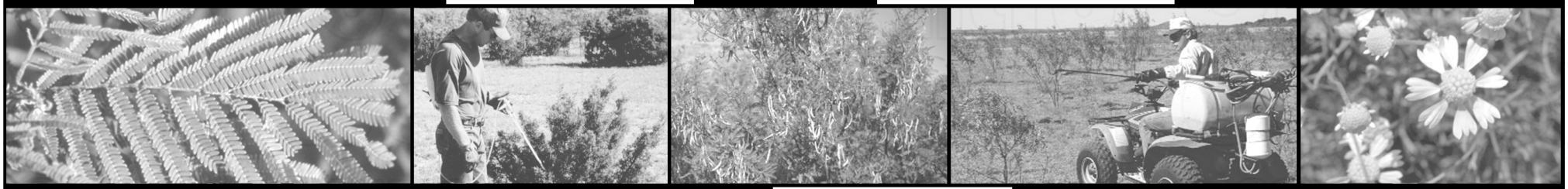
B-1466 4-05

AgriLIFE EXTENSION
Texas A&M System

CHEMICAL WEED AND BRUSH CONTROL



SUGGESTIONS FOR RANGELAND

Chemical Weed and Brush Control Suggestions for Rangeland

*Allan McGinty, Jim Ansley, J. F. Cadenhead, Wayne Hamilton, Wayne C. Hanselka, Charles Hart and Darrell N. Ueckert**

This publication is intended to provide general suggestions for herbicide use to control brush and weeds on Texas rangelands and 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 "Expert System for Brush and Weed Control Technology Selection" (EXSEL) helpful. EXSEL is a decision support expert system designed to recommend the best mechanical and chemical rangeland brush and weed control treatments in Texas. It also provides an analysis of prescription fire potential and will produce a preburn checklist. The user may select the desired plant-kill efficacy level, force the system to consider certain types of treatments, or let the system choose the best alternative. EXSEL is on the World Wide Web (*http://cnrit.tamu.edu/rsg/exsel*) and can be accessed free of charge.

Tommy Welch, former Associate Department Head; Professor and Extension Program Leader for Rangeland Ecology and Management was the original author of this publication. After his retirement in 1995, the Herbicide Use Committee, Rangeland Ecology and Management (members listed above), assumed the responsibility for updating and maintaining this publication.

*Professor and Extension Range Specialist; Professor, Texas AgriLife Research; Assistant Professor and Extension Range and Brush Control Specialist; Senior Lecturer, Department of Rangeland Ecology and Management; Associate Department Head, Professor and Extension Program Leader; Professor and Extension Range Specialist; and Regents Fellow and Professor, Texas AgriLife Research; The Texas A&M System.

Index

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 prevents 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 Texas Cooperative Extension 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.*

Texas Digital Diagnostics (TDD) provides a quick way to identify plants. Accurate plant identification is critical for selecting proper control technologies. TDD uses digital images and the internet to provide this service. Contact your County Extension Agent to learn more about this program.

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
Clopyralid	3,6-dichloro-2-pyridinecarboxylic acid	Reclaim	3 lbs./gal.
2,4-D	(2,4-dichlorophenoxy) acetic acid	Several including Weedar 64, Formula 40,Hi-Dep, Weedone LV4,Esteron 99C and others	amine salts and esters
Dicamba	3,6-dichloro-2-methoxybenzoic acid	Banvel, Clarity	4 lbs./gal.
Dicamba:2,4-D(1:3)	See dicamba and 2,4-D	Weedmaster, Banvel + D, RangeStar	4 lbs./gal.
Diesel fuel oil or kerosene	refined petroleum fractions	Several manufacturers	
Glyphosate	N-(phosphonomethyl) glycine	Several including Rodeo, Roundup, Roundup Ultra, Glypro, Glyphos and others	isopropylamine salt*, concentration varies depending on the product
Hexazinone	3-cyclohexyl-6-(dimethylamino)-1-methyl-1,3,5-triazine-2,4(1H,3H)-dione	Velpar L, Pronone Power Pellet	2 lbs./gal. (Velpar L) 75% (Pronone Power Pellet)
Imazapyr	2-[4,5-dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1H-imidazol-2-yl]-3- pyridinecarboxylic acid	Arsenal, Habitat	2 lbs./gal.
Metsulfuron methyl	methyl 2-[[[[(4-methoxy-6-methyl-1,3,5-triazin-2-yl)amino]carbonyl]amino] sulfonyl] benzoate	Escort, Cimarron	60%
Metsulfuron methyl Dicamba:2,4-D(1:3)	See metsulfuron methyl, dicamba and 2,4-D	Cimarron Max	60% (Part A) 3.87 lbs./gal. (PartB)
Paraquat	1,1'-dimethyl-4,4'-bipyridinium dichloride	Gramoxone Extra	2.5 lbs./gal.
Picloram	4-amino-3,5,6-trichloro-2-pyridinecarboxylic acid	Tordon 22K	2 lbs./gal.
Picloram:Fluroxypyr (1:1)	See picloram and 1-methylheptyl ester:((4-amino-3,5-dichloro-6-fluoropyridin-2-yl)oxy)acetic acid	Surmount	1.34 lbs./gal
Picloram:2,4-D(1:4)	See picloram and 2,4-D	Grazon P+D	2.5 lbs./gal.
Tebuthiuron	N-[5-(1,1-dimethylethyl)-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	Remedy, Pathfinder II	4 lbs./gal. (Remedy) 0.75 lbs./gal (Pathfinder II)
Triclopyr:Fluroxypyr (3:1)	See triclopyr and 1-methylheptyl ester:((4-amino-3,5-dichloro-6-fluoropyridin-2-yl)oxy)acetic acid	PastureGard	2.0 lbs./gal.
Triclopyr:2,4-D(1:2)	See triclopyr and 2,4-D	Crossbow	3 lbs./gal.

*Herbicides have been identified by the accepted Weed Science Society of America common name, and when practical, one or more product names. For herbicides marketed under three or more labels, the designation "several manufacturers" has been used rather than attempting to list all the trade formulations.

