



# Weed Control in Pasture & Range

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There are 24 million acres of native and tame pasture and range as well as 1.4 million acres of grass hayland in South Dakota. Many herbaceous and woody plants are present in these grasslands. Forbs add to the productivity and are desirable. Some may be desirable when found in sparse stands, but become undesirable in heavier stands. Invasive plant species alter the grass species mix and reduce production of palatable forage. Undesirable plants reduce the quality of animal products and still others may be poisonous to livestock. Vigorous grass plants are good weed competitors. Herbicides are an aid to recommended grazing or haying practices. Quality seed, proper seedbed, and good planting techniques will reduce weed problems in new grass seedings.

## HERBICIDE SUGGESTIONS

Herbicides are included only after the chemical is registered by the Environmental Protection Agency (EPA) as to residue tolerances in crops used for food or feed.

This information provides a summary of herbicide uses and does not imply a guarantee. Consider the label to be the final guide. Tradenames

are for reader convenience. Users are responsible for following label directions and precautions.

**Weed Control.** Information is based on Agricultural Experiment Station data, other research and observations in South Dakota. Ratings are based on performance using recommended rates and application at proper weed stage and satisfactory growing conditions. Herbicide performance is better if the grass stand is full and vigorous.

**Herbicides.** Most herbicides are listed by tradename except where the active ingredient is available in several products. The common name (in parentheses) follows the first listing of the tradename. Product labels for the same active ingredient may vary. Consult the label of the product being used.

**Rates.** Rates for each treatment and each formulation are stated as the amount of product per acre. The amount of active ingredient (act) or acid equivalent (ae) is also listed for each treatment.

**Cost.** The cost per acre for low and high rates is listed. Cost of additives is included. Prices do not consider special marketing programs. Consult your dealer for actual price.

**Time to Apply.** Most herbicides for pasture and range are applied when weeds and grass are growing. The optimum growth stage for control of specific weeds is listed in sections of this publication.

## NOXIOUS WEED TREATMENTS

Noxious weeds are found in range and pasture as well as noncrop areas and cropland. Troublesome statewide noxious weeds like Canada thistle, leafy spurge, perennial sow thistle, field bindweed, Russian knapweed and hoary cress can be serious problems in pasture and rangeland. Locally noxious weeds like biennial thistle (musk, plumeless, bull and Scotch) and absinth wormwood are a major concern in pasture and range across the state. Locally noxious weeds that can be a problem in pasture and range in certain areas of South Dakota include: common mullein, biennial knapweeds, tansy, St. Johnswort, dalmatian and yellow toadflax, and burdock. This guide includes treatments for many of these weeds. For a more complete listing of herbicide recommendations refer to SDSU Fact Sheet "Noxious Weed Control", FS 525 N.

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## PASTURE and RANGE IPM

An effective weed control plan for pasture and range involves several management practices. The grazing scheme takes into account the type of livestock as well as the grass and forb species available. Grazing intensity influences the relative abundance of undesirable forbs and grasses. Weeds that are unpalatable when mature may provide acceptable grazing for certain classes of livestock when weeds are young. Grazing schedules are a good IPM practice for weed management. Cultural or mechanical weed management includes mowing or clipping, hand digging, prescribed burning or cultivation. Other IPM tactics include biological control, especially for noxious weeds. Herbicides are an aid to control unwanted weeds.

**Mowing or clipping** temporarily removes weed topgrowth but also removes topgrowth from grass. This system stops seed production but has different effects on the weeds. Annual forbs can be controlled by cutting below the lowest leaf early in the growing season. Undesirable annual grasses should be mowed after the seed stalk has elongated but prior to seed formation. Usually mowing perennial weeds one time reduces seed production; repeated mowing reduces vigor and slows spread. Clipping perennials like Canada thistle or leafy spurge in the spring works well as a set up for fall herbicides when moisture encourages new growth. Digging or chopping works well for scattered biennial thistle. Musk thistle rosettes can be stopped when the root is cut several inches below ground level. This requires more labor and is limited to small patches or scattered plants.

**Burning** is a valuable tool for managing weeds and grasses in range. Most annual broadleaf weeds and grasses and many undesirable perennial broadleaves can be controlled with fire. Forb response to fire depends on the timing of the burn. Burning in late spring when the plants are actively growing is the best time to control most perennial forbs. Biennial weeds that are in the rosette stage are not controlled by fire.

**Biological control** is another weed control tool, especially for noxious weeds. Biological control utilizes natural enemies as a means of weakening or killing the host plant. Insects have been the most common approach to biological control in South Dakota. Noxious weeds that have approved biological control agents (insects) in the state include leafy spurge, musk thistle, Canada thistle, toadflax, St. Johnswort, and biennial knapweeds. South Dakota currently has a collection and release program for leafy spurge flea beetles (*Aphthona* species), coordinated by the South Dakota Department of Agriculture. The county weed and pest board is the local contact point for landowners and managers considering the use of flea beetles on leafy spurge.

**Herbicide** options are available to control many of the undesirable plants found in pasture and range. Many of these treatments, especially those targeting broadleaf weeds, will also remove all or many of the desirable forbs or legumes. Reducing or eliminating beneficial forbs can reduce livestock gains and alter the forage mix.

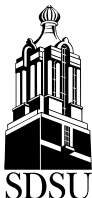
Herbicides perform best if conditions are favorable for plant growth. Careful and selective use of herbicides, combined with proper grazing management and other control tactics hasten recovery of weed infested pastures or range. Use herbicides that are labeled for the target weed and registered for use on pasture and range. Follow all grazing and haying intervals and environmental restrictions.

**Deferred grazing** gives the grasses an opportunity to build up root reserves, develop more topgrowth and produce more herbage. In some pastures, desirable native species no longer abundant will become re-established during the rest period. Deferred grazing can be used in conjunction with other improvement practices to speed recovery.

**ABBREVIATIONS.** Several abbreviations are used in this publication.

pt = pint	ae = acid equivalent
qt = quart	act = active ingredient
gal = gallon	L = liquid
lb = pound	gpa = gallons per acre
oz = ounce	DF = dry flowable
t = teaspoon	WDG = water soluble powder or crystals
T = Tablespoon	MSO = methylated seed oil
ml = milliliter	COC = crop oil concentrate
	NIS = non-ionic surfactant
	P = pellet

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PDF. FS 525-P. March 2006.

## SAFETY FIRST

**Follow the Label.** It is a violation of federal pesticide laws to use an herbicide in a manner inconsistent with its labeling. Read the entire label before using.

**Applicator Safety.** The most serious risk of exposure from chemicals is during handling and mixing operations with the concentrated product. Use protective equipment specified on the label. Use chemical resistant gloves, eye shield, long-sleeved clothing, rubber boots, and appropriate respirator as required.

**Poison Control Center - 1-800-222-1222**

**Water Protection.** Preventing spills and accidents during handling and mixing reduces risk of groundwater and surface water contamination. Mix herbicides away from wells and water sources. Prevent back-siphoning into wells. Install anti-backflow devices in irrigation equipment used for pesticides. Triple rinse containers. Store herbicides properly. Identify high-risk areas, such as coarse soils or areas where the water table is near the surface. Be aware of herbicide properties that increase the risk of contamination.

## Established Grass, Pasture and Range

Herbicides control many annual, biennial, or perennial broadleaved weeds and woody plants in grass pasture and range. Legumes and other desirable plants will be damaged or killed. Herbicides are more effective than mowing for perennials.

Restrictions on grazing or haying after application or removal of slaughter animals from treated areas are specified for each treatment. Check the product label. Some herbicides affect palatability of certain plants, causing livestock to graze species that normally would be avoided. Unpalatable poisonous plants can become more palatable to livestock following an herbicide application. Remove livestock for at least 3 weeks after treatment if poisonous plants are present.

### 2,4-D Ester or Amine

(\$1.45-7.60)

**1 pt - 2 qt 2,4-D 3.8L ae (.5-2 lb ae)**

2,4-D controls many annual and biennial broadleaved weeds and suppresses or controls many broadleaved perennials and woody plants in grass pasture or range. Legumes and other desirable broadleaves will be damaged or killed. It is the most popular herbicide for pasture and range.

Ester formulations are more effective than amines on many pasture weeds. Use esters on woody plants. Diesel oil carrier with esters improves control of tolerant woody species. Use amine formulations where sensitive crops such as alfalfa, sunflowers, soybeans, or trees and shrubs are in the area.

Most 2,4-D products specify sufficient carrier for adequate coverage. Higher amounts of carrier (3-5 gpa air, 10-20 gpa ground) may be helpful for dense weed growth, tolerant species, or woody plants.

