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# Weed and Brush Control Guide

for Forages, Pastures and Non-Cropland in Missouri

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and Barry D. Sims

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Department of Agronomy  
University of Missouri



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## Introduction

The information in this guide is based on research conducted at the University of Missouri Agricultural Experiment Stations and elsewhere. It is written for the crops, soils, and weed problems of the state of Missouri. All herbicide information conforms to federal and state regulations at the time of writing. Consult the label attached to the herbicide container for current use precautions and restrictions.

Use this publication as a guide in selecting and comparing herbicides. It is *not* a substitute for reading the product labels before use. The University of Missouri does not warrant commercial products and regrets any errors or omissions in this guide. Cost of herbicides was not considered in making these recommendations because prices vary with location and time. Herbicides may perform better or

worse than indicated in this guide due to variability in the weeds infesting the field, rainfall, soil type, temperature, and many other environmental factors. Therefore, we have made no effort to list herbicides in order of preference.

Herbicides should be applied only to labeled crops. Do not exceed the maximum recommended rate for a herbicide. Excessive herbicide application rates are expensive and can result in injury to the crop, or make the crop unsafe as food or forage. Apply herbicides only at times specified on the label. Observe label restrictions for required intervals between time of treatment and time of planting, pasturing, or harvesting of a crop. Guard against injury to nearby susceptible crops or plants that may be caused by herbicide drift or volatility.

## Endangered species

As of Feb. 1, 1988, you should check with your local University Extension office, State Game and Fish Office, or your pesticide dealer to determine if the area you are planning to spray with any pesticide is protected for endangered species. You should re-

quest the **Pesticide Use Bulletin for Protection of Endangered Species** for your county. The bulletin indicates which areas are protected for endangered species and lists the pesticides that may and may not be used in that area.

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## Forage and pasture weed management

Annual broadleaf and grass weeds can become a serious problem in pastures and forages unless proper management is practiced. Weeds can interfere with forage and pasture crops to reduce the longevity and nutritional value of the crops. Controlling weeds improves the quality of forage legumes since most weeds are lower in protein and less palatable to livestock. In addition, certain weed species are poisonous to livestock and can become a problem when pastures are over-grazed.

Good management practices that encourage a vigorous, thick stand of pasture grass or forage legumes are important for good weed control. Weed seeds germinate and become established wherever pasture or forage stands are thin. Maintaining optimum soil fertility and pH favor the pasture or forage crop. Rotational grazing and periodic mowing of grass pastures enhances the ability of the pasture grass to compete with most annual weeds. Establishing and maintaining vigorous forage stands by using well-adapted, long-lived varieties, weed-free seed, proper seedbed preparation, and timely cutting reduces weed problems. Deep rooted, broadleaf perennial weeds are a common problem in pastures and forage crops. Crop rotation with cultivated crops can reduce some perennial weed problems.

## Herbicide application and timing

Herbicide application timing varies with the weed species. Annual and biennial weeds (1 and 2 year life-cycles, respectively) are easier to control when they are young. A fall or early spring treatment is usually best for winter annuals or for biennials in the rosette stage of growth. Spring and early summer treatments are best for summer annuals.

Established perennials are most susceptible in the bud to bloom stage, or in the fall when food reserves are moving into the roots. Spray woody brush species when they are fully leafed out and actively growing. Multiple applications are usually needed to obtain complete control of perennial weeds.

The use of herbicides without good cultural practices will generally give poor results. A thin or irregular pasture or forage stand won't be able to fill in areas left empty by weed control before new weeds can become established. Use herbicides only where the pasture grass or forage stand is thick and vigorous enough to fill in the areas where weeds are killed. Consider reestablishment if forage stands are sparse.

Forage legumes are frequently grown with a companion crop such as orchardgrass. However, most herbicides registered for use in forage legumes will

severely injure or kill a grass companion crop. Be sure the herbicide is registered for both forage species before use. If the weed problem is severe, reestablishment may be necessary.

Some herbicides must be used when the pasture or forage crop is dormant to prevent injury. Others may be applied to actively growing pasture or forage crops.

Herbicides are generally applied at the following times:

1. **Preplant** (PPS) onto the soil surface or any early emerged weeds before the crop is planted.
2. **Preplant-incorporated** (PPI) into the soil before crop planting.
3. **Preemergence** (PRE) onto the soil or any emerged weeds after crop planting, but before weed or crop emergence.
4. **Postemergence-overtop** (OTS) onto weeds after the crop and weeds have emerged.
5. **Spot spray**
  - A). Onto the foliage of weeds or brush.
  - B). Basal spray to soil and/or stem of weeds or brush.

Good coverage of the entire weed is necessary to obtain maximum control with postemergence or foliar-spot sprayed herbicides. Consult the herbicide label for recommended spray volumes, pressures, and application equipment.

## Types of herbicide formulations

Several types of herbicide formulations are listed in this guide. The abbreviations used are: emulsifiable concentrates, EC; liquids, L; solutions, S; flowables, F; dry flowables, DF; wettable powders, WP; water dispersible granules, WDG; and pellets, P. Most spray mixtures require constant agitation to prevent the herbicide from settling to the bottom of the spray tank. Granular formulations, G, are dry formulations that cannot be mixed with water. Don't mix granular herbicides with other granular pesticides or fertilizers.

## Herbicide additives

Additives are substances added to the spray mixture to enhance the effectiveness of the herbicide or spray mix. Common additives used for weed control are:

**Adjuvants:** Any substance added to a herbicide to improve its action.

**Emulsifier:** A substance that promotes the suspension of one type liquid in another (for example, oil into water).

**Surfactant:** A material that modifies wetting, spreading, dispersing, or emulsifying of liquids.



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A common term for a surfactant is a *wetting agent*. Wetting agents or surfactants improve foliar herbicide contact and spreading on the plant surface. Most herbicides that require surfactants specify *non-ionic surfactants*. Most surfactants sold for agricultural use are non-ionic. Many surfactants sold for home or industrial use are not non-ionic, so you shouldn't use them.

**Oil concentrates:** (Also crop oil concentrates). These are normally a mixture of non-phytotoxic oil and 10 to 20 percent surfactant.

**Utility modifiers:** Two types are commonly used with herbicides.

1. *Compatibility agents* are frequently used to allow herbicides to be mixed with liquid fertilizers.
2. *Anti-foaming agents* can be added to the tank or sprayed onto the solution surface to prevent foam or suds from forming when filling the spray tank.

**Spray modifiers:** The most common spray mix modifier used with herbicides is the *thickening agent* or *drift control agent*. These materials thicken the spray solution to reduce drift problems. These are usually used by aerial applicators.

Be sure you are using the proper additive for the herbicide you are using. Most herbicide labels specify the type and amount of additive to use. Failure to follow the recommendation can result in poor weed control or excessive crop injury. The proper additive is included in this guide when required or suggested by the label.

## Spray equipment

Proper herbicide application is necessary to obtain the best weed control. Check spray equipment fre-

quently for even and proper spray output. Herbicides are generally applied at pressures ranging from 20 to 40 psi *at the boom*. Most herbicide labels recommend a flat fan or hollow cone spray nozzle. Use stainless steel or nylon tips and 50 mesh screens with wettable powder, flowable, or dry flowable formulations.

Provide adequate agitation to keep herbicides suspended in the tank mix. Wettable powders and flowables are especially susceptible to settling in the tank.

Most herbicide labels contain recommendations for proper spray volume, pressure, and nozzle types.

Accurate sprayer calibration is essential for proper herbicide application and weed control. Sprayer calibration is not difficult, but is usually not done often enough. Screens may become blocked with trash, and nozzles wear, which alters delivery patterns and spray rates. Thoroughly inspect and calibrate spray rigs at least once a year.

