski).

TOADFLAX, Yellow and Dalmation (continued)

Gymnetron linariae	Weevil	Seed head	Approved for Canada. Approval pending for United States. Project of MAES (Nowierski).
Gymnetron collinun	Weevil	Seed head	Will not oviposit in cages. Canada dropped screening. Not recommended for biocontrol.
Mecinus janthinus	Weevil	Stems	Released in Canada. Approval pending for United States. Project of MAES (Nowierski).
Brachypterolus pulicarius	Beetle	Seed head	Established on both yellow and dalmation toadflax in Canada. Approved for United States. A number of releases have been made. Project of MAES (Nowierski).

FIELD BINDWEED

Aceria malherbe	Mites	Leaf gall	Approved for United States. Field release in 1993-94. Recovered in 1995. Rearing in quarantine for field release. Project of MAES (Littlefield) and ARS (Mayer and Mann).
Tyta luctuosa	Moth	Flowers, leaves	Preliminary research by ARS in Texas. Permit for field release. Project of MAES (Littlefield) and ARS.
Fusiarum spp.	Fungus	Roots	Native fungus. Project of MAES (Gray).
Septoria convolvuli	Fungus	Leaves	Native fungus. Widespread in Montana. Causes leaf spot and defoliation. Project of MAES (Gray).

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Agrilus hyperici	Beetle	Roots	Established in Lake County. Permit to import from overseas by ARS (Rees).
Aplocera plagiata	Moth	Leaves, flowers	Cleared and released in 1989. Releases in, Lake, Gallatin and Ravalli Counties. Being worked on by ARS (Rees).
Chrysolina hyperici	Beetle	Leaves, flowers	Established all over Montana. Difficult to tell apart from C. *quadrigemina*. Released in the 1940's.
Chrysolina quadrigemina	Beetle	Leaves, flowers	Established all over Montana. Released in the 1940's.
Zeuxidiolosis giardi	Fly	Leaves	Cleared and approved. Has not done well in Gallatin Valley. Work being done by ARS (Rees).

PURPLE LOOSESTRIFE

Galerucella calmariensis	Weevil		Cleared and approved. On east coast. Being researched by Fish and Wildlife Service. Support effort by ARS (Rees). Released in 1992.
Galerucella pusilla	Weevil		On east coast. Being researched by Fish and Wildlife Service. Support effort by ARS (Rees). Released in 1992.
Hylobius transversovittatus	Beetle		Released in 1992. Insectary set up in 1995 by ARS (Rees and Mayer).
Nanophyes marmoratus	Weevil	Seed head	Cleared for field release. U.S. Fish and Wildlife Service. Permit applied for 1995 by ARS.
Nanophyes brevis	Weevil	Seed head	Cleared for field release. U.S. Fish and Wildlife Service. Permit applied for 1996 by ARS (Rees and Mayer).

TALL LARKSPUR

Sclerotium delphinii	Fungus		ARS working with poisonous plant lab in Logan, Utah.

CANADA THISTLE

Altica carduorum	Beetle	Leaves	Released in Canada.
Ceutorhynchus litura	Weevil	Rosette/stem	Released in 1972. Established at several sites. Disease problems in Gallatin County colony.
Lema cyanella	Beetle	Leaves	
Rhinocyllus conicus	Weevil	Seed head	Released in 1969. Well distributed. Low impact.
Urophora cardui	Fly	Stem	Released in 1985. Established in small numbers. Low impact.
Larinus planus	Weevil	Seed head	Established at several sites. Low impact. Attacks native thistle. Not recommended for distribution.

SULFUR CINQUEFOIL

Tinthia myrmosaeformis	Moth	Root	Being worked on by AES (Story).
Anthonomus rubripes	Weevil	Flower	Being worked on by AES (Story).

HOUNDS TONGUE

Cheilosia pasquorum	Fly	Root	Being screened by IIBC. AES project (Story & Littlefield).
Longitarsus quadriguttatus	Beetle	Root	Being screened by IIBC. AES project (Story & Littlefield).
Mogulones borraginis	Weevil	Seed head	Being screened by IIBC. AES project (Story & Littlefield).
Mogulones cruciger	Weevil	Root	Being screened by IIBC. AES project (Story & Littlefield).
Mogulones trisignatus	Weevil	Stem	Being screened by IIBC. AES project (Story & Littlefield).

HOARY CRESS (Whitetop)

Aceria drabae	Mite	Flower buds	Being screened by MAES (Littlefield).

APPENDIX C

2,4-D AMINE NO. 4

MANUFACTURER
ALBAUGH, INC.
4900 Packers Ave.
St. Joseph, MO 64504
Suppliers Phone Number: (816) 238-3377
Transportation Emergency Phone No: CHEMTREC 1-800-424-9300

Effective Date: 02/01/93
Date Printed:

Product Name: 2,4-D Amine No. 4 Herbicide

SECTION I
IDENTIFICATIONS

Chemical Name: Dimethylamine salt of 2,4-Dichlorophenoxyacetic Acid
Formula: C10H13Cl2NO3
Molecular Weight: 266.12
Synonyms: 2,4-D, dimethylamine salt
CAS No. and Name: 2008-39-1 - Phenoxyacetic Acid - 2,4-D-Dichloro-Dimethylamine Salt.

Important Health Effect Information:

Danger
May be harmful if absorbed through the skin
Causes irreversible eye damage
See Section IV for complete Health Hazard Data.
National Fire Protection Association Rating:

KEY

4 = Extreme
3 = High
2 = Moderate
1 = Slight
0 = Minimum

Health - 3
Fire - 1
Reactivity - 1

S.A.R.A. Title III Hazard Classification:

Immediate (Acute) Health	YES
Delayed (Chronic) Health	YES
Fire	NO
Sudden Release of Pressure	NO
Reactive	NO

SECTION II
HAZARDOUS INGREDIENTS

Material	Weight %
(1) Dimethylamine salt of 2,4-Dichlorophenoxyacetic Acid	46.9%

Allowable Exposure Limits:

No allowable exposure limits have been established for the active ingredient in this formulation. However, for the free acid, 2,4-D, the following applies: 10 mg/cubic meter TWA (ACGIH TLV & OSHA PEL).

SECTION III
PHYSICAL DATA
Specific Gravity: 1.16 at 20/20 Degrees C
Bulk Density: Not Established
Boiling Point, 760 mm Hg, Degrees C (F): Not Established
Melting Point, Degrees C (F): Not Established
Freezing Point, Degrees C (F): -6 (21)
Vapor Pressure, 25 Degrees C: Not Established
Vapor Density (air = 1): Not Established
pH: 7.5 to 10 (product)
Solubility in Water, %/wt at 25 Degrees C: 100%
Appearance and Odor: Clear brown to black liquid, characteristic phenoxy odor.

SECTION IV
HEALTH HAZARD DATA

TOXICOLOGY DATA:
Oral LD50 (rats): 1,150 mg/kg body weight
Dermal LD50 (rabbits): 1,530 mg/kg body weight
Inhalation LC50 (rats - 4 Hour Exposure): No information available
Skin Effects (rabbits): Mild Irritant
Eye Effects (rabbits): Severe irritation
CARCINOGENICITY, TERATOGENICITY, MUTAGENICITY: The International Agency for Research on Cancer (IARC) lists exposure to phenoxyacetic acid herbicides as a class 2B carcinogen, limited evidence for carcinogenicity in humans. The Science Advisory Panel of EPA has given Class D classification (not classifiable as to human carcinogenicity) and has required additional animal studies on 2,4-D. After a professional scientific review of available information, the Company has reservations as to whether the substance presents a carcinogenic risk. Animal studies with the active ingredients in this product have shown that they are not mutagenic or teratogenic.
SIGNS OF POISONING: When individually administered in large doses to animals, the most characteristic signs of poisoning are those of myotonia.
EFFECTS OF SINGLE OVEREXPOSURE:
SWALLOWING: Harmful if swallowed. (See TOXICOLOGY DATA) May cause nausea, vomiting, abdominal pain, myotonia, muscle weakness, and fall in blood pressure.
SKIN ABSORPTION: May be harmful is absorbed through the skin. (See TOXICOLOGY DATA) May cause nausea, myotonia, muscle weakness, and fall in blood pressure.
INHALATION: No specific information available, but vapors or sprays (mists) may be harmful if inhaled and cause irritation to the respiratory tract. May also cause myotonia, muscle weakness and fall in blood pressure.
SKIN IRRITATION: No adverse effects anticipated based on available information. (See TOXICOLOGY DATA)
EYE CONTACT: Causes irreversible eye damage, seen as corneal opacity. (See TOXICOLOGY DATA) Vapors or sprays (mists) are irritating to the eyes.

SECTION IV - cont.
HEALTH HAZARD DATA

EFFECTS OF REPEATED OVEREXPOSURE: Repeated overexposure to 2,4-D herbicides may cause liver, kidney, gastrointestinal and muscular effects. Rare cases of peripheral nerve damage have been reported, but extensive animal studies have failed to substantiate these observations, even at high doses for prolonged periods.

OTHER EFFECTS OF OVEREXPOSURE: See Notes to Physician

EXISTING MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Skin irritation may be aggravated in persons with existing skin lesions. Breathing of vapor, dust or sprays (mists) may aggravate asthma and inflammatory or fibrotic pulmonary disease.

EMERGENCY AND FIRST AID PROCEDURES: Remove the patient from immediate source of exposure and assure that the individual is breathing. Use artificial respiration if necessary, to assure continued breathing. GET MEDICAL ATTENTION.

SWALLOWING: If patient is conscious and alert, give 2-3 glasses of water or milk to drink. If available, give on tablespoon of Syrup of Ipecac to induce voniting. If coniting has not occurred in 20 minutes, the same dose of Syrup of Ipecac may be repeated on additional time. Alternatively, induce voniting by touching back of throat with finger. Do not make unconscious person vomit. GET MEDICAL ATTENTION.

SKIN: Immediately wash skin with plenty of soap and water, if available, while removing contaminated clothing and shoes. Wash clothing separately before reuse.

INHALATION: Remove victim to fresh air. If not breathing, administer cardiopulmonary resuscitation or artificial respiration. If breathing is difficult, administer oxygen: Get MEDICAL ATTENTION.

EYES: Hold eyelids open and flush with a steady gentle stream of water for at least 15 minutes. GET MEDICAL ATTENTION, PREFERABLY AN OPHTHALMOLOGIST.

NOTES TO PHYSICIAN: No Specific antidote is available.

All treatments should be based on observed signs and symptoms of distress in the patient. Overexposure to materials other than this product may have occurred.

This product contains a phenoxy herbicide. Myotoxic effects may include muscle fibrillations, myotonia, and muscular weakness. Ingestion of massive doses may result in persistent fall of blood pressure. Myoglobin and hemoglobin may be found in urine. Elevations in lactate dehydrogenase (LDH), SGOT, SGPT and aldolase indicate the extent of muscle damage. It has been suggested that overexposure in humans may affect both the central and peripheral nervous systems. The acute effects on the central nervous system resemble those produced by alcohol or sedative drugs. In isolated cases, peripheral neuropathy and reduced nerve conduct velocities have been reported although these observations may be related to other factors.

Gas-liquid chromatography for detecting and measuring chlorophenoxy compounds in blood and urine may be useful in confirming and assessing the magnitude of chlorophenoxy absorption.

SECTION V
FIRE AND EXPLOSION HAZARD DATA
Flash Point Degrees C(F): Noncombustible
Flammable Limits in Air (% by volume):
Upper: Not Established Lower: Not Established
Autoignition Temperature Degrees C (F): Not Established
EXTINGUISHING MEDIA: Noncombustible, Use appropriate extinguishing media for material that is supplying fuel.
SPECIAL FIRE FIGHTING PROCEDURES: Wear protective clothing and use self-contained breathing apparatus. Dike area to prevent runoff and contamination of water sources.
UNUSUAL FIRE AND EXPLOSION HAZARDS: Thermal decomposition products may be hazardous. These may include hydrogen chloride and nitrogen oxides.

SECTION VI
REACTIVITY DATA
Stability: Stable
CONDITIONS TO AVOID: Avoid excessive heat.
MATERIALS TO AVOID: Oxidizing agents and acids.
HAZARDOUS DECOMPOSITION PRODUCTS: Decomposition products may be hazardous. These may include hydrochloric acid, sulfur dioxide, hydrogen sulfide, aldehydes, the oxides of carbon, and various hydrocarbons.
Hazardous Polymerization: Will not occur.

SECTION VII
SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED:

Dike large spills using absorbent or impervious materials such as sand or clay. Recover and contain as much free liquid as possible. Recover remaining spilled material as appropriate. Collect and contain contaminated absorbent and dike material for disposal.

Absorb small spills on sand or vermiculite. Place contaminated material in appropriate container for disposal.

If spilled on the ground, the affected area should be removed to a depth of one to two inches and placed in an appropriate container for disposal.

Do not flush material to public sewer systems or any waterways.

Wear appropriate protective clothing and equipment (see below) during cleanup activities.

Ensure adequate decontamination of tools and equipment following cleanup.

WASTE DISPOSAL METHOD:: Dispose of in accordance with local, state and federal regulations.

NOTE: 2,4-D Salts are RCRA hazardous waste (U240) when disposed. Spills are subject to CERLCA (Superfund) reporting requirements: Reportable Quantity (RQ): 100 lbs.

SECTION VIII
SPECIAL PROTECTION INFORMATION
Protective Equipment Should be used During the Following Procedures:
-Manufacture or formulation of this product.
-Repair and maintenance of contaminated equipment
-Clean-up of leaks and spills
RESPIRATORY PROTECTION: Use NIOSH/MSHA approved respirator for pesticide mist. Use positive pressure self-contained breathing apparatus for emergency conditions.
VENTILATION: Local Exhaust ventilation.
PROTECTIVE GLOVES: Chemical-resistant gloves, e.g. PVC or butyl.
EYE PROTECTION: Face shield, goggles, eye bath.
OTHER PROTECTIVE EQUIPMENT: Full-body protective clothing, safety shower.

SECTION IX
SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING:
-Do not get in eyes, on skin or on clothing.
-Do not ingest. Avoid exposure by inhalation.
-Do not contaminate water, food, or feed by storage or disposal.

The information herein is given in good faith but no warranty, expressed or implied, is made.

M A T E R I A L S A F E T Y D A T A S H E E T

Dow Chemical U.S.A.* Midland, MI 48674 Emergency Phone: 517-636-4400

Product Name: CURTAIL (R) HERBICIDE

Effective Date: 06/08/90 Date Printed: 06/19/90 MSDS:003053

1. INGREDIENTS: (% w/w, unless otherwise noted)

2,4-Dichlorophenoxyacetic acid (2,4-D), as alkanolamine salts of the ethanol and isopropanol series (proprietary mixture)	38.4%
3,6-Dichloro-2-pyridinecarboxylic acid (clopyralid), as alkanolamine salts of the ethanol and isopropanol series	7.5%
Other ingredients, total:	54.1%
Water CAS# 007732-18-5	
Proprietary sequestering agent and antifoamer	

This document is prepared pursuant to the OSHA Hazard Communication Standard (29 CFR 1910.1200). In addition, other substances not 'Hazardous' per this OSHA Standard may be listed. Where proprietary ingredient shows, the identity may be made available as provided in this standard.

2. PHYSICAL DATA:

BOILING POINT: 212F, 100C (water)
VAP. PRESS: Not determined
VAP. DENSITY: Not determined
SOL. IN WATER: Miscible
SP. GRAVITY: 1.154 (68/68)
FREEZING POINT: 10F
APPEARANCE: Dark amber liquid
ODOR: Phenolic

3. FIRE AND EXPLOSION HAZARD DATA:

FLASH POINT: >195F, 91C
METHOD USED: TCC

FLAMMABLE LIMITS

(Continued on Page 2)

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3. FIRE AND EXPLOSION HAZARD DATA: (CONTINUED)

LFL: Not determined
UFL: Not determined

EXTINGUISHING MEDIA: Water fog, alcohol resistant foam, CO2, dry chemical.

FIRE AND EXPLOSION HAZARDS: Material is a water solution and except under gross fire conditions should not burn. Avoid contaminating water supplies with run-off water.

FIRE-FIGHTING EQUIPMENT: Wear positive pressure, self-contained breathing apparatus and protective clothing.

4. REACTIVITY DATA:

STABILITY: (CONDITIONS TO AVOID) Store under cool, dry conditions. Avoid elevated temperatures and direct sunlight. Decomposes under fire conditions.

INCOMPATIBILITY: (SPECIFIC MATERIALS TO AVOID) Avoid acid, oxidizing material, halogenated organics, brass and copper.

HAZARDOUS DECOMPOSITION PRODUCTS: Hydrogen chloride, nitrogen oxides, chlorinated pyridine.

HAZARDOUS POLYMERIZATION: Will not occur.

5. ENVIRONMENTAL AND DISPOSAL INFORMATION:

ACTION TO TAKE FOR SPILLS: Absorb spills with materials such as sawdust or sand. Wash area with water. Do not allow wash water to contaminate water supplies.