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%*	1½ %	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 gals.*	1 oz.	2 oz.	3 oz.	4 oz.*	6 oz.	8 oz.	12 oz.	15 ½ oz.	19 oz.	38 oz.	57 oz.	3 qts.
5 gals.	1 ⅔ oz.	3 ⅓ oz.	5 oz.	6 ½ oz.	10 oz.	13 oz.	19 oz.	26 oz.	1 qt.	2 qts.	3 qts.	1 ¼ gals.
10 gals.	3 ⅓ oz.	6 ½ oz.	10 oz.	13 oz.	19 oz.	26 oz.	38 oz.	51 oz.	2 qts.	1 gal.	1 ½ gals.	2 ½ gals.
25 gals.	8 oz.	1 pt.	24 oz.	1 qt.	48 oz.	2 qts.	3 qts.	1 gal.	1 ¼ gals.	2 ½ gals.	3 ¾ gals.	6 ¼ gals.
50 gals.	1 pt.	1 qt.	48 oz.	2 qts.	3 qts.	1 gal.	1 ½ gals.	2 gals.	2 ½ gals.	5 gals.	7 ½ gals.	12 ½ gals.
100 gals.	1 qt.	2 qts.	3 qts.	1 gal.	1 ½ gals.	2 gals.	3 gals.	4 gals.	5 gals.	10 gals.	15 gals.	25 gals.

*Example: To prepare 3 gallons of a spray mixture (herbicide, water and surfactant) containing 1% herbicide, add 4 oz. 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 desired to be 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 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/spot treatment*			
African rue	Velpar L		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.
	Pronone Power Pellet		VH 1 pellet/plant			
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** 1 pt. to 1 qt. (½ to 1 lb.) 4 lbs./gal. product	VH 1% (4 lbs./gal. product)	2 to 4 gals. water for aerial spray; 10 to 25 gals. water for ground broadcast application. Thoroughly wet foliage for individual plant treatment. Add 1 to 2 qts. surfactant per 100 gals. of water.	Spring, weed 4 to 6 inches high, good moisture condition.	Use 2,4-D amine in areas with 25 inches 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 1 qt./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 Weedmaster, 2,4-D plus Banvel, Grazon P+D or 2,4-D plus Tordon 22K. For prairie gerardia control use 1 ½ qts./acre of 2,4-D or the low rate of Weedmaster. Banvel plus 2,4-D, Grazon P+D or Tordon 22K plus 2,4-D when plants are 4 to 6 inches high. Use 1 qt./acre of Grazon P+D or ½ pt. of 2,4-D/acre when plants are 6 to 10 inches high before flowering.
	Weedmaster	VH 1 pt. to 1 qt. (½ to 1 lb.)	VH 1%			
	Tank mix Banvel with 2,4-D amine or low volatile ester	VH ¼ to ½ pt. (⅛ to ¼ lb.) Banvel + ¾ to 1 ½ pts. (⅜ to ¾ lb.) 2, 4-D, 4 lbs./gal. product	VH ¼% Banvel + ¾% 2,4-D (4 lbs./gal. product)			
	Grazon P+D	VH 1 pt. to 1 ½ qts. (0.3 to 0.9 lb.)	VH 1%			
	Tank mix Tordon 22K with 2,4-D amine or low volatile ester	VH ¼ to ¾ qts. (1/16 to 3/16 lb.) Tordon 22 K + ½ to 1 ½ pts. (¼ to ¾ lb.) 2,4-D 4 lbs./gal. product	VH ¼% Tordon 22K + ½% 2,4-D (4 lbs./gal. product)			

*See Guide to Quantity of Herbicide Fromulation for Total Volume of Spray Mix on page 5 for mixing information.
**Treatment control ratings: VH – Very High; H – High; M – Moderate; L – Low

Weed 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/spot treatment*			
	Cimarron Max	VH** Rate 1 to Rate 2	VH 1%			
	Surmount	VH 1.5 pt. to 1 qt. (0.25 to 0.33 lb.)	VH 1%			Use high end of rate range for camphorweed, marshelder and smartweed.
	PastureGard	H 1 to 1.5 qt. (0.5 to 0.75 lb.)	VH 1%			Use high end of rate range for camphorweed, marshelder and smartweed. PastureGard efficacy on smartweed is marginal.
Broomweed (annual or common), plantain (tallowweed), wild carrot	Escort or Cimarron	VH 1/10 oz. (1/16 oz.)		2 to 4 gals. water for aerial spray; 10 to 25 gals. water for ground broadcast application. Add 1 to 2 qts. surfactant per 100 gals. of water.	Spring, weeds less than 4 inches tall.	
Broom snakeweed (perennial broomweed)	Tordon 22K	VH 1 pt. to 1 qt. (1/4 to 1/2 lb.)	VH 1/2 %	2 to 4 gals. water for aerial spray; 10 to 25 gals. water for ground broadcast application. Thoroughly wet foliage for individual plant treatment. Add 1 to 2 qts. surfactant per 100 gals. 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 1 pt./acre of Tordon 22K only in the fall. Use 1 qt./acre of Tordon 22K in the spring. Poor control may be expected if Weedmaster or Banvel:2,4-D mixture is used when growth conditions are less than ideal. Growth conditions should be optimum if Grazon P+D or Tordon 22K:2,4-D mixture is used in the spring.
	Grazon P+D	VH 2 qts. (1 1/4 lbs.)	VH 1%			
	Surmount	VH 1.5 to 3 qt. (0.5 to 1.0 lb.)	VH 1%			
	Tank mix Tordon 22K with 2,4-D amine or low volatile ester.	VH 1 pt. (1/4 lb.) Tordon 22K + 1 pt. to 1 qt. (1/2 to 1 lb.) 2,4-D, 4 lbs./gal. product	VH 1/4 % Tordon 22K + 1/2 % 2,4-D (4 lbs./gal. product)			
	Weedmaster	VH 1 qt. (1 lb.)	VH 1%			
	Tank mix Banvel with 2,4-D amine or low volatile ester.	VH 1/2 pt. (1/4 lb.) Banvel + 1 1/2 pts. (3/4 lb.) 2,4-D, 4 lbs./gal. product	VH 1/4 % Banvel + 3/4 % 2,4-D (4 lbs./gal product)			

*See Guide to Quantity of Herbicide Fromulation for Total Volume of Spray Mix on page 5 for mixing information.
**Treatment control ratings: VH – Very High; H – High; M – Moderate; L – Low

