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CHEMICAL WEED AND BRUSH CONTROL

SUGGESTIONS FOR RANGELAND

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Suggestions for Rangeland

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This publication provides general suggestions for herbicides used to control brush and weeds on Texas rangelands. It also gives information on the levels of control expected. The information is presented in good faith, but no warranty, express or implied, is given. Weed and brush control results may vary tremendously if treatments are applied under less than optimum conditions. Users of this publication may find the decision support system for rangeland weed and brush control technology selection—Pestman—helpful. PESTMAN is designed to recommend appropriate mechanical and chemical rangeland brush and weed control treatments for Texas and New Mexico. All herbicide treatments included in this publication are also included in PESTMAN, which helps in estimating costs and the economic impact of various treatment options. PESTMAN is an Internet-based system (*http://pestman.tamu.edu*) that can be accessed free of charge.

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Control descriptions for weed and brush plants are located on the page numbers indicated. Carefully check the chart. More than one control measure may exist.

Millions of acres of Texas rangeland support an excessive cover of woody plants and forbs. Dense stands of brush and weeds use valuable water for growth, reduce grass production and result in soil erosion. These noxious plants must be managed effectively for rangelands to reach their productive potential. Use of herbicides provides an effective and efficient alternative for controlling brush and weeds for improvement and maintenance of rangelands in a highly productive condition.

This publication lists current suggestions for herbicide use to control brush and weeds on rangeland. Some herbicides provide a high degree of control of certain species; however, seldom is a species eradicated. Consider other potential rangeland uses when developing a brush management program. Many trees, shrubs and forbs are valuable as food and cover for wildlife and may be an important component in livestock diets. Therefore, a brush management program should provide for use of control methods that give optimum benefits to livestock and wildlife.

Herbicide application may increase palatability of poisonous plants. Thus, they are more likely to be consumed by livestock. To prevent losses to toxic plants, herbicide-treated areas with poisonous plants present should not be grazed until the toxic plants dry up and lose their palatability.

Properly used herbicides are effective and safe. Misuse can result in poor brush and weed control and possible hazards associated with herbicidal drift, dangerous residues, or killing desirable plants. Listed below are points to follow for proper herbicide use:

- Identify the weed or brush species and evaluate the need for control.
- Consider expected benefits, costs and alternative control practices.
- Select and purchase the suggested herbicide for the weed or brush species.
- Read and follow herbicide label directions for allowable uses, application rates and special handling or mixing requirements.
- Provide and require the use of proper safety equipment.
- Calibrate spray equipment.
- Mix herbicides in a ventilated area, preferably outside.
- Spray under conditions that prevent drift to susceptible crops.
- Apply the herbicides at the suggested rate and time.
- Keep a record of the herbicide used, the time required to spray, weather conditions, rate of herbicide in carrier, date, location, and the person using the herbicide.

The sprayer used must apply the correct quantity of herbicide mixture to a specific area. To calibrate spray equipment, see Extension publication L-5465, "Weed Busters: Sprayer Calibration Guide."

Suggestions on use of herbicides made by the Texas AgriLife Extension Service are based upon effectiveness under Texas conditions.

Broadcast and individual plant treatments are presented in Table 1 and Table 2. Individual plant treatments are suited for control of thin stands of brush and selective control. Broadcast treatments are useful for dense stands of brush and for weed control.

Suggested herbicides must be registered and labeled for use by the Environmental Protection Agency. *Because the status of herbicide label clearance is subject to change, be certain that the herbicide is currently labeled for the intended use.*

The user is always responsible for the effects of herbicide residue on his livestock and crops, as well as for problems that could arise from drift or movement of the herbicide from his property to that of others. *Always read and follow carefully the instructions on the container label.*

Treatment Control Ratings

A control rating, based on the effectiveness of a herbicide treatment in controlling a target plant, has been assigned to each herbicide use suggestion. These ratings were determined from research and result demonstration data and from observations of commercial applications. The rating represents a degree of plant mortality of the target plant species when the treatment is properly applied under optimum conditions. The rating categories and degree of plant mortality are:

Control rating	Percent of plants killed
Very high	76-100
High	56-75
Moderate	36-55
Low	0-35

Common, Chemical and Product Names of Herbicides*

Herbicide common name	Chemical name	Product name	Active ingredient or acid equivalent
Aminopyralid	2-pyridine carboxylic acid, 4-amino-3, 6-dichloro-2-pyrdine carboxylic acid, triisopropanolammonium salt	Milestone	2 lb/gal
Aminopyralid:2,4-D (1:8)	See Aminopyralid and 2,4-D	GrazonNext HL	3.75 lb/gal
Aminopyralid:Clopyralid (1:4.6)	See Aminopyralid and Clopyralid	Sendero	2.8 lb/gal
Clopyralid	3,6-dichloro-2-pyridinecarboxylic acid	Reclaim, Pyramid R&P, Clopyralid 3	3 lb/gal
2,4-D	(2,4-dichlorophenoxy) acetic acid	Weedar 64, Broad Range 55, Hi-Dep, Weedone LV4, Esteron 99 and others	amine salts, free acids and esters of variable concentration
Dicamba	3,6-dichloro-2-methoxybenzoic acid	Banvel, Clarity, Vision	4 lb/gal
Dicamba:2,4-D(1:3)	See Dicamba and 2,4-D	Weedmaster, Banvel + 2,4-D, RangeStar, Outlaw	4 lb/gal
Diesel fuel oil or kerosene	refined petroleum fractions	Several manufacturers	
Fluroxypyr	1-methylheptyl ester: ((4-amino-3,5-dichloro-6-fluoropyridin-2-yl)oxy)acetic acid	Vista XRT	2.8 lb/gal
Glyphosate	N-(phosphonomethyl) glycine	Several including Rodeo**, Roundup, Roundup Ultradry, Glyphosate 417	isopropylamine salt, concentration varies depending on the product
Hexazinone	3-cyclohexyl-6-(dimethylamino)-1-methyl-1,3,5-triazine-2,4(IH, 3H)-dione	Velpar L, Pronone Power Pellet	2 lb/gal (Velpar L) 75% (Pronone Power Pellet)
Imazapyr	2-[4,5-dihydro-4-methyl-4-(1-methylethy)-5-oxo-IH-imidazol-2-yl]-3-pyridinecarboxylic acid	Arsenal, Habitat**	2 lb/gal
Metsulfuron methyl	methyl 2[[[[(4-methoxy-6-methyl-1,3,5-triazin-2-yl)amino]carbonyl]amino] sulfonyl] benzoate	Escort, Clean Pasture, MSM 60DF	60%
Metsulfuron:Chlorosulfuron (3:1)	See Metsulfuron methyl + 2-Chloro-N-[(4-methoxy-6-methyl-1,3,5-triazin-2-yl)aminocarbonyl] benzenesulfonamide	Cimarron Plus	48% metsulfuron 15% Chlorosulfuron
Metsulfuron:Chlorosulfuron (1:1)	See Metsulfuron: Chlorosulfuron	Cimarron X-Tra	30% Metsulfuron 37.5% Chlorosulfuron
Metsulfuron methyl Dicamba:2,4-D(1:3)	See Metsulfuron methyl, dicamba and 2,4-D	Cimarron Max	60% (Part A) 3.87 lb/gal (Part B)
Picloram	4-amino-3,5,6-trichloro-2-pyridinecarboxylic acid	Tordon 22K, Triumph 22K, Picloram 22K	2 lb/gal
Picloram:Fluroxypyr (1:1)	See Picloram and Fluroxypyr	Surmount	1.34 lb/gal
Picloram:2,4-D(1:4)	See Picloram and 2,4-D	Grazon P+D, Gunslinger, Picloram + D	2.5 lb/gal
Tebuthiuron	N-[5-(1,1-dimethylethy)-1,3,4-thiadiazol-2-yl]-N-N'-dimethylurea	Spike 20P, Spike 80 DF	20% (Spike 20P) 80% (Spike 80 DF)
Triclopyr	{(3,5,6-trichloro-2-pyridinyl)oxy}acetic acid	Clear Pasture, Pathfinder II, Triclopyr R&P Remedy Ultra, Triclopyr 4 EC	0.75 lb/gal (Pathfinder II–ready to use formulation for stem sprays) 4 lb/gal (all others)
Triclopyr:Fluroxypr (3:1)	See Triclopyr and 1-methylhepty ester:((4-amino-3,5-dichloro-6-fluoropyridin-2-yl)oxy)acetic acid	PastureGard	2.0 lb/gal
Triclopyr:2,4-D(1:2)	See Triclopyr and 2,4-D	Crossbow	3 lb/gal

*Herbicides have been identified by the accepted Weed Science Society of America common name, and when practical, one or more product names.
**Aquatic label

Common Measurement Conversions for Use with Herbicide Applications

Liquid

1 gallon (gal) = 4 quarts (qt)
1 gallon = 8 pints (pt)
1 gallon = 16 cups (c)
1 gallon = 128 ounces (oz)
1 gallon = 3784.96 milliliters (ml)
1 quart (qt) = 2 pints
1 quart = 4 cups
1 quart = 32 ounces
1 quart = 946.24 milliliters
1 pint (pt) = 2 cups
1 pint = 16 ounces
1 pint = 473.12 milliliters
1 cup (c) = 8 ounces
1 ounce (oz) = 2 tablespoons (tbs)
1 ounce (oz) =29.57 milliliters
1 tablespoon (tbs) = 3 teaspoons (tsp)
1 tablespoon = ½ ounce
1 tablespoon = 14.79 milliliters
1 teaspoon (tsp) = 4.98 milliliters

Weight

1 pound (lb) = 16 ounces
1 pound = 453.6 grams (g)
1 ounce = 28.35 grams
1 kilogram (kg) = 2.2 pounds

Area

1 acre = 43,560 square feet (sq ft)
1 hectare (ha) = 2.471 acres

Guide to Quantity of Herbicide Formulation for Total Volume of Spray Mix

Total Spray Volume Desired	Herbicide Concentration Desired for Individual Plant and Spot Treatment											
	¼%	½%	¾%	1%*	1 ½%	2%	3%	4%	5%	10%	15%	25%
	Quantity of Herbicide Formulation											
1 gal	⅓ oz	⅔ oz	1 oz	1 ⅓ oz	2 oz	2 ⅔ oz	4 oz	5 ¼ oz	6 ½ oz	13 oz	19 oz	1 qt.
3 gal*	1 oz	2 oz	3 oz	4 oz*	6 oz	8 oz	12 oz	15 ½ oz	19 oz	38 oz	57 oz	96 oz
5 gal	1 ⅓ oz	3 ⅓ oz	5 oz	6 ½ oz	10 oz	13 oz	19 oz	26 oz	32 oz	64 oz	96 oz	1 ¼ gal
10 gal	3 ⅓ oz	6 ½ oz	10 oz	13 oz	19 oz	26 oz	38 oz	51 oz	2 qts.	1 gal	1 ½ gal	2 ½ gal
25 gal	8 oz	16 oz	24 oz	32 oz	48 oz	64 oz	96 oz	1 gal	1 ¼ gal	2 ½ gal	3 ¾ gal	6 ¼ gal
50 gal	16 oz	32 oz	48 oz	64 oz	96 oz	1 gal	1 ½ gal	2 gal	2 ½ gal	5 gal	7 ½ gal	12 ½ gal
100 gal	32 oz	64 oz	96 oz	1 gal	1 ½ gal	2 gal	3 gal	4 gal	5 gal	10 gal	15 gal	25 gal

*Example: To prepare 3 gallons of a spray mixture (herbicide, water and surfactant) containing 1% herbicide, add 4 ounces of herbicide.