DISPOSAL METHOD: If wastes cannot be disposed of by use according to label instructions, contact your State Pesticide or Environmental Control Agency, or the Hazardous Waste representative at

(Continued on Page 3)
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5. ENVIRONMENTAL AND DISPOSAL INFORMATION: (CONTINUED)

the nearest EPA Regional Office for guidance.

6. HEALTH HAZARD DATA:

EYE: May cause severe irritation with corneal injury which may result in permanent impairment of vision, even blindness.

SKIN CONTACT: Prolonged or repeated exposure may cause skin irritation. May cause more severe response if skin is abraded (scratched or cut).

SKIN ABSORPTION: A single prolonged exposure is not likely to result in the material being absorbed through skin in harmful amounts. The LD50 for skin absorption in rabbits is >4000 mg/kg.

INGESTION: Single dose oral toxicity is low. The oral LD50 for male rats is 3730 mg/kg and for females 2830 mg/kg. Amounts ingested incidental to industrial handling are not likely to cause injury; however, ingestion of larger amounts may cause injury. Ingestion may cause gastrointestinal irritation or ulceration.

INHALATION: Single exposure to vapors is not likely to be hazardous.

SYSTEMIC & OTHER EFFECTS: Excessive exposure may cause liver, kidney, gastrointestinal, and muscular, effects. Signs and symptoms of excessive exposure may be nausea and/or vomiting, abdominal cramps and/or diarrhea. Lethargy may be a sign or symptom of excessive exposure. Clopyralid did not cause cancer in longterm animal studies. Various animal cancer tests have shown no reliably positive association between 2,4-D exposure and cancer. Epidemiology studies on herbicide use (2,4-D) have been both positive and negative with the majority being negative. For clopyralid, birth defects are unlikely. Even exposures having an adverse effect on the mother

(Continued on Page 4)

6. HEALTH HAZARD DATA: (CONTINUED)

should have no effect on the fetus. For 2,4-D, birth defects unlikely. Exposures having no effect on the mother should have no effect on the fetus. 2,4-D did not cause birth defects in animals; other effects were seen in the fetus only at doses which caused toxic effects to the mother. The chelating agent component has been reported to cause birth defects in laboratory animals only at exaggerated doses that were toxic to the mother. These effects are likely associated with zinc deficiency due to chelation. Exposures having no effect on the mother should have no effect on the fetus. In animal studies, clopyralid and the chelating agent have been shown not to interfere with reproduction. Excessive dietary levels of 2,4-D caused toxic effects (weight and viability reduction) in rats on a reproduction test. Results of in vitro ('test tube') mutagenicity tests have been negative for clopyralid. Results of mutagenicity tests on 2,4-D in animals have been inconclusive. 2,4-D has been shown to be negative in some in vitro ('test tube') mutagenicity tests and positive in others. For clopyralid, results of mutagenicity tests in animals have been negative.

7. FIRST AID:

EYES: Immediate and continuous irrigation with flowing water for at least 15 minutes is imperative. Prompt medical consultation is essential.

SKIN: Wash off in flowing water or shower.

INGESTION: Induce vomiting immediately by giving two glasses of water and sticking finger down throat. Call a physician. Do not induce vomiting or give anything by mouth to an unconscious person.

INHALATION: Remove to fresh air if effects occur. Consult a physician.

(Continued on Page 5)

7. FIRST AID: (CONTINUED)

NOTE TO PHYSICIAN: May cause tissue destruction leading to stricture. If lavage is performed, suggest endotracheal and/or esophagoscopic control. No specific antidote. Supportive care. Treatment based on judgment of the physician in response to reactions of the patient.

8. HANDLING PRECAUTIONS:

EXPOSURE GUIDELINE(S): Dow Industrial Hygiene Guide is 10 mg/m3 for clopyralid (3,6-dichloropyridine carboxylic acid). ACGIH TLV is 10 mg/m3 for 2,4-D acid. ACGIH TLV and OSHA PEL are 3 ppm for one of the proprietary components.

VENTILATION: Control airborne concentrations below the exposure guideline. Good general ventilation should be sufficient for most conditions.

RESPIRATORY PROTECTION: Atmospheric levels should be maintained below the exposure guideline. When respiratory protection is required for certain operations, use an approved air-purifying respirator.

SKIN PROTECTION: For brief contact, no precautions other than clean body-covering clothing should be needed. Use impervious gloves when prolonged or frequently repeated contact could occur.

EYE PROTECTION: Use chemical goggles. Eye wash fountain should be located in immediate work area.

9. ADDITIONAL INFORMATION:

SPECIAL PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE: See label. Keep out of reach of children. Do not get on skin, in eyes or on clothing. Do not swallow. Washing facilities near work area. Do not store near fertilizers, seed, fungicides

(Continued on Page 6)

9. ADDITIONAL INFORMATION: (CONTINUED)

or insecticides. Do not contaminate irrigation ditches or water used for domestic purposes.

MSDS STATUS: Revised section 9 and regsheet.

(Continued on Page 7)

REGULATION INFORMATION: (Not meant to be all-inclusive--selected regulations represented.)

NOTICE: The information herein is presented in good faith and believed to be accurate as of the effective date shown above. However, no warranty, express or implied, is given. Regulatory requirements are subject to change and may differ from one location to another; it is the buyer's responsibility to ensure that its activities comply with federal, state or provincial, and local laws. The following specific information is made for the purpose of complying with numerous federal, state or provincial, and local laws and regulations. See MSD Sheet for health and safety information.

U.S. REGULATIONS

SARA 313 INFORMATION: This product contains the following substances

subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372:

CHEMICAL NAME	CAS NUMBER	CONCENTRATION
AMINE	proprietary	<5 %

SARA HAZARD CATEGORY: This product has been reviewed according to the EPA "Hazard Categories" promulgated under Sections 311 and 312 of the Superfund Amendment and Reauthorization Act of 1986 (SARA Title III) and is considered, under applicable definitions, to meet the following categories:

An immediate health hazard
A delayed health hazard

(Continued on Page 8)

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PBI/GORDON CORPORATION, KANSAS CITY, MO. PHONE 816-421-4070
AFTER HOURS 913-342-8783

DATE PREPARED: 12/07/89 DATE PRINTED: 2/15/90
REVISION NUMBER: 5 PRODUCT CODE: 808

------- SECTION I - PRODUCT IDENTIFICATION -------

PRODUCT NAME: ACME AGRICULTURAL HI-DEP BROADLEAF HERBICIDE
EPA REG NO.: 2217-703

DEPARTMENT OF TRANSPORTATION INFORMATION

PROPER SHIPPING NAME: (14) COMPOUND TREE OR WEED KILLING LIQUID/DRY
HAZARD CLASSIFICATION: NONE
NMFC CLASSIFICATION NUMBER: 50320 CLASS: 60
DESCRIPTION: NONE

------- SECTION II - HAZARDOUS COMPONENTS -------

THESE CHEMICALS WERE EVALUATED AGAINST THE NTP, IARC & OSHA LIST FOR CARCINOGENICITY

CAS	INGREDIENT	%	TLV-TWA
94-75-7	2,4-DICHLOROPHENOXYACETIC ACID (2,4-D)	38.60	10 MG/M3
124-40-3	DIMETHYLAMINE (DMA)	5.60	10 PPM
111-42-2	DIETHANOLAMINE (DEA)	6.65	3 PPM
107-21-1	ETHYLENE GLYCOL	10.0	

------- SECTION III - PHYSICAL DATA -------

BOILING POINT, 760MM/HG: 230 F. MELTING POINT: NA
SPECIFIC GRAVITY (H2O=1): 1.19 FREEZING POINT: <30 F.
VAPOR DENSITY (AIR=1): >1 VAPOR PRESSURE: <17MM HG AT 20 C.
% VOLATILES BY VOLUME: 43 SOLUBILITY IN H2O: INFI
APPEARANCE: AMBER LIQUID ODOR: AMINE LIKE ODOR
PH: 7.5-8.5 DENSITY AT 20 C: 9.92 LBS/GAL
OCTANOL/PARTITION COEF: NE VISCOSITY: 26.30CP
EVAPORATION RATE (BUTYL ACETATE = 1): >1

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------- SECTION IV - FIRE AND EXPLOSION HAZARD INFORMATION -------

FLASH POINT (CLOSED CUP) RANGE: NA
EXPLOSION LIMIT (%): LOWER: NA UPPER: NA
AUTO IGNITION TEMPERATURE: NA
FLAMMABLE LIMITS IN AIR, % BY VOLUME: NA
EXTINGUISHING MEDIA: FOAM, CO2, DRY CHEMICAL, WATER, LARGE FIRES: WATER SPRAY/FOG/FOAM
SPECIAL FIRE FIGHTING PROCEDURES: 1) WEAR POSITIVE PRESSURE BREATHING APPARATUS AND FULL PROTECTIVE CLOTHING 2) FIGHT FIRE FROM MAXIMUM DISTANCE 3) ISOLATE HAZARD AREA AND DENY ENTRY 4) STAY UP WIND, KEEP OUT OF LOW AREAS.
UNUSUAL FIRE AND EXPLOSION HAZARDS: 1) THIS PRODUCT MAY BURN AT A VERY HIGH TEMPERATURE BUT WILL NOT IGNITE READILY 2) THE FIRE MAY PRODUCE IRRITATING OR POISONOUS GASES 3) RUN OFF FROM FIRE CONTROL OR DILUTION WATER MAY CAUSE POLLUTION 4) IN CASE OF WATER POLLUTION, CALL LOCAL AUTHORITIES.

------- SECTION V - HEALTH HAZARD INFORMATION -------

ACUTE ORAL LD50: 2621 MG/KG (MALE RAT)

ACUTE DERMAL LD50: >2000 MG/KG

PRIMARY DERMAL IRRITATION: MAY BE MODERATELY IRRITATING.
PRIMARY EYE IRRITATION: MAY CAUSE EYE BURNS.
INHALATION 4 HR LC50: 1.54 MG/L
CHRONIC EFFECTS: REPEATED OVEREXPOSURE MAY EFFECT THE SKIN, LIVER, KIDNEYS, MUSCULAR OR GASTROINTESTINAL SYSTEMS. EXISTING MEDICAL CONDITIONS (EG. ASTHMA, SKIN LESIONS)MAY BE AGGRAVATED. PROLONGED INHALATION MAY CAUSE DIZZINESS, BURNING IN CHEST OR COUGHING.
EMERGENCY AND FIRST AID PROCEDURES:

EYES: FLUSH CONTAMINATING CHEMICAL FROM EYES WITH COPIOUS AMOUNTS OF CLEAN WATER FOR 10-15 MINUTES.

SKIN: BATHE AND SHAMPOO WITH SOAP AND WATER TO REMOVE CHEMICALS FROM SKIN AND HAIR. INDIVIDUALS WITH SKIN LESIONS, DISEASE, OR SENSITIVITY SHOULD AVOID CONTACT.

INHALATION: SEVERE INHALATION, REMOVE FROM CONTACT - GET PHYSICIAN. GIVE OXYGEN OR ARTIFICIAL RESPIRATION IF REQUIRED. POSSIBLE 2 DAY REMOVAL FROM SEVERE EXPOSURE.

ORAL: CONTACT PHYSICIAN IMMEDIATELY - IF SUBSTANTIAL AMOUNTS INJESTED SPONTANEOUS VOMITING USUALLY OCCURS. IF VICTIM IS FULLY ALERT INDUCE VOMITING.

NOTES TO PHYSICIAN: TREATMENT IS SYMPTOMATIC. MAY USE IPICAC TO INDUCE VOMITING. CAN USE ACTIVATED CHARCOAL TO ABSORB CHEMICAL REMAINING IN GUT. MAY BE ALMOST TOTALLY EXCRETED IN 24-72 HOURS. ACUTE EFFECTS MAY RESEMBLE THOSE OF ALCOHOL OR SEDATIVE DRUGS.

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AFTER HOURS 913-342-8783

CODE: 808 - ACME AGRICULTURAL HI-DEP BROADLEAF HERBICIDE

------- SECTION VI - REACTIVITY INFORMATION -------

MATERIAL REACTS VIOLENTLY WITH: NONE OF THESE.
HAZARDOUS DECOMPOSITION PRODUCTS: IF HEATED ABOVE DECOMPOSITION TEMPERATURE, HYDROGEN CHLORIDE MAY BE EVOLVED.

HAZARDOUS POLYMERIZATION: STABLE

INCOMPATIBILITY: STRONG ACIDS WILL RENDER PRODUCT NON-EFFICACIOUS.

------- SECTION VII - SPECIAL PROTECTION INFORMATION --------

PROTECTIVE EQUIPMENT SHOULD BE USED IN THE MANUFACTURE OR FORMULATION OF THIS PRODUCT, INCLUDING THE FOLLOWING:

RESPIRATORY PROTECTION: WHERE EXPOSURE LIMITS ARE EXCEEDED WEAR A SUITABLE RESPIRATOR (MSHA/NIOSH APPROVED OR EQUIVALENT).

VENTILATION: GOOD VENTILATION OF WORK PLACE IS ESSENTIAL.

PROTECTIVE CLOTHING: RUBBER GLOVES AND FULL PROTECTIVE CLOTHING AND SHOES

EYE PROTECTION: GOGGLES OR GLASSES OR SPLASH SHIELD.

------- SECTION VIII - SPILL OR LEAK PROCEDURES -------

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED:
SMALL SPILL: 1) DO NOT TOUCH SPILLED PRODUCT 2) WEAR HAND GLOVES & PROTECTIVE CLOTHING 3) CONTAIN SPILL WITH DRI-RITE/SAND/NON-COMBUSTIBLE ABSORBENT - COLLECT INTO DOT DRUMS, COVER, MARK AND REMOVE 4) FLUSH AREA WITH WATER, IF POSSIBLE.

LARGE SPILL: 1) DO NOT TOUCH SPILLED PRODUCT 2) WEAR HAND GLOVES & PROTECTIVE CLOTHING/SHOES, SELF-CONTAINED BREATHING APPARATUS 3) DIKE FAR AHEAD OF SPILL FOR LATER DISPOSAL 4) CONTAIN SPILL WITH DRI-RITE/SAND/NON-COMBUSTIBLE ABSORBENT - COLLECT INTO DOT DRUMS, COVER, MARK AND REMOVE 5) WASH AREA WITH WATER.

WASTE DISPOSAL METHODS: RCRA ID NO. U-240 RQ: 100 LB
DISPOSE OF DOT DRUM, WASTE WATER AND ANY OTHER WASTE ACCORDING TO EPA APPROVED METHODS.

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CODE: 808 - ACME AGRICULTURAL HI-DEP BROADLEAF HERBICIDE

------- SECTION IX - SPECIAL PRECAUTIONS -------

HAZARDS TO HUMANS & DOMESTIC ANIMALS:
DANGER--CORROSIVE, CAUSES EYE DAMAGE & SKIN IRRITATION. DO NOT GET IN EYES, ON SKIN OR ON CLOTHIING. WEAR GOGGLES OR FACE SHIELD, & RUBBER GLOVES WHEN HANDLING. HARMFUL OR FATAL IF SWALLOWED. STATEMENT OF PRACTICAL TREATMENT: IF IN EYES: IN CASE OF EYE CONTACT, IMMEDIATELY FLUSH EYES WITH PLENTY OF WATER FOR 15 MINUTES. CALL A PHYSICIAN AT ONCE. IF ON SKIN: WASH PROMPTLY WITH SOAP & WATER. RINSE THOROUGHLY. IF IRRITATION DEVELOPS, GET MEDICAL ATTENTION. IF SWALLOWED: DRINK 1 OR 2 GLASSES OF WATER. INDUCE VOMITING BY TOUCHING BACK OF THROAT WITH FINGER. CALL A PHYSICIAN AT ONCE. DO NOT INDUCE VOMITING OR GIVE ANYTHING BY MOUTH TO AN UNCONSCIOUS PERSON. IF INHALED: REMOVE VICTIM TO FRESH AIR & APPLY RESPIRATION IF INDICATED.

STORAGE & DISPOSAL STATEMENTS:
STORAGE: STORE IN ORIGINAL CONTAINER IN A LOCKED STORAGE AREA INACCESSIBLE TO CHILDREN OR PETS. KEEP FROM FREEZING. TO PREVENT CROSS-CONTAMINATION, DO NOT STORE NEAR OTHER HERBICIDES, FERTILIZERS, INSECTICIDES, FUNGICIDES, OR NEAR SEEDS.--PESTICIDE DISPOSAL: DO NOT CONTAMINATE WATER, FOOD OR FEED BY STORAGE OR DISPOSAL. PESTICIDE WASTES ARE TOXIC. IMPROPER DISPOSAL OF EXCESS PESTICIDE, SPRAY MIXTURE OR RINSATE IS A VIOLATION OF FEDERAL LAW. IF THESE WASTES CANNOT BE DISPOSED OF BY USE ACCORDING TO LABEL INSTRUCTIONS, CONTACT YOUR STATE PESTICIDE OR ENVIRONMENTAL CONTROL AGENCY OR THE HAZARDOUS WASTE REPRESENTATIVE AT THE NEAREST EPA REGIONAL OFFICE FOR GUIDANCE.--CONTAINER DISPOSAL: FOR PLASTIC CONTAINERS, TRIPLE RINSE (OR EQUIVALENT). THEN OFFER FOR RECYCLING OR RECONDITIONING, OR PUNCTURE & DISPOSE OF IN A SANITARY LANDFILL, OR INCINERATION, OR IF ALLOWED BY STATE & LOCAL AUTHORITIES, BY BURNING. IF BURNED, STAY OUT OF SMOKE. FOR METAL DRUMS, TRIPLE RINSE(OR EQUIVALENT). THEN OFFER FOR RECYCLING.