## Cleaning spray equipment

Flush tanks, lines, booms and nozzles with water while the pump is running after using the sprayer. After using a growth-regulator herbicide (2,4-D, Banvel, Tordon, for example), flush the sprayer with the water and then clean it with one of the following mixed in 50 gallons of water:

1. ½ gallon of household ammonia (let stand in sprayer overnight).
2. 4 pounds trisodium phosphate cleaner.
3. 2½ pounds Sal soda.

Rinse pesticide containers three times and puncture them and dispose of them in an approved burial site or sanitary landfill. Check local regulations before disposing containers.

## List of herbicides, formulations and manufacturers

Trade name	Common name	Formulation	Manufacturer
Atrazine 4L	atrazine	4 lb/gal	Ciba-Geigy, DuPont,
Atrazine 80W		80%	several
AAtrex Nine-0		90%	
Arsenal 2E	not assigned	2 lb/gal	American Cyanamid
Balan 1.5E	benefin	1.5 lb/gal	Elanco
Banvel	dicamba	4 lb/gal	Sandoz
Banvel CST		1 lb/gal	
Banvel 520	dicamba + 2,4-D ester	1 + 1.9 lb/gal	
Banvel 720	dicamba + 2,4-D amine	1 + 1.9 lb/gal	
Butoxone 200	2,4-DB	2 lb/gal	Vertac
Butyrac 200	2,4-DB	2 lb/gal	Union Carbide
Crossbow	2,4-D + triclopyr	2 + 1 lb/gal	Dow
DSMA	DSMA	Several	Several
Eptam 7E	EPTC	7 lb/gal	Stauffer
Furloe 4EC	chlorpropham	4 lb/gal	PPG
Garlon 3A	triclopyr	3 lb/gal	Dow
Garlon 4		4 lb/gal	
Genep	EPTC	7 lb/gal	PPG
Gramoxone	paraquat	1.5 lb/gal	ICI
Hyvar X-L	bromacil	2 lb/gal	DuPont
Karmex 80W	diuron	80%	DuPont
Kerb 50W	pronamide	50%	Rohm & Haas
Krenite	fosamine	4 lb/gal	DuPont
Krovar I	bromacil + diuron	80%	DuPont
Lexone 4L	metribuzin	4 lb/gal	DuPont
Lexone DF		90%	
MSMA	MSMA	Several	Several
Oust	sulfometuron-methyl	75%	DuPont

## List of herbicides, formulations and manufacturers, continued

Trade name	Common name	Formulation	Manufacturer
Poast	sethoxydim	1.5 lb/gal	BASF
Pramitol 25E	prometon	2 lb/gal	Ciba-Geigy
Pramitol 5PS	prometon + simazine + sodium chlorate + sodium metaborate		
Princep 4G	simazine	4%	Ciba-Geigy
Princep 4L		4 lb/gal	
Princep 80W		80%	
Princep Caliber 90		90%	
Pronone 10G	hexazinone	10%	DuPont
Roundup	glyphosate	3 lb acid eq./gal	Monsanto
Sencor 4L	metribuzin	4 lb/gal	Mobay
Sencor DF		90%	
Sinbar	terbacil	80%	DuPont
Spike 80W	tebuthiuron	80%	Elanco
Spike 85DF		85%	
Telar	chlorsulfuron	75%	DuPont
Tordon 22K		2 lb/gal	Dow
Tordon 101	picloram + 2,4-D amine	.54 + 2 lb/gal	
Tordon RTU	picloram + 2,4-D amine	5.4 + 20.9%	
Velpar L	hexazinone	2 lb/gal	DuPont
Velpar		90% SP	
2,4-D amine	2,4-D amine	Several	Several (Union Carbide Vertac, others)
2,4-D ester	2,4-D ester	Several	
Weedmaster	dicamba + 2,4-D amine	1 + 2.8 lb/gal	Sandoz
Weedone 2,4-DP	2,4-DP	3.7 lb/gal	Union Carbide
Weedone 170	2,4-D ester + 2,4-DP	1.85 + 1.85 lb/gal	
Weedone CB	2,4-D ester + 2,4-DP	.66 + .66 lb/gal	

# Legume and Legume Grass-Forges

## Guide to weed response to herbicides

Herbicide	Winter annuals								Summer annuals								Perennials**												
	Cheat	Downy Brome	Chickweed	Henbit	Horseweed	Field Pennycress	Shepherdspurse	Wild Mustard	Yellow Rocket	Barnyardgrass	Crabgrass	Fall Panicum	Foxtails	Kochia	Lambsquarters	Pigweed	Common Ragweed	Smartweed	Curly Dock	Dandelion	Tall Fescue	Goldenrod	Horsenettle	Quackgrass	Red Sorrel	Wild Garlic	Yellow Nutsedge		
<i>Preplant incorporated</i>																													
Balan	P	F	-	P	P	P	P	P	-	G	G	G	G	G	F	G	P	P	P	P	P	P	P	P	P	P	P	P	P
Eptam/Genep	G	F	-	G	P	P	P	P	-	G	G	G	G	G	F	G	F	P	P	P	P	P	P	F	P	P	F		
<i>Postemergence</i>																													
Butyrac/Butoxone (2,4-DB)	P	P	P	P	P	F	G	G	-	P	P	P	P	F	F	F	G	P	P	F	P	P	P	P	P	P	P	P	P
Furloe	-	G	G	P	P	P	P	P	-	P	P	P	P	-	P	P	P	F	P	P	P	-	-	P	-	-	P		
Gramoxone (paraquat)	G	G	G	G	P	F	F	F	-	F	P	F	F	P	F	P	F	P	P	F	F	P	P	P	P	F	P		
Kerb	G	G	F	F	P	P	P	P	P	F	F	P	F	F	P	P	P	P	P	P	P	P	P	F	P	P	P		
Poast	-	-	P	P	P	P	P	P	P	F	G	G	G	P	P	P	P	P	P	P	F	P	P	G	P	P	P		
Roundup	F	G	F	P	F	G	G	G	-	G	G	G	G	-	G	F	F	G	F	G	F	P	P	G	F	F	F		
Sencor/Lexone	F	G	G	F	P	G	G	G	G	F	F	F	F	G	G	G	G	G	F	G	P	P	P	F	P	P	F		
Sinbar	G	G	G	G	P	G	F	G	G	F	G	P	G	G	G	F	F	F	P	F	P	P	P	F	P	P	P		
Velpar	G	G	G	F	-	G	F	G	G	G	G	P	G	G	G	G	F	F	P	G	-	-	-	F	-	-	P		

**G = Good    F = Fair\*    P = Poor    - = No data available**

Use this table as a guide for comparing the relative effectiveness of herbicides on individual weeds. Herbicides may perform better or

worse than indicated in this guide due to extreme weather conditions and other variables. If you are obtaining satisfactory results under

your growing conditions, changing products as a result of information in this table is not necessarily recommended.

\* Fair = Partial control of suppression

\*\* Repeated herbicide applications over several years may be necessary for complete control of perennial weeds.