Weed 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/spot treatment*			
Broom snakeweed (perennial broomweed) (continued)	Escort or Cimarron	VH** ⅝ oz. (⅜ oz.)		2 to 4 gals. water for aerial spray; 10 to 25 gals. water for ground broadcast application. Add 1 to 2 qts. surfactant or 2 gals. crop oil per 100 gals. of water.	Optimum time is in the fall, but may be applied in spring.	
	Cimarron Max	H to VH Rate 1 to Rate 2				
	Spike 20P	VH 3.75 lbs. of pellets (¾ lb.)	VH ⅙ 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)	Grazon P+D	VH 1 to 1 ½ qts. (0.6 to 0.9 lb.)	VH 1%	2 to 4 gals. water for aerial spray; 10 to 25 gals. water for ground broadcast application. Thoroughly wet foliage for individual plant treatment. Add 1 to 2 qts. of surfactant per 100 gals. 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 inches tall. Spray upright prairie-coneflower when plants are 2 to 6 inches tall before flowering.
	Tank mix Tordon 22K with 2,4-D amine or low volatile ester.	VH ½ to ¾ pt. (⅛ to 3/16 lb.) Tordon 22K + 1 to 1 ½ pts. (½ to ¾ lb.) 2,4-D, 4 lbs./gal. product	VH ¼% Tordon 22K + ½% 2,4-D (4 lbs./gal. product)			
	Surmount	VH 1.5 to 2 pt. (0.25 to 0.33 lb.)	VH 1%			
	Cimarron Max	H to VH Rate 1 to Rate 2				
	Weedmaster	VH 1 qt. (1 lb.)	VH 1%			
	Tank mix Banvel with 2,4-D amine or low volatile ester.	VH ½ pt. (¼ lb.) Banvel + 1½ pts. (¾ lb.) 2,4-D, 4 lbs./gal. product	VH ¼% Banvel + ¾% 2,4-D (4 lbs./gal. product)			

*See Guide to Quantity of Herbicide Fromulation for Total Volume of Spray Mix on page 5 for mixing information.
**Treatment control ratings: VH – Very High; H – High; M – Moderate; L – Low

Weed 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/spot treatment*			
Common goldenweed, Drummond's goldenweed	2,4-D low volatile ester	VH** 2 qts. (2 lbs.) 4 lbs./gal. product	VH 2% (4 lbs./gal. product)	2 to 4 gals. water for aerial spray; 10 to 25 gals. water for ground broadcast application. Thoroughly wet foliage for individual plant treatment. Add 1 to 2 qts. surfactant per 100 gals. of water.	Spring when growth conditions are good.	Grazon P+D, Weedmaster and mixtures of Banvel:2,4-D and Tordon 22K: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.
	Weedmaster	VH 3 pts. (1 ½ lbs.)	VH 2%			
	Surmount	VH 2 pt. (0.33 lb.)	VH 1%			
	PastureGard	H 1 to 1.5 qt. (0.5 to 0.75 lb.)	VH 1%			
	Cimarron Max	VH Rate 3				
	Tank mix Banvel with 2,4-D amine or low volatile ester.	VH ¾ pt. (⅜ lb.) Banvel + 2 ¼ pts. (1.125 lbs.) 2,4-D, 4 lbs./gal. product	VH ½% Banvel + 1 ½% 2,4-D (4 lbs./gal. product)			
	Grazon P+D	VH 3 pts. (0.94 lb.)	VH 2%			
	Tank mix Tordon 22K with 2,4-D amine or low volatile ester.	VH ¾ pt. (0.19 lb.) Tordon 22K + 1 ½ pts. (¾ lb.) 2,4-D, 4 lbs./gal. product	VH ½% Tordon 22K + 1% 2,4-D (4 lbs./gal. product)			
Garboncillo, threadleaf groundsel, wooly locoweed	Grazon P+D	VH 3 pts. (0.94 lb.)	VH 2%	2 to 4 gals. water for aerial spray; 10 to 25 gals. water for ground broadcast application. Thoroughly wet foliage for individual plant treatment. Add 1 to 2 qts. of surfactant per 100 gals. 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.
	Tank mix Tordon 22K with 2,4-D amine or low volatile ester.	VH ¾ pt. (0.19 lb.) Tordon 22K + 1 ½ pts. (¾ lb.) 2,4-D, 4 lbs./gal. product	VH ½% Tordon 22K + 1% 2,4-D (4 lbs./gal. product)			
	Surmount	VH 2 pt. (0.33 lb.)	VH 1%			
	PastureGard	H 1 to 1.5 qt. (0.5 to 0.75 lb.)	VH 1%			
	Cimarron Max	VH Rate 2				

*See Guide to Quantity of Herbicide Fromulation for Total Volume of Spray Mix on page 5 for mixing information.
**Treatment control ratings: VH – Very High; H – High; M – Moderate; L – Low

Weed 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/spot treatment*			
Garboncillo, threadleaf groundsel, wooly locoweed (continued)	Weedmaster	VH** 1 qt. (1 lb.)	VH 2%			
	Tank mix Banvel with 2,4-D amine or low volatile ester.	VH ¾ pt. (⅜ lb.) Banvel + 2 ¼ pts. (1 ⅛ lbs.) 2,4-D, 4 lbs./gal. product	VH ½ % Banvel + 1 ½ %, 2,4-D (4 lbs./gal.product)			
Gray goldaster, narrowleaf goldaster	2,4-D low volatile ester	VH 1 qt. (1 lb.)	VH 1%	2 to 4 gals. oil-in-water emulsion (2 qts. of diesel fuel oil and water to make 2 to 4 gals./acre) as aerial spray. 10 to 25 gals. oil-in-water emulsion (1 gal. diesel fuel oil and water to make 10 to 25 gals./acre) as ground broadcast. Thoroughly wet foliage for individual plant treatment. Add 1 to 2 qts. surfactant per 100 gals. of water or 5 gals. of diesel fuel oil per 100 gals. 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.
	Grazon P+D	VH 1.6 qts. (1 lb.)	VH 1%			
	Tank mix Tordon 22K with 2,4-D low volatile ester.	VH 0.8 pt. (0.2 lb.) Tordon 22K + 0.8 qt. (0.8 lb.) 2,4-D, 4 lbs./gal. product	VH ¼ % Tordon 22K + ½ % 2,4-D (4 lbs./gal product)			
	Surmount	VH 2 pt. (0.33 lb.)	VH 1%			
	PastureGard	H 1 to 1.5 qt. (0.5 to 0.75 lb.)	VH 1%			
	Cimarron Max	H to VH Rate 1 to Rate 2				
	Weedmaster	VH 1 qt. (1 lb.)	VH 1%			
	Tank mix Banvel with 2,4-D low volatile ester.	VH ½ pt. (¼ lb.) Banvel + 1 ½ pts. (¾ lb.) 2,4-D, 4 lbs./gal. product	VH ¼ % Banvel + ¾ % 2,4-D (4 lbs./gal. product)			
Lespedeza	Remedy	VH 1 to 2 pts. (½ to 1 lb.)		Ground broadcast 20 to 30 gals. per acre with 1 to 2 qts. of surfactant per 100 gals. of water.	June through August under good growing conditions.	Plants need to be 12 to 18 inches tall before spraying. Use the higher rate if plants are large, approaching maturity, or if the infestation level is high.
	Escort or Cimarron	H ½ oz. (3/10 oz.)				Begin application at flower bud initiation through full bloom.
	Cimarron Max	H Rate 2				