PBI/GORDON CORPORATION, KANSAS CITY, MO. PHONE 816-421-4070
AFTER HOURS 913-342-8783

CODE: 808 - ACME AGRICULTURAL HI-DEP BROADLEAF HERBICIDE

------ SECTION X - ADDITIONAL INFORMATION ------

SECTION 313 SUPPLIER NOTIFICATION --- THIS PRODUCT CONTAINS THE FOLLOWING TOXIC CHEMICALS SUBJECT TO THE REPORTING REQUIREMENTS OF SECTION 313 OF THE EMERGENGY PLANNING AND COMMUNITY RIGHT-TO-KNOW ACT

OF 1986 AND OF 40 CFR 372:

CAS#	CHEMICAL NAME	% BY WEIGHT
111-42-2	DIETHANOLAMINE	5.6
94-75-7	2,4-D ACID	38.6
107-21-1	ETHYLENE GLYCOL	10.0

THIS INFORMATION MUST BE INCLUDED IN ALL MATERIAL SAFETY DATA SHEETS THAT ARE COPIED AND DISTRIBUTED FOR THIS MATERIAL.

MONSANTO PRODUCT NAME
ROUNDUP® Herbicide

MONSANTO COMPANY
800 N. LINDBERGH BLVD.
ST. LOUIS, MO 63167
Emergency Phone No. (Call Collect) 314-694-4000
DATE PREPARED: AUGUST, 1989

PRODUCT IDENTIFICATION

EPA Reg. No.:	524-308
Synonyms:	None
Chemical Name:	Not Applicable, Formulated Product
Active Ingredient:	*Glyphosate, N-Phosphonomethylglycine, in the form of its isopropylamine salt..... 41.0%
Inert Ingredients:	..... 59.0%
	.....100.0%

*Contains 480 grams per liter or 4 pounds per gallon of the active ingredient glyphosate in the form of its isopropylamine salt. Equivalent to 356 grams per liter or 3 pounds per U.S. gallon of the acid, glyphosate.

CAS Reg. No. :	Not Applicable
CAS Reg. No. Active Ingredient:	1071-83-6
DOT Proper Shipping Name:	Not Applicable
DOT Hazard Class/I.D. 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): Immediate

Section 313 Toxic Chemical(s): Not Applicable

Hazardous Chemical(s) Under OSHA Hazard Communication Standard:

This product contains, as components, the substances listed below which are identified as hazardous chemicals under the criteria of the OSHA Hazard Communication Standard (29 CFR 1910.1200):
Ethoxylated Tallowamines, CAS Reg. No. 61791-26-2

WARNING STATEMENTS

Keep out of reach of children
WARNING!
CAUSES EYE IRRITATION
HARMFUL IF SWALLOWED OR INHALED
MAY CAUSE SKIN IRRITATION
REFORMULATION IS PROHIBITED
SEE INDIVIDUAL CONTAINER LABEL FOR REPACKAGING LIMITATIONS.

PRECAUTIONARY MEASURES

Do not get in eyes, on skin or on clothing.
Wash thoroughly after handling. Avoid breathing vapor or spray mist.
Do not apply directly to water or wetland (swamps, bogs, marshes or potholes).
Do not contaminate water when disposing of equipment washwaters.

EMERGENCY AND FIRST AID PROCEDURES

FIRST AID:

IF IN EYES:	Immediately flush with plenty of water for at least 15 minutes. Get medical attention.
IF ON SKIN:	Immediately flush with plenty of water. Remove contaminated clothing. Wash clothing before reuse.
IF SWALLOWED:	This product will produce gastrointestinal irritation. Immediately dilute by swallowing water or milk. Get medical attention.
IF INHALED:	Remove individual to fresh air. Get medical attention if breathing difficulty develops.

NOTE: For additional human emergency first aid or treatment guidance call collect, anytime, day or night (314) 694-4000.

OCCUPATIONAL CONTROL PROCEDURES

EYE PROTECTION:	Wear chemical splash goggles during mixing/pouring operations or other activities in which eye contact with undiluted ROUNDUP® herbicide is likely to occur.
SKIN PROTECTION:	In cases in which prolonged or repeated skin contact with ROUNDUP herbicide may occur, long-sleeved shirt, long pants, and chemical protective (e.g. rubber) gloves are recommended. Wash hands and contaminated skin after handling. Clothing soaked with a solution of ROUNDUP herbicide should be promptly removed and laundered before reuse.
RESPIRATORY PROTECTION:	Respiratory protection should not be required for normal use and handling. During periods of abnormal exposure to heavy spray or mist, use NIOSH/MSHA approved equipment for pesticide vapor/mist is recommended. The respirator use limitations specified by NIOSH/MSHA or the manufacturer must be observed.
VENTILATION:	No special precautions are recommended.

AIRBORNE EXPOSURE LIMITS:

Product: ROUNDUP® Herbicide - 100% by wt.

OSHA PEL:	None established
ACGIH TLV:	None established

Ethoxylated Tallowamine

OSHA PEL:	None established
ACGIH TLV:	None established

FIRE PROTECTION INFORMATION

Flash Point:	> 200°F Method: Tag Closed Cup
Extinguishing Media:	Water spray, foam, dry chemical or CO_2, or any Class B extinguishing agent.
Special Fire Fighting Procedures:	Fire fighters and others who may be exposed to vapors or products of combustion should wear a self-contained breathing apparatus and full protective 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 or applied only in stainless steel, aluminum, fiberglass, plastic and plastic-lined containers. DO NOT MIX, 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 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.
Hazardous Decomposition Products:	None.
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 in an acid-base reaction.

HEALTH EFFECTS SUMMARY

The following information summarizes human experience and results of scientific investigations reviewed by health professionals for hazard evaluation of ROUNDUP® herbicide and development of Precautionary Statements and Occupational Control Procedures recommended in this document.

EFFECTS OF EXPOSURE

Dermal contact and inhalation are expected to be the primary routes of occupational exposure to ROUNDUP herbicide. Direct contact with this material may cause temporary eye irritation and conjunctivitis. Prolonged contact with ROUNDUP may cause skin irritation. Ingestion of ROUNDUP has been reported to produce gastrointestinal discomfort with irritation of the mouth, nausea, vomiting and diarrhea. Oral ingestion of large quantities of concentrated product has been reported to result in hypotension and pulmonary edema.

TOXICOLOGICAL DATA

Data from laboratory studies conducted by Monsanto with ROUNDUP® herbicide are summarized below:

Single exposure (acute) studies indicate:

Oral - Slightly Toxic (Rat LD_{50} - 5,000 mg/kg)
Oral- Practically Nontoxic (Mouse LD_{50} - >5,000 mg/kg)
Dermal - Practically Nontoxic (Rabbit LD_{50} - >5,000 mg/kg)
Inhalation -Slightly Toxic (Rat LC_{50} - 3.18 mg/l)
Eye Irritation - Moderately Irritating (Rabbit)
Skin Irritation - Slightly Irritating (Rabbit, 4-hr exposure)
DOT Skin Corrosion - Not Corrosive (Rabbit, 4-hr exposure)

No skin irritation, allergy or photoallergy was reported in human volunteers following repeated skin exposure; no skin irritation or photoirritation was reported with single skin exposure. No skin allergy was observed in guinea pigs following repeated skin exposure.

Following repeated skin exposure (3-week) to ROUNDUP® herbicide at 5 times the intended use concentration, severe skin irritation and systemic toxic effects (death, reduced food consumption, body weight loss and testicular effects) were observed in rabbits. Slight to moderate skin irritation was the only effect in rabbits treated with 3 times the intended use concentration. Systemic toxic effects at 5 times use concentration were considered to be a secondary response to the stress of severe skin irritation, to which rabbits are particularly sensitive, rather than the result of direct systemic toxicity. There was no evidence of cholinesterase inhibition in dogs (single oral doses). Minor nasal irritation was observed following repeated inhalation (4-weeks) of a 33% ROUNDUP herbicide solution by rats. When ROUNDUP herbicide was applied to skin of rhesus monkeys, an extremely low amount (1.8%) of the active ingredient was absorbed.

COMPONENTS

Data from laboratory studies conducted by Monsanto and from the scientific literature on components of ROUNDUP herbicide:

Isopropylamine Salt of Glyphosate

Data from studies with a formulation comprised of 62% isopropylamine salt of glyphosate (MON 0139) indicate the following:

MON 0139 was practically nontoxic orally (rats) or after skin application (rabbits). It was nonirritating to rabbit eyes and practically nonirritating to rabbit skin. In repeat dosing studies (6-month), dogs fed MON 0139 exhibited slight body weight changes. Following repeated skin exposure (3 week) to MON 0139, skin irritation was the primary effect in rabbits. Additional toxicity information is available on glyphosate, the active herbicidal ingredient of MON 0139, which has been tested in mutagenicity, teratogenicity, reproductive, acute, subchronic and chronic toxicity studies.

Surfactant

The surfactant component of ROUNDUP herbicide is reported to cause irritation to the eyes and skin and may contribute to the irritation potential reported for this herbicide. Ingestion may produce gastrointestinal irritation, nausea, vomiting and diarrhea.

PHYSICAL DATA

Appearance: Clear, viscous amber-colored solution.
Odor: Practically odorless to slight amine-like odor.
pH: 4.4 - 4.9
Specific Gravity (Water = 1): 1.17

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 protective 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 attapulgite, bentonite or other absorbent clays. Collect contaminated absorbent, place in plastic-lined metal drum and dispose of in accordance with instructions provided under DISPOSAL. Thoroughly scrub floor with a strong industrial type detergent solution 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 provided under DISPOSAL.

SPILL, LEAK & DISPOSAL INFORMATION (Continued)

Leaking containers should be separated from non-leakers and either the container or its contents transferred to a plastic-lined drum or other non-leaking container. Dispose of leaking container in accordance with instructions provided under DISPOSAL. Any recovered spilled liquid should be similarly 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 or local procedures.

Emptied container retains vapor and product residue. Observe all labeled safeguards until container is cleaned, reconditioned or destroyed. DO NOT CUT OR WELD ON OR NEAR THIS CONTAINER.

Metal Drums: Triple rinse container. Then offer for recycling or reconditioning, or puncture and dispose of in a sanitary landfill, or by other procedures approved by state and local authorities.
Plastic Jugs: Do not reuse container. Triple rinse container, then puncture and dispose of in a sanitary landfill, or by incineration, or, if allowed by state and local authorities, by burning. If burned, stay out of smoke.
Metal Bulk: Triple rinse emptied bulk containers. Then offer for recycling or reconditioning or disposal in a manner approved by state and local authorities.
Plastic Drums and Mini-Bulk: Do not reuse container. Return container per the Monsanto container return program. If not returned, triple rinse container, then puncture and dispose of in a sanitary landfill, or by incineration, or, if allowed, by state and local authorities, by burning. If burned, stay out of smoke.

ENVIRONMENTAL EFFECTS

ENVIRONMENTAL TOXICITY INFORMATION:

Oral LD_{50} Dog:	>5.0 ml/kg, Practically Nontoxic
Oral LD_{50} Goat:	4,860 mg/kg, Slightly Toxic
48-hr Oral LD_{50} Honeybee:	>100µg/bee
48-hr Dermal LD_{50} Honeybee:	>100µg/bee
48-hr EC_{50} Daphnia magna (With Aeration):	37 mg/l, Slightly Toxic
48-hr EC_{50} Daphnia magna (Without Aeration):	24 mg/l, Slightly Toxic
48-hr EC_{50} Gammarus pseudolimnaeus:	42 mg/l, Slightly Toxic
96-hr TL_{50} Carp:	19.7 ppm, Slightly Toxic
96-hr LC_{50} Bluegill sunfish (Static):	14 mg/l, Slightly Toxic
96-hr LC_{50} Bluegill sunfish (Flow-Through):	5.8 mg/l, Moderately Toxic
96-hr LC_{50} Rainbow trout (Static):	15-26 mg/l, Slightly Toxic
96-hr LC_{50} Rainbow trout (Flow-Through):	8.2 mg/l, Moderately Toxic
96-hr LC_{50} Channel catfish:	16 mg/l, Slightly Toxic
96-hr LC_{50} Fathead minnow:	9.4 mg/l, Moderately Toxic
96-hr LC_{50} Crayfish:	>1,000 ppm, Practically Nontoxic
96-hr LC_{50} Coho salmon:	22 mg/l, Slightly Toxic
96-hr LC_{50} Chinook salmon:	20 mg/l, Slightly Toxic

Carp contained in a static pond were unaffected at any time during a 90-day observation period following exposure by aerial application of ROUNDUP® herbicide at the normal use concentration. Tissue residue analyses indicated that glyphosate, the active ingredient in ROUNDUP herbicide will not bioaccumulate.

Exposure to ROUNDUP herbicide in freshwater at concentrations of 0, 10, 103 and 990 µg/l for 10 days did not impair the ability of salmon smolts to adapt to seawater.

Immersion of chicken eggs at four different embryo ages (0, 6, 12 and 18 days) for about five seconds in 1 or 5% vol/vol ROUNDUP herbicide in water solutions was reported to have no adverse effects on the hatchability or time to hatch of the eggs.

Brahman-cross heifers were given ROUNDUP herbicide, by gavage, at daily dosages of 0, 400, 500, 630 790 and 1000 mg/kg for 7 consecutive days. Clinical signs of toxicity, including loss of appetite, diarrhea and death (790 and 1000 mg/kg) were observed at 500 mg/kg or above. The no-effect level was considered to be 400 mg/kg/day.

DATE: August, 1989 SUPERSEDES: November, 1985 MSDS NUMBER: M00007588

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

Material Safety Data Sheet

DowElanco

Emergency Phone: 517-636-4400
General Phone: 1-800-352-6776

EPA Reg. Number: 62719-6
Effective Date: July 16, 1992
Product Code: 87116
MSDS Number: 000380
DowElanco • Indianapolis, IN 46268

TORDON* 22K Weed Killer

MUTAGENICITY (EFFECTS ON GENETIC MATERIAL): The preponderance of data shows picloram to be non-mutagenic in 'in vitro' (test tube) tests and in test animals and is therefore believed to pose no mutagenic risk.

7. FIRST AID:

EYES: Irrigate with flowing water immediately and continuously for fifteen minutes. Consult medical personnel.

SKIN: Wash off in flowing water or shower.

INGESTION: Induce vomiting if large amounts are ingested. Consult medical personnel.

INHALATION: Remove to fresh air if effects occur. Consult medical.

NOTE TO PHYSICIAN: If burn is present, treat as any thermal burn, after decontamination. No specific antidote. Supportive care. Treatment based on judgment of the physician in response to reactions of the patient.

8. HANDLING PRECAUTIONS:

EXPOSURE GUIDELINE(S): Picloram: ACGIH TLV is 10 mg/m3; OSHA PEL is 10 mg/m3 total dust, 5 mg/m3 respirable. Dow IHG is 2 mg/m3 for polyglycol 26-2.

VENTILATION: Control airborne concentrations below the exposure guideline. Good general ventilation should be sufficient for most conditions.

RESPIRATORY PROTECTION: Atmospheric levels should be maintained below the exposure guideline. When respiratory protection is required for certain operations, use an approved air-purifying respirator.

SKIN PROTECTION: For brief contact, no precautions other than clean body-covering clothing should be needed. When prolonged or frequently repeated contact could occur, use protective clothing impervious to this material. Selection of specific items such as gloves, boots, apron or full-body suit will depend on operation.

EYE PROTECTION: Use chemical goggles, safety glasses, or face shield when handling, depending on [illegible] operation.

9. ADDITIONAL INFORMATION:

SPECIAL PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE: Keep out of reach of children. Avoid contact with skin and eyes. Provide eye fountain and washing facilities near work area. Do not ship or store with food, feeds, drugs or clothing. Do not contaminate irrigation or domestic water, food or feed by storage or disposal.

MSDS STATUS: Sections 6, 8 and regsheet Revised 7/92.

REGULATORY INFORMATION:

(Not meant to be all-inclusive—selected regulations represented).

NOTICE: The information herein is presented in good faith and believed to be accurate as of the effective date shown above. However, no warranty, express or implied, is given. Regulatory requirements are subject to change and may differ from one location to another; it is the buyer's responsibility to ensure that its activities comply with federal, state or provincial, and local laws. The following specific information is made for the purpose of complying with numerous federal, state or provincial, and local laws and regulations. See MSD Sheet for health and safety information.

SARA HAZARD CATEGORY: This product has been reviewed according to the EPA "Hazard Categories" promulgated under Sections 311 and 312 of the Superfund Amendment and Reauthorization Act of 1986 (SARA Title III) and is considered, under applicable definitions, to meet the following categories:

An immediate health hazard
A delayed health hazard

TOXIC SUBSTANCES CONTROL ACT (TSCA): All ingredients are on the TSCA inventory or are not required to be listed on the TSCA inventory.