## Forage crops—Legumes

Herbicide and formulation	Formulated material per broadcast acre	Herbicide (lbs active per acre)	Weeds controlled	Application method and precautions
<b>New seedlings—pure stands, preplant incorporated</b>				
Balan 1.5E	3 to 4 qt/A	benefin 1.1 to 1.5 lb/A	Barnyardgrass, crabgrass, fall panicum, foxtails, kochia, pigweed.	<b>Alfalfa, Birdsfoot trefoil, Clover (Alsike, Ladino, Red):</b> See label for incorporation directions. Use 3 qt rate on coarse (light, sandy) soils, and 4 qt rate on fine (heavy, clay) soils. Do not apply after seeding.
Eptam/Genep 7EC	3.5 to 4.5 pt/A	EPTC 3.1 to 3.9 lb/A	Cheat, henbit, barnyardgrass, crabgrass, fall panicum, foxtails, kochia, pigweed.	<b>Alfalfa, Birdsfoot trefoil, Clovers (Alsike, Ladino, Red), Lespedeza:</b> Incorporate <b>immediately</b> after application. See label for incorporation directions. Temporary stunting may occur if soil is cool and wet during germination and emergence.
<b>New seedlings—pure stands, postemergence</b>				
Butyrac 200/ Butoxone 200	2 qt/A	2,4-DB 1 lb/A	Sheperdspurse, wild mustard, common ragweed.	<b>Alfalfa, Birdsfoot trefoil, Clover (Alsike, Ladino, Red):</b> Apply in fall or spring. Spray after legume emergence when weeds are less than 2 to 3 inches high or rosettes are less than 2 inches across and not bolting.
Furloe 4EC	1 to 3 qt/A	chlorpropham 1 to 3 lb/A	Downy brome, chickweed.	<b>Alfalfa:</b> late summer seeded. Apply 1 to 2 qt from October through January. After February 1, apply 2 to 3 qt/A. Do not apply to new seedlings before alfalfa plants have 4 true leaves.
Furloe 4EC	2 qt/A	chlorpropham 2 lb/A	Downy brome, chickweed.	<b>Birdsfoot trefoil, clover (Ladino, Red, White):</b> Late summer seeded. Do not apply to new seedlings before legume plants have 4 true leaves.
Kerb 50W	1 to 3 lb/A	pronamide .5 to 1.5 lb/A	Cheat, downy brome.	<b>Alfalfa, Birdsfoot trefoil, Clover, Crownvetch:</b> Apply after legume has reached the trifoliate leaf stage. Do not use more than 4 lbs per acre per season. Seed label for use rate for specific weeds. <b>Restricted use pesticide.</b>

## Forage crops—Legumes (continued)

Herbicide and formulation	Formulated material per broadcast acre	Herbicide (lbs active per acre)	Weeds controlled	Application method and precautions
<b>Established pure stands, dormant</b>				
Gramoxone 1.5E + Non-ionic surfactant (80%)	2.5 pt/A  1 pt/100 gal	paraquat .47 lb/A	Cheat, downy brome, chickweed, henbit, many other annual weeds.	<b>Alfalfa</b> at least 1 year old. Apply after last fall cutting when crop is dormant or before spring growth reaches 1 inch. Do not apply if fall regrowth following last fall cutting is more than 6 inches tall. Do not apply more than once in one season. <b>Restricted use pesticide.</b>
Sencor/Lexone 4L or DF	.75 to 2 pt or .5 to 1.3 lb/A	metribuzin .38 to 1 lb/A	Downy brome, chickweed, sheperdspurse, wild mustard, yellow rocket, kochia, lambsquarters, pigweed, common ragweed, smartweed, dandelion.	<b>Alfalfa:</b> Apply only to dormant, established alfalfa. Apply in late fall or early spring before new growth starts. For best control apply when weeds are less than 2 inches tall or before rosettes exceed 2 inches in diameter. See label for use rate for specific weeds.
Sinbar 80W	.5 to 1.5 lb/A	terbacil .4 to 1.2 lb/A	Cheat, downy brome, chickweed, henbit, field pennycress, wild mustard, crabgrass, foxtails, kochia, lambsquarters.	<b>Alfalfa:</b> Apply only to dormant alfalfa that has been established for at least one year. Apply in fall or winter after last cutting or in spring before new growth starts. Apply before or after emergence of weeds but before they are 2 inches tall or wide. Do not replant treated areas within 2 years after last application. Do not apply on snow-covered or frozen ground.
<b>Established pure stands, dormant or non-dormant</b>				
Butyrac 200/ Butoxone 200	2 qt/A	2,4-DB 1 lb/A	Sheperdspurse, wild mustard, common ragweed.	<b>Alfalfa:</b> Apply in late fall or early spring when weeds are small.
Furloe 4EC	1 to 3 qt/A	chlorpropham 1 to 3 lb/A	Downy brome, chickweed.	<b>Alfalfa:</b> Apply 1 to 2 qt from October through January. After Feb. 1, apply 2 to 3 qt/A.
Furloe 4EC	2 qt/A	chlorpropham 2 lb/A	Downy brome, chickweed.	<b>Birdsfoot trefoil, Clover (Ladino, Red, White):</b> Apply after crop has 4 true leaves.
Kerb 50W	1 to 3 lb/A	pronamide .5 to 1.5 lb/A	Cheat, downy brome.	<b>Alfalfa, Birdsfoot trefoil, Clover, Crownvetch:</b> Apply after last cutting in fall when weather and soil temperatures are cool. Do not use more than 4 lb per acre pre season. See label for use rate for specific weeds. <b>Restricted use pesticide.</b>

## Forage crops—Legumes (continued)

Herbicide and formulation	Formulated material per broadcast acre	Herbicide (lbs active per acre)	Weeds controlled	Application method and precautions
Poast 1.5E + Crop oil concentrate	1 to 2 pt + 2 pt/A	sethoxydim .19 to .38 lb/A	Crabgrass, fall panicum, foxtails, seedling and rhizome johnsongrass, bermudagrass, quackgrass.	See label directions for specific weed stages and rates for application. Apply to actively growing weeds. Allow time for regrowth if applying after cutting.
Velpar L or 90SP	1 to 3 qt or .5 to 1.5 lb/A	hexazinone .5 to 1.5 lb/A	Cheat, downy brome, chickweed, field pennycress, wild mustard, yellow rocket, barnyardgrass, crabgrass, foxtails, kochia, lambsquarters, pigweed, dandelion.	<b>Alfalfa:</b> Treat on alfalfa established for 1 year or more. Make a single application in fall or winter after alfalfa becomes dormant. May be applied in spring before new growth exceeds 2 inches, or to stubble after cutting and hay removal but before regrowth exceeds 2 inches in height. See label for use rate on specific soils and weeds. Do not plant treated areas to any other crop within 2 years of treatment.
Roundup (spot treatment)	2.6 oz/gal of water	glyphosate 2% solution	Downy brome, field pennycress, sheperdspurse, wild mustard, barnyardgrass, crabgrass, fall panicum, foxtails, smartweed, dandelion, quackgrass.	<b>Alfalfa, clover:</b> Apply to actively growing weeds. Avoid contact with desirable vegetation. No more than one tenth of any acre should be treated at one time. Further applications may be made in the same area at 30 day intervals.
<b>Established pure stands between harvest</b>				
Gramoxone 1.5E + Non-ionic surfactant (80%)	1.5 pt/A  1 pt/100 gal	paraquat .28 lb/A	Cheat, downy brome, chickweed, henbit, many other annual weeds.	<b>Alfalfa:</b> Apply within 5 days of cutting after alfalfa has been removed for silage or hay. Do not treat more than 5 days after cutting. Apply to established alfalfa stands at least 1 year old. Alfalfa foliage present at the time of application will be burned. <b>Restricted use pesticide.</b>