Note: Add ¼% to ½% commercial, non-ionic surfactant for mixtures using only water as the herbicide carrier.
Add 5% diesel fuel if an oil-in-water emulsion is the herbicide carrier. An oil emulsifying agent (emulsifier) should be added according to label directions. Agitation and the emulsifier are necessary to prevent separation of the spray mixture.

Caution: Non-ionic surfactants are not emulsifying agents and will not result in the formation of an emulsion when diesel fuel and water are mixed and agitated. The emulsifier should be added at 1 to 3 ounces per gallon of the diesel fuel prior to adding the diesel fuel to the spray tank. The spray tank should be filled to about half the desired volume with water prior to adding the diesel fuel-emulsifier premix. The diesel fuel-emulsifier premix is then added to the spray tank slowly, with agitation, after which the spray tank is filled to the desired volume with water.

Table 1. Herbicides for controlling weeds on rangeland.

Weed controlled	Herbicide (common and chemical names -page 6)	Herbicide quantity (active ingredient rate in parenthesis)		Spray volume (per acre for broadcast, as described for individual plant)	Time to apply	Remarks
		Broadcast rate per acre	Individual plant/spot treatment*			
African rue	Hexazinone liquid		VH** 2 ml/plant	Use an exact delivery handgun to apply undiluted herbicide to soil surface at the edge of the plant canopy.	Spring or summer.	Do not use on heavy clay or caliche soils.
	Hexazinone pellet		1 pellet/plant			
	Tebuthiuron 20% pellets	H 7.5 lb (1.5 lb)				
	Imazapyr	H 32 oz (0.5 lb)	VH 0.5%	10 to 25 gal/acre for ground broadcast. Thoroughly wet foliage for individual plant treatment. Add 32 to 64 oz of surfactant per 100 gal water.	Late September through October (to first frost).	Applications should be made to fall regrowth that is in good growing condition. Recommend using individual plant treatment when growing with desirable vegetation to reduce non-target damage. Imazapyr is a non-selective herbicide and will kill or damage desirable vegetation if sprayed.
Berlander lobelia, bitter sneezeweed, broomweed (annual or common), buffalobur, camphorweed, cocklebur, croton, horehound, marshelder (sumpweed, sulfaweed), plantain (tallowweed), prairie gerardia (see remarks), ragweed, smartweed, sunflower, thistles, western bitterweed (see remarks), western ragweed, wild carrot and others	2,4-D amine or low volatile ester	VH** 16 to 32 oz (½ to 1 lb) 4 lb/gal product	VH 1% (4 lb/gal product)	2 to 4 gal water for aerial spray; 10 to 25 gal water for ground broadcast application. Thoroughly wet foliage for individual plant treatment. Add 32 to 64 oz of surfactant per 100 gal of water.	Spring, weeds 4 to 6 in. high, good moisture condition. Spray thistles in rosette stage.	Use 2,4-D amine in areas with 25 in. of rainfall or more. Use 2,4-D low volatile ester in drier areas where no susceptible crops are nearby. For western bitterweed control use 2,4-D low volatile ester or amine at 32 oz/acre before plants flower and temperature (above 72°F) and soil moisture favor plant growth. When three-fourths of plants are blooming and/or temperature is less than 60°F, use Dicamba:2,4-D(1:3), 2,4-D plus Dicamba, Picloram:2,4-D(1:4), Aminopyralid:2,4-D(1:8) or 2,4-D plus Picloram. For prairie gerardia control use 48 oz/acre of 2,4-D or the low rate of Dicamba:2,4-D(1:3). Dicamba plus 2,4-D, Picloram:2,4-D(1:4) or Picloram plus 2,4-D when plants are 4 to 6 in. high. Use 32 oz/acre of Picloram:2,4-D(1:4) or 8 oz of 2,4-D/acre when plants are 6 to 10 in. high before flowering.
	Dicamba:2,4-D(1:3)	VH 16 to 32 oz (½ to 1 lb)	VH 1%			
	Dicamba + 2,4-D amine or low volatile ester	VH 4 to 8 oz (⅛ to ¼ lb) Dicamba + 12 to 24 oz (⅜ to ¾ lb) 2, 4-D, 4 lb/gal product	VH ¼ % Dicamba + ¾ % 2,4-D (4 lb/gal product)			
	Picloram:2,4-D(1:4)	VH 16 to 24 oz (0.3 to 0.9 lb)	VH 1%			
	Picloram + 2,4-D amine or low volatile ester	VH 8 to 24 oz (1/16 to 3/16 lb) Picloram + 8 to 24 oz (¼ to ¾ lb) 2,4-D 4 lb/gal product	VH ¼ % Picloram + ½ % 2,4-D (4 lb/gal product)			
	Metsulfuron methyl Dicamba:2,4-D(1:3)	VH** Rate 1 to Rate 2				
	Picloram:Fluroxypyr (1:1)	VH 24 to 32 oz (0.25 to 0.33 lb)	VH 1%			Use high end of rate range for camphorweed, marshelder and smartweed.
	Triclopyr:Fluroxypr (3:1)	H 32 to 48 oz (0.5 to 0.75 lb)	VH 1%			Use high end of rate range for camphorweed, marshelder and smartweed. Triclopyr:Fluroxypr (3:1) efficacy on smartweed is marginal.

*See Guide to Quantity of Herbicide Formulation for Total Volume of Spray Mix on page 7 for mixing information.
**Treatment control ratings: VH – Very High; H – High; M – Moderate; L – Low

Weed controlled	Herbicide (common and chemical names page 6)	Herbicide quantity (active ingredient rate in parenthesis)		Spray volume (per acre for broadcast, as described for individual plant)	Time to apply	Remarks
		Broadcast rate per acre	Individual plant/spot treatment*			
Berlander lobelia, bitter sneezeweed, broomweed (annual or common), buffalobur, camphorweed, cocklebur, croton, horehound, marshelder (sumpweed, sulfaweed), plantain (tallowweed), prairie gerardia (see remarks), ragweed, smartweed, sunflower, thistles, western bitterweed (see remarks), western ragweed, wild carrot and others (continued)	Aminopyralid:2,4-D (1:8)	VH 24 oz (0.70 lb)		2 to 4 gal water for aerial spray; 10 to 25 gal water for ground broadcast application. Thoroughly wet foliage for individual plant treatment. Add 32 to 64 oz of surfactant per 100 gal of water.	Spring, weeds 4 to 6 in. high, good moisture condition. Spray thistles in rosette stage.	
	Aminopyralid	VH 4 oz (0.125 lb)				Aminopyralid provides excellent control of thistles and annual weed species in general, although at this time efficacy of this herbicide is not confirmed for all of the species in this list.
Broomweed (annual or common), plantain (tallowweed), wild carrot	Metsulfuron methyl	VH 0.1 oz		2 to 4 gal water for aerial spray; 10 to 25 gal water for ground broadcast application. Add 32 to 64 oz of surfactant per 100 gal of water.	Spring, weeds less than 4 in. tall.	
	Metsulfuron:Chlorosulfuron (3:1)	VH 0.125 oz				
	Metsulfuron:Chlorosulfuron (1:1)	VH 0.2 oz				
Broom snakeweed (perennial broomweed)	Picloram	VH 16 to 32 oz (¼ to ½ lb)	VH ½ %	2 to 4 gal water for aerial spray; 10 to 25 gal water for ground broadcast application. Thoroughly wet foliage for individual plant treatment. Add 32 to 64 oz of surfactant per 100 gal of water.	During and after full flower stage in fall when growth conditions are good; or spring during peak plant growth when growth conditions are good.	Add emulsifer to oil for proper emulsion when oil-in-water emulsion is used. Use 16 oz/acre of Picloram only in the fall. Use 32 oz/acre of Picloram in the spring. Poor control may be expected if Dicamba:2,4-D(1:3) or Dicamba:2,4-D mixture is used when growth conditions are less than ideal. Growth conditions should be optimum if Picloram:2,4-D(1:4) or Picloram:2,4-D mixture is used in the spring.
	Picloram:2,4-D(1:4)	VH 64 oz (1 ¼ lb)	VH 1%			
	Picloram:Fluroxypyr (1:1)	VH 48 to 96 oz (0.5 to 1.0 lb)	VH 1%			
	Picloram + 2,4-D amine or low volatile ester.	VH 16 oz (¼ lb) Picloram + 16 to 32 oz (½ to 1 lb) 2,4-D, 4 lb/gal product	VH ¼ % Picloram + ½ % 2,4-D (4 lb/gal product)			
	Dicamba:2,4-D(1:3)	VH 32 oz (1 lb)	VH 1%			
	Dicamba + 2,4-D amine or low volatile ester.	VH 8 oz (¼ lb) Dicamba + 24 oz (¾ lb) 2,4-D, 4 lb/gal product	VH ¼ % Dicamba + ¾ % 2,4-D (4 lb/gal product)			

*See Gulde to Quantity of Herbicide Formulation for Total Volume of Spray Mix on page 7 for mixing information.
**Treatment control ratings: VH – Very High; H – High; M – Moderate; L – Low

Weed controlled	Herbicide (common and chemical names -page 6)	Herbicide quantity (active ingredient rate in parenthesis)		Spray volume (per acre for broadcast, as described for individual plant)	Time to apply	Remarks
		Broadcast rate per acre	Individual plant/spot treatment*			
Broom snakeweed (perennial broomweed) (continued)	Metsulfuron methyl	VH 0.6 oz		2 to 4 gal water for aerial spray; 10 to 25 gal water for ground broadcast application. Add 32 to 64 oz of surfactant or 2 gal crop oil per 100 gal of water.	Optimum time is in the fall, but may be applied in spring.	
	Metsulfuron:Chlorosulfuron (3:1)	VH 0.75 oz				
	Metsulfuron:Chlorosulfuron (1:1)	VH 1.2 oz				
	Metsulfuron methyl Dicamba:2,4-D(1:3)	H to VH Rate 1 to Rate 2				
	Tebuthiuron 20% pellets	VH 3.75 lb of pellets (¾ lb)	VH ⅛ oz of pellets (1/30 oz) per 100 sq ft		Any time–optimum period is Oct. 1 to April 1 except in Trans-Pecos where optimum period is May 1 to July 1.	Use only on sand, loamy sand, sandy loam, loam, silt loam, silt or sandy clay loam soils.
Bullnettle, Carolina horsenettle, dogfennel, silverleaf nightshade, upright prairie-coneflower, western horsenettle (treadsalve), yankeeweed (rosin weed)	Picloram:2,4-D(1:4)	VH 32 to 48 oz (0.6 to 0.9 lb)	VH 1%	2 to 4 gal water for aerial spray; 10 to 25 gal water for ground broadcast application. Thoroughly wet foliage for individual plant treatment. Add 32 to 64 oz of surfactant per 100 gal of water.	Spring (see remarks).	Spray bullnettle, Carolina horsenettle, silverleaf nightshade and western horsenettle when plants begin to flower in the spring. Spray dogfennel and yankeeweed when plants are 8 to 10 in. tall. Spray upright prairie-coneflower when plants are 2 to 6 in. tall before flowering.
	Picloram + 2,4-D amine or low volatile ester.	VH 8 to 12 oz (⅛ to 3/16 lb) Picloram + 16 to 24 oz (½ to ¾ lb) 2,4-D, 4 lb/gal product	VH ¼ % Picloram + ½ % 2,4-D (4 lb/gal product)			
	Picloram:Fluroxypyr (1:1)	VH 24 to 32 oz (0.25 to 0.33 lb)	VH 1%			
	Metsulfuron methyl Dicamba:2,4-D(1:3)	H to VH Rate 1 to Rate 2				
	Dicamba:2,4-D(1:3)	VH 32 oz (1 lb)	VH 1%			
	Dicamba + 2,4-D amine or low volatile ester.	VH 8 oz (¼ lb) Dicamba + 24 oz (¾ lb) 2,4-D, 4 lb/gal product	VH ¼ % Dicamba + ¾ % 2,4-D (4 lb/gal product)			