OSHA HAZARD COMMUNICATION STANDARD: This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

Material Safety Data Sheet

DowElanco

Emergency Phone: 517-636-4400
General Phone: 1-800-352-6776

EPA Reg. Number: 62719-6
Effective Date: July 16, 1992
Product Code: 87116
MSDS Number: 000380
DowElanco • Indianapolis, IN 46268

TORDON* 22K Weed Killer

1. INGREDIENTS: (% w/w, unless otherwise noted)

4-Amino-3,5,6-trichloropicolinic acid, (picloram) Potassium salt
CAS# 002545-60-0 .....24.4%

Inerts 75.6%
Water . . . CAS# 007732-18-5
Plus proprietary dispersing agents

This document is prepared pursuant to the OSHA Hazard Communication Standard (29 CFR 1910.1200). In addition, other substances not 'Hazardous' per this OSHA Standard may be listed. Where proprietary ingredient shows, the identity may be made available as provided in this standard.

2. PHYSICAL DATA:

BOILING POINT: IBP 212°F, 100°C

VAP. PRESS: Approx. 23 mmHg @ 20°C

VAP. DENSITY: Not applic.

SOL. IN WATER: Infinite

SP. GRAVITY: 1.160 (68/68°F, 20°C)

APPEARANCE: Brown liquid.

ODOR: Not available.

3. FIRE AND EXPLOSION HAZARD DATA:

FLASH POINT: None observed up to 214°F (TCC).

METHOD USED: TCC

FLAMMABLE LIMITS:
LFL: Not determined
UFL: Not determined

EXTINGUISHING MEDIA: Alcohol foam, CO2, dry chemical.

FIRE & EXPLOSION HAZARDS: No autoignition temperature when tested to 1022°F. 550°C.

FIRE-FIGHTING EQUIPMENT: Positive-pressure, self-contained air supply. Avoid getting water from fire fighting into domestic or irrigation water supplies.

INCOMPATIBILITY: (SPECIFIC MATERIALS TO AVOID) None under normal use conditions. Under abnormal conditions avoid oxidizing materials and strong acids. Consult manufacturer for specific cases.

HAZARDOUS DECOMPOSITION PRODUCTS: Hydrogen chloride and nitrogen oxides under fire conditions.

HAZARDOUS POLYMERIZATION: Will not occur.

5. ENVIRONMENTAL AND DISPOSAL INFORMATION:

ACTION TO TAKE FOR SPILLS/LEAKS: Absorb in inert material such as sand or sawdust. In case of large spills, dike area to contain. Consult manufacturer for clean-up.

DISPOSAL METHOD: Bury in non-crop land away from water supplies or dispose of in a landfill approv for pesticides in accordance with applicable federal, state and local regulations.

6. HEALTH HAZARD DATA:

EYE: May cause severe eye irritation. Corneal injury is unlikely. Effects likely to heal readily.

SKIN CONTACT: Prolonged or repeated exposure may cause skin irritation, even a burn.

SKIN ABSORPTION: A single prolonged skin exposure is not likely to result in absorption of harmful amounts. The LD50 for skin absorption in rabbits is >2000 mg/kg.

INGESTION: Single dose oral toxicity is extremely low The oral LD50 for male and female rats is >5000 mg/kg. Small amounts swallowed incidental to normal handling operations are not likely to cause injury; swallowing amounts larger than that may cause injury.

INHALATION: Single exposure to vapors is not likely to be hazardous.

SYSTEMIC (OTHER TARGET ORGAN) EFFECTS: Repeated excessive exposures to high amounts may cause liver effects.

CANCER INFORMATION: Did not cause cancer in long-term animal studies.

TERATOLOGY (BIRTH DEFECTS): Birth defects

REPRODUCTIVE EFFECTS

DowElanco
Indianapolis, IN 46268-1189

DowElanco

Material Safety Data Sheet

DowElanco Indianapolis, IN 46268 Emergency Phone: 517-636-4400

Product Code: 87116 Page: 1

Product Name: TORDON (R) 22K WEED KILLER

Effective Date: 07/16/92 Date Printed: 04/14/93 MSDS:000380

1. INGREDIENTS: (% w/w, unless otherwise noted)

4-Amino-3,5,6-trichloropicolinic acid, (picloram) Potassium salt	CAS# 002545-60-0	24.4%
Inerts		75.6%
Water	CAS# 007732-18-5	
Plus proprietary dispersing agents		

This document is prepared pursuant to the OSHA Hazard Communication Standard (29 CFR 1910.1200). In addition, other substances not 'Hazardous' per this OSHA Standard may be listed. Where proprietary ingredient shows, the identity may be made available as provided in this standard.

2. PHYSICAL DATA:

BOILING POINT: IBP 212F, 100C
VAP. PRESS: Approx. 23 mmHg @ 20C
VAP. DENSITY: Not applic.
SOL. IN WATER: Infinite
SP. GRAVITY: 1.160 (68/68F, 20C)
APPEARANCE: Brown liquid.
ODOR: Not available.

3. FIRE AND EXPLOSION HAZARD DATA:

FLASH POINT: None observed up to 214F (TCC).
METHOD USED: TCC

FLAMMABLE LIMITS
LFL: Not determined
UFL: Not determined

EXTINGUISHING MEDIA: Alcohol foam, CO2, dry chemical.

FIRE & EXPLOSION HAZARDS: No autoignition temperature when tested to 1022F, 550C.

3. FIRE AND EXPLOSION HAZARD DATA: (CONTINUED)

FIRE-FIGHTING EQUIPMENT: Positive-pressure, self-contained air supply. Avoid getting water from fire fighting into domestic or irrigation water supplies.

4. REACTIVITY DATA:

STABILITY: (CONDITIONS TO AVOID) Avoid sources of ignition if temperature is near or above flash point.

INCOMPATIBILITY: (SPECIFIC MATERIALS TO AVOID) None under normal use conditions. Under abnormal conditions avoid oxidizing materials and strong acids. Consult manufacturer for specific cases.

HAZARDOUS DECOMPOSITION PRODUCTS: Hydrogen chloride and nitrogen oxides under fire conditions.

HAZARDOUS POLYMERIZATION: Will not occur.

5. ENVIRONMENTAL AND DISPOSAL INFORMATION:

ACTION TO TAKE FOR SPILLS/LEAKS: Absorb in inert material such as sand or sawdust. In case of large spills, dike area to contain. Consult manufacturer for clean-up.

DISPOSAL METHOD: Bury in non-crop land away from water supplies or dispose of in a landfill approved for pesticides in accordance with applicable federal, state and local regulations.

6. HEALTH HAZARD DATA:

EYE: May cause severe eye irritation. Corneal injury is unlikely. Effects likely to heal readily.

SKIN CONTACT: Prolonged or repeated exposure may cause skin irritation, even a burn.

SKIN ABSORPTION: A single prolonged skin exposure is not likely to result in absorption of harmful amounts. The LD50 for skin absorption in rabbits is >2000 mg/kg.

6. HEALTH HAZARD DATA: (CONTINUED)

INGESTION: Single dose oral toxicity is extremely low. The oral LD50 for male and female rats is >5000 mg/kg. Small amounts swallowed incidental to normal handling operations are not likely to cause injury; swallowing amounts larger than that may cause injury.

INHALATION: Single exposure to vapors is not likely to be hazardous.

SYSTEMIC (OTHER TARGET ORGAN) EFFECTS: Repeated excessive exposures to high amounts may cause liver effects.

CANCER INFORMATION: Did not cause cancer in long-term animal studies.

TERATOLOGY (BIRTH DEFECTS): Birth defects are unlikely. Even exposures having an adverse effect on the mother should have no effect on the fetus.

REPRODUCTIVE EFFECTS: No relevant information found.

MUTAGENICITY (EFFECTS ON GENETIC MATERIAL): The preponderance of data shows picloram to be non-mutagenic in 'in vitro' (test tube) tests and in test animals and is therefore believed to pose no mutagenic risk.

7. FIRST AID:

EYES: Irrigate with flowing water immediately and continuously for fifteen minutes. Consult medical personnel.

SKIN: Wash off in flowing water or shower.

INGESTION: Induce vomiting if large amounts are ingested. Consult medical personnel.

INHALATION: Remove to fresh air if effects occur. Consult medical.

NOTE TO PHYSICIAN: If burn is present, treat as any thermal burn, after decontamination. No specific antidote. Supportive care. Treatment based on judgment of the physician in response

7. FIRST AID: (CONTINUED)

to reactions of the patient.

8. HANDLING PRECAUTIONS:

EXPOSURE GUIDELINE(S): Picloram: ACGIH TLV is 10 mg/m3; OSHA PEL is 10 mg/m3 total dust, 5 mg/m3 respirable. Dow IHG is 2 mg/m3 for polyglycol 26-2.

VENTILATION: Control airborne concentrations below the exposure guideline. Good general ventilation should be sufficient for most conditions.

RESPIRATORY PROTECTION: Atmospheric levels should be maintained below the exposure guideline. When respiratory protection is required for certain operations, use an approved air-purifying respirator.

SKIN PROTECTION: For brief contact, no precautions other than clean body-covering clothing should be needed. When prolonged or frequently repeated contact could occur, use protective clothing impervious to this material. Selection of specific items such as gloves, boots, apron or full-body suit will depend on operation.

EYE PROTECTION: Use chemical goggles, safety glasses, or face shield when handling, depending on the type of handling operation.

9. ADDITIONAL INFORMATION:

SPECIAL PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE: Keep out of reach of children. Avoid contact with skin and eyes. Provide eye fountain and washing facilities near work area. Do not ship or store with food, feeds, drugs or clothing. Do not contaminate irrigation or domestic water, food or feed by storage or disposal.

MSDS STATUS: Sections 6, 8 and regsheet Revised 7/92.

REGULATORY INFORMATION: (Not meant to be all-inclusive--selected regulations represented.)

NOTICE: The information herein is presented in good faith and believed to be accurate as of the effective date shown above. However, no warranty, express or implied, is given. Regulatory requirements are subject to change and may differ from one location to another; it is the buyer's responsibility to ensure that its activities comply with federal, state or provincial, and local laws. The following specific information is made for the purpose of complying with numerous federal, state or provincial, and local laws and regulations. See MSD Sheet for health and safety information.

U.S. REGULATIONS

SARA HAZARD CATEGORY: This product has been reviewed according to the EPA "Hazard Categories" promulgated under Sections 311 and 312 of the Superfund Amendment and Reauthorization Act of 1986 (SARA Title III) and is considered, under applicable definitions, to meet the following categories:

An immediate health hazard
A delayed health hazard

TOXIC SUBSTANCES CONTROL ACT (TSCA):

All ingredients are on the TSCA inventory or are not required to be listed on the TSCA inventory.

OSHA HAZARD COMMUNICATION STANDARD:

This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

DUPONT

MATERIAL SAFETY DATA SHEET

FOR

MATERIAL IDENTIFICATION

NUMBER : M0000027
NAME : "Escort" Herbicide

GRADE : 60% Formulation

CHEMICAL FAMILY : Sulfonylurea
CAS NAME : (See Additional Information Section)
MANUFACTURER/DISTRIBUTOR : E.I. du Pont de Nemours & Co., Inc.
1007 Market Street
Wilmington, DE 19898
PRODUCT INFORMATION PHONE : 1-(800)441-7515
TRANSPORTATION EMERGENCY PHONE : 1-(800)424-9300
MEDICAL EMERGENCY PHONE : 1-(800)441-3637

****

COMPONENTS

Material	CAS Number	%
Metsulfuron methyl	74223-64-6	60
Inert Ingredients		40

****

PHYSICAL DATA

Solubility in Water : Dispersible
Odor : Odorless
Form : Solid
Color : Off-white
Specific Gravity : 1.47
Bulk Density : 33.9 lbs/cu ft (loose)

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HAZARDOUS REACTIVITY

Instability : Stable at normal temperatures and storage conditions.
Incompatibility : None reasonably foreseeable.
Decomposition : Decomposition will not occur.
Polymerization : Polymerization will not occur.

IRE AND EXPLOSION DATA

Flammable Limits in Air, % by Vol.
LEL : 0.356 g/L
Not a fire and explosion hazard.

IRE AND EXPLOSION HAZARDS

None.

XTINGUISHING MEDIA

Water Spray. Chemical Foam. Dry Chemical. CO2.

PECIAL FIRE FIGHTING INSTRUCTIONS

Evacuate personnel to a safe area. Wear self-contained breathing apparatus. Use water spray. Cool tank/container with water spray.

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THER PHYSICAL HAZARDS

If area is heavily exposed to fire and if conditions permit, let fire burn itself out since water may increase contamination hazard.

****

EALTH HAZARD INFORMATION

WARNING! May irritate eyes, nose, throat and skin.

Acute oral LD50 (rat): greater than 5,000 mg/kg. Very low toxicity by ingestion.

Acute dermal LD50 (rabbit): greater than 2,000 mg/kg. Slightly to moderately toxic by contact.

Skin irritation (rabbit) and sensitization (guinea pig): not a primary skin irritant, not a sensitizer.

Eye irritation (rabbit): mild to moderate corneal irritation in unwashed eyes and mild conjunctival irritation in washed eyes. All effects reversed within 7 days.

CHRONIC STUDIES: Metsulfuron methyl

FEEDING STUDY: (Technical) No oncogenic effects observed in 18 month mouse and 2 year rat feeding studies.

REPRODUCTION: (Technical) Slightly decreased parental body weight at 5,000 ppm. No effect on rat reproduction or lactation at any dose tested (highest dose tested 5,000 ppm).

(HEALTH HAZARD INFORMATION - CONTINUED)

TERATOGENICITY: (Technical) Not teratogenic or embryo-fetal toxic by gavage in rats (highest dose tested 1,000 mg/kg) or by gavage in rabbits (highest dose tested 700 mg/kg).

MUTAGENICITY: (Technical) Not mutagenic in Ames bacterial assay, Chinese Hamster Ovary Cell assay, or DNA rat liver repair assay; positive in the in vitro Chinese Hamster Ovary Cell cytogenetic assay but negative in the in vivo rat bone marrow cytogenetic assay.

No data is available to confidently predict the effects of overexposure to humans; however, based on animal studies, human health effects of overexposure by inhalation, ingestion, or skin or eye contact may initially include: eye irritation with discomfort, tearing, or blurring of vision; or irritation of the upper respiratory passages.

Carcinogenicity

None of the components in this chemical is listed by IARC, NTP, or OSHA as a carcinogen.

Exposure Limits for "Escort" Herbicide

TLV * (ACGIH) : None Established
PEL (OSHA) : None Established

* TLV is a registered trademark.

Metsulfuron methyl - AEL (DuPont) 10 mg/m3 (8 & 12 hr TWA)

Safety Precautions

Avoid breathing vapors or mist. Avoid breathing dust. Avoid contact with eyes, skin, or clothing. Wash thoroughly after handling. Wash clothing after use.

****

RST AID

INHALATION
If inhaled, remove to fresh air. If not breathing, give artificial respiration, preferably mouth-to-mouth. If breathing is difficult, give oxygen. Call a physician.

SKIN CONTACT
Flush with water after excessive contact.

EYE CONTACT
In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Call a physician.

INGESTION

(FIRST AID - CONTINUED)

No specific intervention is indicated as the compound is not likely to be hazardous by ingestion. However, consult a physician if necessary.

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PROTECTION INFORMATION

Generally Applicable Control Measures and Procedures

Use only with adequate ventilation. Keep away from heat, sparks and flames. Do not consume food, drink or tobacco in the areas where they may become contaminated with this material.

Personal Protective Equipment

Wear chemical splash goggles during mixing/pouring operations or other situations in which eye contact is likely to occur.

Respiratory protection should not be required for normal use and handling. During abnormal exposures, use of an approved pesticide use respirator is recommended.

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POSAL INFORMATION

Aquatic Toxicity : LC50 is greater than 150 ppm for Rainbow Trout.

Spill, Leak, or Release

NOTE: Review FIRE AND EXPLOSION HAZARDS and SAFETY PRECAUTIONS before proceeding with clean up. Use appropriate PERSONAL PROTECTIVE EQUIPMENT during clean up.
Dike spill. Prevent liquid from entering sewers, waterways or low areas. Shovel or sweep up.
If spill area is on ground near valuable plants or trees, remove top 2 inches of soil after initial cleanup.

Waste Disposal

Treatment, storage, transportation and disposal must be in accordance with applicable Federal, State, and Local regulations. Remove nonusable solid material and/or contaminated soil, for disposal in an approved and permitted landfill. Do not flush to surface water or sanitary sewer system.
Triple rinse (or equivalent) the container. Then offer for recycling or reconditioning or puncture and dispose of in a sanitary landfill or by incineration, if allowed.

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SHIPPING INFORMATION

DOT
Proper Shipping Name : Not regulated by D.O.T.
Freight Class : Weed Killing Compound, N.O.S.

****

STORAGE CONDITIONS

Store below 140 deg C. Store in well ventilated area. Keep container tightly closed. Do not store or consume food, drink or tobacco in areas where they may become contaminated with this material. Do not store with other pesticides, fertilizer, food or feed.