## Forage crops—Legumes (continued)

Herbicide and formulation	Formulated material per broadcast acre	Herbicide (lbs active per acre)	Weeds controlled	Application method and precautions
<b>Legume—grass mixtures, established stands</b>				
Sencor/Lexone 4L or DF	.75 to 1.5 pt or	metribuzin .38 to .75 lb/A	Downy brome, chickweed, field pennycress, sheperdspurse, wild mustard, yellow rocket, kochia, lambsquarters, pigweed, common ragweed, smartweed, dandelion.	<b>Alfalfa-grass mixtures:</b> Treat only dormant, established alfalfa-grass mixtures. Apply once in late fall or early spring before new growth starts. Apply before or after emergence of weeds but before they are 2 inches tall or wide. See label for use rate for specific soil textures. Rates of 1 to 1.5 pt of 4L or .6 to .8 lb DF will give partial reduction of forage grass stands. Higher rates will severely reduce forage grass stands.
Roundup 3EC (spot treatment)	2.6 oz/gal of water	glyphosate 2% solution	Downy brome, field pennycress, sheperdspurse, wild mustard, barnyardgrass, crabgrass, fall panicum, foxtails, lambsquarters, smartweed, dandelion, quackgrass.	<b>Alfalfa or clover-grass mixtures:</b> Apply to actively growing weeds. Avoid contact with desirable vegetation. See label for timing of application for specific weeds. No more than one-tenth of any acre should be treated at one time. Further applications may be made in the same area at 30 day intervals. Remove livestock before application.
<b>Forage crops: Forage sorghum or sorghum-sudan Preplant incorporated or preemergence</b>				
Atrazine 80W, 4L or AAtrex Nine-0	2 to 2.5 lb, 3.2 to 4 pt or 1.7 to 2.2 lb/A	atrazine 1.6 to 2 lb/A	Black nightshade, cocklebur, jimsonweed, lambsquarters, morningglories, pigweed, prickly sida, common and giant ragweed smartweed, velvetleaf, barnyardgrass, red rice.	Do not use on coarse (light, sandy) soils. Do not use on medium (loam) or fine (heavy, clay) soils with less than 1% organic matter. Use lower rates on medium (loam, silt loam) soils, and higher rates for heavy (fine, clay) soils. Do not plant small grains or small seeded legumes in the fall of the same year.
<b>Forage sorghum only</b>				
Dual 8E	1.5 to 2.5 pt/A	metolachlor 1.5 to 2.5 lb/A	Black nightshade, pigweed, barnyardgrass, crabgrass, fall panicum, foxtails, goosegrass, red rice, yellow nutsedge.	<b>Use Concep-treated seed.</b> Use lower rates on coarse (light, sandy) soils, and higher rates for heavy (fine, clay) soils. Small grains can be planted 4.5 months after application.



## Forage crops—Legumes (continued)

Herbicide and formulation	Formulated material per broadcast acre	Herbicide (lbs active per acre)	Weeds controlled	Application method and precautions
Dual 8E + Atrazine 80W, 4L or AAtrex Nine-0 or (Bicep 4.5E)	1.5 to 2 pt + 1.5 to 2 lb, 1.2 to 1.6 qt or 1.3 to 1.8 lb or (2.4 to 3.2 qt/A)	metolachlor 1.5 to 2 lb + atrazine 1.2 to 1.6 lb or (metolachlor + atrazine 1.5 + 1.2 to 2 + 1.6 lb/A)	Black nightshade, cocklebur, jimsonweed, lambsquarters, morningglories, pigweed, prickly sida, common ragweed, smartweed, barnyardgrass, crabgrass, fall panicum, foxtails, goosegrass, red rice, yellow nutsedge.	<i>Use Concep-treated seed.</i> Do not use on coarse (light, sandy) soils. Do not use on medium (loam) soils with less than 1.5% organic matter. Use lower rates on medium (loam, silt loam) soils, and higher rates for heavy (fine, clay) soils. Do not plant small grains or small seeded legumes in the fall of the same year.

## Forage sorghum and sorghum-sudan Postemergence—Overtop

Atrazine 80W, 4L or AAtrex Nine-0	2.5 to 3.75 lb, 2 to 3 qt or 2.2 to 3.3 lb/A	atrazine 2 to 3 lb/A	Black nightshade, cocklebur, jimsonweed, lambsquarters, morningglories, pigweed, prickly sida, common and giant ragweed, smartweed, sunflower, velvetleaf, barnyardgrass, red rice.	Apply before weeds exceed 1.5 inches in height. Do not use on sand or loamy sand.
Atrazine 80W, 4L or AAtrex Nine-0 + crop oil concentrate	3 lb, 2.4 qt, 2.7 lb + 1 qt/A	atrazine 2.4 lb/A	Black nightshade, cocklebur, jimsonweed, lambsquarters, morningglories, pigweed, prickly sida, common and giant ragweed, smartweed, sunflower, velvetleaf, barnyardgrass, red rice.	May cause crop injury. Apply after grain sorghum reaches 3-leaf stage. Do not use on sand or loamy sand.
Buctril 2E	1 to 1.5 pt/A	bromoxynil .25 to .38 lb/A	Black nightshade, cocklebur, jimsonweed, lambsquarters, morningglories, common ragweed, smartweed, sunflower, velvetleaf.	See label for specific rates and weed stages for application. Do not spray when grain sorghum foliage is wet. Application may be made from the 3-leaf stage of sorghum up to 14 inches tall.
Buctril 2E + Atrazine 80W, 4L or AAtrex Nine-0 or (Buctril/Atrazine 3F package-mix.)	.75 to 1.5 pt + .6 to 1.5 lb, .5 to 1.2 qt or .6 to 1.3 lb or (1.5 to 3 pt/A)	bromoxynil .19 to .38 lb + atrazine .5 to 1.2 lb/A or (bromoxynil + atrazine .19 + .38 to .38 + .75 lb/A)	Black nightshade, cocklebur, jimsonweed, lambsquarters, morningglories, pigweed, prickly sida, common and giant ragweed, smartweed, sunflower, velvetleaf.	See label for specific rates, crop and weed stages for application. Buctril and/or atrazine may be added to the package-mix to improve control in heavy infestations or for hard-to-control weeds. Application may be made from the 2-leaf stage (.19 lb Buctril rate), the 3-leaf stage (.25 lb rate) or the 4-leaf stage (.38 lb rate) of sorghum up to 10 inches tall.

## Forage crops—Legumes (continued)

Herbicide and formulation	Formulated material per broadcast acre	Herbicide (lbs active per acre)	Weeds controlled	Application method and precautions
2,4-D amine (4 lb/gal formulation)	1 pt/A	2,4-D amine .5 lb/A	Cocklebur, jimsonweed, lambsquarters, morningglories, pigweed, prickly sida, common and giant ragweed, sunflower, velvetleaf.	Treat only after grain sorghum is over 6 inches tall and before it is 15 inches tall. If crop is over 8 inches tall, use drop nozzles to keep spray off leaves.



## Grass pastures and rangeland

### Guide to weed response to herbicides

Herbicide	Winter annuals		Summer annuals		Biennials		Perennials**									
	Horseweed	Field Pennycress	Common Ragweed	Giant Ragweed	Bull thistle	Musk thistle	Dandelion	Curly Dock	Goldenrod	Ironweed	Multiflora Rose	Prickly Pear	Red sorrel	Sow thistle	Canada thistle	White snakeroot
<i>Preemergence (Warm season grasses only)</i>																
Atrazine	G	-	G	-	P	-	-	P	P	-	-	P	F	-	-	-
<i>Postemergence</i>																
2,4-D amine	F	G	G	G	G	G	G	F	F	F	F	P	P	F	F	F
2,4-D ester	F	G	G	G	G	G	G	F	F	F	F	P	P	F	F	F
Banvel	G	G	G	G	G	G	G	G	G	G	G	P	G	G	G	G
Roundup	F	F	F	F	F	F	G	F	F	G	G	P	F	G	G	G
Tordon	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G
Weedmaster	G	G	G	G	G	G	G	G	G	G	P	F	F	G	G	

G = Good    F = Fair\*    P = Poor    - = No data available

This table should be used as a guide for comparing the relative effectiveness of herbicides on individual weeds. Herbicides may

perform better or worse than indicated in this guide due to extreme weather conditions and other variables. If you are obtaining satisfacto-

ry results under your growing conditions, changing products as a result of information in this table is not necessarily recommended.

\* Fair = Partial control of suppression

\*\* Repeated herbicide applications over several years may be necessary for complete control of perennial weeds.