**RESTRICTIONS:** Avoid drift to trees and sensitive broadleaved crops. Labeling for 2,4-D products varies, reflecting changing regulatory requirements. Most labels do not allow grazing lactating dairy animals on treated areas for 7 days after application. Most labels allow harvesting hay 30 days after application. A 3-day removal period before slaughter is required for most animals grazing treated areas within 2 weeks after application. Check label on product used.

Refer to 2,4-D formulation table below to determine product rates for other formulations.

### 2,4-D RATE - Product Per Acre

<b>Lb/A ae Required</b>	<b>3.8L*</b>	<b>5.7L*</b>	<b>FORMULATION</b>	
			<b>80% WSP</b>	<b>90% WSP</b>
.5	1 pt	.66 pt	.66 lb	.6 lb
1	2 pt	1.33 pt	1.25 lb	1.1 lb
1.5	3 pt	2 pt	1.9 lb	1.7 lb
2	4 pt	2.66 pt	2.5 lb	2.2 lb

## 2,4-D ESTER or AMINE (Continued . . . )

Rates of 2,4-D vary according to weed species. A spring application of 1 to 1.5 qt 3.8L ae per acre is a good program for general broadleaf control. Rates above 1.5 to 2 qt 3.8L ae may cause temporary stunting of grasses, especially during boot stage. Do not treat from boot to milk stage where grass seed production is desired.

**Annuals.** Small actively growing annual weeds require less herbicide than larger, more mature plants. Most annuals can be controlled with 1 to 2 pt 3.8L ae per acre. Winter annuals can be treated in fall or early spring. The low rate is for weeds under 6 inches and growing actively. Use the high rate for amine formulations.

**Biennials.** (Gumweed, biennial thistle, etc.). Apply 1 pt to 1.5 qt 3.8L ae per acre at rosette stage. Usually applied in spring. Results are best when temperatures exceed 65 degrees F. Gives good to very good control when applied at rosette stage. Weeds become more tolerant and control diminishes considerably after flower stalk elongates.

**Perennials.** (Goldenrod, noxious weeds, etc.). Apply 1 to 2 qt 3.8L ae per acre at pre-bud stage. Good to very good control of noncreeping perennials. Limited stand reduction of creeping perennials. Retreatment in the fall required.

**Woody Plants.** Apply 1 to 2 qt 3.8L ae per acre. Use ester formulations. Control is fair to good. Results are best when plants are actively growing and not under stress. Diesel oil for air or an emulsion of diesel oil and water (1 part fuel, 3 parts water) as carrier for ground application improves control of most tolerant species.

### RATE of 2,4-D to CONTROL SEVERAL BIENNIAL and PERENNIAL WEEDS Rates in ( ) are lb ae per acre

<i>Biennials</i>	<i>Perennials</i>	<i>Brush</i>
Gumweed (.75)	Wormwood sage (2)	Buckbrush (2)
Musk thistle (1.5-2)	Goldenrod (1.5)	Sand sagebrush (1.5-2)
Plumeless thistle (1.5-2)	Canada thistle (1.5)	Fringed sagebrush (1.5-2)
Bull thistle (1.5-2)	Leafy spurge (1.5)	Green sagewort (1.5-2)
Burdock (1)		Silver sagebrush (2)

### **Banvel, Clarity, Sterling (*dicamba*)**

(\$4.00-32.00)

### **Overdrive (*dicamba* + *diflufenzapyr*)**

#### **.5-4 pt Banvel or Clarity or Sterling 4L (.25-2.0 lb ae)**

Dicamba products control several annual, biennial, and perennial broadleaf weeds and woody plants in grass pasture and range. Legumes and other desirable broadleaf plants will be killed. Dicamba is especially useful for perennial weeds. Banvel, Clarity, or Sterling contain 4 lb/gal dicamba. Banvel and Sterling are formulated as a dimethylamine salt; Clarity is a diglycolamine salt. Clarity has less temperature or humidity restrictions for application near sensitive crops. Weed control has been similar for these products. Minimum carrier is 3 gpa for ground and 2 gpa for air.

Rates for specific weeds are listed in the chart below.

**Annuals.** Apply .5 to 1 pt per acre to control seedlings of susceptible weeds. Small annual weeds require lower rates than larger weeds. Use 1 to 1.5 pt per acre for larger, established weeds. Control is best when weeds are actively growing. Very good control.

**Biennials.** Apply 1 to 2 pt per acre for most biennials in the rosette stage. Rates of .5 to 1 pt per acre may be satisfactory for rosettes under 3 inches. Increase rates to 2 to 3 pt per acre if plants have bolted. Good to very good control of weeds when applied at the rosette stage. Expect considerably reduced control if plants have bolted.

**Perennials.** Apply 1 to 2 pt per acre for fair to good topgrowth suppression. Apply 2 to 4 pt per acre for good to very good control of most perennials. Treat perennials before bloom stage. Retreatment the following season is usually required.

**Woody Plants.** Apply .5 to 1 qt per acre for suppression only. Apply 1 to 2 qt for topgrowth control; 2 to 4 qt for stem and sprout control; and 2 qt per acre for stem and root bud control. Some retreatment usually required.

**Spot Treatment:** Dicamba may be applied at 2 qt per acre as a spot treatment to individual clumps or small areas using a handgun or similar equipment. Apply diluted sprays to allow complete wetting (up to runoff) of foliage and stems.

**BANVEL, CLARITY, STERLING or OVERDRIVE (Continued . . . )**

**PRECAUTIONS:** Do not exceed a total of 2 qt per acre during a growing season. Do not treat areas where movement into soil or surface water may occur. Do not treat over the root zone of trees and shrubs. Do not treat grasses to be harvested for seed. Do not apply if expected daytime temperature exceeds 85° F.

**RESTRICTIONS:** Meat animals must be removed from treated areas 30 days before slaughter. Grazing or haying restrictions for lactating dairy animals (cows, goats, horses) are based on the Banvel rate as listed below:

RESTRICTIONS for LACTATING DAIRY

Rate Dicamba 4L/A	Days before Grazing	Days before Hay Harvest
1 pt	7 days	37 days
1-2 pt	21 days	51 days
1-2 qt	40 days	70 days
2-8 qt	60 days	90 days

**4-8 oz Overdrive 70WDG (.125-.25 + .05-.1 lb ae) (\$10.45-20.90)**

Overdrive contains 50% dicamba (.5 lb ae) plus 20% diflufenzopyr (.2 lb ae). Overdrive is a selective postemergence herbicide used to control annual and biennial broadleaf weeds and control or suppress perennial broadleaf weeds in pasture, hay, and rangeland sites. Overdrive controls weeds by auxin transport inhibition.

**Spring or Fall.** Rate is 4 to 8 oz per acre based on weed species and maturity. Use the higher rates for perennials like Canada thistle, sowthistle and biennial thistle. A maximum of 8 oz per acre can be applied in pasture, hay, or rangeland per season. Add 1 qt NIS per 100 gal or MSO at the rate of 1.5 to 2 pt per acre. Minimum carrier is 3 gpa. Spray is rainfast 4 hours after application. Overdrive can be tank-mixed with several labeled tank-mix partners to improve weed spectrum.

**PRECAUTIONS:** Overdrive may injure bentgrass, and buffalograss. Severe injury will occur if applied to alfalfa, clovers, vetch and other legumes. Established grasses growing under stress may exhibit more pronounced injury symptoms.

**RESTRICTIONS:** Do not apply by air. Do not plant any crops for 30 days after last application. Pasture or rangeland grass treated with Overdrive can be grazed or harvested for livestock feed immediately after application. Do not apply to newly seeded grasses.

**TANK-MIXES and PREMIXES**

Dicamba may be tank-mixed with several approved herbicides to control additional broadleaf weeds and woody brush. Labeled tank-mix partners include glyphosate, metsulfuron-methyl, paraquat, picloram, triclopyr, 2,4-D and others. Refer to specific product label approved tank-mix partners.

**DICAMBA PRODUCTS + 2,4-D (dicamba + 2,4-D)**

**.25 pt -2 qt dicamba 4L + .5 to 4 pt 2,4-D 3.8L ae (.12-2 + .25-2 lb ae) (\$2.75-39.60)**

**WEEDMASTER or BRASH or BANVEL/2,4-D (dicamba + 2,4-D)**

**.5-6 pt Weedmaster or Brash or Banvel/2,4-D 3.87L (.06-.38 to .18-1 lb ae)**

Premixes contain 1 lb dicamba (Banvel) + 2.87 lb 2,4-D amine per gal. Low rates are for annuals and some biennials. The 5 to 6 pt rate is suggested for most perennials. Rates over 4 pt are for spot treatment only. Equivalent rates of Banvel + 2,4-D are listed below.