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ADDITIONAL INFORMATION AND REFERENCES

Material Identification-CAS Name
Methyl 2-[[[[(4-methoxy-6-methyl-1,3,5-triazin-2-yl)-amino] carbonyl]amino]sulfonyl]benzoate

****

Date of latest Revision : 88/01/11
Person Responsible for MSDS : Registration & Regulatory Aff.
Agricultural Products Dept.
Wilmington, DE 19898

[illegible] 6F2-6376
Banvel

Date: October 15, 1985
Supersedes: March 15, 1979

BANVEL® HERBICIDE

Material Safety Data Sheet

The information provided herein is applicable only to BANVEL® HERBICIDE as manufactured by/for Velsicol Chemical Corporation.

Velsicol Chemical Corporation

Product/Material	BANVEL® HERBICIDE
Manufacturer Address	Velsicol Chemical Corporation 341 East Ohio Street, Chicago, Illinois 60611
EMERGENCY PHONE	312/670-4500

I. Product Information

Trade Name	BANVEL® HERBICIDE, BANVEL® 4S and BANVEL® 4WS
Synonyms	None known
Active Ingredient	Dimethylamine salt of dicamba
Chemical Family	Substituted benzoic acid
Chemical Formula	Mixture
CAS Registry Number	2300-66-5 (Active Ingredient)
DOT Hazard Class	Not regulated

II. Health/Safety Alert

WARNING **HARMFUL IF SWALLOWED. AVOID CONTACT WITH SKIN, EYES AND CLOTHING.**

III. First Aid Procedures

Eye	Flush eyes with tap water for at least 15 minutes. Consult an opthalmologist.
Skin	Wash with mild soap and water. Rinse with copious amounts of water. Launder clothing thoroughly before reuse.
Ingestion	Drink 1 or 2 glasses of water. Induce vomiting by touching back of throat with finger or blunt object. Do not induce vomiting or give anything by mouth to an unconscious person. Consult a physician.
Inhalation	Remove to fresh air. Apply artificial respiration if necessary. Consult a physician.

IN ALL CASES OF EMERGENCY CONTACT A PHYSICIAN.

IV. Note to Pysician

Treatment is symptomatic. For ingestion, lavage stomach with tap water. Instill 30 gm activated charcoal in 3-4 oz of water. Catharsis with 15 gm sodium sulfate in 6-8 oz of water.

V. Fire & Explosion Information

Explosive Limits	Lower: Not applicable Upper: Not applicable
Flammability	Non-flammable
Flash Point	No flash point noticed up to 200°F
Extinguishing Media	Water spray, foam, dry chemical, CO_2
Special Protective Equipment	In case of severe fire involving dicamba solution. protective clothing and self-contained breathing apparatus should be worn.
Special Fire Fighting Procedures	Use water to keep fire exposed containers cool. At first opportunity, remove from fire.
Products of Combustion	May yield steam, dicamba amine salt, HCl, organochloride products, oxides of nitrogen, carbon monoxide.
Unusual Fire and Explosion Hazards	Drums may burst as a result of steam being generated.

VI. Spill Control & Cleanup

Steps to be taken	Contain spill and absorb with clay granules, sawdust or equivalent. Collect and place in suitable container for disposal. Area can be washed down with water and detergent to remove remaining herbicide. DO NOT ALLOW WASHINGS IN SEWER.
Absorbents	Clay granules, sawdust or dirt
Counteractants	Not applicable
Incompatables	None known
Reportable Quantity	1000 lbs. of dicamba

VII. Product/Waste Disposal

Incinerate product/waste at a U.S. EPA permitted waste incinerator.

VIII. Special Precautions

Storage Keep in an area suitable for pesticide storage. Store in a cool, ventilated area away from seed, fertilizers, insecticides or fungicides. Keep away from children, wildlife, domestic animals, and pets.

IX. Health Hazard Information

Primary Route(s) of Entry
Oral: No
Inhalation: Yes
Dermal/Eye: Yes

Carcinogen as determined by:
NTP: No
IARC: No
OSHA: No

Signs and Symptoms of Acute Overexposure Nonspecific. Symptoms may include exhaustion, muscular spasms, urinary incontinence, dyspnea and cyanosis. Severe eye damage may occur. Skin irritation may occur.

Acute Toxicity: Oral The acute oral toxicity (LD_{50}) in rats has been reported to be 2629 mg/kg.

Dermal The acute dermal toxicity (LD_{50}) in rabbits has been reported to be ≥2000 mg/kg.

Inhalation The acute inhalation toxicity (LD_{50}) in rats has been reported to be >200 mg/liter (nominal concentration) for a 4-hour exposure.

Other Toxicological Information
Skin Irritation: Mildly to moderately irritating to the skin of rabbits but not a primary skin irritant.

Eye Irritation: Extremely irritating and may be corrosive to the eyes of rabbits.

Other Repeated high levels of dermal exposure to rabbits has resulted in skin irritation and toxicity. The liver, kidney and lung appear to be the most sensitive organs affected from repeated oral, dermal, and inhalation exposures in experimental animals.

Health Hazard Information (cont.)

Other (continued)

Dicamba, the active ingredient in BANVEL® HERBICIDE, has been studied extensively to determine potential health effects. Animal experimentation with dicamba has not demonstrated any carcinogenic, teratogenic or other reproductive effects with the exception of slightly reduced fetal body weights and post-implantation losses reported at the Maximum Tolerated Dose level. The preponderance of experimental data suggests dicamba is not a mutagen.

X. Recommended General Precautions

Personal Protective Equipment

Under normal conditions of use, respiratory protection is not required. In cases where inhalation is likely, a MSHA/NIOSH approved respirator for pesticides is recommended. In cases where eye and skin contact are likely, use of chemical safety goggles, impermeable gloves, and clean, body-covering clothing are recommended.

XI. Product Information-Hazardous Ingredients

NFPA Rating	**Health:** 1, **Fire:** 0, **Reactivity:** 0, **Special Properties:** None
Exposure Limits	**OSHA PEL:** Not established **ACGIH TLV:** Not established **NIOSH Limit:** Not established
Hazardous Ingredient(s) (As defined by OSHA)	Dimethylamine salt of dicamba (3,6-dichloro-o-anisic acid), 48.2%; TLV: Not established
	Dimethylamine salt of related acids, 12%; TLV: Not established
	Dimethylamine, 17%; TLV: 10 ppm

XII. Physical and Chemical Information

Appearance and Odor	Amber solution, mild amine odor
Molecular Weight	Not applicable
Boiling Point	212° F
Melting Point	Not determined
Vapor Pressure	18 mm Hg as water @ 68°
Vapor Density	> 1.0 (Air = 1)
Specific Gravity	1.190 @ 21°C (H_2O = 1)
Solubility	Miscible in water
Evaporation Rate	Unknown
Stability	Stable
Reactivity	Not applicable
Decomposition Products	None

XIII. Regulatory Status

Regulated by EPA under FIFRA, Clean Water Act and CERCLA (Superfund).

Material Safety Data Sheet

DowElanco

Emergency Phone: 517-636-4400
General Phone: 1-800-352-6776

EPA Reg. Number: 62719-73
Effective Date: August 4, 1992
Product Code: 11388
MSDS Number: 002805
DowElanco • Indianapolis, IN 46268

TRANSLINE* Herbicide

1. INGREDIENTS: (% w/w, unless otherwise noted)

Active Ingredient: 40.9%
Clopyralid (3,6-dichloro-2- pyridinecarboxylic acid), Monoethanolamine salt . . . CAS# 057754-85-5

Inert Ingredients: 59.1%
Water . . . CAS# 007732-18-5
Isopropyl alcohol . . . CAS# 000067-63-0
Proprietary surfactant

This document is prepared pursuant to the OSHA Hazard Communication Standard (29 CFR 1910.1200). In addition, other substances not 'Hazardous' per this OSHA Standard may be listed. Where proprietary ingredient shows, the identity may be made available as provided in this standard.

2. PHYSICAL DATA:

BOILING POINT: 212°F, 100°C

VAP. PRESS: 23.5 mmHg @ 20°C

VAP. DENSITY: 1.06 @ 20°C

SOL. IN WATER: Infinite

SP. GRAVITY: 1.161 @ 68°F, 20°C

APPEARANCE: Dark brown clear liquid

ODOR: Sweet

3. FIRE AND EXPLOSION HAZARD DATA:

FLASH POINT: 117°F, 47.2°C

METHOD USED: TCC

FLAMMABLE LIMITS:
LFL: Not deter.
UFL: Not deter.

EXTINGUISHING MEDIA: Water fog, alcohol resistant foam, CO2, dry chemical, foam preferred.

FIRE & EXPLOSION HAZARDS: Material is a water solution and except under gross fire conditions should not burn. Avoid contaminating water supplies with run-off water.

FIRE-FIGHTING EQUIPMENT: Under fire conditions use a positive pressure self-contained breathing apparatus and protective clothing.

4. REACTIVITY DATA:

STABILITY: (CONDITIONS TO AVOID) Store under cool, dry conditions. Avoid elevated temperatures and direct sunlight. Combustible: do not use or store near heat, open flame, or other sources of ignition, especially if temperatures are near or at the flash point.

INCOMPATIBILITY: (SPECIFIC MATERIALS TO AVOID) Avoid acid, oxidizing material, halogenated organics, brass, copper, zinc, and aluminum.

HAZARDOUS DECOMPOSITION PRODUCTS: Hydrogen chloride, nitrogen oxides under fire conditions, chlorinated pyridine.

HAZARDOUS POLYMERIZATION: Will not occur.

5. ENVIRONMENTAL AND DISPOSAL INFORMATION:

ACTION TO TAKE FOR SPILLS/LEAKS: Absorb spills with inert materials such as sawdust or sand. Dike areas in case of large spills. Do not contaminate water supplies and irrigation ditches.

DISPOSAL METHOD: Bury waste material in approved dump (non-crop land) away from water supplies in accordance with applicable federal, state, and local regulations.

6. HEALTH HAZARD DATA:

EYE: May cause very slight transient (temporary) corneal injury.

SKIN CONTACT: Prolonged exposure may cause skin irritation. Repeated contact may cause drying or flaking of skin.

SKIN ABSORPTION: A single prolonged exposure is not likely to result in the material being absorbed through skin in harmful amounts. The LD50 for skin absorption in rabbits is >5000 mg/kg.

INGESTION: Single dose oral toxicity is low. The oral LD50 for both male and female rats is >5000 mg/kg. Small amounts swallowed incidental to normal handling operations are not likely to cause injury; swallowing amounts larger than that may cause injury.

DowElanco

TRANSLINE* Herbicide

Emergency Phone: 517-636-4400
General Phone: 1-800-352-6776

EPA Reg. Number: 62719-73
Effective Date: August 4, 1992
Product Code: 11388
MSDS Number: 002805
DowElanco • Indianapolis, IN 46268

INHALATION: Excessive vapor concentrations are attainable and could be hazardous on single exposure. The LC50 for rats is >3.0 mg/l. Excessive exposure to isopropanol, a minor component, may cause eye, nose, and throat irritation at around 400 ppm, and at prolonged (hours) and progressively higher levels, incoordination, confusion, hypotension, hypothermia, circulatory collapse, respiratory arrest and even death.

SYSTEMIC (OTHER TARGET ORGAN) EFFECTS: Lethargy may be a sign or symptom of excessive exposure. Repeated excessive exposures to high amounts may cause liver and kidney effects. Observations in animals include middle ear lining damage upon exposure to vapors of isopropanol.

CANCER INFORMATION: Did not cause cancer in long-term animal studies.

TERATOLOGY (BIRTH DEFECTS): For the active ingredient, birth defects are unlikely. Even exposures having an adverse effect on the mother should have no effect on the fetus. At excessively high concentrations (17 times the TLV), isopropanol, a minor component, has been reported to cause birth defects in rats. At progressively lower concentrations there were no birth defects.

REPRODUCTIVE EFFECTS: In animal studies, has been shown not to interfere with reproduction.

MUTAGENICITY (EFFECTS ON GENETIC MATERIAL): Results of in-vitro ('test tube') mutagenicity tests on the active ingredient have been negative. Results of mutagenicity tests on the active ingredient in animals have been negative.

7. FIRST AID:

EYES: Flush with plenty of water. Get medical attention if irritation persists.

SKIN: Wash off in flowing water or shower; use soap if available. Get medical attention.

INGESTION: Induce vomiting if large amounts are ingested. Consult medical personnel.

INHALATION: Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, oxygen should be administered by qualified personnel. Call a physician or transport to a medical facility.

NOTE TO PHYSICIAN: No specific antidote. Supportive care. Treatment based on judgment of the physician in response to reactions of the patient.

8. HANDLING PRECAUTIONS:

EXPOSURE GUIDELINE(S): For isopropyl alcohol, the ACGIH TLV and OSHA PEL are 400 ppm TWA, 500 ppm STEL. An exposure guideline has been established for the proprietary component.

VENTILATION: Control airborne concentrations below the exposure guideline. Good general ventilation should be sufficient for most conditions. Local exhaust ventilation may be necessary for some operations.

RESPIRATORY PROTECTION: Atmospheric levels should be maintained below the exposure guidelines. When respiratory protection is required for certain operations, use an approved air-purifying respirator. If respiratory irritation is experienced, use an approved air-purifying respirator.

SKIN PROTECTION: For brief contact, no precautions other than clean body-covering clothing should be needed. When prolonged or frequently repeated contact could occur, use protective clothing impervious to this material. Selection of specific items such as gloves, boots, apron or full-body suit will depend on operation.

9. ADDITIONAL INFORMATION:

EYE PROTECTION: Use safety glasses.

SPECIAL PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE: Keep out of reach of children and animals. Do not swallow. Avoid contact with eyes, skin and clothing. Wash thoroughly after handling. Remove and wash contaminated clothing. Keep container closed. Do not ship or store with food, feed, drugs or clothing.

MSDS STATUS: Sections 4,7,8 and regsheet Revised 8/92

REGULATORY INFORMATION:

(Not meant to be all-inclusive—selected regulations represented).

NOTICE: The information herein is presented in good faith and believed to be accurate as of the effective date shown above. However, no warranty, express or implied, is given. Regulatory requirements are subject to change and may differ from one location to another; it is the buyer's responsibility to ensure that its activities comply with federal, state or provincial, and local laws. The following specific information is made for the purpose of complying with numerous federal, state or provincial, and local laws and regulations. See MSD Sheet for health and safety information.

DowElanco

TRANSLINE* Herbicide

Emergency Phone: 517-636-4400
General Phone: 1-800-352-6776

EPA Reg. Number: 62719-73
Effective Date: August 4, 1992
Product Code: 11388
MSDS Number: 002805
DowElanco • Indianapolis, IN 46268

SARA HAZARD CATEGORY: This product has been reviewed according to the EPA "Hazard Categories" promulgated under Sections 311 and 312 of the Superfund Amendment and Reauthorization Act of 1986 (SARA Title III) and is considered, under applicable definitions, to meet the following categories:

An immediate health hazard
A delayed health hazard
A fire hazard

TOXIC SUBSTANCES CONTROL ACT (TSCA):
All ingredients are on the TSCA inventory or are not required to be listed on the TSCA inventory.

OSHA HAZARD COMMUNICATION STANDARD:
This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

MONSANTO MATERIAL SAFETY DATA

MONSANTO PRODUCT NAME
RODEO®
Herbicide

MONSANTO COMPANY
800 N. LINDBERGH
ST. LOUIS, MO 63167
EMERGENCY PH. NO. (CALL COLLECT) (314) 694-4000
Date Prepared: March, 1993

PRODUCT IDENTIFICATION

EPA Registration Number:	524-343
Synonyms:	None
Chemical Name:	Not Applicable, Formulated Product
Active Ingredient:	Glyphosate, N-phosphonomethylglycine, in the form of its isopropylamine salt 53.5%
Inert Ingredients:	..... 46.5%
	100.0%

*Contains 648 grams per liter 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 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/I.D. No.:	Not Applicable
DOT Label:	Not Applicable
Reportable Quantity (RQ) Under Clean Water Act:	Not Applicable
U.S. Surface Freight Classification:	Weed killing compound, N.O.I.B.N.

SARA Hazard Notification

Hazardous 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 BE HARMFUL IF INHALED

PRECAUTIONARY MEASURES

- Remove contaminated clothing and wash clothing before reuse.
- 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 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 special protection. Avoid eye contact as good industrial practice.

Skin Protection: RODEO® herbicide does not present significant skin concern requiring special protection.

Respiratory Protection: For Handling of the Undiluted Product: Undiluted RODEO® herbicide is not likely to represent an airborne exposure concern during normal handling. In the event of an accidental discharge of the material during manufacture or handling which produces a heavy vapor or mist, workers should put on respiratory protection equipment. Consult respirator manufacturer to determine appropriate type of equipment. Observe respirator use limitations specified by NIOSH/MSHA or the manufacturer.

For Application of Product Diluted in accordance with label instructions: Respirators are not required for applications of use - dilutions of RODEO® herbicide.

Ventilation: No special precautions are recommended.

Airborne Exposure Limits:

Product: RODEO® herbicide - 100% by weight:

OSHA PEL/TWA: None established ACGIH TLV/TWA/STEL: None established

FIRE PROTECTION INFORMATION

Flash Point: This material is not combustible as tested by the Tag Cup Test.