*See Guide to Quantity of Herbicide Formulation for Total Volume of Spray Mix on page 7 for mixing information.
**Treatment control ratings: VH – Very High; H – High; M – Moderate; L – Low

Weed controlled	Herbicide (common and chemical names -page 6)	Herbicide quantity (active ingredient rate in parenthesis)		Spray volume (per acre for broadcast, as described for individual plant)	Time to apply	Remarks
		Broadcast rate per acre	Individual plant/spot treatment*			
Common goldenweed, Drummond's goldenweed	2,4-D low volatile ester	VH** 64 oz (2 lb) 4 lb/gal product	VH 2% (4 lb/gal product)	2 to 4 gal water for aerial spray; 10 to 25 gal water for ground broadcast application. Thoroughly wet foliage for individual plant treatment. Add 32 to 64 oz of surfactant per 100 gal of water.	Spring when growth conditions are good.	Picloram:2,4-D(1:4), Dicamba:2,4-D(1:3) and mixtures of Dicamba:2,4-D and Picloram:2,4-D are more effective than 2,4-D alone when growth conditions are less than optimal. When oil-in-water emulsion is used, add emulsifier to oil for proper emulsion.
	Dicamba:2,4-D(1:3)	VH 48 oz (1 ½ lb)	VH 2%			
	Picloram:Fluroxypyr (1:1)	VH 32 oz (0.33 lb)	VH 1%			
	Triclopyr:Fluroxypr (3:1)	H 32 to 48 oz (0.5 to 0.75 lb)	VH 1%			
	Metsulfuron methyl Dicamba:2,4-D(1:3)	VH Rate 3				
	Dicamba + 2,4-D amine or low volatile ester.	VH 12 oz (⅜ lb) Dicamba + 36 oz (1.125 lb) 2,4-D, 4 lb/gal product	VH ½% Dicamba + 1 ½% 2,4-D (4 lb/gal product)			
	Picloram:2,4-D(1:4)	VH 48 oz (0.94 lb)	VH 2%			
	Picloram+2,4-D amine or low volatile ester.	VH 12 oz (0.19 lb) Picloram + 24 oz (¾ lb) 2,4-D, 4 lb/gal product	VH ½% Picloram + 1% 2,4-D (4 lb/gal product)			
Flathead sedge	Dicamba:2,4-D(1:3)	VH 64 oz (2 lb)		Ground broadcast 20 to 30 gal per acre with the addition of 32 to 64 oz of surfactant per 100 gal of water.	Spring or fall.	Control may be enhanced if the stand is burned and/or shredded and allowed to regrow to a height of 12 to 15 in. before spraying.
	Metsulfuron methyl Dicamba:2,4-D(1:3)	VH Rate 2				
Garboncillo, threadleaf groundsel, wooly locoweed	Picloram:2,4-D(1:4)	VH 48 oz (0.94 lb)	VH 2%	2 to 4 gal water for aerial spray; 10 to 25 gal water for ground broadcast application. Thoroughly wet foliage for individual plant treatment. Add 32 to 64 oz of surfactant per 100 gal water.	Fall, good moisture conditions.	Herbicide application may increase palatability of these poisonous plants. Therefore, treated areas should not be grazed until the toxic plants dry up and lose their palatability.
	Picloram + 2,4-D amine or low volatile ester.	VH 12 oz (0.19 lb) Picloram + 24 oz (¾ lb) 2,4-D, 4 lb/gal product	VH ½% Picloram + 1% 2,4-D (4 lb/gal product)			
	Picloram:Fluroxypyr (1:1)	VH 32 oz (0.33 lb)	VH 1%			
	Triclopyr:Fluroxypr (3:1)	H 32 to 48 oz (0.5 to 0.75 lb)	VH 1%			
	Metsulfuron methyl Dicamba:2,4-D(1:3)	VH Rate 2				

*See Guide to Quantity of Herbicide Formulation for Total Volume of Spray Mix on page 7 for mixing information.
**Treatment control ratings: VH – Very High; H – High; M – Moderate; L – Low

Weed controlled	Herbicide (common and chemical names -page 6)	Herbicide quantity (active ingredient rate in parenthesis)		Spray volume (per acre for broadcast, as described for individual plant)	Time to apply	Remarks
		Broadcast rate per acre	Individual plant/spot treatment*			
Garboncillo, threadleaf groundsel, wooly locoweed (continued)	Dicamba:2,4-D(1:3)	VH** 32 oz (1 lb)	VH 2%			
	Dicamba + 2,4-D amine or low volatile ester.	VH 12 oz (⅜ lb) Dicamba + 36 oz (1 ⅛ lb) 2,4-D, 4 lb/gal product	VH ½% Dicamba + 1 ½%, 2,4-D (4 lb/galproduct)			
Gray goldaster, narrowleaf goldaster	2,4-D low volatile ester	VH 32 oz (1 lb)	VH 1%	2 to 4 gal oil-in-water emulsion (64 oz of diesel fuel oil and water to make 2 to 4 gal/acre) as aerial spray. 10 to 25 gal oil-in-water emulsion (1 gal diesel fuel oil and water to make 10 to 25 gal/acre) as ground broadcast. Thoroughly wet foliage for individual plant treatment. Add 32 to 64 oz of surfactant per 100 gal of water or 5 gal of diesel fuel oil per 100 gal spray mix (1:19 oil-in-water emulsion). Oil-in-water emulsion requires use of emulsifier.	Spring during bud stage (pre-bloom).	Bud stage usually occurs during mid-May to early June.
	Picloram:2,4-D(1:4)	VH 51 oz (1 lb)	VH 1%			
	Picloram + 2,4-D low volatile ester.	VH 13 oz (0.2 lb) Picloram + 26 oz (0.8 lb) 2,4-D, 4 lb/gal product	VH ¼ % Picloram + ½% 2,4-D (4 lb/gal product)			
	Picloram:Fluroxypyr (1:1)	VH 32 oz (0.33 lb)	VH 1%			
	Triclopyr:Fluroxypr (3:1)	H 32 to 48 oz (0.5 to 0.75 lb)	VH 1%			
	Metsulfuron methyl Dicamba:2,4-D(1:3)	H to VH Rate 1 to Rate 2				
	Dicamba:2,4-D(1:3)	VH 32 oz (1 lb)	VH 1%			
	Dicamba + 2,4-D low volatile ester.	VH 8 oz (¼ lb) Dicamba + 24 oz (¾ lb) 2,4-D, 4 lb/gal product	VH ¼ % Dicamba + ¾% 2,4-D (4 lb/gal product)			
Lespedeza	Triclopyr	VH 16 to 32 oz (½ to 1 lb)		Ground broadcast 20 to 30 gal per acre with 32 to 64 oz of surfactant per 100 gal of water.	June through August under good growing conditions.	Plants need to be 12 to 18 in. tall before spraying. Use the higher rate if plants are large, approaching maturity, or if the infestation level is high.
	Metsulfuron methyl	H 0.5 oz				Begin application at flower bud initiation through full bloom.
	Metsulfuron:Chlorosulfuron (3:1)	H 0.7 oz				
	Metsulfuron:Chlorosulfuron (1:1)	H 1.0 oz				
	Metsulfuron methyl Dicamba:2,4-D(1:3)	H Rate 2				
	Picloram:Fluroxypyr (1:1)	VH 24 to 32 oz (0.25 to 0.33 lb)	VH 1%			
	Triclopyr:Fluroxypr (3:1)	VH 24 to 32 oz (0.38 to 0.5 lb)	VH 0.75%			

*See Guide to Quantity of Herbicide Formulation for Total Volume of Spray Mix on page 7 for mixing information.
**Treatment control ratings: VH – Very High; H – High; M – Moderate; L – Low

Table 1. Herbicides for Controlling Weeds on Rangeland

Weed controlled	Herbicide (common and chemical names -page 6)	Herbicide quantity (active ingredient rate in parenthesis)		Spray volume (per acre for broadcast, as described for individual plant)	Time to apply	Remarks
		Broadcast rate per acre	Individual plant/spot treatment*			
Rayless goldenrod (jimmyweed)	Metsulfuron methyl	VH 0.75 oz		2 to 4 gal water for aerial spray; 10 to 25 gal water for ground broadcast application. Add 32 to 64 oz of surfactant per 100 gal of water. Thoroughly wet foliage for individual plant treatment. Add 32 to 64 oz of surfactant per 100 gal of water.	Fall.	
	Metsulfuron:Chlorosulfuron (3:1)	VH 1.0 oz				
	Metsulfuron:Chlorosulfuron (1:1)	VH 1.5 oz				
	Picloram:Fluroxypyr (1:1)	VH 96 oz (1.0 lb)	VH 2%			
	Picloram	VH 32 oz (½ lb)	VH 1%			
Spiny aster (wolfweed)	Picloram:2,4-D(1:4)	VH 32 oz (0.63 lb)	VH 1%	10 to 25 gal water for ground broadcast application. Thoroughly wet foliage for individual plant treatment. Add 32 to 64 oz of surfactant per 100 gal of water.	Spring during good moisture and growth conditions.	Shred plants during winter. Regrowth will have leaves. Apply herbicide when regrowth is 10 to 12 in. tall.
	Picloram + 2,4-D amine or low volatile ester.	VH 8 oz (⅛ lb) Picloram + 16 oz (½ lb) 2,4-D, 4 lb/gal product	VH ¼ % Picloram + ½ % 2,4-D (4 lb/gal product)			
	Picloram:Fluroxypyr (1:1)	VH 24 to 32 oz (0.25 to 0.33 lb)	VH 1%			
	Triclopyr:Fluroxypr (3:1)	H 32 to 48 oz (0.5 to 0.75 lb)	VH 1%			
	Dicamba:2,4-D(1:3)	VH 32 oz (1 lb)	VH 1%			
	Dicamba + 2,4-D amine or low volatile ester.	VH 8 oz (¼ lb) Dicamba + 24 oz (¾ lb) 2,4-D, 4 lb/gal product	VH ¼ % Dicamba + ¾ % 2,4-D (4 lb/gal product)			
Threadleaf groundsel	Metsulfuron methyl	VH 0.4 oz		2 to 4 gal water for aerial spray; 10 to 25 gal water for ground broadcast application. Add 32 to 64 oz of surfactant per 100 gal of water.	Fall.	
	Metsulfuron:Chlorosulfuron (3:1)	VH 0.5 oz				
	Metsulfuron:Chlorosulfuron (1:1)	VH 0.8 oz				
	Metsulfuron methyl Dicamba:2,4-D(1:3)	VH Rate 2				
Twinleaf senna (twoleaf senna)	Picloram:2,4-D(1:4)		VH** 1%	Thoroughly wet foliage. Mix with water and add 32 to 64 oz of surfactant per 100 gal spray mix.	Late spring, good moisture and growth conditions.	
	Picloram:Fluroxypyr (1:1)		VH 1%			
	Dicamba:2,4-D(1:3)		VH 1%			