Premix pt/A	Equivalent Product/A	
	Dicamba Product	2,4-D 3.8L ae
.5	2 oz	.38 pt
1	4 oz	.75 pt
2	8 oz	1.5 pt
4	16 oz	3 pt
6	24 oz	4.5 pt

## DICAMBA TANK-MIXES and PREMIXES (Continued . . . )

**Annuals.** Tank-mix .25 to .5 pt dicamba + .5 to 1 pt 2,4-D 3.8L ae per acre or use 1 pt per acre Weedmaster, Brash, or Banvel/2,4-D herbicide premix when weeds are actively growing. Use higher rates after the seedling stage. Very good control.

**Biennials.** Tank-mix .5 to 1 pt dicamba + 1 to 2 pt 2,4-D 3.8L ae per acre or use 1 to 2 qt per acre Weedmaster, Brash, or Banvel/2,4-D herbicide premix when weeds are in the rosette stage. Good to excellent control.

**Perennials.** Tank-mix .5 to 1 pt dicamba + 1 to 2 pt 2,4-D 3.8L ae per acre for topgrowth suppression of perennials or to control alfalfa and dandelion. Tank-mix 1 to 2 pt Banvel + 1 qt 2,4-D 3.8L ae per acre or use 2 qt per acre Weedmaster, Brash, or Banvel/2,4-D herbicide premix to control other perennials. Good stand reduction of noncreeping perennials. Limited stand reduction of creeping perennials. Retreatment required the following season.

**Woody Plants.** Tank-mix 2 qt 2,4-D 3.8L ae ester + 1 to 4 pt dicamba per acre as suggested in the section for dicamba alone. The 2,4-D will improve control, especially with lower dicamba rates. Very limited SDSU tests.

**RESTRICTIONS:** Refer to the section for 2,4-D and dicamba alone.

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## Tordon 22K (*picloram*)

(\$5.80-46.40)

### .5 pt-2 qt Tordon 22K 2L (.125-1 lb ae)

Tordon 22K controls several annual, biennial, or perennial broadleaved weeds in established pasture and range. Legumes, trees, and desirable broadleaved plants will be severely damaged or killed. Most useful for improved control of difficult biennial or perennial weeds which are not adequately controlled with 2,4-D.

Results with lower rates for annual weeds are best when weeds are growing actively. Higher rates give consistent performance under varied conditions due to extended soil residual (1 to 3 years).

Minimum carrier is 10 gpa for ground and 2 gpa for air. Spot treatment rates require 20 gpa minimum. Most grasses are tolerant to rates up to 2 qt per acre. Grasses such as brome grass will be seriously damaged with higher rates. Bluegrass is tolerant. Do not apply to grass seed crops.

Avoid drift to sensitive crops. Do not rotate or interseed treated areas to other crops. Do not apply where soils have rapid permeability (such as loamy sand to sand) and where the underlying aquifer is shallow.

**Annuals:** Apply 1 pt per acre in spring when weeds are in seedling stage. Limited potential when compared to other treatments.

**Biennials:** Apply .5 to 2 pt per acre in late fall when weeds are in the rosette stage.

**Biennial thistles.** Apply at the seedling or rosette stage at .5 pt per acre in the fall. Provides excellent control under wide range of growing conditions. Visual effects develop more slowly than for some treatments.

**Common mullein.** Apply in spring at rosette stage or prior to stalk elongation. Use 1 qt Tordon 22K per acre. Reduction is apparent for at least 2 years.

**Perennials:** Apply 1 to 2 qt per acre in spring or fall.

**Leafy spurge** - Spot treatment. Spring or fall. Apply 2 qt per acre using minimum of 20 gpa carrier. Primarily for small patches. Will reduce stand, however; follow-up Tordon or other herbicide applications may be required. Apply anytime during growing season.

**Canada thistle** - Spot treatment. Use 1 to 2 qt per acre for small infestations in spring or fall. The 2 qt rate is a spot treatment program using 20 gpa carrier. Apply anytime during the growing season. Make spring treatment before seed forms. Make fall applications before soil freezeup. Use 2,4-D or other herbicides to control stragglers or seedlings in succeeding years.

**Toadflax (dalmatian and yellow)** - Spot treatment. Apply 2 qt to actively growing plants in spring before full bloom or in late summer or fall. Use lower rate for fall application shortly after killing frost.

**RESTRICTIONS:** There are no restrictions for haying or grazing for dairy or beef at rates of 1 qt per acre or less. Do not treat more than 50% of an acre when making spot treatments at rates over 1 qt per acre. Do not harvest for hay within 2 weeks after treatment when spot treating with rates of 1 qt per acre or more. Meat animals grazing treated areas within 2 weeks after application should be removed 3 days before slaughter. Do not graze dairy animals on treated areas for 2 weeks after treatment. RESTRICTED USE PESTICIDE.

TORDON (Continued . . .)

**TANK-MIXES and PREMIXES**

**TORDON + 2,4-D (picloram + 2,4-D)**

.5-1.5 pt Tordon 22K 2L + 1 qt 2,4-D 3.8L ae (.12-.38 + 1 lb ae) (\$8.70-21.20)

**GRAZON P+D (picloram + 2,4-D)**

2-4 pt Grazon P+D (.12-.27 + .5-1 lb ae) (\$7.60-15.20)

Primarily for infestations of mixed weed species or to provide improved suppression of perennial (noxious) broadleaved weeds. Improves seasonal suppression of perennials; however Tordon rate is too low to provide substantial stand reduction in one season. Has potential for use in a 3 to 4 year program for large infestations.

Primary activity is foliar uptake. The herbicides are translocated through the plant. Ester or amine formulations of 2,4-D may be used. Amines cause less leaf burn and are preferred if growth is lush. Visual effects develop more slowly than for some treatments. Apply in minimum of 10 gpa for ground or 2 gpa for aerial application.

Grazon P+D is a premix containing .54 lb picloram (Tordon) + 2 lb ae 2,4-D amine per gal. The 2 pt rate is equivalent to .54 pt Tordon + 1 pt 2,4-D 3.8L.

**Biennial Thistles:** Apply at the seedling or rosette stage. Provides excellent control under a wide range of growing conditions. Best fall treatment. Rates of .5 pt Tordon + 1 qt 2,4-D 3.8L ae per acre or 2 to 3 pt Grazon P+D gives excellent biennial thistle control. Surfactant improves penetration through wooly leaf surface. Reduction is apparent for at least 2 years.

**Perennials:** Apply 1 to 1.5 pt Tordon 22K + 1 qt 2,4-D 3.8L ae or 4 pt Grazon P+D per acre. Weeds should be actively growing and treated at pre-bud stage.

**Leafy spurge, hoary cress, and Russian knapweed.** Tank-mix Tordon at 1.5 pt + 1 qt 2,4-D 3.8L ae ester per acre. Intended as a 4 to 5 year program. Apply in late bud stage. Lower rates may not provide sufficient residual control into the fall. Use ester 2,4-D formulation unless site limitations require 2,4-D amine. Intended as one application per year; some regrowth may be noted in wet seasons.

**Canada thistle, field bindweed, and perennial sowthistle.** Tank-mix Tordon at 1 pt + 1 qt 2,4-D 3.8L ae per acre or use 4 pt Grazon premix per acre. This combination is promising to improve stand reduction over a period of several years. Lower rates do not provide sufficient residual control into fall.

**Absinth wormwood.** Apply spring or fall before wormwood is over 12 inches. Tordon at .5 to 1 pt + 2,4-D ester at 1 qt 2,4-D ester 3.8L ae per acre has provided excellent results in SDSU tests. Results on larger plants have been better than 2,4-D alone. Promising as a fall treatment.

**RESTRICTIONS:** Avoid drift to sensitive broadleaf plants and trees or to other cropland. Avoid contaminating water. Note other label precautions. Do not graze lactating dairy for 7 days after application. Labels allow harvesting hay 30 days after application and require a 3 day removal period before slaughter. RESTRICTED USE PESTICIDE.

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**Milestone (*aminopyralid*)**

(\$7.50-17.50)

**3-7 oz Milestone (0.05-0.11 lb ae)**

Milestone is a growth regulator herbicide that controls many annual, biennial, and perennial broadleaf weed species in pasture and range. Very effective on many invasive and noxious weeds, but it is not labeled for leafy spurge, field bindweed, or toadflax. Milestone may be applied to non-irrigation ditch banks and seasonally dry wetlands, but may not be applied over surface water. Applications may be made on warm and cool season grasses.