## Grass pastures and rangeland

Herbicide and formulation	Formulated material per broadcast acre	Herbicide (lbs active per acre)	Weeds controlled	Application method and precautions
2,4-D amine (4 lb/gal formulation) (many brands)	2 to 4 pt/A	2,4-D amine 1 to 2 lb/A	Field pennycress, common ragweed, giant ragweed, bull thistle, musk thistle, dandelion, many other broadleaf weeds.	<p><b>Fall:</b> The best time to obtain broadleaf weed control is in the fall after rains when weeds are actively growing. Biennial and perennial weeds should be in the rosette stage.</p> <p><b>Spring:</b> Apply to actively growing weeds, preferably before they exceed 4 to 6 inches in height. Repeated treatments in the fall or spring for 2 or more years may be necessary for good control.</p>
2,4-D ester (4 lb/gal formulation) (many brands)	2 qt/A	2,4-D ester 2 lb/A	Common ragweed, bull thistle, musk thistle, many other broadleaf weeds.	<p><b>Fall:</b> The best time to obtain broadleaf weed control is in the fall after rains when weeds are actively growing. Biennial and perennial weeds should be in the rosette stage.</p> <p><b>Spring:</b> Apply to actively growing weeds, preferably before they exceed 4 to 6 inches in height. Repeated treatments in the fall or spring for 2 or more years may be necessary for good control.</p>
2,4-D ester (4 lb/gal formulation) (many brands)	2 to 3 qt/A	2,4-D ester 2 to 3 lb/A	Wild garlic, wild onion, many broadleaf weeds and brush species.	Use a multiple application program of late fall and early spring applications. A minimum of 3 applications (fall-spring-fall or spring-fall-spring) is necessary for garlic or onion control. Several years may be needed for satisfactory control of perennial broadleaf weed and brush species.
Banvel (4 lb/gal formulation)	.5 to 2 gal	dicamba .25 to 8 lb/A	Horseweed, field pennycress, common ragweed, giant ragweed, bull thistle, musk thistle, dandelion, curly dock, goldenrod, ironweed, multiflora rose, red sorrel, sowthistle, Canada thistle, white snakeroot, other broadleaf weeds.	<p><b>Fall:</b> The best time to obtain broadleaf weed control is in the fall after rains when weeds are actively growing. Biennial and perennial weeds should be in the rosette stage.</p> <p><b>Spring:</b> Apply to actively growing weeds, preferably before they exceed 4 to 6 inches in height. Repeated treatments in spring or fall for 2 or more years may be necessary for good control. See label for use rates for specific weeds and woody plants.</p>

## Grass pastures and rangeland (continued)

Herbicide and formulation	Formulated material per broadcast acre	Herbicide (lbs active per acre)	Weeds controlled	Application method and precautions
Banvel + 2,4-D amine  <b>or</b> (Weedmaster)	.5 + 1.5 pt to 1 + 3 pt/A  <b>or</b> (1 to 2 qt/A)	dicamba + 2,4-D amine .25 + .75 to .5 + 1.5 lb/A  (dicamba + 2,4-D amine .25 + .7 to .5 + 1.4 lb/A)	Horseweed, field pennycress, common ragweed, giant ragweed, bull thistle, musk thistle, dandelion, curly dock, goldenrod, ironweed, multiflora rose, Canada thistle, white snakeroot, other broadleaf weeds.	<b>Fall:</b> The best time to obtain broadleaf weed control is in the fall after rains when weeds are actively growing. Biennial and perennial weeds should be in the rosette stage. <b>Spring:</b> Apply to actively growing weeds, preferably before they exceed 4 to 6 inches in height. Repeated treatments in spring or fall for 2 or more years may be necessary for good control. See label for use rates for specific weeds. Use lower rates for annual weeds and higher rates for perennial weeds and woody plants.
Tordon 22K	6 fl. oz to 1 pt/A	picloram .09 to .25 lb/A	Musk thistle, goldenrod, ironweed, prickly pear, other broadleaf weeds.	Use 6 to 8 fl. oz/A rate for musk thistle and goldenrod. Use 1 pt/A for ironweed. Apply in late fall to rosette stage of weeds, or in spring to actively growing weeds before the flower stalk elongates or bolts above the rosette. Do not use where runoff may flow to adjacent broadleaf crop areas. Do not transfer livestock from treated grass area onto a broadleaf crop area without first allowing 7 days of grazing on untreated grass pasture. Do not rotate treated pasture or rangeland to other crop uses. <b>Restricted use pesticide.</b>

## Grass pastures and rangeland (continued)

Herbicide and formulation	Formulated material per broadcast acre	Herbicide (lbs active per acre)	Weeds controlled	Application method and precautions
<b>Warm season grasses only</b>				
Atrazine 80W, 4L or AAtrex Nine-0	2.5 lb, 2 qt or 2.2 lb/A	atrazine 2 lb/A	Horseweed, common rag- weed, many other annual weeds.	<b>Big bluestem and switchgrass.</b> <b>Establishment:</b> Apply after planting but before weeds and crop emerge. Plant ½ inch deep in a firm seedbed.  <b>Established stands:</b> Apply in spring (April to early May) before regrowth of crop and before weed emergence. Do not use on sandy soils or soils with less than 1% organic matter. Do not cut for hay, and do not graze for 4 months following application at seed- ing, or 3 months following application to established crop.
<b>Selective application equipment</b>				
Roundup (wick or wiper application)	1 gal/ 2 gal water	glyphosate 33% by volume	Many annual and perennial broadleaf and grass weeds.	Apply when weeds are at least 6 inches above desirable pas- ture grass. Avoid contact with crop plants.

## Grass pasture, rangeline and non-cropland

Guide to woody plant responses to herbicides\*\*

Herbicide	Blackberry	Buckbrush	Cedar	Dogwood	Elm	Greenbrier	Hickory	Honeylocust	Honeysuckle	Kudzu	Maple	Mulberry	Multiflora Rose	Oaks	Osage Orange	Persimmon	Pine	Poison Ivy	Sassafras	Sumac	Sweetgum	Trumpet creeper	Willow	Established Grass Pasture and Rangeland	Forestry	Noncropland Except ditchbanks	Ditch Banks
Arsenal (FS)	P	-	P	G	P	G	G	P	G	G	G	G	G	G	P	P	P	G	G	G	G	G	G	N	N	L	L
2,4-D amine (FS)	P	G	P	P	P	P	F	P	P	P	P	P	P	F	P	P	P	P	P	F	P	P	P	L	L	L	L
2,4-D amine (CS)	P	-	P	F	G	P	F	F	P	P	F	F	P	F	F	F	F	F	G	F	F	F	G	L	L	L	L
2,4-D ester (FS)	P	F	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	F	P	P	P	L	L	L	L
2,4-DP (FS)	F	-	P	-	-	P	F	F	P	P	P	-	P	F	-	P	P	F	F	F	F	P	F	N	N	L	L
Banvel (FS)	G	F	F	F	F	P	P	P	F	G	P	N	F	F	P	G	G	F	F	F	F	F	F	L	L	L	L
Banvel 520 (BS)	P	-	F	F	F	P	F	F	P	P	F	P	P	F	P	P	F	P	F	G	P	P	F	N	L	L	L
Crossbow (FS)	G	F	P	P	F	P	F	F	P	P	F	P	F	G	P	F	F	P	F	G	F	P	F	L	N	L	L
Garlon 3A (FS)	G	-	P	F	F	P	F	F	P	P	F	F	F	G	P	F	G	P	F	G	G	P	F	N	L	L	L
Garlon 3A (CS)	P	-	F	F	F	P	F	F	P	P	G	F	F	G	F	F	P	G	F	G	G	P	F	N	L	L	L
Garlon 4 (FS)	G	P	P	F	F	P	F	F	P	P	F	F	F	G	P	F	G	P	F	G	G	P	F	N	L	L	L
Garlon 4 (BS)	G	-	F	G	F	P	G	F	P	P	G	F	F	G	P	F	G	P	F	G	G	P	F	N	L	L	L
Hyvar X-L (ST)	F	-	F	F	F	P	F	F	P	P	F	F	F	F	F	P	F	F	P	F	F	P	F	N	N	L	L
Krenite (FS)	F	-	F	F	F	P	F	P	P	G	F	P	F	F	F	P	G	P	P	F	F	F	F	N	L	L	L
Pronone 10G (ST)	G	-	G	F	G	P	F	G	G	F	F	F	G	G	F	P	P	F	P	G	G	F	F	N	L	L	N
Roundup (FS)	G	-	P	P	F	P	P	P	F	F	P	P	F	G	P	F	P	F	P	F	F	F	F	L	L	L	L