*See Guide to Quantity of Herbicide Formulation for Total Volume of Spray Mix on page 7 for mixing information.
**Treatment control ratings: VH – Very High; H – High; M – Moderate; L – Low

Table 1. Herbicides for Controlling Weeds on Rangeland

Weed controlled	Herbicide (common and chemical names -page 6)	Herbicide quantity (active ingredient rate in parenthesis)		Spray volume (per acre for broadcast, as described for individual plant)	Time to apply	Remarks
		Broadcast rate per acre	Individual plant/spot treatment*			
Upright prairie-coneflower	Metsulfuron methyl	VH 0.2 oz		2 to 4 gal water for aerial spray. 10 to 25 gal water for ground broadcast application. Add 32 to 64 oz of surfactant per 100 gal of water.	Spring, before flower stalk development.	
	Metsulfuron: Chlorosulfuron (3:1)	VH 0.25 oz				
	Metsulfuron: Chlorosulfuron (1:1)	VH 0.4 oz				

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**Treatment control ratings: VH – Very High; H – High; M – Moderate; L – Low

Table 1. Herbicides for Controlling Weeds on Rangeland

Table 2. Herbicides for controlling brush on rangeland.

Brush controlled	Herbicide (common and chemical names page 6)	Herbicide quantity (active ingredient rate in parenthesis)		Spray volume (per acre for broadcast, as described for individual plant)	Time to apply	Remarks
		Broadcast rate per acre	Individual plant treatment*			
Ashe juniper (blueberry cedar)	Hexazinone liquid		VH** 2 ml per 3 ft of height or canopy diameter, whichever is greater		Late winter through summer.	Apply undiluted Hexazinone liquid, Picloram or Hexazinone pellets between the stem base and the edge of the canopy. Use an exact delivery handgun applicator to apply Hexazinone liquid and Picloram. If plant size requires more than a single 2 ml or 4 ml application of Hexazinone liquid or Picloram, or more than 1 Hexazinone pellet, apply subsequent applications or pellets equally spaced around the plant. Do not use these treatments on marshy or poorly drained sites nor on soils classified as clays. Best results are expected on coarse-textured soils.
	Hexazinone pellet		VH 1 pellet per 3 ft of height or canopy diameter, whichever is greater			
	Picloram		VH 4 ml per 3 ft of height or canopy diameter, whichever is greater			
Ashe juniper (blueberry cedar), cholla, dog cactus, redberry juniper (redberry cedar), tasajillo	Picloram		VH 1% H rating for cholla	Thoroughly wet foliage and stems or joints and stems for individual plant treatment. Mix with water and add 32 to 64 oz of surfactant per 100 gal spray mix.	Anytime.	
Baccharis (dryland willow, Roosevelt willow, seep willow or willow baccharis)	2,4-D low volatile ester	H 48 to 96 oz (1 ½ to 3 lb) 4 lb/gal product	H 1%	4 to 5 gal of water for aerial spray; 15 to 20 gal water for ground broadcast. For individual plant treatment, thoroughly wet the entire foliage, stems and trunks. Add 32 to 64 oz of surfactant per 100 gal of water.	Spring, when leaves are fully expanded and dark green in color.	
	Picloram:2,4-D(1:4)		H 1%	For individual plant treatment thoroughly wet the entire plant—foliage, stems and trunks. Add 32 to 64 oz of surfactant per 100 gal water.		
	Dicamba:2,4-D(1:3)		H 1%			
	Triclopyr		VH 1%			
	Triclopyr:Fluroxypr (3:1)		VH 1%			
	Picloram:Fluroxypyr (1:1)		VH 1%			

*See Guide to Quantity of Herbicide Formulation for Total Volume of Spray Mix on page 7 for mixing information.
**Treatment control ratings: VH – Very High; H – High; M – Moderate; L – Low

Brush controlled	Herbicide (common and chemical names -page 4)	Herbicide quantity (active ingredient rate in parenthesis)		Spray volume (per acre for broadcast, as described for individual plant)	Time to apply	Remarks
		Broadcast rate per acre	Individual plant treatment*			
Baccharis (dryland willow, Roosevelt willow, seep willow or willow baccharis) (continued)	Hexazinone liquid		VH** 2 ml per 3 ft of height or canopy diameter, whichever is greater		Late winter through summer	Apply undiluted Hexazinone liquid or Hexazinone pellet to soil surface between the stem base and the edge of the canopy. Use an exact delivery handgun applicator to apply Hexazinone liquid. If plant size requires more than a single 2 ml application of Hexazinone liquid, or a single Hexazinone pellet, apply subsequent applications or pellets equally spaced around the plant. Do not use these treatments on marshy or poorly drained sites nor on soils classified as clays. Best results are expected on coarse-textured soils.
	Hexazinone pellet		VH 1 pellet per 3 ft of height or canopy diameter, whichever is greater			
Baccharis (dryland willow, Roosevelt willow, seep willow or willow baccharis), blackbrush, bois d'arc, catclaw acacia, catclaw mimosa, Chinese tallowtree, elm, greenbriar, hackberry, huisache, pricklyash, (Hercules club), Texas persimmon (see remarks), winged elm, yaupon	Triclopyr		VH 25% in diesel fuel oil	Apply to lower 12 to 18 in. of trunk to wet the trunk; do not spray to point of runoff. Apply completely around the trunk.	Anytime–optimum time is during growing season when plants have mature leaves.	This is commonly called the low volume basal application method. Use a fan or hollow cone nozzle. Use only on plants with smooth bark and a trunk diameter less than 4 in. For Texas persimmon, apply in spring after leaves mature but before June 15.
	Triclopyr		VH 25% in diesel fuel oil 10% d,l-limonene (a penetrant) may be added to the mixture–see remarks	Apply to the trunk in a 3- to 4-in.-wide band near ground level or at line dividing smooth bark from corky bark. Apply completely around the trunk.	Anytime–optimum time is during growing season when plants have mature leaves.	This is commonly called the streamline basal application method. Use a straight stream nozzle. Use only on plants with smooth bark and trunk diameter less than 4 in. Addition of a penetrant to the mixtures aids with coverage around the trunk and increases the degree of control for most species. Trade names for d,l limonene are Quick Step II, AD 100, Cide-Kick II and Cide-Kick. Other penetrants may be effective but have not been tested on rangeland in Texas. For Texas persimmon, apply in spring after leaves mature but before June 15.
Bigelow shinoak (white shinoak)	Tebuthiuron 20% pellets	VH 7.5 lb of pellets (1½ lb)	VH ½ oz of pellets (1/10 oz) per 100 sq ft		Anytime during year–optimum period is Oct. 1 to April 1.	For individual plant treatment, apply pellets evenly on the soil under the plant canopy and 1 ft beyond canopy edge.

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**Treatment control ratings: VH – Very High; H – High; M – Moderate; L – Low

Brush controlled	Herbicide (common and chemical names -page 4)	Herbicide quantity (active ingredient rate in parenthesis)		Spray volume (per acre for broadcast, as described for individual plant)	Time to apply	Remarks
		Broadcast rate per acre	Individual plant treatment*			
Blackberry	Picloram:Fluroxypyr (1:1)	VH** 48 to 64 oz (0.5 to 0.67 lb)	VH 1 to 2%	Use at least 10 gal of water per acre, but increased volume up to 25 gal per acre will improve coverage, and subsequent herbicide penetration into the plant. Add 32 to 64 oz of surfactant per 100 gal spray mix.	Apply when leaves are fully expanded and the foliage is dark green, either before first flower or after fruit drop. Do not treat blackberries in the same year after shredding, or burning.	
	Triclopyr:Fluroxypr (3:1)	H 48 to 64 oz (0.75 to 1.0 lb)	VH 1 to 2%			
Blackbrush, guajillo	Tebuthiuron 20% pellets	H 10 to 15 lb pellets (2 to 3 lb)	VH ½ oz of pellets (1/10 oz) per 45 sq ft or 2 to 4 in. of stem diameter		Anytime during year–optimum period is Oct. 1 to April 1.	Use higher rate on deep soils with higher clay content. For individual plant treatment apply pellets evenly on the soil under the plant canopy and 1 ft beyond canopy edge. Best results are expected on coarse-textured soils.
Blackjack oak, bois d'arc, elm, hackberry, lotebush, post oak, pricklyash (Hercules club), whitebrush (beebrush, beebush), willow, winged elm	Hexazinone liquid		VH 4 ml per 3 ft of canopy diameter or height, whichever is greater		Late winter through summer.	Apply undiluted Hexazinone liquid or Hexazinone pellets to soil surface between the stem base and the edge of the canopy. Use an exact delivery handgun applicator to apply Hexazinone liquid. If plant size requires more than a single 4 ml application of Hexazinone liquid, or 2 Hexazinone pellets, apply subsequent applications or pellets equally spaced around the plant. Do not use these treatments on marshy or poorly drained sites nor on soils classified as clays. Best results are expected on coarse-textured soils.
	Hexazinone pellet		VH 2 pellets per 3 ft of canopy diameter or height, whichever is greater		Anytime during year–optimum period is Oct. 1 to April 1.	
Blackjack oak, post oak, winged elm	Tebuthiuron 20% pellets	VH 10 lb of pellets (2 lb)	VH ½ oz of pellets (1/10 oz) per 45 sq ft or 2 to 4 in. of stem diameter		Anytime during year–optimum period is Oct. 1 to April 1.	For individual plant treatment apply pellets evenly on the soil under the plant canopy and 1 ft beyond canopy edge.
Blackgum, sweetgum and other hardwoods	Triclopyr:2,4-D(1:2)		H 4% in diesel fuel oil	Apply to freshly cut surface of stump immediately after cutting.	Anytime–best results when soil is dry.	
Burrobrush	Picloram		VH 1%	Thoroughly wet foliage for individual plant treatment.	Aprily through July.	
	Picloram:2,4-D(1:4)		VH 2%			

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**Treatment control ratings: VH – Very High; H – High; M – Moderate; L – Low