For most applications, apply when weeds are actively growing prior to the bud to early flowering growth stage unless specified otherwise on the label. Use higher rates for weeds at advanced growth stages or in adverse growing conditions. May provide some soil residual control of emerging weed seedlings.

Use a non-ionic surfactant (NIS) at 0.25-0.5% (1-2 qt per 100 gallons spray solution) under adverse growing conditions, advanced weed growth stages, or pubescent plants. Coverage is important for optimal efficacy. To allow for uptake and translocation, avoid mowing or burning for 7 days following application.

## MILESTONE (Continued . . . )

**Perennials:** Apply 5-7 oz/A to control Canada thistle and 3-5 oz/A to control perennial sowthistle. Make applications before the bud stage or early flowering.

For absinth wormwood (wormwood sage), apply 6-7 oz/A. For tansy ragwort, apply 4-5 oz/A to actively growing plants prior to flowering. For Russian knapweed, apply 4-6 oz/A in the spring and summer to plants in the bud to flower growth stage and to dormant plants in the fall.

**Biennials:** For bull, musk, or plumeless thistles, apply 3-5 oz/A in the spring or summer to plants in the rosette or bolting growth stages or in the fall to seedlings or rosettes. Apply 4-5 oz/A when plants are in the late bolting through early flowering growth stages.

For diffuse and spotted knapweeds, apply 5-7 oz/A when plants are actively growing in the rosette to bolting stage or in the fall.

**RESTRICTIONS:** Do not apply more than 7 fl oz (0.11 lb ae) per acre per year for broadcast applications or 14 fl oz (0.22 lb ae) for spot treatments (less than 1/2 acre). There are no grazing restrictions, but aminopyralid may be transferred in manure from livestock grazing on grass that had been sprayed within 3 days. After grass seeding, wait until perennial grasses are well established with a secondary root system before applying Milestone. Some grasses, such as smooth brome, may be suppressed under adverse growing conditions. Not a restricted use herbicide.

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## Plateau (*imazapic*)

**2-12 oz Plateau 2L (.03-.18 lb act)**

**(\$4.40-26.40)**

Plateau is an imidazolinone herbicide used for specific weed problems in pasture and range, including leafy spurge, dalmatian toadflax, and Russian knapweed. Rates depend on weed species. Plateau has activity on several grassy weed problems. Several native warm-season grasses have very good tolerance. Add 1 qt MSO plus 1 qt 28% N per acre for postemergence applications. Minimum carrier is 10 gpa for conventional ground or 2 gpa for low volume equipment.

Plateau is being marketed only through public agencies and organizations. However, it is labeled and may be applied to private as well as public lands.

**Annuals:** Several grass and broadleaf weed species are controlled and suppressed. Rates are 2 to 8 oz Plateau 2L per acre. Apply 4 oz per acre in a single application that coincides with successful establishment or release of desirable vegetation. For best results, maximum weed size is 2 in for "cheatgrass". It has been used at 2 to 4 oz per acre to control green and yellow foxtail in new CRP seedings.

**Perennials:** Apply 8 to 12 oz per acre in the fall for difficult to control perennial weeds.

**Leafy spurge.** Suggested rates are 8 to 12 oz per acre as a fall treatment on active growth. Use the higher rate for dense infestations that have been established for longer periods of time. Results have been promising in SDSU tests; 70 to 90% control has been reported the year after application. Field plot data suggest follow up control programs are required to prevent reinfestation. Be sure milky sap is still present in leafy spurge stems when making fall applications.

**Russian knapweed and dalmatian toadflax.** Apply 12 oz per acre as a fall treatment. Follow up treatments will be required to maintain control.

**SPOT TREATMENT:** Mix a .25 to 1.5% solution (0.3-1.9 oz Plateau 2L per gal). Add 1% MSO. Do not exceed per acre recommendation rate.

**PRECAUTIONS:** Grass tolerance is an important issue. Plateau is labeled as a seedhead growth suppressant for cool-season grasses. Many warm-season grass species and forbs have tolerance. Refer to label for lists of susceptible and tolerant species. Do not exceed 12 oz per acre in one year.

**RESTRICTIONS:** Do not harvest hay for 7 days after treatment. There are no grazing restrictions.

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## ALLY or CIMARRON (*metsulfuron-methyl*)

**.1-1 oz Ally 60XP or Cimarron 60DF (.004-.04 lb act)**

**(\$2.60-26.00)**

Ally and Cimarron are sulfonyl-urea herbicides used to control or suppress several annual, biennial, and perennial broadleaf weeds in pasture and range. Bluegrass, bluestem, bromegrass, grama and timothy have shown good tolerance in SDSU studies. For best results apply to young, actively growing weeds. Rate depends on weed species and size. Rates of .1 to 1 oz per acre are recommended. Rate of .3 oz is used for most pasture situations; with higher rates for special weed problems. Lower rates are usually used with 2,4-D or other tank-mix partners. Refer to rate chart in label for specific weeds. For spot application, use 1 oz per 100 gal. The addition of NIS at 2 to 4 pt per 100 gal is recommended; reduce NIS to .5 pt per 100 gal for fescue or timothy. Minimum carrier is 10 gpa for ground and 2 gpa by air.



**CIMARRON or ALLY (Continued . . . )**

**PRECAUTIONS:** Do not use on grasses grown for seed. Stunting and seedhead suppression may be noted under cool, wet conditions. Broadleaf forages or legumes in pasture may be severely injured or killed. Do not apply on or near desirable trees or plants.

**RESTRICTIONS:** There are no grazing or haying restrictions for labeled rates of Ally or Cimarron.

**ESCORT 60XP (metsulfuron-methyl)**

**.1 to 1.66 oz Escort 60XP (.004-.067 lb act)**

Special supplemental labeling for Escort XP allows use on rangeland. Additional special labeling provides for aerial application in rangeland in South Dakota and other western states including rates to 3.33 oz per acre. Refer to the Ally and Cimarron section.

**RESTRICTIONS:** There are no grazing restrictions at rates less than 1.66 oz per acre. Rates of 1.66 to 3.33 oz allow forage grasses to be cut for hay, fodder, green forage and fed to livestock including lactating dairy 3 days after treatment.

**TANK-MIXES and PREMIXES**

May be tank-mixed with 2,4-D, dicamba, Tordon 22K, Grazon P+D, Weedmaster, Remedy, or Amber to improve performance on hard to control weeds.

**ALLY or CIMARRON + 2,4-D (metsulfuron + 2,4-D) (\$4.50-9.50)**

**.1 to 1 oz Ally 60XP or Cimarron 60DF + 1 to 2 pt 2,4-D 3.8L (.004-.008 lb act + .5-1 lb ae)**

Tank-mix .1 to 1 oz Ally or Cimarron + 1 to 2 pt 2,4-D 3.8L ae per acre to increase control on certain pasture weeds including cocklebur, common ragweed, western ragweed, Canada thistle, perennial sowthistle, and others. Tank-mix rates are .2 to .3 oz Ally or Cimarron for most situations.

**Canada thistle and perennial sowthistle.** Apply in spring after most thistles have emerged and are actively growing at the rosette to 6 in elongating stem stage.

**CIMARRON MAX (metsulfuron + dicamba + 2,4-D) (\$7.40-28.00)**

**20-5 Acres/.5 oz Part A + 2.5 gal Part B (.01-.038 lb act + .12-.5 lb ae + .38-1.5 lb ae)**

Cimarron Max herbicide is a twin-pak combination. Part A contains metsulfuron (Ally). Part B contains 1 lb dicamba (Banvel) plus 2.87 lb ae 2,4-D amine per gal. The use ratio is .5 oz Part A (metsulfuron) to 2.5 gal of Part B (dicamba + 2,4-D amine) to treat 5 to 20 acres. Refer to following rate table for acres treated.

<b>Cimarron Max Rate</b>	<b>Part A Rate (oz/A)</b>	<b>Part B Rate (pt/A)</b>	<b>Acres Treated with .5 oz Part A + 2.5 gal Part B</b>
Rate I	0.25	1	20A
Rate II	0.5	2	10A
Rate III	1	4	5 A

The Rate II or 10 acre rate provides the equivalent of .5 oz Ally 60XP + .5 pt Banvel 4L + 1.5 pt 2,4-D 3.8L per acre. Rates are based on weed species and weeds less than 4 inches tall. Do not apply more than the equivalent of 1.66 oz per acre of Cimarron Max Part A per year. Add NIS 2 to 4 pt/100 gal. May be applied by ground or air. No restrictions or waiting period between treatment and grazing for non-lactating animals. Remove meat animals 30 days prior to slaughter. Do not graze lactating dairy within 7 days of treatment. Do not harvest hay for 37 days after treatment.