*See Guide to Quantity of Herbicide Fromulation for Total Volume of Spray Mix on page 5 for mixing information.
**Treatment control ratings: VH – Very High; H – High; M – Moderate; L – Low

Weed 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/spot treatment*			
	Surmount	VH** 1.5 to 2 pt. (0.25 to 0.33 lb.)	VH 1%			
	PastureGard	VH 1.5 to 2 pt. (0.38 t 0.5 lb.)	VH 0.75%			
Rayless goldenrod (jimmyweed)	Escort or Cimarron	VH ¾ oz. (0.45 oz.)		2 to 4 gals. water for aerial spray; 10 to 25 gals. water for ground broadcast application. Thoroughly wet foliage for individual plant treatment. Add 1 to 2 qts. surfactant per 100 gals. of water.	Fall.	
	Surmount	VH 6 pt. (1.0 lb.)	VH 2%			
	Tordon 22K	VH 1 qt. (½ lb.)	VH 1%			
Spiny aster (wolfweed)	Grazon P+D	VH 1 qt. (0.63 lbs.)	VH 1%	10 to 25 gals. water for ground broadcast application. Thoroughly wet foliage for individual plant treatment. Add 1 to 2 qts. surfactant per 100 gals. 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 inches tall.
	Tank mix Tordon 22K with 2,4-D amine or low volatile ester.	VH ½ pt. (⅛ lb.) Tordon 22K + 1 pt. (½ lb.) 2,4-D, 4 lbs./gal. product	VH ¼ % Tordon 22K + ½ % 2,4-D (4 lbs./gal. product)			
	Surmount	VH 1.5 to 2 pt. (0.25 to 0.33 lb.)	VH 1%			
	PastureGard	H 2 to 3 pt. (0.5 to 0.75 lb.)	VH 1%			
	Weedmaster	VH 1 qt. (1 lb.)	VH 1%			
	Tank mix Banvel with 2,4-D amine or low volatile ester.	VH ½ pt. (¼ lb.) Banvel + 1 ½ pts. (¾ lb.) 2,4-D, 4 lbs./gal. product	VH ¼ % Banvel + ¾ % 2,4-D (4 lbs./gal. product)			
Threadleaf groundsel	Escort or Cimarron	VH 4/10 oz. (¼ oz.)		2 to 4 gals. water for aerial spray; 10 to 25 gals. water for ground broadcast application. Add 1 to 2 qts. surfactant per 100 gals. of water.	Fall.	
	Cimarron Max	VH Rate 2				

*See Guide to Quantity of Herbicide Fromulation for Total Volume of Spray Mix on page 5 for mixing information.
**Treatment control ratings: VH – Very High; H – High; M – Moderate; L – Low

Weed 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/spot treatment*			
Twinleaf senna (twoleaf senna)	Grazon P+D		VH** 1%	Thoroughly wet foliage. Mix with water and add 1 to 2 qts. surfactant per 100 gals. spray mix.	Late spring, good moisture and growth conditions.	
	Surmount		VH 1%			
	Weedmaster		VH 1%			
Upright prairie-coneflower	Escort or Cimarron	VH 2/10 oz. (1/8 oz.)		2 to 4 gals. water for aerial spray. 10 to 25 gals. water for ground broadcast application. Add 1 to 2 qts. surfactant per 100 gals. of water.	Spring, before flower stalk development.	

*See Guide to Quantity of Herbicide Fromulation for Total Volume of Spray Mix on page 5 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*			
Ashe juniper (blueberry cedar)	Velpar L		VH** 2 ml. per 3 ft. of height or canopy diameter, whichever is greater		Late winter through summer.	Apply undiluted Velpar L, Tordon 22K or Pronone Power Pellets between the stem base and the edge of the canopy. Use an exact delivery handgun applicator to apply Velpar L and Tordon 22K. If plant size requires more than a single 2 ml. or 4 ml. application of Velpar L or Tordon 22K, or more than 1 Pronone Power 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.
	Pronone Power Pellet		VH 1 pellet per 3 ft. of height or canopy diameter, whichever is greater			
	Tordon 22K		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	Tordon 22K		VH 1% H rating for cholla	Thoroughly wet foliage and stems or joints and stems for individual plant treatment. Mix with water and add 1-2 qts. surfactant per 100 gals. spray mix.	Anytime.	
Baccharis (dryland willow, Roosevelt willow, seep willow or willow baccharis)	2,4-D low volatile ester	H 3 pts. to 3 qts. (1 ½ to 3 lbs.) 4 lbs./gal. product	H 1%	4 to 5 gals. of water for aerial spray; 15 to 20 gals. water for ground broadcast. For individual plant treatment, thoroughly wet the entire foliage, stems and trunks. Add 1 to 2 qts. surfactant per 100 gals. of water.	Spring.	Individual plant treatment with 2,4-D may be applied anytime during the growing season when soil moisture is available for active growth. However, spring treatment provides the best control.

*See Guide to Quantity of Herbicide Fromulation for Total Volume of Spray Mix on page 5 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)	Velpar L		VH** 2 ml. per 3 ft. of height or canopy diameter, whichever is greater		Late winter through summer	Apply undiluted Velpar L or Pronone Power Pellet to soil surface between the stem base and the edge of the canopy. Use an exact delivery handgun applicator to apply Velpar L. If plant size requires more than a single 2 ml. application of Velpar L, or a single Pronone Power 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.
	Pronone Power 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	Remedy		VH 25% in diesel fuel oil	Apply to lower 12 to 18 inches 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 inches. For Texas persimmon, apply in spring after leaves mature but before June 15.
	Remedy		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-inch-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 inches. 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)	Spike 20P	VH 7.5 lbs. of pellets (1½ lbs.)	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.