Brush controlled	Herbicide (common and chemical names page 4)	Herbicide quantity (active ingredient rate in parenthesis)		Spray volume (per acre for broadcast, as described for individual plant)	Time to apply	Remarks
		Broadcast rate per acre	Individual plant treatment*			
Catclaw mimosa	Tebuthiuron 20% pellets	H** 3.75 lb of pellets (¾ lb)	VH ½ oz of pellets (⅒ oz) per 100 sq ft or 2 to 4 in. of stem diameter		Anytime during year–optimum period is May 1 to July 1 in Trans-Pecos and Oct. 1 to April 1 in rest of state.	Use only when brush is growing on sand, loamy sand or sandy loam soil. For individual plant treatment, apply pellets evenly on the soil under the plant canopy and 1 ft beyond canopy edge.
Cenizo	Tebuthiuron 20% pellets	VH 3.75 lb of pellets (¾ lb)	VH ½ oz of pellets (⅒ oz) per 100 sq ft or 2 to 4 in. of stem diameter		Anytime during year–optimum period is Oct. 1 to April 1.	For individual plant treatment apply the pellets evenly on soil under the plant canopy and 1 ft beyond canopy edge.
Chinese tallowtree	Picloram:2,4-D(1:4)	VH 1 gal (2.5 lb)	VH 1%	5 to 15 gal as aerial spray or 10 to 25 gal for ground broadcast application. Thoroughly wet foliage for individual plant treatment. Add 32 to 64 oz of surfactant per 100 gal water.	Spring or fall.	
	Picloram + 2,4-D amine	VH 32 oz (½ lb) Picloram + 64 oz (2 lb) 2,4-D, 4 lb/gal product	VH ¼ % Picloram + ½% 2,4-D (4 lb/gal product)			
	Picloram:Fluroxypyr (1:1)	VH 80 oz (0.84 lb)	VH 1%			
	Picloram	VH 32 oz (½ lb)	VH ½%			
	Picloram + Triclopyr	VH 32 oz (½ lb) Picloram + 16 oz (½ lb) Triclopyr	VH ½ % Picloram + ¼ % Triclopyr			
	Hexazinone Liquid		VH 4 ml per 3 ft of canopy diameter or height, whichever is greater		Late winter through summer.	Apply undiluted Tebuthiuron 20% pellets, Hexazinone Liquid or Hexazinone Pellets to soil between stem base and the edge of the canopy. Use an exact delivery handgun applicator to apply Hexazinone Liquid. If plant size requires more than a single 4 ml application of Hexazinone Liquid, or 2 Hexazinone Pellets, apply subsequent applications or pellets equally spaced around the plant. Do not use these treatments on marshy or poorly drained sites nor on soils classified as clays. Best results are expected on coarse-textured soils.
	Hexazinone Pellet		VH 2 pellets per 3 ft of canopy diameter or height, whichever is greater			
	Tebuthiuron 20% pellets		VH ½ oz of pellets (⅒ oz) per 45 sq ft or 2 to 4 in. of stem diameter		Anytime during year–optimum period is Oct. 1 to April 1.	

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**Treatment control ratings: VH – Very High; H – High; M – Moderate; L – Low

Brush controlled	Herbicide (common and chemical names -page 4)	Herbicide quantity (active ingredient rate in parenthesis)		Spray volume (per acre for broadcast, as described for individual plant)	Time to apply	Remarks
		Broadcast rate per acre	Individual plant treatment*			
Chinese tallowtree (continued)	Triclopyr		VH** 15% in diesel fuel	Apply to lower 12 to 18 in. of trunk to wet the bark, but not to point of runoff. Apply completely around the trunk.	Anytime–optimum time is during growing season when plants have mature leaves.	Use only on plants with a smooth bark and/or a trunk diameter less than 4 in. This is commonly called the low-volume basal application method. A 5500-X1 nozzle is preferred.
	Triclopyr		VH 25% in diesel fuel			Use on plants with rough, corky bark and/or a trunk diameter of 4 in. or greater. This is commonly called the low-volume basal application method. A 5500-X1 nozzle is preferred.
Christ thorn	Triclopyr		VH 1%	Add 32 to 64 oz of surfactant per 100 gal of water. Thoroughly wet foliage.	Early summer.	
	Triclopyr + Picloram.		VH ½% Triclopyr + ½% Picloram			
Common or eastern persimmon	Dicamba	L 64 oz (2 lb)	H 1%	Ground broadcast 15 to 20 gal water. Thoroughly wet foliage for individual plant treatment. Add 32 to 64 oz of surfactant per 100 gal of water.	Spring, when leaves are fully developed.	
	Picloram:Fluroxypyr (1:1)		VH 1 to 2%			
Creosotebush, tarbush, whitethorn acacia	Tebuthiuron 20% pellets	H 3.75 to 5 lb of pellets (¾ to 1 lb)	VH ½ oz of pellets (1/10 oz) per 100 sq ft		Anytime during year–optimum period is May 1 to July 1.	Use 5 lb of pellets/acre when soil is a loam, silt loam, silt, sandy clay loam or clay loam. Use low rate when soil is a sand, loamy sand or sandy loam. Do not treat mountainside or gravelly ridges with slopes of 7 percent or more. Do not treat if soils have a cation exchange capacity greater than 30 meq per 100 grams (commonly called "gyp" soils.) For individual plant treatment apply pellets evenly on soil under the plant canopy and 1 ft beyond the canopy edge.

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**Treatment control ratings: VH – Very High; H – High; M – Moderate; L – Low

Brush controlled	Herbicide (common and chemical names page 4)	Herbicide quantity (active ingredient rate in parenthesis)		Spray volume (per acre for broadcast, as described for individual plant)	Time to apply	Remarks
		Broadcast rate per acre	Individual plant treatment*			
Eastern redcedar	Picloram		VH** 4 ml per 3 ft of height or canopy diameter, whichever is greater		Spring or fall.	Apply undiluted Hexazinone liquid, Picloram or Hexazinone pellets to soil surface between the stem base and the edge of the canopy. Use an exact delivery handgun applicator to apply Hexazinone liquid and Picloram. If plant size requires more than a single 4 ml application of Hexazinone liquid or Picloram, or more than 2 Hexazinone pellets, apply subsequent applications or pellets equally spaced around the plant. Do not use these treatments on marshy or poorly drained sites nor on soils classified as clays. Best results are expected on coarse-textured soils.
	Hexazinone liquid		VH 4 ml per 3 ft of height or canopy diameter, whichever is greater, or 1 in. of trunk diameter		Late winter through summer.	
	Hexazinone pellet		VH 2 pellets per 3 ft of height or canopy diameter, whichever is greater, or 1 in. of trunk diameter			
Elm, granjeno (spiny hackberry), hackberry, huisache, lotebush, pricklyash (Hercules club), yaupon	Tebuthiuron 20% pellets		VH ½ oz of pellets (1/10 oz) per 45 sq ft or 2 to 4 in. of stem diameter L rating for huisache and lotebush		Anytime during year–optimum period is Oct. 1 to April 1 except in Trans-Pecos where optimum period is May 1 to July 1.	Apply pellets evenly on the soil under the plant canopy and 1 ft beyond canopy edge.
Flameleaf sumac	Picloram:2,4-D(1:4)		VH 1%	2 to 4 gal of oil-in-water emulsion (1 to 5 oil to water ratio is considered optimum) or 2 to 4 gal of water with 32 to 64 oz of surfactant per 100 gal water for aerial spray. Ground broadcast use 10 to 25 gal oil-in-water emulsion (½ to 1 gal diesel fuel oil and water to make 10 to 25 gal/acre) or 10 to 25 gal of water with 32 to 64 oz of surfactant per 100 gal water as ground broadcast. Thoroughly wet foliage for individual plant treatment. Add 32 to 64 oz surfactant per 100 gal of water or 5 gal of diesel fuel oil per 100 gal spray mix (1:19 oil-in-water emulsion). Oil-in-water emulsion requires use of emulsifier.	Late spring, when leaves mature.	
	Picloram:Fluroxypyr (1:1)	H 48 to 96 oz (0.5 to 1.0 lb)	VH 0.75%			
	Picloram	H 16 to 32 oz (¼ to ½ lb)	VH ½%			
	Picloram + Triclopyr.	H 16 oz (¼ lb) Picloram + 8 oz (¼ lb) Triclopyr	VH ¼% Picloram + ¼% Triclopyr			
	Picloram + 2,4-D amine or low volatile ester.		VH ¼% Picloram + ½%, 2,4-D (4 lb/gal product)			

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**Treatment control ratings: VH – Very High; H – High; M – Moderate; L – Low

Brush controlled	Herbicide (common and chemical names -page 4)	Herbicide quantity (active ingredient rate in parenthesis)		Spray volume (per acre for broadcast, as described for individual plant)	Time to apply	Remarks
		Broadcast rate per acre	Individual plant treatment*			
Giantreed	Imazapyr	VH 64 oz (1 lb)	VH ½ %	Use a minimum 20 to 30 gal/acre total volume of ground broadcast applications and a minimum 15 gal/acre for aerial. When using individual plant applications, spray plants to runoff. Add 1% MSO to individual plant treatments and 32 oz/acre for broadcast applications.	Spray when plants are actively growing during the summer or fall with a minimum 3 ft of plant height.	Do not mow plants for 3 to 4 months after treatment. When exposure to aquatic environments is possible, use herbicide with aquatic label.
Greenbriar	Dicamba + 2,4-D low volatile ester.		H** 1 ½ % Dicamba + 3% 2,4-D (4 lb/gal product) in diesel fuel oil	Thoroughly wet stems with diesel/herbicide mix.	Winter.	Use as dormant stem treatment. Constant agitation is needed to maintain proper mixture.
Hardwoods with a diameter of more than 1 inch except mesquite and huisache	2,4-D amine		H Undiluted	Use tree injector or other injecting equipment. Apply in cuts spaced 2 in. apart at base of trees. Apply until 2,4-D runs from each end of cut.	Summer or winter.	
Honeylocust	Picloram:2,4-D(1:4)		VH 1%	Add 32 to 64 oz of surfactant per 100 gal water. Apply to the leaves. Thoroughly wet foliage, but not to the point of dripping.	Spring, when leaves mature.	
Huisache	Triclopyr		H 15% in diesel fuel oil	Apply to lower 12 to 18 in. of trunk to wet the trunk; do not spray to point of runoff. Apply completely around the trunk.	Anytime–optimum time is growing season when plants have mature leaves.	This is commonly called the low-volume basal application method. A 5500-X1 adjustable cone nozzle is preferred.
	Picloram:2,4-D(1:4)		VH 1%	Add 32 to 64 oz of surfactant per 100 gal water. Apply to the leaves. Thoroughly wet foliage, but not to the point of dripping.	Best results are generally obtained in the fall.	If plants are shredded, wait until regrowth is 3 ft tall or higher before treatment.