Extinguishing Media: Use appropriate extinguishing media for exposure fire.

Special Firefighting Procedures: Firefighters or others who may be exposed to mists or products of combustion should wear a self-contained breathing apparatus and full protective 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 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 OR UNLINED STEEL (EXCEPT STAINLESS STEEL) CONTAINERS OR SPRAY TANKS. This product or 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.

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 in an acid-base reaction.

MONSANTO MATERIAL SAFETY DATA

HEALTH EFFECTS SUMMARY

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

EFFECTS OF EXPOSURE

Inhalation and skin 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® herbicide is not expected to produce significant adverse human effects when recommended safety precautions are followed.

TOXICOLOGICAL DATA

Data from laboratory studies conducted by Monsanto with RODEO® herbicide are summarized below.

Oral -	Practically Non-toxic, (Rat LD_{50} - >5,000 mg/kg)
Dermal -	Practically Non-toxic, (Rabbit LD_{50} - >5000 mg/kg)
Inhalation -	No more than Slightly Toxic (Rat 4-hr LC_{50} - >1.3 mg/L, the highest atmospheric concentration achievable in this study.)
Eye Irritation -	Non Irritating (Rabbit, 0.0/110.0)
Skin Irritation -	Practically Nonirritating (Rabbit, 24-hr exposure, 0.1/8.0)

In repeat dosing studies (6-months), dogs fed RODEO® herbicide exhibited slight body weight changes. Following repeated skin exposure (3-weeks) to RODEO® herbicide, skin irritation was the only effect in rabbits. No skin allergy was observed in guinea pigs following repeated skin exposure. Additional toxicity information is available on glyphosate, the active herbicidal ingredient of RODEO® herbicide. Following repeated exposures (90-days) to glyphosate in their feed, decreased weight gains were noted at the highest test level in mice, while no treatment-related effects occurred in rats. Following repeated skin exposure (3 weeks) to glyphosate, slight skin irritation was the primary effect observed in rabbits. No skin allergy was observed in guinea pigs following repeated skin exposure. There was no evidence of effects on the nervous system, including delayed effects in chickens (repeat oral doses) or cholinesterase inhibition in rats (single oral doses). Reduced body weight gain and effects on liver tissues were observed with long-term (2-year) feeding of glyphosate to mice at high-dose levels. Reduced body weight gain and eye changes were observed at the high-dose level in one long-term (2 year) feeding study with rats, while no treatment-related effects occurred in a second study. No adverse effects were observed in feeding studies with dogs. Glyphosate did not produce tumors in any of these studies. **Based on the results from the chronic studies, EPA has classified glyphosate in category E (evidence of non-carcinogenicity for humans).** No birth defects were noted in rats and rabbits given glyphosate orally during pregnancy, even at amounts which produced adverse effects on the mothers. Glyphosate was fed continuously to rats at very high dose levels for 2 successive generations. Toxicity was reported in offspring from the high dose, a level which also produced adverse effects on the mothers. In a 3 generation study conducted at lower dose levels, no effects were seen on the ability of male or female rats to reproduce. Glyphosate has produced no genetic changes in a variety of standard tests using animals and animal or bacterial cells.

PHYSICAL DATA

Appearance:	Colorless solution
Odor:	Essentially odorless
pH:	4.6 - 4.8
Specific Gravity:	1.22 - 1.25 (water = 1)

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

ILL/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 attapulgite, bentonite or other absorbent clays. Collect contaminated absorbent, place in plastic-lined metal drum and dispose of in accordance with instructions provided under DISPOSAL. Thoroughly scrub floor or other impervious surfaces with a strong industrial type detergent solution 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 provided under DISPOSAL.

Leaking containers should be separated from non-leakers and either the 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 similarly 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.

Emptied 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 sanitary landfill or by incineration or, if allowed by State and local authorities, by burning. If burned, stay out of smoke.

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 mg/L, 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} *Daphnia*: 930 mg/L, Practically Nontoxic
Oral LD_{50} Goat: 5,700 mg/Kg, 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 appetite, diarrhea 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 environmental toxicity information of Glyphosate, the active herbicidal ingredient of RODEO® herbicide, refer to the Glyphosate Material Safety Data Sheet.

MONSANTO MATERIAL SAFETY DATA

DATE: March, 1993 SUPERSEDES: February, 1992 MSDS NO.: S00010153

FOR ADDITIONAL NON-EMERGENCY INFORMATION, CALL: 1-800-332-3111

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 representations 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.

DU PONT

Du Pont Agricultural Products

MSDS

M0000022 Revised 12-JAN-1993 Printed 22-JUN-1994

"Krenite" S Brush Control Agent

CHEMICAL PRODUCT/COMPANY IDENTIFICATION

Material Identification

"KRENITE" is a registered trademark of DuPont.

Corporate MSDS Number	DU003056
Grade	CONTAINS 4 LBS. ACTIVE INGREDIENT PER GALLON

Company Identification

MANUFACTURER/DISTRIBUTOR

DuPont
1007 MARKET STREET
WILMINGTON, DE 19898

PHONE NUMBERS

Product Information	1-800-441-7515
Transport Emergency	CHEMTREC 1-800-424-9300
Medical Emergency	1-800-441-3637

COMPOSITION/INFORMATION ON INGREDIENTS

Components

Material	CAS Number	%
FOSAMINE AMMONIUM	25954-13-6	41.5
(AMMONIUM SALT OF FOSAMINE [ETHYL HYDROGEN (AMINOCARBONYL) PHOSPHONATE])		
INERT INGREDIENTS		58.5

HAZARDS IDENTIFICATION

Potential Health Effects

WARNING! Causes eye irritation.

(Continued)

HAZARDS IDENTIFICATION(Continued)

ANIMAL DATA:

Oral LD50: > 5,000 mg/kg (rats)
Very low toxicity.

Dermal LD50: > 5,000 mg/kg (rabbit)
Slightly toxic.

SKIN

Not a primary skin irritant when applied as 0.5 ml undiluted formulation to shaved, intact, or abraided skin of rabbits.

EYE

Caused mild to no corneal opacity and temporary severe to moderate conjunctival irritation in the unwashed rabbit eyes. Eyes were normal within 7 days.

INHALATION

LC50 (4-hour): 3.30 mg/L (male rats); LC50: 2.75 mg/L (females) Moderately toxic.

SUBCHRONIC STUDIES - FOSAMINE AMMONIUM

90-Day Rat Feeding Study: Slight effects on kidneys of male rats at 5,000-10,000 ppm, 1,000 ppm no-effect level.

6-Month Dog Feeding Study: No nutritional, clinical, hematological, biochemical, urinary, or gross pathological evidence of toxicity in the test dogs fed 10,000 ppm. Relative stomach weights were significantly high at 10,000 ppm but were associated with no other clinical or gross pathological changes.

1-Generation Rat Reproduction Study: No reproductive effects seen at 5,000 ppm, the highest level fed.

TERATOGENICITY STUDIES

Not teratogenic or embryotoxic in rats at 10,000 ppm, the highest level fed.

MUTAGENICITY STUDIES

Not mutagenic in Ames, CHO point mutation and DNA repair (UDS) assays. Mutagenic in in vitro Cytogenetic assay, but negative in in vivo Cytogenetic assay.

HUMAN HEALTH EFFECTS

Overexposure by excessive skin contact with fosamine ammonium may initially cause skin irritation with discomfort

(Continued)

HAZARDS IDENTIFICATION(Continued)

or rash. Significant skin permeation, and systemic toxicity, after contact appears unlikely.

Eye contact may initially include eye irritation with discomfort, tearing, or blurring of vision.

Inhalation may include irritation of the upper respiratory passages, and nonspecific discomfort, such as nausea, headache, or weakness.

Ingestion of high doses may include nonspecific discomfort, such as nausea, headache, or weakness.

Carcinogenicity Information
None of the components present in this material at concentrations equal to or greater than 0.1% are listed by IARC, NTP, OSHA or ACGIH as a carcinogen.

FIRST AID MEASURES

First Aid
INHALATION

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.

SKIN CONTACT

In case of contact, immediately wash skin with soap and water. Wash contaminated clothing before reuse.

EYE CONTACT

In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Call a physician.

INGESTION

No specific intervention is indicated as compound is not likely to be hazardous by ingestion. Consult a physician if necessary.

FIRE FIGHTING MEASURES

Flammable Properties
Not a fire or explosion hazard.

Extinguishing Media
Water Spray, Foam, Dry Chemical, CO2.

(Continued)

FIRE FIGHTING MEASURES(Continued)

Fire Fighting Instructions
Wear self-contained breathing apparatus. Wear full protective equipment. Use water spray. Cool tank/container with water spray. Runoff from fire control may be a pollution hazard.

If area is heavily exposed to fire, and if conditions permit let fire burn itself out since water may increase the contamination area.

ACCIDENTAL RELEASE MEASURES

Safeguards (Personnel)
NOTE: Review FIRE FIGHTING MEASURES and HANDLING (PERSONNEL) sections before proceeding with clean-up. Use appropriate PERSONAL PROTECTIVE EQUIPMENT during clean-up.

Initial Containment
Dike spill. Prevent material from entering sewers, waterways, or low areas.

Spill Clean Up
Soak up with sawdust, sand, oil dry or other absorbent material. Shovel or sweep up. Never return to container for reuse. Scoop into bags or boxes with plastic or aluminum shovel.

Accidental Release Measures
If spill area is on ground near valuable plants or trees, remove top 2 inches of soil after initial cleanup.

HANDLING AND STORAGE

Handling (Personnel)
Do not get in eyes, on skin, or on clothing. Avoid breathing vapors or mist. Wash thoroughly after handling. Do not store or consume food, drink or tobacco in areas where they may become contaminated with this material.

Storage
Store in a well ventilated place. Keep container tightly closed. Do not store or consume food, drink or tobacco in areas where they may become contaminated with this material.

EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls
Use only with adequate ventilation. Keep container tightly closed.

(Continued)

EXPOSURE CONTROLS/PERSONAL PROTECTION(Continued)

Personal Protective Equipment

Label instructions do not specify any PPE to be worn when handling this product.

The protective equipment listed below is recommended for industrial handling and formulation:

Wear safety glasses. Wear coverall chemical splash goggles and face shield when the possibility exists for eye and face contact due to splashing or spraying of material.

Wear protective clothing such as gloves, apron, boots, or coveralls, as appropriate.

Respiratory protection should not be required for normal use and handling. During abnormal exposures, use of an approved pesticide respirator is recommended.

Exposure Guidelines

Exposure Limits

"Krenite" S Brush Control Agent

PEL	(OSHA)	None Established
TLV	(ACGIH)	None Established

PHYSICAL AND CHEMICAL PROPERTIES

Physical Data

Solubility in Water	Soluble
Form	Liquid
Color	Amber
Specific Gravity	1.17 @ 24C (75F)

STABILITY AND REACTIVITY

Chemical Stability

Stable at normal temperatures and storage conditions.

Incompatibility with Other Materials

None reasonably foreseeable.

Decomposition

Decomposition will not occur.

Polymerization

Polymerization will not occur.

(Continued)

ECOLOGICAL INFORMATION

Ecotoxicological Information
Aquatic Toxicity

The active ingredient demonstrates low toxicity.

96 hour LC50, fathead minnows: > 1,000 mg/L
96 hour LC50, rainbow trout: 300 mg/L
96 hour LC50, bluegill sunfish: 590 mg/L
48 hour LC50, daphnia magna: 1,524 ppm

ENVIRONMENTAL TOXICITY

Oral LD50, mallard duck: > 10,000 mg/kg
Oral LD50, bobwhite quail: > 10,000 mg/kg

DISPOSAL CONSIDERATIONS

Waste Disposal
Treatment, storage, transportation, and disposal must be in accordance with applicable Federal, State/Provincial, and Local regulations. Recover nonusable free liquid and dispose of in approved and permitted incinerator. Do not flush to surface water or sanitary sewer system.

Do not contaminate water, food, or feed by storage or disposal. Wastes resulting from the use of this product may be disposed of on site or at an approved waste disposal facility.

CONTAINER DISPOSAL: Triple rinse (or equivalent) the container. Then offer for recycling or reconditioning, or puncture and dispose of in a sanitary landfill, or incineration, or, if allowed by State and Local authorities, by burning. If burned, stay out of smoke.

TRANSPORTATION INFORMATION

Shipping Information
DOT/IMO
Proper Shipping Name NOT REGULATED

REGULATORY INFORMATION

U.S. Federal Regulations
TITLE III HAZARD CLASSIFICATIONS SECTIONS 311, 312

Acute : Yes
Chronic : No
Fire : No
Reactivity : No
Pressure : No

(Continued)

OTHER INFORMATION

NFPA, NPCA-HMIS

NFPA Rating	
Health	1
Flammability	0
Reactivity	0
NPCA-HMIS Rating	
Health	1
Flammability	0
Reactivity	0

Personal Protection rating to be supplied by user depending on use conditions.

Additional Information

This product is registered under EPA/FIFRA regulations.

EPA Reg. No. 352-395.

The data in this Material Safety Data Sheet relates only to the specific material designated herein and does not relate to use in combination with any other material or in any process.

Responsibility for MSDS	Du Pont
Address	Agricultural Products Wilmington, DE 19898
Telephone	800-441-7515

End of MSDS

APPENDIX D

APPENDIX D: BIOCONTROL AGENTS RELEASED ON THE SMITH RIVER FROM 1991-1996

SITE NUM.	RELEASE DATE	AGENT	NUMBER PLACED	RESP. AGENCY	LEGAL DESCRIPTION	SITE* REVIEW	NOTES
MC7-91	Jul-91	APNI	250	MCWD	SE28,T13N,R4E?	1993/ND	Across fr. Lazy10 cabin; Wside of river, est. unknown
							Rust found on leafy spurge
MC8-91	Jul-91	APNI	250	MCWD	SE29,T13N,R4E	1993/ND	Possible location 25' up fr. fir tree & 15' up fr. end of
							Indian Sp. BC sign
MC9-91	Jul-91	APNI	250	MCWD	NWNE18,T13N,R4E	1993/ND	93 photo, stake located
						1996/ND	
MC10-91	Jul-91	APNI	250	MCWD	SE25,T14N,R3E	1993/ND	93 photo, no stake
						1996/ND	No insects detected.
MC11-91	Jul-91	APNI	250	MCWD	SE25,T14N,R3E	1992/ND	Tenderfoot, cabin corner post
						1993/E	APNI thriving at site, moved 1000 to other S and W facing
						1994/E	dry sites. Released 500 APNI fr APHIS on upper & NE area.
						1995/E	
						1996/E	Collect about 2250 APNI for redistribution downstream
MC12-91	Jul-91	APNI	250	MCWD	SE25,T14N,R3E	NR	Tenderfoot, thru trees in clearing
MC13-91	Jul-91	APNI	250	MCWD	SE25,T14N,R3E	1993/ND	Tenderfoot, top of bench, 93 photo
MC14-91	Jul-91	APNI	250	MCWD	SE25,T14N,R3E	NR	N. side Tenderfoot
MC15-91	Jul-91	APNI	250	MCWD	not found		
MC16-91	Jul-91	APFL	250	MCWD	E29,T13,R4E	1993/ND	Middle of island
						1996/ND	
MC17-91	Jul-91	APFL	250	MCWD	Sec 18,T13N,R4E?	NR	Not found
						1996/ND	Not a suitable site
MC18-91	Jul-91	APFL	250	MCWD	SE7,T13N,R4E	1993/ND	Island
						1996/ND	No bugs, poor site, too early to collect.
MC19-91	Jul-91	APFL	250	MCWD	SW31,T14N,R4E	NR	Island before Dry Canyon sign
						1996/ND	No insects detected.
MC20-91	Jul-91	APFL	250	MCWD	SE25,T14N,R3E	1993/ND	Tenderfoot, 10 paces fr. cedar
						1994/E	Collected 20 APFL by Smith R.
MC21-91	Jul-91	APFL	250	MCWD	NE25,T14N,R3E	1993/ND	Around corner fr. Tenderfoot, R. bank
MC22-91	Jul-91	APFL	250	MCWD	SE24,T14N,R3E	NR	Scotty Allens cabin
MC23-91	Jul-91	APFL	250	MCWD	NE13,T14N,R3E	NR	1 mi. upstream fr. Cow Coulee Island
MC24-91	Jul-91	APFL	250	MCWD	E12,T14N,R3E	NR	McMicking on Benett, by cottonwood W side
USFS1-91	Jul-91	APNI	500	USFS	SW30,T14N,R4E	1992/ND	Riparian area, Tenderfoot
							HYEU found on site in '91
USFS2-91	Jul-91	APNI	?	USFS	NESW24,T14N,R3E	NR	Sheep Wagon BC
USFS3-91	Jul-91	APNI	500	USFS	SE24,T15N,R3E	NR	Ranger Sta. Flat or Bear Gu. BC