*See Guide to Quantity of Herbicide Fromulation for Total Volume of Spray Mix on page 5 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*			
Blackberry	Surmount	VH** 3 to 4 pt. (0.5 to 0.67 lb.)	VH 1 to 2%	Use at least 10 gallons of water per acre, but increased volume up to 25 gallons per acre will improve coverage, and subsequent herbicide penetration into the plant. Add 1 to 2 qts. surfactant per 100 gals. 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.	
	PastureGard	H 3 to 4 pt. (0.75 to 1.0 lb.)	VH 1 to 2%			
Blackbrush, guajillo	Spike 20P	H 10 to 15 lbs. pellets (2 to 3 lbs.)	VH ½ oz. of pellets (1/10 oz.) per 45 sq. ft. or 2 to 4 inches 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	Velpar L		VH 4 ml. per 3 ft. of canopy diameter or height, whichever is greater		Late winter through summer.	Apply undiluted Velpar L or Pronone Power Pellets to soil surface between the stem base and the edge of the canopy. Use an exact delivery handgun applicator to apply Velpar L. If plant size requires more than a single 4 ml. application of Velpar L, or 2 Pronone Power 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.
	Pronone Power 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	Spike 20P	VH 10 lbs. of pellets (2 lbs.)	VH ½ oz. of pellets (1/10 oz.) per 45 sq. ft. or 2 to 4 inches 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	Crossbow		H 4% in diesel fuel oil	Apply to freshly cut surface of stump immediately after cutting	Anytime–best results when soil is dry	

*See Guide to Quantity of Herbicide Fromulation for Total Volume of Spray Mix on page 5 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*			
Catclaw mimosa	Spike 20P	H** 3.75 lbs. of pellets (¾ lb.)	VH ½ oz. of pellets (1/10 oz.) per 100 sq. ft. or 2 to 4 inches 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	Spike 20P	VH 3.75 lbs. of pellets (¾ lb.)	VH ½ oz. of pellets (1/10 oz.) per 100 sq. ft. or 2 to 4 inches 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	Grazon P+D	VH 1 gal. (2.5 lbs.)	VH 1%	5 to 15 gals. as aerial spray or 10 to 25 gals. for ground broadcast application. Thoroughly wet foliage for individual plant treatment. Add 1 to 2 qts. of surfactant per 100 gals. water.	Spring or fall.	
	Tank mix Tordon 22K with 2,4-D amine	VH 1 qt. (½ lb.) Tordon 22K + 2 qts (2 lbs.) 2,4-D, 4 lbs./gal. product	VH ¼ % Tordon 22K + ½ % 2,4-D (4 lbs./gal. product)			
	Surmount	VH 5 pts. (0.84 lbs.)	VH 1%			
	Tordon 22K	VH 1 qt. (½ lb.)	VH ½ %			
	Tank mix Tordon 22K with Remedy	VH 1 qt. (½ lb.) Tordon 22K + 1 pt. (½ lb.) Remedy	VH ½ % Tordon 22K + ¼ % Remedy			
	Velpar L		VH 4 ml. per 3 ft. of canopy diameter or height, whichever is greater		Late winter through summer.	Apply undiluted Spike 20P, Velpar L or Pronone Power Pellets to soil between stem base and the edge of the canopy. Use an exact delivery handgun applicator to apply Velpar L. If plant size requires more than a single 4 ml. application of Velpar L, or 2 Pronone Power 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.
	Pronone Power Pellet		VH 2 pellets per 3 ft. of canopy diameter or height, whichever is greater			
	Spike 20P		VH ½ oz. of pellets (1/10 oz.) per 45 sq.ft. or 2 to 4 inches of stem diameter		Anytime during year–optimum period is Oct. 1 to April 1.	

*See Guide to Quantity of Herbicide Fromulation for Total Volume of Spray Mix on page 5 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*			
Chinese tallowtree (continued)	Remedy		VH** 15% in diesel fuel	Apply to lower 12-18 inches 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 inches. This is commonly called the low-volume basal application method. A 5500-X1 nozzle is preferred.
	Pathfinder II		VH Undiluted			
	Remedy		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	Remedy		VH 1%	Add 1 to 2 qts. of surfactant per 100 gals. of water. Thoroughly wet foliage.	Early summer.	
	Tank mix Remedy with Tordon 22K		VH ½% Remedy + ½% Tordon 22K			
Common or Eastern persimmon	Banvel	L 2 qts. (2 lbs.)	H 1%	Ground broadcast 15 to 20 gals. water. Thoroughly wet foliage for individual plant treatment. Add 1 to 2 qts. of surfactant per 100 gals. of water.	Spring, when leaves are fully developed.	
	Surmount		VH 1 to 2%			
Creosotebush, tarbush, whitethorn acacia	Spike 20 P	H 3.75 to 5 lbs. 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 lbs. 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.

*See Guide to Quantity of Herbicide Fromulation for Total Volume of Spray Mix on page 5 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*			
Eastern redcedar	Tordon 22K		VH** 4 ml. per 3 ft. of height or canopy diameter, whichever is greater		Spring or fall.	Apply undiluted Velpar L, Tordon 22K or Pronone Power Pellets to soil surface between the stem base and the edge of the canopy. Use an exact delivery handgun applicator to apply Velpar L and Tordon 22K. If plant size requires more than a single 4 ml. application of Velpar L or Tordon 22K, or more than 2 Pronone Power 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.
	Velpar L		VH 4 ml. per 3 ft. of height or canopy diameter, whichever is greater, or 1 inch of trunk diameter		Late winter through summer.	
	Pronone Power Pellet		VH 2 pellets per 3 ft. of height or canopy diameter, whichever is greater, or 1 inch of trunk diameter			
Elm, granjeno (spiny hackberry), hackberry, huisache, lotebush, pricklyash (Hercules club), yaupon	Spike 20P		VH ½ oz. of pellets (1/10 oz.) per 45 sq. ft. or 2 to 4 inches 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	Grazon P+D		VH 1%	2 to 4 gals. of oil-in-water emulsion (1 to 5 oil to water ratio is considered optimum) or 2 to 4 gals. of water with 1 to 2 qts. of surfactant per 100 gals. water for aerial spray. Ground broadcast use 10 to 25 gals. oil-in-water emulsion (½ to 1 gal. diesel fuel oil and water to make 10 to 25 gals./acre) or 10 to 25 gals. of water with 1 to 2 qts. of surfactant per 100 gals. water as ground broadcast. Thoroughly wet foliage for individual plant treatment. Add 1 to 2 qts. surfactant per 100 gals. of water or 5 gals. of diesel fuel oil per 100 gals. spray mix (1:19 oil-in-water emulsion). Oil-in-water emulsion requires use of emulsifier.	Late spring, when leaves mature.	
	Surmount	H 3 to 6 pt. (0.5 to 1.0 lb.)	VH 0.75%			
	Tordon 22K	H 1 to 2 pts. (¼ to ½ lb.)	VH ½%			
	Tank mix Tordon 22K with Remedy	H 1 pt. (¼ lb.) Tordon 22K + ½ pt. (¼ lb.) Remedy	VH ¼% Tordon 22K + ¼% Remedy			
	Tank mix Tordon 22K with 2,4-D amine or low volatile ester		VH ¼% Tordon 22K + ½%, 2,4-D (4 lbs./gal. product)			