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**Telar (*chlorsulfuron*)****.25-1.33 oz Telar 75DF (.012-.062 lb act)****(\$5.10-27.25)**

Supplemental labeling. Telar controls and suppresses several broadleaf weeds in pasture, range, and CRP. It is effective in Canada thistle and knapweed control programs. Rates are .25 to 1 oz per acre. Use .25 to .5 oz for annuals or .5 to 1 oz per acre for biennial and perennial weeds. Annual weeds are controlled best when treated at early stages. Perennial weeds should be treated in the bud to bloom stage or at fall rosette. Grass tolerance should be considered. Rates of .25 to 1 oz per acre are suggested for blue grama, brome grasses, bluegrass, wheatgrasses and orchardgrass. Grass species listed for .25 to .5 oz per acre rate include bluestem, fescues, green needlegrass, side-oats grama, buffalo grass, switchgrass, Indian grass and wild ryegrass. Perennial ryegrass may be severely injured.

**PRECAUTIONS:** Do not apply more than 1.33 oz per acre in one year. Broadleaf forage species are sensitive to Telar and may be injured. Applications made to grass under stress may cause injury. Applications made to some cool season grasses before the initiation of flowering may cause abortion or suppression of seedheads.

**RESTRICTIONS:** There are no grazing restrictions for any class of livestock for rates up to 1.33 oz per acre.

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**Amber (*triasulfuron*)****.28-.56 oz Amber 75DF (.013-.026 lb act)****(\$2.30-4.60)**

Amber can be used in several pasture and range grasses including bluestem, smooth brome; blue and sideoats grama and several wheatgrass species. Grasses must be established at least 60 days.

Amber at low rate controls mustards, kochia, pigweed, cocklebur, and common mallow and suppresses western ragweed. Annuals should be small. The high rate suppresses curly dock, Canada thistle, goldenrod, and musk thistle. Downy brome suppression can be noted with the high rate in fall application prior to weed emergence; control is variable. Control of most weeds will be improved if tank-mixed with 2,4-D, Banvel, and other herbicides used for pasture and range. Minimum carrier is 3 gpa for ground or 2 gpa for air.

**RESTRICTIONS:** Do not apply more than 0.84 oz Amber per acre in one year. Allow 60 days between applications in split treatments. Refer to label for restrictions on specific grass species in new grass seedings.

**TANK-MIXES and PREMIX**

Amber can be applied with other labeled herbicides to manage weed resistance and improve weed spectrum. Approved tank-mix partners include 2,4-D, dicamba (Banvel, Clarity), Curtail, Crossbow, Grazon P+D, Stinger, Tordon and Weedmaster. Tank-mix partner should be used at recommended tank-mix rate.

**RAVE (*triasulfuron* + *dicamba*)****2-4 oz Rave 63.8WDG (.011-.022 lb act + .06-.12 lb ae)****(\$2.85-5.70)**

Rave is a premixed selective herbicide for control of many broadleaf weeds in pasture and range. Rave has two modes of action. Rave contains 8.8% triasulfuron (Amber) and 55% dicamba sodium salt (.50% ae) in a water dispersible granule. Postemergence rates are based on weed species and size using 2 oz or 3 to 4 oz per acre. Rave may be applied at 5 oz per acre in pasture and range for heavy infestations. Apply to actively growing weeds. Add NIS at 1 to 2 pt per 100 gal or COC at 1 qt per 100 gal.

The maximum amount of Rave is 5 oz per acre. Make only one application per year.

**RESTRICTIONS and PRECAUTIONS:** Do not apply Rave to grasses underseeded with legumes. Do not allow spray to drift to nontarget crops or other desirable plants. Refer to label for restrictions on specific grass species in new seedings.

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**Stinger or Transline (*clopyralid*)****.5-1.33 pt Stinger 3L or Transline 3L (.19-.5 lb ae)****(\$21.30-80.40)**

Controls some annuals and or suppresses some perennial broadleaf weeds in rangeland and permanent grass pasture. Lower rates are for annuals such as cocklebur, sunflower, buffalobur. Higher rates are for spotted and diffuse knapweed, Canada thistle and suppression of perennial sow thistle and Russian knapweed. Pasture grass has good tolerance. Weeds should be treated at early stages. Minimum carrier is 2 gpa for ground equipment. Stinger is marketed for agricultural uses; Transline is available through a special marketing program for governmental and agency use. Excellent spot treatment option for thistles.

## STINGER or TRANSLINE (Continued . . . )

**PRECAUTIONS:** New grass seedlings may be injured until development of tillers and secondary roots. Some forbs are susceptible. Do not spray pastures containing desirable broadleaf plants, especially legumes.

**RESTRICTIONS:** There are no grazing restrictions for treated areas. Do not apply Stinger by air. Remove livestock for 7 days before transferring to pasture with sensitive broadleaf plants. Do not apply to new pasture seedings.

### TANK-MIXES and PREMIXES

#### CURTAIL (*clopyralid* + 2,4-D)

2-4 qt Curtail ( .19-.38 + 1-2 lb ae)

(\$18.60-37.20)

Premix containing .38 lb clopyralid (Stinger) plus 2 lb ae 2,4-D amine per gallon. Controls several annual and some perennial broadleaf weeds in rangeland and permanent grass pasture. Treat early when weeds are small. Apply 2 to 4 qt per acre when weeds are actively growing. For biennial thistle, spotted and diffuse knapweed and Canada thistle, apply 2 qt per acre for light to moderate infestations or for poor growing conditions. For control of Russian knapweed, apply 3 to 4 qt per acre at early bud to mid flowering stage or for fall regrowth. Minimum carrier is 2 gpa for ground or air.

**RESTRICTIONS:** Do not graze dairy cattle for 14 days after application. Remove meat animals from freshly treated areas 7 days before slaughter. Remove livestock for 7 days before transferring to pasture with sensitive broadleaf plants. Do not use on new seedlings. Do not cut treated grass for hay within 30 days after application.

#### REDEEM (*triclopyr* + *clopyralid*)

1.5-4 pt Redeem R&P (.42-1.12 + .14-.38 lb ae)

(\$17.80-47.55)

Premix containing 2.25 lb ae triclopyr amine salt (Garlon 3A) plus .75 lb ae clopyralid (Stinger) per gallon. Weeds need to be actively growing. Redeem is labeled for use in rangeland, grass pastures, CRP grass seedings, fencelines, and other non-crop areas. Minimum carrier is 10 gpa for ground or 3 gpa for air.

Apply as a broadcast or spot treatment for broadleaf weeds using 1.5 to 2 pt for annuals and up to 4 pt per acre for deep rooted perennial weeds. Refer to rate table in label for specific weeds.

**RESTRICTIONS:** Do not graze or harvest forage for dairy cattle for 14 days after application. Do not harvest hay until the next growing season for dairy or harvest hay for other livestock for 7 days after treatment. Remove meat animals at least 3 days before slaughter. Do not treat banks or bottom of irrigation ditches. Do not apply more than 4 pt per acre per year on rangeland or permanent pasture.

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## Remedy (*triclopyr ester*)

.5-4 qt Remedy 4L (.5-4 lb ae)

(\$11.70-93.70)

Remedy is an oil soluble, emulsifiable herbicide containing triclopyr. It controls susceptible woody plants, shrubs, and annual and broadleaf weeds. May be applied to woody or herbaceous broadleaf weeds as a foliar spray or as a basal bark or cut stump treatment.

**Annual, biennial, perennial broadleaf weeds.** Apply .5 to 1 qt per acre as a broadcast treatment at 10 gpa for ground or 2 gpa for air. Apply anytime weeds are actively growing. May be tank-mixed with 2,4-D amine or ester.

**Woody plants and brush.** Use 1 to 2 qt per acre for most woody plant species. May be mixed with other broadleaf herbicides like 2,4-D ester, 2,4-D amine, Tordon 22K and Grazon P+D to help improve effectiveness. Use a minimum of 10 gpa carrier for ground application or a minimum of 4 gpa for aerial application. Labeling allows use of higher rates for late season applications on mature plants, during drought conditions, and for specific difficult to control species.

**PRECAUTIONS:** Do not spray on pastures containing desirable forb or legumes as injury or loss of plants will occur. Do not reseed treated areas for at least 3 weeks following treatment.