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**Treatment control ratings: VH – Very High; H – High; M – Moderate; L – Low

Brush controlled	Herbicide (common and chemical names -page 4)	Herbicide quantity (active ingredient rate in parenthesis)		Spray volume (per acre for broadcast, as described for individual plant)	Time to apply	Remarks
		Broadcast rate per acre	Individual plant treatment*			
Huisache, retama	Picloram + Triclopyr	L to M 32 oz (½ lb) Picloram + 16 oz (½ lb) Triclopyr	H ½% Picloram + ½% Triclopyr	4 to 5 gal oil-in-water emulsion as aerial spray (32 oz to 1 gal diesel fuel oil and water to make 4 to 5 gal/acre; a 1 to 5 oil to water ratio is considered optimum); 20 to 25 gal oil-in-water emulsion (½ to 1 gal diesel fuel oil and water to make 20 to 25 gal/acre) or 20 to 25 gal water plus surfactant (32 to 64 oz of surfactant per 100 gal water) as ground broadcast. Thoroughly wet foliage for individual plant treatment. Add 32 to 64 oz surfactant per 100 gal of water or 5 gal of diesel fuel oil per 100 gal spray mix (1:19 oil-in-water emulsion). Oil-in-water emulsion requires use of emulsifier.	Spring, with mature foliage or fall with good soil moisture and foliage.	When using oil-in-water emulsion, use emulsifier added to oil for proper emulsion.
	Picloram + Clopyralid	L to M 32 oz (½ lb) Picloram + 11 to 21 oz (¼ to ½ lb) Clopyralid	H ½% Picloram + ½% Clopyralid			
	Picloram:Fluroxypyr (1:1)	L to M 96 oz (1.0 lb)	H 1%			
	Picloram	L to M 32 oz (½ lb)	H 1%			
Lotebush	Triclopyr		VH 15% in diesel fuel	Apply to lower 12 to 18 in. of the trunk to wet the bark. Do not spray to point of runoff. Apply completely around the trunk.	Anytime–optimum time is during growing season when plants have mature leaves.	
Macartney rose (mowed and other disturbed stands within 3 years of disturbance)	2,4-D amine	L** 64 oz (2 lb) 4 lb/gal product	L 1% (4 lb/gal product)	5 to 15 gal water as aerial spray; 25 to 30 gal water as ground broadcast. Thoroughly wet foliage and stems for individual plant treatment. Add 32 to 64 oz of surfactant per 100 gal of water.	Spring before June 1, good growth conditions.	Avoid spraying earlier than 9 to 12 months following mowing or when plants have high percentage of new growth. Poor control may be expected if plants are less than 3 ft tall when sprayed. Repeat treatment when necessary.
	Picloram:2,4-D(1:4)	H 1 gal (2.5 lb)	VH 1%		Spring or fall, good growing conditions.	
	Picloram + 2,4-D amine or low volatile ester	H 32 oz (½ lb) Picloram + 64 oz (2 lb) 2,4-D, 4 lb/gal product	VH ¼ % Picloram + ½% 2,4-D (4 lb/gal product)			
	2,4-D low volatile ester	L 64 oz (2 lb) 4 lb/gal product	L 1% (4 lb/gal product)		Fall, under good moisture conditions, before Nov. 1.	

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**Treatment control ratings: VH – Very High; H – High; M – Moderate; L – Low

Brush controlled	Herbicide (common and chemical names -page 4)	Herbicide quantity (active ingredient rate in parenthesis)		Spray volume (per acre for broadcast, as described for individual plant)	Time to apply	Remarks
		Broadcast rate per acre	Individual plant treatment*			
Macartney rose (undisturbed stands)	2,4-D amine	L 1 gal (4 lb) 4 lb/gal product	L 1% (4 lb/gal product)	5 to 15 gal water as aerial spray; 25 to 30 gal water as ground broadcast. Thoroughly wet foliage and stems for individual plant treatment. Add 32 to 64 oz of surfactant per 100 gal of water.	Spring before June 1, good growth conditions.	
	Picloram:2,4-D(1:4)	H 1 gal (2.5 lb)	VH 1%		Spring or fall, good growth conditions.	
	Picloram + 2,4-D amine or low volatile ester	H 32 oz (½ lb) Picloram + 64 oz (2 lb) 2,4-D, 4 lb/gal product	VH ¼ % Picloram + ½ % 2,4-D (4 lb/gal product)			
	2,4-D low volatile ester	L 96 oz (3 lb) 4 lb/gal product	L 1% (4 lb/gal product)	5 to 15 gal water as aerial spray; 25 to 30 gal water as ground broadcast. Thoroughly wet foliage and stems for individual plant treatment. Add 32 to 64 oz of surfactant per 100 gal of water.	Fall, under good moisture conditions, before Nov. 1.	
Mesquite, huisache, twisted acacia	Diesel fuel oil, kerosene		H	Apply to base of trunk from 12 to 18 in. above soil surface down to soil surface. Apply until solution puddles on soil surface.	Anytime soil is dry and pulled away from the trunk.	Apply sufficient oil to penetrate to plant bud zone. Diesel fuel oil does not evaporate as fast as kerosene.
Mesquite, huisache	Hexazinone liquid		M to H** 4 to 8 ml per 3 ft of canopy diameter or height, whichever is greater		Late winter through summer.	Apply undiluted Hexazinone liquid or Hexazinone pellets to soil surface between the stem base and the edge of the canopy. Use an exact delivery handgun applicator to apply Hexazinone liquid. If plant size requires more than a single 4 ml application of Hexazinone liquid, or 2 Hexazinone pellets, apply subsequent applications or pellets equally spaced around the plant. Do not use these treatments on marshy or poorly drained sites nor on soils classified as clays. Best results are expected on coarse-textured soils.
	Hexazinone pellet		M to H 2 to 4 pellets per 3 ft of canopy diameter or height, whichever is greater			
Mesquite (basal stem diameter 1½ in. or less)	Triclopyr		VH 15% in diesel fuel oil or basal bark oil	Apply to lower 12 to 18 in. of trunk to wet the trunk; do not spray to point of runoff. Apply completely around the trunk.	Anytime–optimum time is during growing season when plants have mature leaves.	This is commonly called the low volume basal application method. Use a 5500X1 adjustable cone nozzle. Use only on plants with smooth bark and a trunk diameter less than 4 in.
Mesquite (basal stem diameter greater than 1½ in.), Christ thorn	Triclopyr		VH 25% in diesel fuel oil or basal bark oil			

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Brush controlled	Herbicide (common and chemical names -page 4)	Herbicide quantity (active ingredient rate in parenthesis)		Spray volume (per acre for broadcast, as described for individual plant)	Time to apply	Remarks
		Broadcast rate per acre	Individual plant treatment*			
Mesquite (basal stem diameter 1½ in. or less)	Triclopyr		VH 15% in diesel fuel oil 10% d,l limonene (a penetrant) may be added to the mixture–see remarks	Apply to the trunk in a 3 to 4-in.-wide band near ground level or at line dividing smooth bark from corky bark. Apply completely around the trunk.	Anytime–optimum time is during growing season when plants have mature leaves.	This is commonly called the streamline basal application method. Use a straight stream nozzle. Use only on plants with smooth bark and a trunk diameter less than 4 in. Addition of a penetrant to the mixture aids with coverage around the trunk. Trade names for d,l limonene are Quick Step II, Cide-Kick, Cide-Kick II and AD 100. Other penetrants may be effective but have not been tested on rangelands in Texas.
Mesquite (basal stem diameter greater than 1½ in.)	Triclopyr		VH 25% in diesel fuel oil 10% d,l limonene (a penetrant) may be added to the mixture–see remarks			
Mesquite (seedlings and saplings)	Triclopyr		VH 5% in diesel fuel oil	Apply to lower 12 to 18 in. of trunk to point of runoff, but not to the point of puddling.	May through August	This is commonly called the low volume basal application method. Use a 5500X1 adjustable cone nozzle.
Mesquite, Christ thorn and other hardwoods (cut stumps)	Triclopyr		VH** 15% in diesel fuel oil or basal bark oil	Spray the sides of the stump and the outer portion of the cut surface, including the cambium, immediately after cutting, to thoroughly wet the stem and root collar area, but not to the point of runoff.	Any season of the year, except when snow or water prevent spraying to the ground line.	This is commonly called the cut stump application method. Apply with a backpack or knapsack sprayer using low pressures and a solid cone or flat fan nozzle. This is an excellent treatment to use after cutting mesquite with hydraulic shears.
	Triclopyr:Fluroxypr (3:1)		VH 20% in diesel fuel oil or basal bark oil			

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Brush controlled	Herbicide (common and chemical names -page 4)	Herbicide quantity (active ingredient rate in parenthesis)		Spray volume (per acre for broadcast, as described for individual plant)	Time to apply	Remarks
		Broadcast rate per acre	Individual plant treatment*			
Mesquite (suppression and weed control)	2,4-D amine or low volatile ester	L 32 to 128 oz (2 to 4 lb)	M 2% (4 lb/gal product)	For aerial applications, suggested total spray volume is 4 gal/acre. Use oil-in-water emulsion (1 to 5 oil to water ratio considered optimum), or water plus surfactant, crop oil or methylated seed oil. For ground broadcast applications, the suggested total spray volume is 10 to 25 gal/acre. Use oil-in-water emulsion (1 to 5 oil to water ratio considered optimum), or water plus surfactant, crop oil or methylated seed oil. Thoroughly wet foliage for individual plant treatments. Add 32 to 64 oz of surfactant per 100 gal of water or an oil-in-water emulsion (5% diesel + 95% water).	Late spring to mid-summer with mature leaves (dark green color). Optimum period of application begins when soil temperature at a depth of 12 in. reaches 75°F and continues for 45 days thereafter. If treatment is applied prior to optimum soil temperatures, efficacy rates will be lower and multiple applications over a period of years may be necessary to maintain less than 10% canopy cover.	Treatments will control many weeds. When using oil-in-water emulsion, use emulsifier. Use of a treatment with a low control rating may result in multi-stem growth form that may be more difficult to control in the future.
	Picloram:2,4-D(1:4)	L 32 to 48 oz (0.6 to 0.9 lb)				
	Dicamba:2,4-D(1:3)	L 32 to 48 oz (1 to 1.5 lb)				
	Metsulfuron methyl Dicamba:2,4-D(1:3)	L Rate 1 to Rate 2				
	Picloram + 2,4-D amine or low volatile ester	L 8 to 12 oz (⅛ to 3/16 lb) Picloram + 32 to 48 oz (1 to 1.5 lb) 2,4-D, 4 lb/gal product				
	Dicamba + 2,4-D amine or low volatile ester	L 8 to 12 oz (¼ to ⅜ lb) Dicamba + 24 to 36 oz (¾ to 1 ⅛ lb) 2,4-D, 4 lb/gal product				
	Triclopyr	L 16 to 32 oz (0.5 to 1 lb)	M 1%			
	Dicamba	L 16 to 32 oz (0.5 to 1 lb)	M 1%			
Mesquite	Triclopyr		VH** 2% in diesel fuel oil	Apply to base of trunk from groundline to a height of 12 to 18 in. above the soil surface. Apply until solution puddles on soil surface.	Anytime soil is dry and pulled away from trunk.	