Roundup (CS)	F	-	F	F	F	P	F	F	G	P	F	F	P	G	F	F	G	G	F	F	G	P	F	L	L	L	L
Spike (ST)	F	-	F	F	G	F	F	G	G	P	F	F	G	G	P	P	F	P	P	G	F	F	F	L	N	L	L
Tordon 101 (FS)	F	-	P	F	F	P	F	F	F	F	F	F	F	P	F	G	P	F	F	F	P	F	N	L	L	N	
Tordon 101 (CS)	F	-	F	F	F	P	G	G	G	G	F	G	F	G	P	F	G	P	F	F	G	F	F	N	L	L	N
Tordon RTU (CS)	P	-	F	F	F	P	F	F	F	P	F	P	P	F	P	F	G	P	P	P	F	P	P	N	L	L	N
Velpar (ST)	F	-	F	F	F	P	F	G	P	P	F	F	G	G	F	F	P	F	P	F	F	P	F	N	L	L	L
Weedmaster (FS)	P	G	P	P	P	P	P	P	F	P	P	P	P	P	P	F	P	F	P	F	P	F	P	L	N	L	L
Weedone 170 (FS)	F	-	P	P	P	P	F	P	G	P	P	P	G	G	P	P	F	F	F	G	F	P	P	N	L	L	L
Weedone 170 (BS)	F	-	P	P	P	P	G	P	G	P	P	P	G	G	P	P	F	F	F	G	F	P	P	N	L	L	L
Weedone CB (BS)	P	-	P	P	F	P	F	P	P	P	F	P	F	F	P	F	F	F	P	P	P	P	P	N	L	L	L

G = Good    F = Fair    P = Poor or not labeled

FS = Foliar Spray    BS = Basal Spray    CS = Cut Surface    ST = Soil Treatment    L = Labeled    N = Not labeled

This table should be used as a guide for comparing the relative effectiveness of herbicides on woody plants. Herbicides may perform better or worse than indicated in this guide due to extreme weather conditions and other variables. If you are obtaining satisfactory results under your growing conditions, changing products as a result of information in this table is not necessarily recommended.

\* Fair = Partial control or defoliation.

\*\* Repeated herbicide applications over several years may be necessary for complete control of woody plants.

## Woody plant control in permanent grass pastures and rangeland

Herbicide and formulation	Formulated material per broadcast acre	Herbicide (lbs active per acre)	Weeds controlled	Application method and precautions
Banvel 4EC	1 pt to 2 gal	dicamba .5 to 8 lb/A	Persimmon, poison ivy.	Apply as foliar treatment at full leaf-out. May be tank-mixed with 2,4-D for control of additional brush species (see instructions for Weedmaster).
Banvel + 2,4-D amine  <b>or</b> (Weedmaster)	1 to 2 qt/A  <b>or</b> 1 to 2 qt/A	dicamba + 2,4-D amine, .25 + .7 to .5 + 1.4 lb/A  <b>or</b> (dicamba + 2,4-D amine, .25 + .7 to .5 + 1.4 lb/A	Persimmon, poison ivy, honeysuckle.	Spot treatment foliar spray. Apply to actively growing plants.
Crossbow 3E	1.5 to 4 gal/A	triclopyr + 2,4-D ester 1.5 + 3 lb to 4 + 8 lb/A	Many annual and brush weed species.	The most favorable time for application is in the spring after full leaf-out and into early summer. Repeated treatments for 2 or more years may be necessary for good control of some perennial brush species.
Roundup	2 to 5 qt/A or 1 to 2% solution for spot treatment, or 50% solution as cut-stump treatment.	glyphosate 1.5 to 3.75 lb/A	Blackberry, honeysuckle, kudzu, oaks, poison ivy, trumpet creeper.	Spot treatment. Roundup will kill or severely injure most vegetation that comes in contact with the solution. See label for use rates for specific plants.
Spike 20P or Brush Bullets 250	5 to 20 lb/A or 4 to 16 Brush Bullets/100 square feet	tebuthiuron 4 to 16 lb/A or 1 to 4 lb/A	Many annual and perennial brush and tree species.	<b>Warning:</b> Spike will cause some injury to perennial pasture grass species. Apply when grass is dormant. Do not apply when soil is frozen or snow-covered. Do not apply to soil containing more than 5% organic matter or more than 30% clay. Rainfall is required to initiate activity. It may take 1 to 3 years following application to completely kill some species.

## Woody plant control in non-cropland (Rights-of-way, fence rows, industrial sites, etc.)

Herbicide and formulation	Formulated material per broadcast acre	Herbicide (lbs active per acre)	Weeds controlled	Application method and precautions
<b>Foliar spray</b>				
Banvel 720  or (Weedmaster)	3 gal  or (1 pt to 2 qt/A)	dicamba + 2,4-D amine 3 + 5.7 lb/A  or (dicamba + 2,4-D amine .125 + .35 to .5 + 1 lb/A)	Persimmon, poison ivy, other broadleaf plants.	Apply uniformly as a foliar spray after leaves are fully developed until three weeks before a frost. Wet foliage to point of runoff with a backpack sprayer. Apply in 200 to 300 gal per acre with a hydraulic sprayer. See label for application directions for specific brush species.
Crossbow	1 qt to 4 gal/A	2,4-D ester + triclopyr .5 + .25 to 8 + 4 lb/A	Oaks, poison ivy, sumac, sweetgum, willow, other broadleaf plants.	Apply during warm weather when brush is actively growing. Apply broadcast sprays in enough water to deliver 15 to 30 gal of spray per acre. Apply in 100 gal per acre with a hydraulic sprayer. <b>Spot treatment of broadleaf weeds:</b> See label for application directions for specific brush species.
Garlon 3A or 4	.75 to 1 gal	triclopyr 2.25 to 4 lb/A	Sweetgum, other broadleaf plants.	Apply uniformly as a foliar spray after leaves are fully developed until 3 weeks before a frost. Wet foliage to point of runoff with a backpack sprayer. Apply in 100 to 400 gal per acre with a hydraulic sprayer. See label for application directions for specific brush species.
Krenite  + Surfactant (non-ionic)	1.5 to 3 gal/A  + 1 qt/100 gal of water	fosamine 6 to 12 lb/A	Blackberry, multiflora rose, sumac, other woody plants.	Apply as a foliar spray from July until the first frost in the fall. Complete coverage is required for control. See label for application directions for specific brush species.
Roundup  + Surfactant (non-ionic)	2 to 5 qt/A  + 2 qt/100 gal of water	glyphosate 1.5 to 3.75 lb/A	Blackberry, honeysuckle, kudzu, oaks, poison ivy, trumpet creeper.	Apply to actively growing brush. See label for use rates for specific brush species. Apply in 10 to 40 gpa of water.
Tordon 101	1 to 4 gal/A	picloram + 2,4-D amine .54 + 2 lb to 2.2 + 8 lb/A	Oaks, other woody plants.	Use 15 to 25 gpa spray mix. Apply to actively growing plants. See label for use rates for specific woody plant species. <b>Restricted use pesticide.</b>
Weedone 2,4-DP	1 to 3 gal/A	2,4-DP 3.7 to 11.1 lb/A	Oaks, other woody plants.	Apply uniformly to foliage of actively growing plants. Use 100 to 300 gals of mix per acre. See label for use rates for specific woody plant species. Follow label precautions and restrictions for use.