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SITE NUM.	RELEASE DATE	AGENT	NUMBER PLACED	RESP. AGENCY	LEGAL DESCRIPTION	SITE* REVIEW	NOTES
USFS4-91	Jul-91	APNI	?	USFS	SE24,T15N,R3E	NR	Ranger Sta. Flat or Bear Gu. BC, Riparian
USFS5-91	Jul-91	APNI	500	USFS	NW18,T15N,R4E	NR	Table Rock BC
USFS6-91	Jul-91	APNI	500	USFS	NW31,T16N,R4E	NR	Parker Flats BC
AGENTS RELEASED IN 1992							
MC1-92	Jul-92	APNI	200	MTDOA	SE25,T14N,R3E	NR	Next to MC20-91
USFS1-92	Jul-92	APNI	?	USFS	S30,T14N,R4E	NR	Riparian area, Tenderfoot
USFS2-92	Jul-92	APNI	?	USFS	S30,T14N,R4E	NR	Riparian area, Tenderfoot
AGENTS RELEASED IN 1994							
MC1-94	Jul-94	APNI	250	MCWD	NW26T13NR4E	NR	J. Bowman Williams Ranch
MC2-94	Jul-94	APNI	250	MCWD	SW26T13NR4E	NR	Elk Canyon Ranch
MC3-94	Jul-94	APNI	500	MCWD	NWNE3,T12N,R4E	NR	Elk Canyon Ranch
MC4-94	Jul-94	APNI	200	MCWD	NWSE25,T14N,R3E	1995/E	N end of field, thru stone shelter, top of river ledge
MC5-94	Jul-94	APCY	250	MCWD	NWSE25,T14N,R3E	1996/ND	N end of field, thru stone shelter, top of river ledge
MC6-94	Jul-94	APFL	500	MCWD	NWSE25,T14N,R3E	1996/ND	N end of field, thru stone shelter, top of river ledge
MC7-94	Jul-94	APFL	500	MCWD	NWSE25,T14N,R3E	1996/ND	N end of field, thru stone shelter, top of river ledge
CC1-94	Jul-94	APNI	500	CCWD	SW29,T17N,R3E	NR	
CC2-94	Jul-94	APNI	500	CCWD	NE18,T17N,R3E	1995/ND	Eden Bridge Take Out
CC3-94	Jul-94	APNI	500	CCWD	NE18,T17N,R3E	1995/ND	Eden Bridge Take Out
AGENTS RELEASED IN 1995							
MC1-95	Jul-95	APNI	1500	MCWD	SWSW35,T13NR4E	NR	Elk Canyon Ranch, (APNI fr. APHIS)
MC2-95	Jul-95	APNI	500	MCWD	SWSW35,T13NR4E	NR	Elk Canyon Ranch, (APNI fr. APHIS)
MC3-95	Jul-95	APFL	400	MCWD	NWSE25,T14N,R3E	1996/ND	Tenderfoot, near Smith R.
MC4-95	Jul-95	SPES	1 BNDL	MCWD	NWSE25,T14N,R3E	1996/ND	Tenderfoot, near Smith R.
CC1-95	Jul-95	APNI	1000	CCWD	NW30,T15N,R4E	NR	Watkins/Thompson
CC2-95	Jul-95	APNI	1000	CCWD	NW30,T15N,R4E	NR	Watkins/Thompson
BLM1-95	Jul-95	APLA	250	BLM	SW30,T16N,R4E	NR	Released by Vic Roberts,near Paradise Bend BC
		APCZ	80	BLM	SW30,T16N,R4E		330 total insects released, estimated APCZ=80 & APLA=250
FWP1-95	Jul-95	APNI	300-800	FWP	NW30,T14N,R4E	NR	N side of Rvr. from Canyon Depth BC (APNI fr. site MC11-91)
FWP2-95	Jul-95	APNI	300-800	FWP	NW30,T14N,R4E	NR	Bench upstream fr Canyon Depth BC (APNI fr. site MC11-91)
FWP3-95	Jul-95	APNI	300-800	FWP	NW30,T14N,R4E	NR	Bench upstream fr Canyon Depth BC (APNI fr. site MC11-91)
FWP4-95	Jul-95	APNI	300-800	FWP	SE24,T14N,R3E	1996/E	Two Creeks BC, L of trail to latrine @ top of bench (MC11-91)
FWP5-95	Jul-95	APNI	300-800	FWP	NE36,T14N,R3E	NR	County Line BC, N end of camp on bench (APNI fr.. MC11-91)
FWP6-95	Jul-95	APNI	300-800	FWP	W30,T15N,R4E	NR	Bear Gulch BC,both sides of road bet. camp(APNI fr. MC11-91)
FWP7-95	Jul-95	APNI	300-800	FWP	W30,T15N,R4E	NR	Upper Bear Gulch BC, river side of road (APNI fr. MC11-91)
FWP8-95	Jul-95	APNI	300-800	FWP	S11,T16N,R3E	NR	Upper Given BC,above upper camp on middle bench (MC11-91)

APPENDIX D: BIOCONTROL AGENTS RELEASED ON THE SMITH RIVER FROM 1991-1996

SITE NUM.	RELEASE DATE	AGENT	NUMBER PLACED	RESP. AGENCY	LEGAL DESCRIPTION	SITE* REVIEW	NOTES
FWP9-95	Jul-95	APNI	300-800	FWP	S11,T16N,R3E	NR	Middle Given BC, L bend on trail to latrine (APNI fr. CCWD)
FWP10-95	Jul-95	APNI	300-800	FWP	S11,T16N,R3E	NR	Middle Given BC, around latrine sign (APNI fr. CCWD)
FWP11-95	Jul-95	APNI	300-800	FWP	S11,T16N,R3E	NR	Middle Given BC, E side of rvr, base of talus(APNI fr. CCWD)
FWP12-95	Jul-95	APNI	300-800	FWP	S11,T16N,R3E	NR	Middle Given BC, E side of rvr, base of talus(APNI fr. CCWD)
FWP13-95	Jul-95	APNI	300-800	FWP	S11,T16N,R3E	1996/E	Lower Given BC, near lower fire ring (APNI fr. CCWD)-stake
FWP14-95	Jul-95	APNI	300-800	FWP	S11,T16N,R3E	1996/E	Lower Given BC, to R of trial to upper fire ring -stake
FWP15-95	Jul-95	APNI	300-800	FWP	S11,T16N,R3E	1996/E	Lower Given BC, N edge of upper fire ring (APNI fr. CCWD)
FWP16-95	Jul-95	APNI	300-800	FWP	S11,T16N,R3E	1996/E	Lower Given BC, spurge E of upper fire ring(APNI fr. CCWD)
FWP17-95	Jul-95	APNI	300-800	FWP	S11,T16N,R3E	1996/ND	Upper Rattlesnake BC, upper end above rapids (CCWD)
FWP18-95	Jul-95	APNI	300-800	FWP	SW11,T16N,R3E	1996/ND	Upper Rattlesnate BC, S of latrine to river (stake) (CCWD)
FWP19-95	Jul-95	APNI	300-800	FWP	SW11,T16N,R3E	1996/E	Between Upper & Lower Rattlesnate BC, (stake) (CCWD)
FWP20-95	Jul-95	APNI	300-800	FWP	SE3,T16N,R3E	NR	Approx. 1 mi. below Rattlesnake Bend BC on W side
FWP21-95	Jul-95	APNI	300-800	FWP	SE3,T16N,R3E	NR	Approx. 1 mi. below Rattlesnake Bend BC on W side
AGENTS RELEASED IN 1996							
FWP1-96	Jun-96	APNI	250	FWP	NWNW30,T14N,R4E		N side of Rvr. from Canyon Depth BC (APNI fr. site MC11-91)
FWP2-96	Jun-96	APNI	500	FWP	SE24,T14N,R3E		Two Creeks BC, 300' L of original release (FWP4-95)
FWP3-96	Jun-96	APNI	1000	FWP	SE24,T14N,R3E		Two Creeks BC, 300' R of trail to latrine @ top of bench
FWP4-96	Jun-96	APNI	500	FWP	SE24,T14N,R3E		Two Creeks BC, upper 1/4 acre patch of spurge on bench
FWP5-96	Jun-96	APNI	1000	FWP	SE24,T14N,R3E		Two Creeks BC, 500' R of trail to latrine @ top of bench
FWP6-96	Jul-96	APNI	1000	FWP	NESE12,T16N,R3E		200 yds below Merganser Bend BC, left bank by chair sized
							rock on bench.
FWP7-96	Jul-96	APNI	1000	FWP	SE11,T16N,R3E		Upstream of pvt land sizn on bench, right side river, post at
							upstream end of release
FWP8-96	Jul-96	APNI	1000	FWP	SE11,T16N,R3E		80 yds down from 7-96 in open area, right bank.
FWP9-96	Jul-96	APNI	1000	FWP	SE11,T16N,R3E		Left bank, above Givens Gulch. upslope near base of tree, post
FWP10-96	Jul-96	APNI	1000	FWP	SE11,T16N,R3E		Right bank, opposite Givens island. top of bank above gully
							near juniper trees
FWP11-96	Jul-96	APNI	1000	FWP	SE11,T16N,R3E		Same bench as 10-96 on downstream end.
FWP12-96	Jul-96	APNI	1000	FWP	SE11,T16N,R3E		Up gulch above juniper on same bench as 11-96.
FWP13-96	Jul-96	APNI	1000	FWP	SE11,T16N,R3E		Right bank opposite Middle Givens Gulch on bench,post.
FWP14-96	Jul-96	APNI	1000	FWP	SE11,T16N,R3E		Right bank opposite Middle Givens Gulch on bench,post.
FWP15-96	Jul-96	APNI	1000	FWP	SE11,T16N,R3E		Right bank opposite Middle Givens Gulch on bench,post.
FWP16-96	Jul-96	APNI	1000	FWP	SE11,T16N,R3E		Upstream end of Middle Givens Gulch BC. post
FWP17-96	Jul-96	APNI	1000	FWP	SE11,T16N,R3E		Upstream end of Lower Givens BC, upper bench, west of
							Juniper tree on bench edge.

APPENDIX D: BIOCONTROL AGENTS RELEASED ON THE SMITH RIVER FROM 1991-1996

SITE NUM.	RELEASE DATE	AGENT	NUMBER PLACED	RESP. AGENCY	LEGAL DESCRIPTION	SITE* REVIEW	NOTES
FWP18-96	Jul-96	APNI	1000	FWP	NESW11,16N,R3E		Isolated patch E of Lower Rattlesnake BC
FWP19-96	Jul-96	APNI	1000	FWP	NESW11,16N,R3E		Below "end of BC" sign below Rattlesnake BC. above
							fishermans trail. post.
FWP20-96	Jul-96	APNI	1000	FWP	NW11,T16N,R3E		Bottom end of Rattlesnake BC bench. Above fisherman trail,
							upstrem end on patch, light infestation.
FWP21-96	Jul-96	APNI	1000	FWP	NW11,T16N,R3E		Left bank across from 19-96.
FWP22-96	Jul-96	APNI	1000	FWP	NESW11,16N,R3E		Along bank edge toward river from 96-21.
FWP23-96	Jul-96	APNI	1000	FWP	NW11,T16N,R3E		Downstream end of 22-96, left bank. from post and to east.
FWP24-96	Jul-96	APNI	1000	FWP	NW11,T16N,R3E		Patch west of 23-96 along bench edge.
FWP25-96	Jul-96	APNI	1000	FWP	NW11,T16N,R3E		Right bank, bench below 24-96. Edge of bench, above & below
USFS1-96	Jul-96	APLA	500	USFS	NW18,T15N,R4E		Upper Table Rock BC, 200 ft upstream,post - see map
USFS2-96	Jul-96	SPES	1 BNDL	USFS	NW18,T15N,R4E		Upper Table Rock BC, post-see map
USFS3-96	Jul-96	SPES	1 BNDL	USFS	NW18,T15N,R4E		Upper Table Rock BC, post-see map
USFS4-96	Jul-96	APNI	2000	USFS	NW18,T15N,R4E		Upper Table Rock BC, post-see map
USFS5-96	Jul-96	APLA	500	USFS	SE18,T15N,R4E		Crows foot BC, post - mix of APLA & APCZ-see map
USFS6-96	Jul-96	SPES	1 BNDL	USFS	SE18,T15N,R4E		Crows foot BC, post- see map
USFS7-96	Jul-96	APLA	500	USFS	NW19,T15N,R4E		Mouth of Trout Creek, post - mix of APLA & APCZ-see map
USFS8-96	Jul-96	SPES	1 BNDL	USFS	NW19,T15N,R4E		Mouth of Trout Creek, post -see map
USFS9-96	Jul-96	APNI	2500	USFS	NW19,T15N,R4E		Mouth of Trout Creek, post-see map
USFS10-96	Jul-96	SPES	1 BNDL	USFS	NW19,T15N,R4E		Mouth of Trout Creek, post-see map
USFS11-96	Jul-96	APNI	1000	USFS	NW19,T15N,R4E		Mouth of Trout Creek, post-see map
USFS12-96	Jul-96	APNI	500	USFS	NW19,T15N,R4E		Trout Creek flats, post-see map
USFS13-96	Jul-96	SPES	1 BNDL	USFS	NW19,T15N,R4E		Watkins Border to south, post-see map
USFS14-96	Jul-96	APNI	1000	USFS	NW19,T15N,R4E		Watkins Border to south, post- see map
USFS15-96	Jul-96	SPES	1 BNDL	USFS	SW19,T15N,R4E		Trout Creek BC, post-see map
USFS16-96	Jul-96	APLA	500	USFS	SE24,T14NR3E		Two Creeks BC
USFS17-96	Jul-96	APLA	250	USFS	NE36,T15N,R3E		County Line BC, 80 ft below firepit- see release form
USFS18-96	Jul-96	APLA	500	USFS	NW18,T15N,R4E		Table Rock BC, middle - see release form
USFS19-96	Jul-96	APLA	250	USFS	SW24,T14N,R3E		Sheep Wagon Boat Camp - see release form
USFS20-96	Jul-96	APLA	1000	USFS	NE12,T14N,R3E		Upper Middle Cow Coulee BC - see release form
USFS21-96	Jul-96	SPES	1 BNDL	USFS	SE25,T14N,R3E		Dawson's, mouth of Tenderfoot - see release form
USFS22-96	Jul-96	SPES	1 BNDL	USFS	SE25,T14N,R3E		Dawson's, mouth of Tenderfoot - see release form
USFS23-96	Jul-96	APLA	500	USFS	SE25,T14N,R3E		Dawson's, mouth of Tenderfoot - see release form
USFS24-96	Jul-96	APLA	500	USFS	SE25,T14N,R3E		Dawson's, mouth of Tenderfoot - see release form
USFS25-96	Jun-96	APLA	200	USFS	SW11,T16N,R3E		Upper Rattlesnate BC, S facing hillside next to river.

APPENDIX D: BIOCONTROL AGENTS RELEASED ON THE SMITH RIVER FROM 1991-1996

SITE NUM.	RELEASE DATE	AGENT	NUMBER PLACED	RESP. AGENCY	LEGAL DESCRIPTION	SITE* REVIEW	NOTES
MC1-96	Jun-96	APLA	1000	MCWD	NWSE25,T14N,R3E		Tenderfoot, near Smith R.

SUMMARY OF RELEASES

TOTAL 24	1991	APNI	4250+	Note: Tenderfoot area received 1750
		APFL	2250	Note: Tenderfoot area received 500
TOTAL 3	1992	APNI	200+	Note: Tenderfoot area
TOTAL 10	1994	APNI	3000	Note: Tenderfoot area received 200
		APFL	1000	Note: Tenderfoot area received 500
		APCY	250	Note: Tenderfoot area received 250
TOTAL 28	1995	APNI	13600+	Note: Tenderfoot area received 3900
		APCZ	80	Note: Paradise Bend BC
		APLA	250	Note: Paradise Bend BC
		APFL	400	Note: Tenderfoot area
		SPES	1BNDL	Note: Tenderfoot area
TOTAL 51	1996	APNI	30250	Note: FWP releases from CCWD
		SPES	9 BNDL'S	Note: Insects from G. Markin
		APLA	6200	Note: Mix of APLA and APCZ

Legend:
MCWD= Meagher County Weed District
CCWD=Cascade County Weed District
FWP=Mt. Dept. Fish Wildlife & Parks, Gt. Falls
APNI= Aphthona nigriscutis
APFL= Aphthona flava
APCY= Aphthona cyparissiae
APCZ= Aphthona czwalinae
APLA= Aphthona lacertosa - mix of APLA and APCZ
SPES=Spurgia esula

*ND=not detected
*E=established
*NR=not reviewed

APPENDIX E

Appendix E: Threatened, endangered, and sensitive plant and wildlife species within areas managed by FWP Region 4, FWP.