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Brush controlled	Herbicide (common and chemical names -page 4)	Herbicide quantity (active ingredient rate in parenthesis)		Spray volume (per acre for broadcast, as described for individual plant)	Time to apply	Remarks
		Broadcast rate per acre	Individual plant treatment*			
Mesquite (continued)	Aminopyralid:clopyralid (1:4.6)	H 1.75 pints (0.61 lb)		For aerial applications, suggested total spray volume is 4 gal/acre. Use oil-in-water emulsion (1 to 5 oil to water ratio considered optimum), or water plus surfactant, crop oil or methylated seed oil. For ground broadcast applications, the suggested total spray volume is 10 to 25 gal/acre. Use oil-in-water emulsion (1 to 5 oil to water ratio considered optimum), or water plus surfactant, crop oil or methylated seed oil. Thoroughly wet foliage for individual plant treatments. Add 32 to 64 oz of surfactant per 100 gal of water or an oil-in-water emulsion (5% diesel + 95% water).	Late spring to mid-summer with mature leaves (dark green color). Optimum period of application begins when soil temperature at a depth of 12 in. reaches 75°F and continues for 45 days thereafter. When Clopyralid is used alone or in a tank mix the period should continue for 60 days. For optimum root kill, do not spray if white flowers or bean elongation are observable, if over 25% of the leaf canopy is damaged due to insects, disease or hail, if soil temperatures are less than 75°F 1 ft deep, or if new vegetative growth is present due to recent rains.	Use 16 oz/acre Picloram plus 8 oz/acre Triclopyr, 8 oz/acre Dicamba plus 8 oz/acre Triclopyr, 16 oz/acre Picloram plus 8 oz/acre Dicamba, 16 oz/acre Picloram plus 11 oz/acre Clopyralid and 11 oz/acre Clopyralid only in West Texas. Dicamba and Dicamba mixtures have been more effective in West Texas than in other parts of the state. Use mixtures that include 4 oz/acre Triclopyr and 5 oz/acre Clopyralid only in Montague, Wise, Parker, Hood, Somervell, Bosque, Coryell, Lampasas, Burnet, Blanco, Kendall, Bandera, Real, Edwards and Val Verde counties and those counties north and west of the named counties. Mixtures that include 8 oz Triclopyr and 11 oz Clopyralid will give better control than mixtures with 4 oz Triclopyr and 5 oz Clopyralid. When using oil-in-water emulsion, use emulsifier added to oil for proper emulsion. Use of a treatment with a low-control rating may result in a multi-stem growth form that may be more difficult to control in the future.
	Clopyralid	M to H 11 to 21 oz (¼ to ½ lb)	VH 1%			
	Triclopyr + Picloram	M 8 to 16 oz (¼ to ½ lb) Triclopyr + 16 to 32 oz (¼ to ½ lb) Picloram	M to H ½% Triclopyr + ½% Picloram			
	Triclopyr + Dicamba	L 8 to 16 oz (¼ to ½ lb) Triclopyr + 8 to 16 oz (¼ to ½ lb) Dicamba	M ½% Triclopyr + ½% Dicamba			
	Triclopyr + Clopyralid	M to H 4 to 16 oz (⅛ to ½ lb) Triclopyr + 5 to 11 oz (⅛ to ¼ lb) Clopyralid	VH ½% Triclopyr + ½% Clopyralid			
	Picloram + Dicamba	M 16 to 32 oz (¼ to ½ lb) Picloram + 8 to 16 oz (¼ to ½ lb) Dicamba	H ½% Picloram + ½% Dicamba			
	Picloram + Clopyralid	M to H 16 to 32 oz (¼ to ½ lb) Picloram + 11 to 21 oz (¼ to ½ lb) Clopyralid	VH ½% Picloram + ½% Clopyralid			
	Triclopyr + Clopyralid + Picloram	M to H** 4 to 8 oz (⅛ to ¼ lb) Triclopyr + 5 to 11 oz (⅛ to ¼ lb) Clopyralid + 32 oz (½ lb) Picloram				Recommended for mixtures of mesquite and pricklypear cactus.

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Brush controlled	Herbicide (common and chemical names –page 4)	Herbicide quantity (active ingredient rate in parenthesis)		Spray volume (per acre for broadcast, as described for individual plant)	Time to apply	Remarks
		Broadcast rate per acre	Individual plant treatment*			
Mesquite (continued)	Clopyralid (see remarks)	H 21 oz (½ lb)	VH 1%		Aug. 1 to Sept. 30 with a soil temperature of 75°F or more at a depth of 12 in. Do not apply after a frost has occurred.	Use only in Montague, Wise, Coryell, Lampasas, Burnet, Blanco, Kendall, Bandera, Real, Edwards and Val Verde Counties and those counties north and west of the named counties.
	Picloram		VH 1 gal (2 lb)	Applied with a carpeted roller.	Late spring through August with mature leaves (dark green color). Best control during the period that begins when soil temperature at a depth of 12 in. reaches 75°F and continued for 45 days thereafter; when Clopyralid is used alone or in a tank mix the period should continue for 60 days after soil temperature reaches 75°F.	Mesquite should be less than 6 ft tall and should pass under carpeted roller without breaking the main stem. Mix recommended quantity of herbicide with water to make 8 gal of mixture. Add 3 to 6 oz of surfactant for each 8 gal mixed.
	Clopyralid		VH 84 oz (2 lb)			
	Picloram + Clopyralid		VH 64 oz (1 lb) Picloram + 43 oz (1 lb) Clopyralid			
Mesquite, western honey	Triclopyr + Clopyralid		VH ½% Triclopyr + ½ % Clopyralid	Thoroughly wet foliage for individual plant treatment. Add 32 to 64 oz surfactant per 100 gal of water or 5 gal of diesel fuel oil per 100 gal spray mix (1:19 oil-in-water emulsion). Oil-in-water emulsion requires use of emulsifier.	Begin spraying in the spring after the soil temperature has reached 75°F, at 12 in. deep. This often coincides with the change in color of the foliage from a light pea green to a uniform dark green. The spray period will last through September.	Western honey mesquite is most common in the western portion of the Trans-Pecos region of Texas. This variety of mesquite is not usually killed by broadcast sprays.

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Brush controlled	Herbicide (common and chemical names -page 4)	Herbicide quantity (active ingredient rate in parenthesis)		Spray volume (per acre for broadcast, as described for individual plant)	Time to apply	Remarks
		Broadcast rate per acre	Individual plant treatment*			
Mixed brush (South Texas–will include several of the following: blackbrush, catclaw acacia, guajillo, granjeno or spiny hackberry, huisache, mesquite, pricklypear, retama, skunkbush, tasajillo, twisted acacia	Picloram + Triclopyr	M** 32 oz (½ lb) Picloram + 16 oz (½ lb) Triclopyr	H ½% Picloram + ½% Triclopyr	4 gal oil-in-water emulsion as aerial spray (32 oz to 1 gal diesel fuel oil and water to make 4 gal/acre; a 1 to 5 oil to water ratio is considered optimum); 20 to 25 gal oil-in-water emulsion (64 oz to 1 gal diesel fuel oil and water to make 20 to 25 gal/acre) or 20 to 25 gal water/acre plus surfactant (32 to 64 oz of surfactant per 100 gal water) as ground broadcast. Thoroughly wet foliage for individual plant treatment. Add 32 to 64 oz surfactant per 100 gal of water or 5 gal of water or 5 gal of diesel fuel oil per 100 gal spray mix (1:19 oil-in-water emulsion). Oil-in-water emulsion requires use of emulsifier.	Late spring to mid-summer with mature leaves (dark green color). Optimum period of application begins when soil temperature at a depth of 12 in. reaches 75°F and continues for 45 days thereafter; with the Clopyralid tank mix the period should continue for 60 days after soil temperature reaches 75°F. If mesquite has 10% canopy cover or less, application may be made in spring or fall.	The mixture of 32 oz Picloram plus 21 oz Clopyralid will usually provide better results than the 32 oz Picloram plus 11 oz Clopyralid mixture. Mixtures will control most weeds. When using oil-in-water emulsion, use emulsifier added to oil for proper emulsion.
	Picloram + Clopyralid	M 32 oz (½ lb) Picloram + 11 to 21 oz (¼ to ½ lb) Clopyralid	H ½% Picloram + ½% Clopyralid			
	Picloram + Dicamba	M 32 oz (½ lb) Picloram + 16 oz (½ lb) Dicamba	H ½% Picloram + ½% Dicamba			
Mixed brush–Davis Mountains (includes catclaw acacia, catclaw mimosa and whitebrush)	Tebuthiuron 20% pellets	M** 7.5 to 10 lb of pellets (1.5 to 2 lb)	H ½ oz of pellets (1/10 oz) per 50 to 100 sq ft		Anytime during year–optimum period is May 1 to July 1.	Use 10 lb of pellets/acre when soil is a loam, silt loam, silt, sandy clay loam or clay loam. Use low rate when soil is a sand, loamy sand or sandy loam. For individual plant treatment apply pellets evenly on soil under the plant canopy and 1 ft beyond the canopy edge.
Mohrs shinoak	Tebuthiuron 20% pellets	VH 5 lb of pellets (1 lb)	VH ½ oz of pellets (1/10 oz) per 100 sq ft		Anytime during year–optimum period is Oct. 1 to April 1.	Use only when oak stand is predominantly Mohrs shinoak. These stands are generally found in Taylor, Nolan, Coke, Sterling and Mitchell counties. For individual plant treatment, apply pellets evenly on the soil under the plant canopy and 1 ft beyond canopy edge.

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Brush controlled	Herbicide (common and chemical names -page 4)	Herbicide quantity (active ingredient rate in parenthesis)		Spray volume (per acre for broadcast, as described for individual plant)	Time to apply	Remarks
		Broadcast rate per acre	Individual plant treatment*			
Pricklypear, tasajillo	Picloram	H** 16 to 32 oz (¼ to ½ lb)	VH 1%	For aerial applications suggested total spray volume is 4 gal/acre. Use oil-in-water emulsion (1 to 5 oil to water ratio considered optimum), or water plus surfactant, crop oil or methylated seed oil. For ground broadcast applications the suggested total spray volume is 10 to 25 gal/acre. Use oil-in-water emulsion (1 to 5 oil to water ratio considered optimum), or water plus surfactant, crop oil or methylated seed oil. Thoroughly wet plants for individual plant treatment adding 1 to 2 qt surfactant per 100 gal of spray mix.	Anytime; best results have been obtained with late summer through fall applications.	Use emulsifier when adding diesel fuel oil to water. Use 1 pt/acre Picloram only on High Plains where no brush overstory is present. Late summer or fall applications, especially with Fluroxypyr, will provide best results, but aerially spray in the winter or early spring if heavy overstory of woody plants is present or if damage to live oak is a concern.
	Picloram:Fluroxypyr (1:1)	H 64 oz (0.67 lb)	VH 1%			
	Picloram:2,4-D(1:4)	H 1 gal (2.5 lb)	VH 2%			
	Fluroxypyr		VH ½ %			
	Prescribed burn + Picloram	VH** 8 to 16 oz (⅛ to ¼ lb)	VH 1%	For individual plant treatment, thoroughly wet all pads and crowns that survive the fire. Use a water carrier and add 32 to 64 oz of surfactant/100 gal of water.	After burn, when new pads are 3 in. tall. If new pads do not develop, spray by April 30.	Carry out prescribed burn between December and March. Sufficient fine fuel with good fuel continuity should be present to provide a uniform burn with moderate to high intensity. Spray the burned area within 5 months of the burn but no later than April 30 (May 31 if new pads do not develop by April 30). Use 8 oz Picloram when the prescribed burn is sufficiently intense to brown-out most pricklypear pads with less than 10 percent of the pricklypear green 2 weeks after the burn. Use 16 oz Picloram following moderate intensity burn with more than 10 percent of the pricklypear green 2 weeks after the burn. The prescribed burn plus Picloram treatment is not recommended for the Rio Grande Plains land resource area.