## Woody plant control in non-cropland (continued)

Herbicide and formulation	Formulated material per broadcast acre	Herbicide (lbs active per acre)	Weeds controlled	Application method and precautions
Weedone 170	2 to 9 gal/A	2,4-DP + 2,4-D 3.7 + 3.7 to 16.6 + 16.6 lb/A	Oaks, other woody plants.	Apply uniformly to foliage of actively growing plants. Use 200 to 600 gals of mix per acre. See label for use rates for specific woody plant species. Follow label precautions and restrictions for use.
<b>Soil treatments</b>				
Hyvar X-L	2.25 to 12 gal/A	bromacil 4.5 to 24 lb/A	Oaks, poison ivy, sweetgum, willow.	Use higher rates (greater than 5 gpa) on high organic soils. Use as a soil treatment or basal treatment. For use on drainage ditches, use only as basal treatment. Apply broadcast treatments using at least 200 gal per acre of water. Basal treatment may be applied undiluted using a hand-gun applicator, or mixed with water in a ratio of 1 gal Hyvar in 5 gals of water. Apply to actively growing plants when rainfall is expected for activation. Do not apply near desirable vegetation. See label for use roles for specific woody plant species.
Spike 85DF (Granular formulations available also)	2.5 to 7.5 lb/A	tebuthiuron 2 to 6 lb/A	Blackberry, honeylocust, honeysuckle, kudzu, multiflora rose, oaks, pine, poison ivy, sumac, trumpet creeper.	Apply in 15 to 150 gal of water per acre before or during the period of active growth of target plants. See label for use rates for specific plant species to be controlled. Do not broadcast where maintenance of a grass cover is desired. Has some postemergence activity on some herbaceous weeds. May be used as an individual plant treatment on forage or pasture area when used at less than 5 lb/A. Do not cut for hay for 1 year after application.
Velpar L  or Pronone 10G	1 to 6 gal  5 to 40 lb/A	hexazinone 2 to 12 lb  hexazinone .5 to 4 lb/A	Honeylocust, oaks, sumac, willow.	Apply in late winter or early spring before rainfall that is needed for activation. Direct spray to the soil beneath woody plants to be controlled.
<b>Cut surface (frill, injection, hypo-hatchet, stump)</b>				
2,4-D amine (4 lb/gal formulation)	undiluted	1 to 2 ml of concentrate per injection.	Many woody species.	Make injections as near the root collar as possible. Injections should be made during the growing season (May to October). See label for instructions for specific woody plant species.

## Woody plant control in non-cropland (continued)

Herbicide and formulation	Formulated material per broadcast acre	Herbicide (lbs active per acre)	Weeds controlled	Application method and precautions
Garlon 3A	undiluted	triclopyr	Many woody plant species.	Apply 1 ml of concentrate to cuts spaced 3 inches apart around the true trunk. Apply during active growth in spring or summer. May also be applied with frill or girdle method.
Roundup	undiluted	glyphosate	Honeysuckle, oats, other woody plant species.	Apply 1 ml in cuts spaced 2 to 3 inches apart around the trunk. Apply during active growth.
Tordon 101 or Tordon RTU	undiluted	picloram + 2,4-D amine	Oaks, other woody plant species.	Apply .5 ml of undiluted solution to cuts spaced 3 inches apart around the trunk. Or use 1 ml of 50% solution of Tordon 101 in a continuous cut girdling the trunk. Use any time except during heavy sap flow. Use undiluted Tordon RTU for frill method. <b>Restricted use pesticide.</b>
<b>Basal spray</b>				
Banvel 520  + diesel or fuel oil + emulsifier	1 to 3 gal in 100 gal spray mix  + 10 to 15%	dicamba + 2,4-D ester 1 + 1.9 to 3. + 5.7 lb/A	Many woody plant species.	Spray the lower part of the brush or tree trunk from the ground line up to 1.5 to 2 ft. Thorough wetting is needed for control, especially the root crown. Apply any time of year except when snow or water prevent spraying the ground line.
Weedone 170  + Diesel or fuel oil	3 to 4 gal in 100 gal of oil	2,4-D ester + 2,4-DP	Many woody plant species.	Spray the lower part of the brush or tree trunk from the ground line up to 1.5 to 2 ft. Thorough wetting is needed for control especially the root crown. Apply any time of year except when snow or water prevent spraying the ground line.
Weedone CB	undiluted	2,4-D ester + 2,4-DP	Many woody plant species.	Spray the lower part of the brush or tree trunk from the ground line up to 1.5 to 2 ft. Thorough wetting is needed for control especially the root crown. Apply any time of year except when snow or water prevent spraying the ground line. Also may be applied to freshly cut stump.

## General herbaceous weed control for non-cropland (Rights-of-way, fence rows, industrial sites, etc.)

Herbicide and formulation	Formulated material per broadcast acre	Herbicide (lbs active per acre)	Weeds controlled	Application method and precautions
Arsenal 2E	2 to 6 pt/A	.5 to 3 lb/A	Greenbrier, trumpetcreeper, many grasses and broadleaf weeds.	May be applied preemergence or as postemergence spray. Post sprays are usually more effective. Apply to wet foliage. Apply to actively growing vegetation.
2,4-D amine	1 to 4 qt/A	2,4-D amine 1 to 4 lb/A	Many annual and perennial broadleaf weeds.	Apply as a foliar spray in 15 to 30 gpa of water to young, vigorously growing weeds. Avoid drift to susceptible crops or other desirable vegetation.
Banvel	1 pt to 2 gal	dicamba .5 to 8 lb/A	Many annual and perennial broadleaf weeds.	Apply to actively growing weeds and brush. May be tank-mixed with 2,4-D, Karmex, Dalapon, Princep, Tordon, Amitrole, Hyvar, Velpar, Spike, Garlon, and other herbicides to broaden spectrum of weed and brush control. See label for more information.
Banvel 720	1% solution	dicamba + 2,4-D amine	Many annual and perennial broadleaf weeds.	Apply to actively growing weeds and brush. May be tank-mixed with Hyvar, Karmex, Krenite, Pramitol, Spike, Velpar, and other herbicides to broaden spectrum of weed control. See label for more information.
DSMA or MSMA	Many formulations	DSMA or MSMA 2.7 to 5.4 lb/A	Johnsongrass control in other perennial grasses.	Apply when johnsongrass is 6 inches tall until early head stage. Repeat applications may be needed.
Krenite + Surfactant (non-ionic)	1.5 to 3 gal/A	fosamine 6 to 12 lb/A	Blackberry, multiflora rose, sumac, other brush and woody plant species.	Apply as a foliar spray from July through first frost. Complete coverage is essential for good control.
Oust 75DG	1 to 12 oz/A	sulfometuron-methyl .05 to .56 lb/A	Johnsongrass, fescue, most annual grass and broadleaf weeds.	Apply preemergence or early postemergence in late spring to early summer. Use non-ionic surfactant for postemergence applications. Do not apply where runoff water may flow onto agricultural land or where other desirable vegetation is growing. May be tank-mixed with Karmex, Velpar and other herbicides for broader spectrum weed control. See label for more information.

**General herbaceous weed control for non-cropland (continued)**  
**(Rights-of-way, fence rows, industrial sites, etc.)**

Herbicide and formulation	Formulated material per broadcast acre	Herbicide (lbs active per acre)	Weeds controlled	Application method and precautions
Roundup	2 to 5 qt/A	glyphosate .75 to 3.75 lb/A	Johnsongrass, bermudagrass, fescue, dandelion, multiflora rose, thistles, most annual weeds, and many perennial plants.	Apply as foliar spray to actively growing plants. See label for use rates for specific plant species.
Telar	.25 to 3 oz/A	chlorsulfuron .01 to .14 lb/A	Many annual broadleaf weeds.	Bermudagrass, bluegrass, fescue and smooth brome are tolerant at rates of .5 to 1 oz/A. Higher rates may cause temporary yellowing and growth suppression of grasses. Use preemergence or postemergence. See label for use rates on specific weeds. Apply in 10 to 40 gal of water per acre. Do not apply where runoff water may flow onto agricultural land or other desirable vegetation.