**RESTRICTIONS:** For lactating dairy, do not graze or harvest green forage from areas treated with less than 2 qt per acre for 14 days and the next growing season for rates over 2 qt per acre. For other livestock there are no restrictions for rates under 2 qt and 14 days for rates over 2 qt per acre. If less than 25% of a grazed area is treated there is no grazing restriction. Haying treated acres is restricted until the next growing season for lactating dairy and 7 days for all other livestock with application rates of 2 qt per acre or less. Rates from 2 to 4 qt per acre have a 14 day grazing restriction for other livestock. Withdraw livestock from grazing or consumption of treated hay at least 3 days before slaughter.

REMEDY (Continued . . . )

**CROSSBOW (triclopyr + 2,4-D)**

1-4 qt Crossbow (.25-1 + .5-2 lb ae)

(\$14.00-56.00)

Premix containing 1 lb ae triclopyr (Remedy) plus 2 lb ae 2,4-D ester per gallon. Controls several annual and perennial broadleaves and provides very good brush control. Use lower rates for annuals and higher rates for perennials and brush. Apply when weeds are actively growing. Biennials are controlled best in the rosette stage. Minimum carrier is 10 gpa.

**RESTRICTIONS:** Do not graze or harvest green forage for dairy within 14 days of treatment. Do not harvest hay for 14 days after treatment for livestock; do not harvest hay for dairy until the next season. Remove slaughter animals for 3 days before slaughter if grazing or feeding forage or hay. Do not apply by fixed-wing aircraft.

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**Spike (tebuthiuron)**

2.5-20 lb Spike 20P (.5-4 lb act)

(\$18.50-148.00)

Spike 20P is a surface applied soil-active herbicide that controls woody plants. Spike must be applied with equipment capable of accurate and uniform calibration. Misapplication or poor distribution may result in injury or death of vegetation outside the intended treatment area. Dormant season application is recommended to minimize injury to non-target grasses and herbaceous plants. Rates for application are dependent on weed species. Refer to species rate chart in label for correct application rates.

**PRECAUTIONS:** Do not apply more than 10 lb per acre Spike 20P in pasture and rangeland receiving 20 in or less average rainfall. For areas receiving 20 in or more annual rainfall, apply no more than 20 lb per acre. Do not apply to areas where the water table is predominantly shallow (5 ft or less), or areas adjacent to streams or lakes. Do not apply more than once per year.

**RESTRICTIONS:** Grazing is allowed in areas treated with no more than 20 lb per acre. In areas treated with 20 lb per acre or less, grass may be harvested for hay 1 year after application.

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**Velpar (hexazinone)**

2.75-4.5 pt Velpar 2L (.69-1.13 lb act)

(\$20.60-33.80)

Velpar L is a water dispersible liquid herbicide that controls brush and weeds. Effectiveness depends on sufficient moisture to activate.

**Broadleaf and Grass Weeds:** Velpar controls barnyardgrass, fescue, lespedeza, little barley, oxalis, pepperweed, and pigweed in pasture and range. Rates are 2.75 to 4.5 pt per acre. Use lower rates on coarse textured soils and higher rates on fine textured soils and soils with high organic matter. For ground applications, use a minimum of 25 gpa carrier.

**Woody Plants and Brush:** For brush control in pasture and range, apply Velpar from late winter through summer, pre-bud break until new growth hardens off. For basal treatments, apply at the rate of 2 to 4 ml for each inch of stem diameter or breast height. Do not exceed .33 gallon per acre per year. Direct the treatment to the soil within 3 inches of the root collar of woody plants. When treating large stems, make applications on opposite sides of the stem.

**PRECAUTIONS:** Do not use on frozen soil. Injury or loss of desirable trees or other plants may result if equipment is drained or flushed in non-target areas. Injury may result when desirable grasses are under stress.

**RESTRICTIONS:** There are no restrictions on grazing or haying for basal soil treatments. For broadcast pasture applications, do not cut treated vegetation for forage or hay or graze livestock on treated acres for 60 days.

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## NEW GRASS SEEDINGS

New seedings of perennial grasses are poor weed competitors. New seedings may be damaged if treated before grasses are well established. Clip annual broadleaved weeds until grasses are well established. Annual grasses cannot be controlled with herbicide in new grass seedings.

Several herbicides are labeled for establishment of perennial grass stands in Conservation Reserve Program (CRP) acres. Many have a broadleaf weed component and susceptible pasture/range broadleaf forbs and legumes may be injured or killed. Refer to product label for specific rates and precautions or refer to the SDSU Extension Publication, FS 525-CRP, "Weed Control in CRP Plantings".

### 2,4-D Amine

**.5-1.5 pt 2,4-D amine 3.8L ae (.25-.75 lb ae) (\$ .75-2.25)**

Primarily for controlling small, susceptible annual broadleaves such as mustard, lambsquarters, and sunflower. Gives limited topgrowth suppression of broadleaved perennials. Poor kochia control. Annual weeds should be less than 4 to 6 in tall. Grasses must be well established before treating. Delay application on new spring seedings until mid-summer or fall. Fall application will control winter annual seedlings such as pennycress. Grasses are tolerant to spring applications the year after seeding.

Reports indicate cool-season grasses are more tolerant than warm-season species. Grasses should have reached the 5-leaf stage before treating. Maximum rates are lower for new seedings than for established pasture. Suggested rates are .5 to 1.5 pt 2,4-D amine 3.8L ae for cool-season grasses and .5 to 1 pt 2,4-D amine 3.8L ae for warm-season species. Amine formulations provide better crop tolerance than esters. Drought stress increases the risk of injury to new grass seedings. Refer to restrictions in 2,4-D Established Pasture Section (Page 3).

### Plateau (*imazapic*)

**2-12 oz Plateau 2L (.03-.18 lb act) (\$4.40-26.40)**

**Preemergence.** For best results in establishing mixed grass stands with Plateau, make application at planting prior to grass seedling emergence. Rates of 2 to 6 oz per acre will provide control or suppression of several annual grasses and broadleaf weeds. Tests at SDSU has shown excellent foxtail control at 4 oz per acre. The 2 oz rate is used on soils with a pH less than 7 and have a low CEC and coarse texture with minimum clay and organic matter.

**Postemergence.** Newly emerged grasses can be sensitive to Plateau. If grasses have begun to emerge, wait until they reach the five leaf stage to make the postemergence application. Use NIS instead of COC for postemergence applications to avoid loss of grass species tolerance. The use of high rates may result in foliar and or seedhead suppression of established grass stands. Grass injury will more likely occur on light soils and where there is low weed pressure, low rainfall, and short growing season.

Grass tolerance is an important consideration. Refer to rate chart for maximum rates and special precautions for specific grass species.

Plateau is being marketed only through public agencies and organizations. However, it is labeled and may be applied to private as well as public lands.

<i>Grass (Common name)</i>	<i>Plateau Herbicide Rate (oz/A)</i>	
	<i>New Seeding</i>	<i>Established</i>
Big & little bluestem	2-12	2-12
Indiangrass	2-12	2-12
Needlegrass	----	2-12*
Needle and thread	----	2-12*
Smooth brome grass	----	2-12*
Kentucky bluegrass	----	2-12*
Wheatgrasses	----	2-12*
Russian wildrye	2-6	2-12*
Side-oats grama	2-8**	2-8
Blue grama	2-8**	2-8
Buffalograss	2-4	2-8

\* High rates may result in stunting and growth suppression.

\*\* High preemergence rates applied to newly seeded sideoats and blue grama may result in thinning or loss of stand.

## PLATEAU (Continued . . . )

The Plateau label lists many prairie wild flower and forb species that have varying degrees of tolerance for both the preemergence and postemergence treatments. Refer to label for specific species tolerances.

**PRECAUTIONS and RESTRICTIONS:** Do not use Plateau for establishment of pure stands of switchgrass as severe injury or death may result. Treatment of Plateau on smooth brome grass, common Kentucky bluegrass and the wheatgrasses may result in foliar height and seedhead suppression. Treated areas may be grazed. Do not harvest hay for 7 days after treatment.

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## PASTURE RENOVATION

Renovation of permanent pasture or range is an improvement practice best suited to areas that cannot be tilled and reseeded. The practice utilizes herbicides to suppress existing grasses and other vegetation so more desirable grasses and/or legumes may be direct seeded with no-till equipment. Rainfall for establishing the new forages is the major factor for success.

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### Gramoxone Max (*paraquat*)

**.7-1.3 pt Gramoxone Max 3.0 lb/gal (.25-.5 lb act) (\$3.75-6.95)**

Paraquat is a contact herbicide that kills topgrowth of existing grasses and broadleaves. It frequently is applied in a narrow band in the row area. Results on bluegrass have been more satisfactory than with brome grass or other vigorous, spreading grasses.