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Brush controlled	Herbicide (common and chemical names page 4)	Herbicide quantity (active ingredient rate in parenthesis)		Spray volume (per acre for broadcast, as described for individual plant)	Time to apply	Remarks
		Broadcast rate per acre	Individual plant treatment*			
Redberry juniper (redberry cedar)	Hexazinone liquid (plants less than 6 ft tall)		VH 2 ml per 3 ft of height or canopy diameter (whichever is greater)		Late winter through summer.	Apply undiluted Hexazinone Liquid or Hexazinone Pellets to soil surface between the stem base and the edge of the canopy. Use an exact delivery handgun applicator to apply Hexazinone Liquid. If plant size requires more than a single 2 or 4 ml application of Hexazinone Liquid, or 1 Hexazinone pellet, apply subsequent applications or pellets equally spaced around the plant. Do not use these treatments on marshy or poorly drained sites nor on soils classified as clays. Best results are expected on coarse-textured soils.
	Hexazinone pellet (plants less than 6 ft tall)		VH 1 pellet per 3 ft of height or canopy diameter (whichever is greater)			
	Hexazinone liquid (plants more than 6 ft tall)		H 4 ml per 3 ft of height or canopy diameter (whichever is greater)			
	Hexazinone pellet (plants more than 6 ft tall)		H 2 pellets per 3 ft of height or canopy diameter (whichever is greater)			
	Picloram		VH** 4 ml per 3 ft of height or canopy diameter (whichever is greater)		Spring through fall, before expected rainfall.	Apply undiluted Picloram to the stem base at or near the ground line. Use an exact delivery handgun applicator to apply the 4 ml dose. If plant size requires more than a single 4 ml application, space subsequent applications equally around the plant. Do not use on marshy or poorly drained sites nor on soils classified as clays.
Redberry juniper (cut stumps)	Picloram		VH 4% in water	Spray the sides of the stump and the cut surface, including the cambium, immediately after cutting, to thoroughly wet the stem and root collar area, but not to the point of runoff. Add 32 to 64 oz of surfactant to 100 gal of spray mix.	Any season of the year, except when snow or water prevent spraying to the ground line.	This is commonly called the cut stump application method. Apply with a backpack or knapsack sprayer using low pressures and a solid cone or flat fan nozzle. Add 32 to 64 oz of surfactant per 100 gal of water.

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Brush controlled	Herbicide (common and chemical names -page 4)	Herbicide quantity (active ingredient rate in parenthesis)		Spray volume (per acre for broadcast, as described for individual plant)	Time to apply	Remarks
		Broadcast rate per acre	Individual plant treatment*			
Running live oak	Tebuthiuron 20% pellets	VH 5 to 10 lb of pellets (1 to 2 lb)	VH ½ oz of pellets (⅒ oz) per 50 to 100 sq ft		Anytime during year–optimum period is Oct. 1 to April 1.	Use low rate on brush 2 to 8 ft tall. Use 7.5 lb of pellets/acre when brush is 2 to 8 ft tall on rolling or hummocking site and when live oak plants are 8 ft or taller without understory species such as yaupon. Use 10 lb of pellets/acre when live oak plants are taller than 8 ft and an understory of yaupon and other species is present. For individual plant treatment, apply pellets evenly on the soil under the plant canopy and 1 ft beyond canopy edge.
Sacahuista	Tebuthiuron 20% pellets		H ¼ oz of pellets (0.05 oz) per plant		Anytime during year–optimum period is Oct. 1 to April 1 except in Trans-Pecos where optimum period is May 1 to July 1.	Apply pellets evenly on the soil under the plant canopy near the stem base.
Saltcedar	Imazapyr	VH** 64 oz (1 lb)	VH 1%	Minimum 10 gal/acre for aerial or ground broadcast sprays. Thoroughly wet foliage for individual plant treatment. Add 32 to 64 oz of surfactant per 100 gal of water.	July through September, or until leaves begin to turn yellow.	When exposure to aquatic environments is possible use aquatic labels of Imazapyr and Glyphosate (see table "Common, Chemical and Product Names of Herbicides"). Imazapyr alone or in combination with Glyphosate will cause damage to desirable plants if contacted by the spray mix.
	Imazapyr + Glyphosate	VH 32 oz (½ lb) Imazapyr + 16 oz (½ lb) Glyphosate	VH ½% Imazapyr + ½% Glyphosate			
	Triclopyr		VH 25% in diesel fuel oil	Apply to lower 12 to 18 in. of trunk to wet the trunk; do not spray to point of runoff. Apply completely around the trunk.	Growing season when trees have mature leaves.	This is commonly called the low volume basal application method. Use a hollow cone nozzle with XI orifice.

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Brush controlled	Herbicide (common and chemical names -page 4)	Herbicide quantity (active ingredient rate in parenthesis)		Spray volume (per acre for broadcast, as described for individual plant)	Time to apply	Remarks
		Broadcast rate per acre	Individual plant treatment*			
Sand sagebrush	2,4-D low volatile ester	H 32 oz (1 lb) 4 lb/gal product (up to 64 oz (2 lb) for ground broadcast)	VH 1% (4 lb/gal product)	2 to 4 gal oil-in-water emulsion as aerial spray (16 oz to 1 gal diesel fuel oil and water to make 2 to 4 gal/acre; a 1 to 5 oil to water ratio is considered optimum). Ground broadcast 20 to 25 gal oil-in-water emulsion (1 gal diesel fuel oil and water to make 20 to 25 gal/acre) or 20 to 25 gal of water/acre with 32 to 64 oz of surfactant per 100 gal of water. Thoroughly wet foliage for individual plant treatment. Add 32 to 64 oz of surfactant per 100 gal of water or 5 gal of diesel fuel oil per 100 gal spray mix (1:19 oil-in-water emulsion). Oil-in-water emulsion requires use of emulsifier.	May 1 to June 15 under good growth conditions with plants fully leafed.	Do not spray when plants are defoliated by late freeze, hail or unfavorable growth conditions.
	Metsulfuron methyl Dicamba:2,4-D(1:3) + 2,4-D low volatile ester	H Rate 1 Metsulfuron methyl Dicamba:2,4-D(1:3) + 16 oz (0.5 lb) 2, 4-D 4 lb/gal product				
Sand shinnery oak	Tebuthiuron 20% pellets	VH 3.75 to 5 lb of pellets (¾ to 1 lb)	VH ½ oz of pellets (1/10 oz) per 100 sq ft		Anytime during year–optimum period is Oct. 1 to April 1 except in Trans-Pecos where optimum period is May 1 to July 1.	Use 3.75 lb of pellets/acre in southern High Plains and Rolling Plains. Use 5 lb of pellets/acre in eastern Panhandle north of Prairie Dog Town Fork of the Red River. For individual plant treatment, apply pellets evenly on the soil under the plant canopy and 1 ft beyond canopy edge.
	Tebuthiuron 80DF	H to VH 1.25 lb (1.0 lb)		Apply by mixing with water and using ground equipment equipped with straight stream nozzles spaced 3 to 6 ft apart delivering a total spray volume of 20 to 30 gal per acre.	Anytime during year–optimum period is Oct. 1 to April 1 except in Trans-Pecos where optimum period is May 1 to July 1.	Use the closer spacing of nozzles when treating high densities of sand shinnery. Applications will result in damage to grass directly under each nozzle that can persist for 1 to 3 years. Agitation is important to dissolve and maintain Tebuthiuron 80DF in solution during application.
Saw palmetto	Metsulfuron methyl Dicamba:2,4-D(1:3)	H to VH Rate 2 or Rate 3 (see remarks)		For ground broadcast applications, the suggested total spray volume is 15 to 30 gal/acre. Use water plus surfactant, crop oil or methylated seed oil.	Mid to late summer (August).	Rate 2 applications generally result in "high" control levels the first year after treatment, improving to "very high" by the second year after treatment. Rate 3 applications can be expected to produce "very high" control levels by the first year after treatment. Do not mow treated areas for at last 1 year.

*See Guide to Quantity of Herbicide Formulation for Total Volume of Spray Mix on page 7 for mixing information.
**Treatment control ratings: VH – Very High; H – High; M – Moderate; L – Low

Table 2. Herbicides for Controlling Brush on Rangeland

Brush controlled	Herbicide (common and chemical names -page 4)	Herbicide quantity (active ingredient rate in parenthesis)		Spray volume (per acre for broadcast, as described for individual plant)	Time to apply	Remarks
		Broadcast rate per acre	Individual plant treatment*			
Whitebrush (beebrush, beebush)	Tebuthiuron 20% pellets	VH** 5 to 7.5 lb of pellets (1 to 1 ½ lb)	VH ½ oz of pellets (1/10 oz) per 50 to 100 sq ft		Anytime during year–optimum period is Oct. 1 to April 1 except in Trans-Pecos where optimum period is May 1 to July 1.	Use 5 lb of pellets/acre on sand, loamy sand or sandy loam soils. Use 6.25 lb of pellets/acre on soils with 20 to 30 percent clay. Use 7.5 lb of pellets/acre on areas with grass production greater than 1,500 lb/acre or on areas where mesquite, Texas persimmon or other woody plants have a canopy cover of 20 percent or more with whitebrush that is 6 ft tall or taller. For individual plant treatment apply pellets evenly on the soil under the plant canopy and 1 ft beyond canopy edge.
Yucca	Triclopyr		H 2% in diesel fuel oil	Spray the center of each individual whorl of leaves to the point of runoff.	Any time.	Complete coverage of leaves is not necessary. The crown of each plant must be thoroughly wet with the herbicide mixture.
			H 2% in 1:5 diesel fuel oil:water emulsion		May through September.	Use emulsifier and agitate to maintain emulsion. Complete coverage of leaves is not necessary. The crown of each plant must be thoroughly wet with the herbicide mixture.
			VH 15% in diesel fuel oil	Use an adjustable cone nozzle (X1 orifice) and spray a 2 second burst into each whorl.	Spring and summer.	Direct spray into the center of each whorl.
			H Undiluted 2 to 4 ml per plant whorl	Use an exact delivery handgun set at 2 or 4 ml per whorl dose.		
	Triclopyr		VH Undiluted	Use an adjustable cone nozzle (XI orifice) and spray a 2-second burst into each whorl.		
	Metsulfuron methyl Dicamba:2,4-D(1:3) + 2,4-D low volatile ester	H Rate 2 Metsulfuron methyl Dicamba:2,4-D(1:3) + 16 to 24 oz 2,4-D (4 lb a.i./gal product)		Crop oil concentrate, modified seed oil or modified seed oil/ organosilicone are the preferred adjuvants. For aerial applications, a minimum of 4 gal/acre total spray volume is recommended.	Spring through fall prior to frost.	A second follow-up application of Metsulfuron methyl Dicamba:2,4-D(1:3) at Rate 1 or Rate 2 plus 2,4-D low volatile ester at 0.5 to 0.75 lb a.i./acre within 2 years of the initial application may be required to control yucca seedlings and regrowth from rootstocks.
	Metsulfuron: Chlorosulfuron (3:1) + 2,4-D low volatile ester	H 0.675 oz Metsulfuron: Chlorosulfuron (3:1) + 32 oz 2,4-D (4 lb a.i./gal product)				

*See Guide to Quantity of Herbicide Formulation for Total Volume of Spray Mix on page 7 for mixing information.
**Treatment control ratings: VH – Very High; H – High; M – Moderate; L – Low

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