*See Guide to Quantity of Herbicide Fromulation for Total Volume of Spray Mix on page 5 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*			
Greenbriar	Tank mix Banvel with 2,4-D low volatile ester		H** 1½% Banvel + 3% 2,4-D (4 lbs./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 inches apart at base of trees. Apply until 2,4-D runs from each end of cut.	Summer or winter.	
Honeylocust	Grazon P+D		VH 1%	Add 1 to 2 qts. of surfactant per 100 gals. water. Apply to the leaves. Thoroughly wet foliage, but not to the point of dripping.	Spring, when leaves mature.	
Huisache	Remedy		H 15% in diesel fuel oil	Apply to lower 12 to 18 inches 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.
	Pathfinder II		VH Undiluted			
	Grazon P+D		VH 1%	Add 1 to 2 qts. of surfactant per 100 gals. 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.
Huisache, retama	Tank mix Tordon 22K with Remedy	L to M 1 qt. (½ lb.) Tordon 22K + 1 pt. (½ lb.) Remedy	H ½% Tordon 22K + ½% Remedy	4-5 gals. oil-in-water emulsion as aerial spray (1 qt. to 1 gal. diesel fuel oil and water to make 4-5 gals./acre; a 1-5 oil to water ratio is considered optimum); 20-25 gals. oil-in-water emulsion (½ to 1 gal. diesel fuel oil and water to make 20-25 gals./acre) or 20-25 gals. water plus surfactant (1 to 2 qts. of surfactant per 100 gals. water) as ground broadcast. Thoroughly wet foliage for individual plant treatment. Add 1-2 qts. surfactant per 100 gals. of water or 5 gals. of diesel fuel oil per 100 gals. 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.
	Tank mix Tordon 22K with Reclaim	L to M 1 qt. (½ lb.) Tordon 22K + ⅓ to ⅔ qt. (¼ to ½ lb.) Reclaim	H ½% Tordon 22K + ½% Reclaim			
	Surmount	L to M 6 pt. (1.0 lb.)	H 1%			
	Tordon 22K	L to M 1 qt. (½ lb.)	H 1%			

*See Guide to Quantity of Herbicide Fromulation for Total Volume of Spray Mix on page 5 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*			
Lotebush	Remedy		VH 15% in diesel fuel	Apply to lower 12-18 in. of the trunk to wet the bark. Do not spray to point of runoff. Apply completely around the trunk.	Antime–optimum time is during growing season when plants have mature leaves.	
	Pathfinder II		VH Undiluted			
Macartney rose (mowed and other disturbed stands within 3 years of disturbance)	2,4-D amine	L** 2 qts. (2 lbs.) 4 lbs./gal. product	L 1% (4 lbs./gal. product)	5 to 15 gals. water as aerial spray; 25 to 30 gals. water as ground broadcast. Thoroughly wet foliage and stems for individual plant treatment. Add 1 to 2 qts. of surfactant per 100 gals. 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.
	Grazon P+D	H 1 gal. (2.5 lbs.)	VH 1%		Spring or fall, good growing conditions.	
	Tank mix Tordon 22K with 2,4-D amine or low volatile ester	H 1 qt. (½ lb.) Tordon 22K + 2 qts. (2 lbs.) 2,4-D, 4 lbs./gal. product	VH ¼ % Tordon 22K + ½ % 2,4-D (4 lbs./gal. product)			
	2,4-D low volatile ester	L 2 qts. (2 lbs.) 4 lbs./gal. product	L 1% (4 lbs./gal. product)		Fall, under good moisture conditions, before Nov. 1.	
Macartney rose (undisturbed stands)	2,4-D amine	L 1 gal. (4 lbs.) 4 lbs./gal. product	L 1% (4 lbs./gal. product)	5 to 15 gals. water as aerial spray; 25 to 30 gals. water as ground broadcast. Thoroughly wet foliage and stems for individual plant treatment. Add 1 to 2 qts. of surfactant per 100 gals. of water.	Spring before June 1, good growth conditions.	
	Grazon P+D	H 1 gal. (2.5 lbs.)	VH 1%		Spring or fall, good growth conditions.	
	Tank mix Tordon 22K with 2,4-D amine or low volatile ester	H 1 qt. (½ lb.) Tordon 22K + 2 qts. (2 lbs.) 2,4-D, 4 lbs./gal. product	VH ¼ % Tordon 22K + ½ % 2,4-D (4 lbs./gal. product)			
	2,4-D low volatile ester	L 3 qts. (3 lbs.) 4 lbs./gal. product	L 1% (4 lbs./gal. product)	5 to 15 gals. water as aerial spray; 25 to 30 gals. water as ground broadcast. Thoroughly wet foliage and stems for individual plant treatment. Add 1 to 2 qts. of surfactant per 100 gals. 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 inches 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.