Apply .7 to 1.3 pt per acre at the time of seeding. Use the higher rate for dense vegetation. Existing vegetation should be closely grazed or mowed so it is not over 2 to 3 in tall.

Minimum carrier is 10 gpa for ground and 5 gpa for air. Use higher volumes for dense vegetation. Add NIS at 1 pt per 100 gal or COC at 1 gal per 100 gal.

New seedings should be 3 to 6 in high before grazing. Paraquat is highly toxic if ingested; follow label precautions. RESTRICTED USE PESTICIDE.

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### Glyphosate Products (*glyphosate*)

**(\$2.50-30.50)**

**1-4 qt Glyphosate 3L ae (.38-3 lb ae)**

Can be used for spot treatment, wiper applications, or pasture renovation. Controls many annual and perennial plants. Rates are 1 pt to 4 qt (.38-3 lb ae) of 3 lb ae glyphosate per acre. Adjust rates for other formulations. Emerged grasses will be damaged or killed. Rates of .38 to .75 lb ae are used for most annual weeds; most perennials require 1.5 to 3 lb ae per acre. Perennial grasses to be controlled in renovation programs require 1.5 to 2.25 lb ae for most situations. Retreatment may be required for tolerant species. Spot treatment can be used in bluegrass, brome, orchardgrass, wheatgrass, alfalfa and clover. Minimum carrier is 3 gpa.

Refer to the glyphosate formulation table below to determine product rates for other formulations.

#### GLYPHOSATE PRODUCTS - Equivalent Rates

<u>Formulation</u>	<u>Amount of Product for lb ae</u>			
	<u>.38 ae</u>	<u>.75 ae</u>	<u>1.5 ae</u>	<u>3 ae</u>
3 lb ae (4 lb ai) L	16 oz	32 oz	64 oz	128 oz
3.75 lb ae (5 lb ai) L	13 oz	26 oz	51 oz	102 oz
4 lb ae (5.4 lb ai) L	12 oz	24 oz	48 oz	96 oz
4.17 lb ae (----) L	12 oz	23 oz	46 oz	92 oz
4. lb ae (5.5 lb ai) L	11 oz	21 oz	43 oz	85 oz

#### **RESTRICTIONS:**

**Spot or Wiper:** Do not treat more than 10% at one time. Remove livestock for 14 days after treatment. Do not harvest for 14 days.

**Pasture Renovation:** Do not harvest or graze livestock for 8 weeks.

# ***SPECIAL WEED PROBLEMS***

## ***When to Treat***

**Refer to herbicide sections and weed response chart for treatment options.**

<b>Gumweed</b>	Biennial. Treat in early June. Excellent control. Delaying until mid or late June may control new seedlings and second year plants. Late treating with 2,4-D is not effective.
<b>Musk, Bull, Plumeless, Scotch thistle</b>	Biennials. Late fall for rosettes of new seedlings. Treat in spring, usually mid to late May for musk and plumeless thistle. Temperature over 65° F improves results. Mow before flowers open.
<b>Goldenrod</b>	Perennial. Make applications before weeds are over 6 in. Late treatment not effective.
<b>Burdock</b>	Biennial. Treat in early spring before flower stalk is fully elongated. Mow or chop before bloom.
<b>Absinth wormwood</b>	Perennial. Spring treatment before weeds are over 8 to 10 in. Temperature over 60° F improves results with 2,4-D. Late fall is effective if plants were mowed and new growth is present. Grows very late.
<b>Puncturevine</b>	Annual. Treat at prebud stage. Small plants are most susceptible.
<b>Leafy spurge Hoary cress Russian knapweed</b>	Perennials. Apply spring herbicide treatments at early bud stage. Fall treatments must be applied to active growth. Leafy spurge should have milky sap flow. Hoary cress and Russian knapweed may not produce adequate fall growth.
<b>Canada thistle Perennial sowthistle Field bindweed</b>	Perennials. Treat or mow thistle from prebud to 7 to 10 days after flower. Fall treatment is effective if there is adequate new growth from the underground system.
<b>Prickly pear</b>	Perennial. Apply herbicide at bud to bloom stage. Results may not be apparent until next season.
<b>Deathcamas</b>	Perennial. Treat in spring at bud stage.
<b>Western snowberry Buckbrush Sumac</b>	Woody perennials. Apply herbicides in spring when new leaves are fully expanded. Reduced effectiveness under dry, poor growing conditions.
<b>Sand sagebrush Fringed sagebrush Green sagewort</b>	Perennials. Apply herbicides in spring when new twig growth is elongating. Dry conditions reduce effectiveness. Retreatment the following year may be required for complete control.
<b>Big sagebrush Silver sagebrush</b>	Woody perennials. Apply herbicides in spring when new growth is developed but before it becomes "hardened". Use full rates. Reduced results in dry seasons.
<b>Rabbit brush</b>	Woody perennial. Treat in spring when new growth is expanding and exceeds three inches. May require retreatment.
<b>Willows</b>	Woody perennial. Treat in spring when new leaves are fully expanded. Herbicides are usually very effective.
<b>Russian olive</b>	Woody perennial. Treat expanded foliage in mid June. Basal bark treatments may be applied anytime during the season. Retreating may be necessary.

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**WEED RESPONSE**

Response of weed species to several herbicides is shown in the table below. Performance is affected by rate, weather conditions, temperature and weed size. Rating are based on SDSU field test data, other research and observations.

P = Poor  
M = Marginal  
F = Fair  
G = Good

	<i>2,4-D amine</i>	<i>2,4-D ester</i>	<i>dicamba</i>	<i>Overdrive</i>	<i>Tordon</i>	<i>Tordon + 2,4-D</i>	<i>dicamba + 2,4-D</i>	<i>Plateau</i>	<i>Stinger/Transline</i>	<i>Curtail</i>	<i>Redeem</i>	<i>Cimarron/Ally</i>	<i>Cimarron Max</i>	<i>Ally + 2,4-D</i>	<i>Amber</i>	<i>Amber + 2,4-D</i>	<i>Telar</i>	<i>Rave</i>
<b><u>ANNUALS</u></b>																		
Buffalo bur	P	M	F	F	F	G	F	G	F	M	M	M	G	M	F	G	-	G
Cocklebur	G	G	F	G	G	G	G	F	F	G	F	G	G	G	F	G	-	G
Common ragweed	F	G	G	G	G	G	G	F	M	F	F	M	F	F	F	G	F	G
Kochia	M	M	G	G	P	M	G	F	P	M	F	F	G	F	F	F	F	G
ALS kochia	M	M	G	G	P	M	G	P	P	M	F	P	F	M	P	M	P	F
Russian thistle	F	F	F	G	M	F	G	F	-	F	-	F	G	G	F	G	F	G
Marestail	M	F	F	F	F	G	G	P	F	F	G	M	F	M	F	G	F	F
<b><u>BIENNIALS</u></b>																		
Bull, musk, plumeless thistle	F	G	F	G	G	G	G	M	G	G	G	F	G	G	F	G	G	G
Biennial knapweeds	M	F	F	F	G	G	G	-	G	G	G	F	G	F	F	F	-	F
Common burdock	F	G	G	G	G	G	G	-	F	F	G	M	F	F	F	G	-	G
Common mullein	M	M	M	M	F	F	M	-	-	M	M	F	G	-	-	-	-	-
Gumweed	F	G	F	G	G	G	G	P	M	F	F	G	G	G	G	G	G	G
Poison hemlock	M	F	G	G	G	G	G	F	P	M	P	M	F	M	-	-	-	F
Scotch thistle	M	F	F	F	G	G	F	-	G	G	-	F	G	F	F	F	F	F
Sweetclover	F	F	G	G	G	G	G	P	M	M	-	F	G	G	F	G	F	G
<b><u>PERENNIALS</u></b>																		
Absinth wormwood	F	F	F	F	G	G	F	-	-	M	F	-	-	-	-	-	-	-
Blue vervain	F	G	F	F	G	G	F	M	-	-	-	-	-	-	-	-	-	-
Canada thistle	F	F	F	G	G	G	G	P	G	F	G	F	G	G	F	G	G	G
Common tansy	P	P	M	M	G	F	M	-	P	P	M	F	G	F	-	-	F	-
Curly dock	M	M	G	G	G	F	F	M	M	M	G	F	G	F	F	F	F	G
Dalmatian toadflax	P	P	F	F	F	F	F	M	-	-	-	M	M	M	-	-	M	F
Deathcamas	M	M	F	F	M	M	M	-	-	-	-	-	-	-	-	-	-	-
Goldenrod	M	F	F	F	G	G	G	P	P	M	F	F	G	G	F	F	M	F
Russian knapweed	P	M	M	M	G	F	M	F	G	F	G	M	F	M	-	-	F	F
Scouring rush	P	M	M	-	G	F	M	-	-	-	-	M	F	M	-	-	M	-
St. Johnswort	P	M	M	M	G	F	M	-	-	-	-	F	G	F	-	-	-	-
Water hemlock	M	G	G	G	-	-	G	-	P	M	P	-	-	-	-	-	-	M
Dandelion	F	M	M	F	M	F	F	F	F	F	G	F	G	G	-	-	-	F
Puncturevine	M	F	F	F	M	F	G	M	-	-	-	F	G	G	-	F	G	G
Perennial ragweed	M	F	M	G	G	G	F	-	G	F	-	-	-	-	-	-	-	-