**Soil sterilants**  
**(Fence rows, field margins, roadsides, industrial sites, etc.)**

Atrazine 80W, 4L or AAtrex Nine-0	6 to 50 lb, 4.8 to 40 qt or 5.3 to 44.4 lb/A	atrazine 4.8 to 40 lb/A	Many annual, biennial and perennial broadleaf and grass weeds.	Apply before or soon after weeds begin growth. Use at least 1 gal of water for each pound of product, more if practical. Do not use near desirable vegetation. May be tank-mixed with Princep for long-term control. See label for use rates for specific weeds.
Hyvar XL	1.5 to 12 gal/A	bromacil 3 to 24 lb/A	Many annual and perennial broadleaf and grass weeds.	Apply as spray in 100 to 200 gal of water per acre. See label for use rates for specific weeds.
Karmex 80W	5 to 60 lb/A	diuron 4 to 48 lb/A	Many annual and perennial broadleaf and grass weeds.	Apply to soil shortly before weed growth begins. See label for use rates for specific weeds.
Krovar I WP	4 to 40 lb/A	bromacil + diuron 3.2 + .8 to 32 + 8 lb/A	Many annual and perennial broadleaf and grass weeds.	Apply just before weed emergence or in early stages of weed growth. See label for use rates for specific weeds.
Pramitol 25E	5 to 30 gal/A	prometon 1.25 to 7.5 lb/A	Many annual and perennial broadleaf and grass weeds.	Apply prior to emergence until 3 months after weed emergence. Will give residual control for over 1 year. See label for use rates for specific weeds and uses.

**General herbaceous weed control for non-cropland (continued)**  
**(Rights-of-way, fence rows, industrial sites, etc.)**

Herbicide and formulation	Formulated material per broadcast acre	Herbicide (lbs active per acre)	Weeds controlled	Application method and precautions
Pramitol 5PS	.5 to 2 lb/ 100 sq. ft.	prometon + simazine + sodium chlorate + sodium metaborate	Many annual and perennial broadleaf and grass weeds.	Apply prior to emergence until 3 months after weed emergence. Will give residual control for over 1 year. See label for use rates for specific weeds and uses.
Princep 4G, 4L, 80W, or Caliber 90	250 to 1000 lb, 2.5 to 10 gal, 12.5 to 50 lb, or 11.1 to 44.4 lb/A	simazine 10 to 40 lb/A	Many annual and perennial broadleaf and grass weeds.	Best results are obtained when applied prior to weed emergence. See labels for use rates for specific weeds.
Spike 85DF	1.5 to 18.75 lb/A	tebuthiuron 1.27 to 16 lb/A	Many annual and perennial broadleaf and grass weeds.	May be applied anytime except when ground is frozen or the soil is saturated with moisture. Do not apply near desirable vegetation where roots may come in contact with the herbicide. Avoid contamination of irrigation water. See label for use rates for specific weeds.
Velpar L	3 to 6 gal/A	hexazinone 6 to 12 lb/A	Many annual and perennial broadleaf and grass weeds.	Apply to soil from late winter to early summer, or in fall. Needs rainfall for activation. See label for use rates for specific weeds.



## Grazing restrictions and labeled crop species for forage and pasture herbicides

Herbicide	Labeled crops	Restriction	Time interval	Precautions
2,4-D amine	FG,GP,SS	B L,S H	I 14 days* 30 days	*Varies by manufacturer. Refer to label.
2,4-D ester	FG,GP,SS	B L S H	I 7 days 14 days 30 days	
2,4-DB (Butoxone)	AC,AL,BT,LC, RC***	*B,L,S,H **B,L,S,H	*30 days **60 days	*Established forage crops. **Seedling forage crops. ***Do not use on established clovers grown for seed.
atrazine	BB,SW,FS,SS	B.L.H. S	21 days No information on label.	
Balan	AC,AL,BT,LC, RC	No information on label.		
Banvel	FG	B S *L,H	I 30 days 1 pt/A 1 qt/A 2 qt/A up to 8 qt/A	*Interval depends on rate used. L = 7 days H = 37 days L = 21 days H = 51 days L = 40 days H = 70 days L = 60 days H = 90 days
Bicep	FS	No information on label.		
Buctril	FS	H,B,L S	30 days No information on label.	
Buctril + atrazine	FS	H,B,L S	30 days No information on label.	
Crossbow	GP	B B* S** L,H	I 1 year 3 day 1 year	*If treated with more than 1.5 gal/A. **Interval in effect for 1 year following treatment.
Dual	FS	No information on label.		
Eptam/Genep	AC,AL,BT,L, LC,RC	B,L,H S	14 days No information on label.	
Furloe	AL	B,L,H S	40 days. No information on label.	
Gramoxone	AL	B,L,H,S B,L,H,S	60 days* 30 days*	*Fall dormant season application. **Between cutting application.
Karmex	AL	H,B,L S	70 days No information on label.	

## Grazing restrictions and labeled crop species for forage and pasture herbicides (continued)

Herbicide	Labeled crops	Restriction	Time interval	Precautions
Kerb	AC,AL,BT,CV, LC,WC	H,B,L  S	Depends on rate used and crop. AL below 3.0 lb/A - 25 days. AL 3 to 4 lb/A - 45 days. All other crops - 125 days. No information on label.	
Poast	AL	B,L,S H	7 days 20 days	
Roundup	AL,FG,FL	B,L,H S	14 days No information on label.	
Sencor/Lexone	AL*	B,L,S,H	28 days	*May also be used on alfalfa-grass mixtures.
Sinbar	AL	H,B S,L	70 days No information on label.	
Spike 20P, Brush-Bullets 250	GP	B,L,S,H*	I**	*Hay may not be cut for 1 year if more than 20 Brush Bullets per tree, 16 Brush Bullets per 100 ft <sup>2</sup> , or any rate of Spike 20P was used. **Do not graze or cut for hay for 1 year if more than 20 lb/A of 20P was used.
Tordon	GP	H,B,S,L	No information on label.	Do not transfer livestock from treated grass area onto a broad-leaf crop area without first allowing 7 days grazing on untreated grass pastures.
Velpar	AL	H,B,S,L	30 days	
Weedmaster	GP	B L S H	I 7 days 30 days 37 days	

### Key

<b>Crop</b>	<b>Crop</b>	<b>Crop</b>
AC = Alsike clover	FL = Forage legumes	RC = Red clover
AL = Alfalfa	FS = Forage sorghum	SC = Sweet clover
B = Bermudagrass	GP = Permanent grass pasture (B,BB,BG,IN,SW,TF)	SS = Sorghum-sudan
BB = Big bluestem	IN = Indiangrass	SW = Switchgrass
BG = Bluegrass	L = Lespedeza (All types)	TF = Tall fescue
BT = Birdsfoot trefoil	LC = Ladino clover	WC = White clover
CV = Crownvetch		

### Restriction type:

B = interval before grazing beef cattle	S = interval before slaughter
L = interval before grazing lactating dairy cattle	H = interval before cutting for hay
	I = Immediately

\*This table applies to the major forage crops of Missouri. Refer to herbicide labels for the latest crop labeling and grazing restriction information. The University of Missouri does not warrant herbicides and regrets any omissions or errors in this guide. Always refer to product labels before using pesticides.



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■ Issued in furtherance of Cooperative Extension Work Acts of May 8 and June 30, 1914 in cooperation with the United States Department of Agriculture. Gail L. Imig, Interim Director, Cooperative Extension, University of Missouri and Lincoln University, Columbia, Missouri 65211. ■ An equal opportunity institution.

**MP 581    2/88/2M**