*See Guide to Quantity of Herbicide Fromulation for Total Volume of Spray Mix on page 5 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*			
Mesquite, huisache	Velpar L		M to H** 4 to 8 ml. per 3 ft. of canopy diameter or height, whichever is greater.		Late winter through summer.	Apply undiluted Velpar L or Pronone Power Pellets to soil surface between the stem base and the edge of the canopy. Use an exact delivery handgun applicator to apply Velpar L. If plant size requires more than a single 4 ml. application of Velpar L, or 2 Pronone Power 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.
	Pronone Power Pellet		M to H 2 to 4 pellets per 3 ft. of canopy diameter or height, whichever is greater.			
Mesquite (basal stem diameter 1½ inches or less)	Remedy		VH 15% in diesel fuel oil	Apply to lower 12 to 18 inches 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 inches.
	Pathfinder II		VH Undiluted			
Mesquite (basal stem diameter greater than 1½ inches), Christ thorn	Remedy		VH 25% in diesel fuel oil			
Mesquite (basal stem diameter 1½ inches or less)	Remedy		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-inch-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 inches. 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 inches)	Remedy		VH 25% in diesel fuel oil 10% d,l limonene (a penetrant) may be added to the mixture-see remarks			
Mesquite (seedlings and saplings)	Remedy		VH 5% in diesel fuel oil	Apply to lower 12 to 18 inches 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.

*See Guide to Quantity of Herbicide Fromulation for Total Volume of Spray Mix on page 5 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*			
Mesquite, Christ thorn and other hardwoods (cut stumps)	Remedy		VH** 15% in diesel fuel 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.
	PastureGard		VH 30% in diesel fuel oil			
	Pathfinder II		VH Undiluted			
Mesquite (suppression and weed control)	2,4-D amine (including Hi-Dep) or low volatile ester	L 2 to 4 qts. (2 to 4 lbs.)	M 2% (4 lbs./gal. product)	2 to 4 gals. oil-in-water emulsion as aerial spray (1 pt. to 1 gal. diesel fuel oil and water to make 2 to 4 gals./acre; 1 to 5 oil to water ratio is considered optimum; 20 to 25 gals. oil-in-water emulsion (½ to 1 gal. diesel fuel oil and water to make 20 to 25 gals./acre) or 20 to 25 gals. water/acre plus surfactant (1 to 2 qts. surfactant per 100 gals. water as ground broadcast. Thoroughly wet foliage for individual plant treatment. Add 1 to 2 qts. surfactant per 100 gals. of water or 5 gals. of water or 5 gals. of diesel fuel oil per 100 gals. 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 inches 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.
	Grazon P+D	L 1 to 1 ½ qts. (0.6 to 0.9 lb.)				
	Weedmaster	L 1 to 1 ½ qts. (1 to 1 ½ lbs.)				
	Cimarron Max	L Rate 1 to Rate 2				
	Tank mix Tordon 22K with 2,4-D amine or low volatile ester	L ½ to ¾ pt. (⅛ to 3/16 lb.) Tordon 22K + 1 to 1 ½ qts. (1 to 1 ½ lbs.) 2,4-D, 4 lbs./gal. product				
	Tank mix Banvel with 2,4-D amine or low volatile ester	L ½ to ¾ pt. (¼ to ⅜ lb.) Banvel + ¾ to 1 ⅛ qts. (¾ to 1 ⅛ lbs.) 2,4-D, 4 lbs./gal. product				
	Remedy	L 1 pt. to 1 qt. (½ to 1 lb.)	M 1%			
	Banvel	L 1 pt. to 1 qt. (½ to 1 lb.)	M 1%			

*See Guide to Quantity of Herbicide Fromulation for Total Volume of Spray Mix on page 5 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*			
Mesquite	Remedy		VH** 2% in diesel fuel oil	Apply to base of trunk from 12 to 18 inches above soil surface down to soil surface. Apply until solution puddles on soil surface.	Anytime soil is dry and pulled away from trunk.	
	Reclaim	M to H ⅓ qt. to ⅔ qt. (¼ to ½ lb.)	VH 1%	2 to 4 gals. oil-in-water emulsion as aerial spray (1 pt. to 1 gal. diesel fuel oil and water to make 2 to 4 gals./acre; 1 to 5 oil to water ratio is considered optimum); 20 to 25 gals. oil-in-water emulsion (½ to 1 gal. diesel fuel oil and water to make 20 to 25 gals./acre) or 20 to 25 gals. water/acre plus surfactant (1 to 2 qts. surfactant per 100 gals. water) as ground broadcast. Thoroughly wet foliage for individual plant treatment. Add 1 to 2 qts. surfactant per 100 gals. of water or 5 gals. of diesel fuel oil per 100 gals. 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 inches reaches 75°F and continues for 45 days thereafter; when Reclaim 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 deg. 1 ft. deep, or if new vegetative growth is present due to recent rains.	Use 1 pt./acre Tordon 22K plus ½ pt./acre Remedy, ½ pt./acre Banvel plus ½ pt./acre Remedy, 1 pt./acre Tordon 22K plus ½ pt./acre Banvel, 1 pt./acre Tordon 22K plus ⅓ qt./acre Reclaim and ⅓ qt./acre Reclaim only in West Texas. Banvel and Banvel mixtures have been more effective in West Texas than in other parts of the state. Use mixtures that include ¼ pt./acre Remedy and ⅓ pt./acre Reclaim 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 ½ pt. Remedy and ⅔ pt. Reclaim will give better control than mixtures with ¼ pt. Remedy and ⅓ pt. Reclaim. 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.
	Tank mix Remedy with Tordon 22K	M ½ to 1 pt. (¼ to ½ lb.) Remedy + 1 to 2 pts. (¼ to ½ lb.) Tordon 22K	M to H ½% Remedy + ½% Tordon 22K			
	Tank mix Remedy with Banvel	L ½ to 1 pt. (¼ to ½ lb.) Remedy + ½ to 1 pt. (¼ to ½ lb.) Banvel	M ½% Remedy + ½% Banvel			
	Tank mix Remedy with Reclaim (see remarks)	M to H ¼ to 1 pt. (⅛ to ½ lb.) Remedy + ⅓ to ⅔ pt. (⅛ to ¼ lb.) Reclaim	VH ½% Remedy + ½% Reclaim			
	Tank mix Tordon 22K with Banvel	M 1 to 2 pts. (¼ to ½ lb.) Tordon 22K + ½ to 1 pt. (¼ to ½ lb.) Banvel	H ½% Tordon 22K + ½% Banvel			
	Tank mix Tordon 22K with Reclaim	M to H 1 to 2 pts. (¼ to ½ lb.) Tordon 22K + ⅓ to ⅔ qt. (¼ to ½ lb.) Reclaim	VH ½% Tordon 22K + ½% Reclaim			