WEED RESPONSE

	<i>2,4-D amine</i>	<i>2,4-D ester</i>	<i>dicamba</i>	<i>Tordon</i>	<i>Tordon + 2,4-D</i>	<i>Remedy</i>	<i>Crossbow</i>	<i>Spike 20P</i>	<i>Velpar L</i>	<i>Cimarron/Escort</i>	<i>Cimarron Max</i>
<b><u>BRUSH:</u></b>											
Buckbrush	M	G	F	P	M	P	F	F	F	F	G
Eastern red cedar	P	M	F	G	M	P	M	M	G	M	F
Fringed sagebrush	P	F	M	G	F	-	-	-	-	-	F
Green sagebrush	P	F	-	F	F	-	-	-	-	-	-
Sand sagebrush	M	G	-	G	G	-	-	-	-	-	-
Silver sagebrush	P	F	-	F	F	-	-	-	-	-	-
Russian olive	P	M	F	-	-	-	-	F	-	-	-
Sumac	F	F	F	F	F	G	G	G	F	P	M
Willow	M	F	F	F	F	F	F	F	F	G	G
Yucca	-	P	M	F	P	F	M	-	F	-	-

## Summary Grazing and Haying Restrictions

	Grazing Restriction	Haying Restriction	Aquatic Use	Aerial Application
Tordon (picloram)	1 qt/A or more Lactating dairy-14 dy Non-lactating dairy & beef - none <sup>1/2</sup> Slaughter interval-3 dy	1 qt/A or more - 14 dy	No	Yes
2,4-D ester	Lactating dairy-7 dy Slaughter interval-3 dy	30 dy	Some <sup>2/2</sup>	Yes
2,4-D amine	Lactating dairy-7 dy Slaughter interval-3 dy	30 dy	Some <sup>2/2</sup>	Yes
Grazon P+D (picloram+2,4-D amine)	Lactating dairy-14 dy Other livestock: none	30 dy	No	Yes
Banvel, Clarity, Sterling (dicamba)	Lactating dairy: 1 pt/A-7 dy 1 qt/A-21 dy 2 qt/A-40 dy Non-lactating dairy & beef-none Slaughter interval-30 dy	Lactating dairy: 1 pt/A-37 dy 1 qt/A-51 dy 2 qt/A-70 dy	No	Yes
Plateau (imazapic)	None	Do not harvest-7 dy	No	Yes
Stinger (clopyralid)	None	None	No	No
Transline (clopyralid)	None	None	No	Yes
Curtail (clopyralid+2,4-D)	Lactating dairy-14 dy Non-lactating dairy - none Slaughter interval-7 dy <sup>3/2</sup>	30 dy	No	Yes
Ally/Cimarron	None	None	No	Yes
Escort (metsulfuron)	>1.66 oz-3 dy	>1.66 oz-3 dy	No	No
Cimarron Max (metsulfuron + dicamba + 2,4-D)	Lactating dairy-7 dy Slaughter interval-30 dy	Lactating dairy 37 dy	No	Yes
Amber (triasulfuron)	None	30 dy	No	Yes
Rave (triasulfuron + dicamba)	Lactating dairy-7 dy Slaughter interval-30 dy	Use not listed	No	Yes
Telar (chlorsulfuron)	None for <1.3 oz	Use not listed	No	No
Spike 20P (tebuthiuron)	Note rate restrictions <sup>4/2</sup>	1 yr except for rate limits <sup>4/2</sup>	No	No
Remedy (triclopyr ester)	Lactating dairy: <2 qt-14 dy >2 qt-next season Other livestock: <2 qt-none >2 qt-next season <sup>5/2</sup> Slaughter interval - 3 dy	Lactating dairy: next season Other livestock-7 dy Slaughter interval-3 dy	No	Yes
Overdrive	None	None	No	No

	Grazing Restriction	Haying Restriction	Aquatic Use	Aerial Application
Crossbow (triclopyr+2,4-D)	Lactating dairy: <2 gal/A-14 dy >2 gal/A-next year Other livestock: <2 gal/A-none 2-4 gal/A-14 dy <sup>5/</sup> Slaughter interval-3 dy	Lactating dairy: next year Other livestock: <2 gal/A-7 dy >2 gal/A-14 dy Removal before slaughter-3 dy	No	Yes
Redeem (triclopyr+ clopyralid)	Lactating dairy-14 dy Other livestock-no restriction	Lactating dairy: Do not harvest until next growing season. Other livestock-7 dy	No	Yes
Glyphosate Products	Slaughter interval-3 dy Spot treatment <sup>6/</sup> -14 dy Broadcast treatment-8 weeks	Spot treatment-14 dy Broadcast treatment-8 wks	No	Yes

- <sup>1/</sup> Remove livestock to untreated grass pasture for 7 days before transferring livestock to broadleaf or broadleaf-mixed pasture areas. Otherwise, urine may contain enough product to cause injury to sensitive broadleaf plants.
- <sup>2/</sup> Refer to specific label for aquatic use products.
- <sup>3/</sup> Withdrawal not needed if 2 weeks or more time elapsed since application.
- <sup>4/</sup> Maximum rate 20 lb if >20 in rainfall or 10 lb/A if <20 in rainfall.
- <sup>5/</sup> If less than 25% of grazed area is treated, there is no grazing restrictions.
- <sup>6/</sup> Do not treat more than 1/10 of any given acre at one time with spot or wiper applications. Remove livestock before application.
- <sup>7/</sup> Fence rows, around farm buildings, and equipment pathways.

## Spot Treatment for Noxious Weeds (Spray to Wet)

	<u>Leafy Spurge</u>	<u>Canada &amp; P. Sow Thistle</u>	<u>Field Bindweed</u>	<u>R. Knapweed Hoary Cress</u>	<u>Biennial Thistle</u>	<u>Wormwood Sage</u>
<b>Amount for 1 gallon . . .</b>						
Tordon 22K 2L	2.5T	2.5T	2.5T	2.5T	1t	2t
Dicamba Product 4L	---	2.5T	2.5T	---	3t	4t
Glyphosate Product 3L	---	4T	4T	5T	---	3T
Stinger/Transline 3L	---	2t	---	2t	2t	---
2,4-D 4L	4T	3T	3T	4T	3T	3T
Tordon+2,4-D	3+4t	2+4t	2+4t	3+4t	1+4t	1+4t
Dicamba Product 4L+						
2,4-D	---	4+4t	4+4t	---	2+4t	2+4t
Curtail 2.38L	---	2.5T	---	2.5T	2T	---
Plateau 2L	1.5t	---	---	---	---	---
<b>Amount for 10 gallons . . .</b>						
Tordon 22K 2L	1.6C	1.6C	1.6C	1.6C	.2C	.4C
Dicamba Product 4L	---	1.6C	1.6C	---	.6C	.8C
Glyphosate Product 3L	---	2.5C	2.5C	3C	---	1.8C
Stinger/Transline 3L	---	.4C	---	.4C	.4C	1.6C
2,4-D 4L	1.6C	1.2C	1.2C	1.6C	1.6C	1.6C
Tordon+2,4-D	.6+.8C	.4+.8C	.4+.8C	.6+.8C	.2+.8C	.2+.8C
Dicamba Product 4L+						
2,4-D	---	.8+.8C	.8+.8C	---	.4+.8C	.4+.8C
Curtail 2.38L	---	1.6C	---	1.6C	1.2C	.4C
Plateau 2L	.3C	---	---	---	---	---

Select product based on labeling for the site or crop.

t = teaspoon  
T = Tablespoon  
C = Cup

1 tablespoon = 15 ml  
1 fl oz = 2 Tablespoons  
1 fl oz = 6 teaspoons  
8 fl oz = 1 cup  
1 fl oz = 30 ml