Site Name	Species of Special Concern	State Rank	Global Rank	USFS Status
Sun River	information pending			
Blackleaf WMA	Grizzly bear- *Ursus arctos horribiis*	S1S2	G4T3	THREATENED
	Westslope cutthroat trout- *Oncorhynchus clarki lewisi*	S3	G4TE	SENSITIVE
	Poor sedge, *Carex paupercula*	S2S3	G5	SENSITIVE
	Small yellow lady's slipper *Cypripedium calceolus*	S2S3	G5	SENSITIVE
	Autum willow - *Salix serissima*	S1	G4	WATCH
Ear Mountain WMA	Grizzly bear- *Ursus arctos horribiis*	S1S2	G4T3	THREATENED
	Westslope cutthroat trout- *Oncorhynchus clarki lewisi*	S3	G4TE	SENSITIVE
	White-margined knotweed - *Polygonum polygaloides*	S2	G4G5	
	Austins knotweed - *P. douglasii*	S2S3	G4T4	SENSITIVE
Freezeout Lake WMA	black-crowned night-heron- *nycticorax nycticorax*	S2S3B SZN	G5	
	Black tern- *Chlidonias niger*	S3B,SZN	G4	
	Great basin downingia - *Downingia laeta*	S1	G5	
	Clarks grebe - *Aechmophorus clarkii*	S2S3B	G5	
	Baird's sparrow - *Ammodramus bairdii*	S3S4B,SZN	G3G4	
	Franklin's gull - *Larus pipixcan*	S3B,SZN	G5	
	Common tern - *Sterna hirundo*	S3B,SZN	G5	
	Black necked stilt -*Himantopus mexicanus*	S2S3B	G5	
	Foresters tern - *Sterna forsteri*	S2S3B	G5	
Beartooth WMA	Bald eagle- *Haliaeetus leucocephalus*	S3B,S3N	G4	ENDANGERED
Giant Sp/Heritage State Park	white four o'clock - *Mirabilis albida* (recently discovered)			

APPENDIX F

NOXIOUS WEED MONITORING PLAN

Monitoring will be conducted to establish baseline data and record changes in noxious weed populations following herbicide applications. Changes will be recorded by measuring weed density along permanent transects and/or utilizing photo points. Because of the large number of sites and budget constraints, it is not possible to conduct the level of sampling required to statistically analyze results. However, if permanent transects are used, means from data can be compared to determine changes in weed density over time. Reports, including data tables, figures, and photographs will be made annually.

Monitoring Techniques:

1. Permanent transects: A total of 3, 30 foot permanent transects will be established within key sites in FAS, SP, and WMA. Sites selected for transects will be representative of the area in terms of topography, weed density, other vegetation, aspect, and soil type. Baseline site information will be recorded for each access site. Weed density counts will be collected within 5, 0.25 meter square plot frames along each transect (10 per site) prior to herbicide applications. Effectiveness of treatments will be determined by collecting weed density data after fall regrowth is initiated and following peak plant growth. Density measurements will be collected on mature and seedling weed species if possible. Forage production data may be collected from access sites with treated and comparison non-treated areas. Pre and post application data means will be compared, and graphs developed to depict data results.

Photo points will also be established on each permanent transect to visually record changes over time.

2. Photo Plots: Photo plots are established on typical or representative sites within a weed management area. Two photographs (a long view and a close-up) should be taken from each photo point. A steel post or other permanent stake will be used to mark the permanent photo point. Although a visible stake makes it easier to relocate the photo point, it is often necessary to choose a stake that minimizes conflicts with resource users.

A field form will be used to systematically record the location, time of year, and weed species information for each photograph. Description of each photo point will include: photo point number or name, name of photographer, date of photograph, date established, time of day, location, comments and notations on vegetation and other conditions. To make it easier to re-photograph the exact scene, a tree, large rock, old building, or some other characteristic feature of the landscape will be included in the long-view photo. Close-up plots will be taken about 5 to 10 feet from the photo point.

Collection of these data will provide a photographic collection for portraying changes at sites on a large scale and to transfer this information to various audiences that may not have a scientific background. The strengths of repeated photographs in monitoring vegetation change are: 1) a complete inventory of the landscape is encased in the picture, and 2) rates of vegetation change and events associated with that change are visually documented.

APPENDIX G

NOTICE

This area has been sprayed with a herbicide to help control noxious weeds.

_____

Herbicide used

_____

Target weed

_____

Date Sprayed

For questions call (406) 454-5840.
This weed control action is in accordance with the FWP Region Four Weed Management Plan. All herbicides used have been registered by the EPA, approved for use in Montana, and applied by a licensed herbicide applicator.

Montana Department of Fish, Wildlife & Parks

APPENDIX H

HERBICIDE EMERGENCY RESPONSE PLAN

The improper use or accidental release of an herbicide may pose serious health and environmental hazards. Accidental spills and releases must be managed quickly and efficiently to protect human health and the environment. Additional information on the handling and use of herbicides can be found in the Montana Pesticide Act (80.8.101 MCA) and its Administrative Rules (ARM 4.10.101).

During herbicide emergencies, the first priority is the safety of personnel involved in the accident. The next priority is spill containment and clean-up to minimize environmental contamination.

This plan outlines field response and reporting procedures to follow in the event of a herbicide spill. This plan applies to all DFWP personnel and contractors when an accident occurs involving the transport, application, use or handling of a herbicide.

IN THE EVENT OF A SPILL:

1. **Administer First Aid to injured or contaminated persons.**
2. **Identify type of pesticide released.**
3. **Notify the appropriate authorities.**
4. **Quarantine the area.**
5. **Contain the spill if possible.**
6. **Complete Pesticide Emergency Response Record.**
7. **Develop a clean-up plan where appropriate.**

1. Administer First Aid to injured or contaminated persons.

Of greatest importance is the immediate threat to human health and the aid of someone injured during a herbicide spill. Any injured parties should be removed from the contaminated area immediately. Contaminated clothing should be removed. All persons should avoid direct contact with the spilled material until it is positively identified.

If the released chemical is known, labels and Material Safety Data Sheets (MSDS) can be consulted for the appropriate procedures for decontamination and administering first aid. For most herbicides, washing with water and detergent is the best method. Initial first aid for eye contact usually includes rinsing with eye-safe solutions (e.g. contact lens saline solution) or water. Injured parties should be transported to medical facilities as soon as possible, with the name of the released material, label, and MSDS accompanying the injured person.

2. Identify type of pesticide released.

To administer the most appropriate emergency response plan, the spilled herbicide must be accurately identified. Herbicide label information and MSDS should accompany all DFWP personnel and their contractors if an herbicide is handled, transported or applied. In addition, MSDS's should also be kept on file at any location where herbicides are stored. MSDS's describe appropriate response procedures for administering emergency aid to affected parties and appropriate protective clothing for containing a spill. The transporter and applicator of the herbicide must carry records describing mixtures of all herbicides applied.

3. Notify the appropriate authorities.

Herbicides can pose serious threats to human health and the environment and should be handled with extreme care. All accidental herbicide releases must be reported to the Montana Dept. of Agriculture within 48 hours. The written report must include the time of the release, its location, herbicide name, type of formulation, method of application, and the DFWP contact for the project. The report should also name all parties involved in the incident, including names and addresses who may be affected by the spill. If spilled herbicide is classified as either toxic or highly toxic, the Dept. of Agriculture must be notified immediately. The following authorities may be contacted.

DFWP : Regional Parks Maintenance Supervisor (always contacted)	454-5840
Local Emergency Response	911
County Sheriffs Office	
Blaine Co.	357-3260
Cascade Co.	454-6820
Chouteau Co.	622-5451
Fergus Co.	538-3415
Glacier Co.	873-2711
Hill Co.	265-2512
Judith Basin Co.	566-2212
Lewis & Clark Co. (Augusta Area)	562-3460
Lewis & Clark Co. (Helena Area)	442-7883
Liberty Co.	759-5171
Meagher Co.	547-3397
Petroleum Co.	429-6551
Pondera Co.	278-4060
Teton Co.	466-5781
Toole Co.	434-5585
Wheatland Co.	632-5614
Montana Disaster & Emergency Services:	444-6911

National Response Center: (800)424-8802

Montana Dept of Agriculture: 444-3144

Montana Poison Control Center: (800)525-5042

Chemtrec: (800)424-9300
The Chemical Manufacturer's Assn. maintains this 24 hour hotline to provide information about chemicals and their related health and environmental hazards for fire and police crews responding to chemical accidents and spills.

4. Quarantine the area.

In the event of a spill, restrict access to the site using physical barriers such as emergency tape, flagging, or signs. The area should be secured to prevent entry of unauthorized personnel into the spill area. Only authorized persons wearing appropriate protective clothing should be allowed into the area.

5. Contain the spill if possible.

Once the spilled material is positively identified, it must be contained as soon as possible. Technical labels and MSDS's provide information on protective clothing requirements for clean-up personnel. Generally it will be clothing similar to the protective clothing required for the application.

Put on all necessary protective clothing, including respirators, before approaching the spill from an upwind direction. Avoid inhaling fumes, vapors, and dust from the spill. Smoking is not allowed in a spill area. Examine the area and determine an effective method to contain the spill. Any person attempting to contain a spilled herbicide should follow these procedures.

- Minimize human contact with the spill, using mechanical equipment if possible.
- Avoid raising dust.
- Avoid diluting material with water (except for misting dry substances).
- Treat all absorbent material used during containment as a hazardous waste.
- Remove and dispose of all contaminated soil as a hazardous waste.
- Wash and properly decontaminate hands and face prior to consuming any food.

Potential spill containment methods include:

Liquid Spills

- Create small collection pools for runoff.
- Create dikes to impound runoff.
- Cover spill material with approximately double its volume in absorbent material (hydrated lime, sawdust, kitty litter).

- Transfer absorbent material onto an impermeable barrier (e.g. tarp).
- Divert spilled material away from open waters.
- Monitor and plug leaks in containment structures.

Dry Spills

- Cover with a plastic tarp and secure the edges of the tarp.
- Spray with a fine mist to minimize dust.
- Shovel material into clearly marked plastic bags or drums and seal.

6. Complete Pesticide Emergency Response Record.

An herbicide spill or accident can have long lasting effects beyond the immediate health and environmental threats. It is important to document all circumstances and events pertaining to the accident or spill. Important information includes the names and type of herbicides (including MSDS) the names of any injured or contaminated persons, the amount of herbicide spilled or released, spill location, and whether chemicals were discharged into a water body. The following pages have the form for recording all spill/incidents as well as listing the minimum safety equipment/requirements for transporters and applicators.

EMERGENCY
POISON PHONE NUMBERS

CHEMTREC.....800-424-9300

ROCKY MOUNTAIN POISON CENTER
DENVER, COLORADO.....800-525-5042

NATIONAL PESTICIDE
TELECOMMUNICATIONS NETWORK.....800-858-7378

INFORMATIONAL ASSISTANCE FOR PESTICIDES

MONTANA DEPARTMENT OF AGRICULTURE:

HELENA.....406-444-2944
BILLINGS.....406-652-3615
BOZEMAN.....406-587-3766
GT. FALLS.....406-761-0926
MISSOULA.....406-549-9678

PESTICIDE MANUFACTURERS

AMERICAN CYANAMID COMPANY.....201-835-3100
CHEVRON CHEMICAL COMPANY (COLLECT).....415-233-3737
CIBA GEIGY CORPORATION.....914-478-3131
DOW/ELANCO.....517-636-4400
DuPONT CHEMICAL (24-HOUR).....800-441-3637
FMC CORPORATION.....716-735-3765
HOECHST-ROUSSEL AGRI-VET COMPANY.....210-231-2244
ICI AMERICAS, INC. .....800-441-7747 ext. 3192
MONSANTO CHEMICAL COMPANY.....314-694-1000
PBI/GORDON.....913-342-8783
ROHM AND HAAS COMPANY.....215-592-3000
SANDOZ CROP PROTECTION COMPANY.....312-670-4500
SHELL CHEMICAL COMPANY.....713-473-9461
STAUFFER CHEMICAL COMPANY.....203-226-6602
UNION CARBIDE COMPANY.....800-822-4357
UNIROYAL CHEMICAL COMPANY.....209-224-8910

HERBICIDE SPILL EMERGENCY RESPONSE FORM

Complete all appropriate items and add additional notes to document special conditions or unusual circumstances. Take photos when possible to supplement notes.

1. Immediately contact the appropriate response agencies.

2. Were there injuries related to the spill? ___yes ___no
   Were any individuals contaminated with herbicide? ___yes ___no
   Was aid provided to affected individuals? ___yes ___no
   Was transportation to a medical facility required? ___yes ___no

3. Was a vehicle accident involved? ___yes ___no

4. What materials/herbicides were involved? (include MSDS)
   _____

5. Estimate amount of herbicide or herbicide mixture spilled in gallons.
   Herbicide: _____ ____ gals Mixture: _____ ____ gals
   Herbicide: _____ ____ gals Mixture: _____ ____ gals
   Herbicide: _____ ____ gals Mixture: _____ ____ gals

6. Location of Incident (name of site): _____
   ___1/4 ___1/4 ___Sec ___T ___R Highway/Road: _____
   Time of Incident:_____ Date: _____

   Provide a description of the site (water bodies, vegetation, landmarks)
   _____
   _____
   _____
   Distance to picnic/play campground area: _____
   nearest well: _____
   surface water: _____

7. Is there a danger of surface water contamination? ___yes ___no
   Has an herbicide already entered the water body? ___yes ___no
   Name of Stream/Lake _____

8. Is there a danger of ground water contamination? ___yes ___no
   Depth to groundwater: _____
   Elevation above nearest surface water: _____

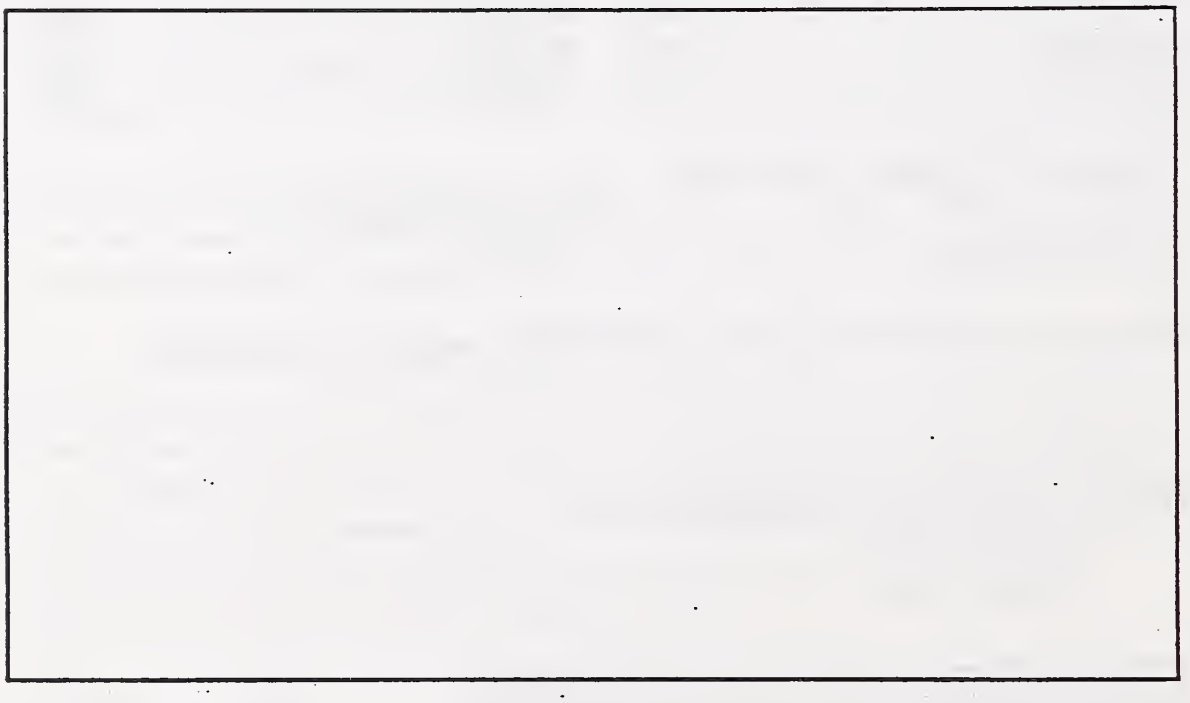
9. General Soil Description (check one for surface and subsurface soil)

Surface	☐	Dark Colored, Organic, Rock Free
	☐	Medium Textured
	☐	Light Colored, Rocky
Subsoil	☐	Dark Colored, Organic, Rock Free
	☐	Medium Textured
	☐	Light Colored, Rocky

10. List Agencies Notified

FWP Authority _____ When _____
Local Authority _____ When _____
State Authority _____ When _____
Federal Authority _____ When _____
Other Authority _____ When _____

11. Site Sketch



12. Describe Incident: _____

_____

13. Public Contact/Comment During Incident: _____

_____

14. Name: _____ Date: _____

CHEMICAL EMERGENCY SPILL KIT

All FWP personnel and contractors applying or transporting herbicides must carry the following safety items in the vehicle.

- at least one pair of neoprene or plastic gloves for each crew member present
- at least one pair of rubber, neoprene, or plastic material boots
- at least one pair of unvented goggles for each crew member present
- at least one approved respirator for applied pesticide
- at least one pair of coveralls or disposable coveralls (Tyvek) for each crew member
- absorbent material (kitty litter, floor dry)
- heavy duty plastic garbage sacks
- plastic tarp
- shovel
- dustpan and shop brush
- one pint liquid detergent
- portable eye wash kit
- five-pound ABC-type fire extinguisher
- first aid kit
- safety tape/flagging
- Material Safety Data Sheets and technical label information for each herbicide handled and used
- Herbicide Spill Response Plan