*See Guide to Quantity of Herbicide Fromulation for Total Volume of Spray Mix on page 5 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*			
Mesquite (continued)	Tank mix Remedy, Reclaim and Tordon 22K	M to H** ¼ to ½ pt. (⅛ to ¼ lb.) Remedy + ⅓ to ⅔ pt. (⅛ to ¼ lb.) Reclaim + 2 pts. (½ lb.) Tordon 22K				Recommended for mixtures of mesquite and pricklypear cactus.
	Reclaim (see remarks)	H ⅔ qt. (½ lb.)	VH 1%		Aug. 1 to Sept. 30 with a soil temperature of 75°F or more at a depth of 12 inches. 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.
	Tordon 22K		VH 1 gal. (2 lbs.)	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 inches reaches 75°F and continued for 45 days thereafter; when Reclaim 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 gals. of mixture. Add 3 to 6 ozs. of surfactant for each 8 gals. mixed.
	Reclaim		VH ⅔ gal. (2 lbs.)			
	Tank mix Tordon 22K with Reclaim		VH 2 qts. (1 lb.) Tordon 22K + 1⅓ qt. (1 lb.) Reclaim			
Mesquite, western honey	Tank mix Remedy with Reclaim		VH 1/2 % Remedy + 1/2 % Reclaim	Thoroughly wet foliage for individual plant treatment. Add 1 to 2 qts. surfactant per 100 gals. of water or 5 gals. of diesel fuel oil per 100 gals. 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.

*See Guide to Quantity of Herbicide Fromulation for Total Volume of Spray Mix on page 5 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*			
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	Tank mix Tordon 22K with Remedy	M** 2 pts. (½ lb.) Tordon 22K + 1 pt. (½ lb.) Remedy	H ½% Tordon 22K + ½% Remedy	4 gals. oil-in-water emulsion as aerial spray (1 qt. to 1 gal. diesel fuel oil and water to make 4 gals./acre; a 1 to 5 oil to water ratio is considered optimum); 20 to 25 gals. oil-in-water emulsion (½ to 1 gal. diesel fuel oil and water to make 20 to 25 gals./acre) or 20 to 25 gals. water/acre plus surfactant (1 to 2 qts. surfactant per 100 gals. water) as ground broadcast. Thoroughly wet foliage for individual plant treatment. Add 1 to 2 qts. surfactant per 100 gals. of water or 5 gals. of water or 5 gals. of diesel fuel oil per 100 gals. 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 inches reaches 75°F and continues for 45 days thereafter; with the Reclaim 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 1 qt. Tordon 22K plus ⅔ qt. Reclaim will usually provide better results than the 1 qt. Tordon 22K plus ⅓ qt. Reclaim mixture. Mixtures will control most weeds. When using oil-in-water emulsion, use emulsifier added to oil for proper emulsion.
	Tank mix Tordon 22K with Reclaim	M 1 qt. (½ lb.) Tordon 22K + ⅓ to ⅔ qt. (¼ to ½ lb.) Reclaim	H ½% Tordon 22K + ½% Reclaim			
	Tank mix Tordon 22K with Banvel	M 2 pts. (½ lb.) Tordon 22K + 1 pt. (½ lb.) Banvel	H ½% Tordon 22K + ½% Banvel			
Mixed brush - Davis Mountains (includes catclaw acacia, catclaw mimosa and whitebrush)	Spike 20P	M** 7.5 to 10 lbs. of pellets (1.5 to 2 lbs.)	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 lbs. 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	Spike 20P	VH 5 lbs. 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.

*See Guide to Quantity of Herbicide Fromulation for Total Volume of Spray Mix on page 5 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*			
Pricklypear, tasajillo	Tordon 22K	H** 1 pt. to 1 qt. (¼ to ½ lb.)	VH 1%	2 to 4 gals. oil-in-water emulsion as aerial spray (1 pt. to 1 gal. diesel fuel oil and water to make 2 to 4 gals./acre; a 1 to 5 oil to water ratio is considered optimum); 20 to 25 gals. oil-in-water emulsion (½ to 1 gal. diesel fuel oil and water to make 20 to 25 gals./acre) as ground broadcast or 20 to 25 gals. of water/acre (with 1 to 2 qts. of surfactant per 100 gals. of water) as ground broadcast. Thoroughly wet foliage for individual plant treatment. Add 1 to 2 qts. surfactant per 100 gals. of water or 5 gals. of water or 5 gals. of diesel fuel oil per 100 gals. spray mix (1:19 oil-in-water emulsion). Oil-in-water emulsion requires use of emulsifier.	Anytime; best results have been obtained with late summer through fall applications.	Use emulsifier added to oil for proper emulsion. Use 1 pt./acre Tordon 22K only on High Plains where no brush overstory is present. Late summer or fall application will provide best results. Aerially spray in the winter if heavy overstory of woody plants is present or if damage to live oak is a concern.
	Surmount	H 4 pt. (0.67 lb.)	VH 1%			
	Grazon P+D	H 1 gal. (2.5 lbs.)	VH 2%			
	Gramoxone Extra		L 3%	Complete coverage of pricklypear plant is essential.	May through September when sun is shining and/or when sunshine is expected for several days.	Most grass and other herbaceous plants sprayed with Gramoxone Extra will be damaged and may be killed. Gramoxone Extra is a restricted use pesticide because of acute toxicity. Carefully read and follow use directions on label.
	Tank mix Tordon 22K with Gramoxone Extra		VH 1% Tordon 22K + 3% Gramoxone Extra			

*See Guide to Quantity of Herbicide Fromulation for Total Volume of Spray Mix on page 5 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*			
Pricklypear, tasajillo (continued)	Prescribed burn + Tordon 22K	VH** ½ pt. to 1 pt. (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 1-2 qts. surfactant/100 gals. 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 ½ pt. Tordon 22K 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 1 pt. Tordon 22K following moderate intensity burn with more than 10 percent of the pricklypear green 2 weeks after the burn. The prescribed burn plus Tordon 22K treatment is not recommended for the Rio Grande Plains land resource area.
Redberry juniper (redberry cedar)	Velpar L (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 Velpar L or Pronone Power Pellets to soil surface between the stem base and the edge of the canopy. Use an exact delivery handgun applicator to apply Velpar L. If plant size requires more than a single 2 or 4 ml. application of Velpar L, or 1 Pronone Power 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.
	Pronone Power Pellet (plants less than 6 ft. tall)		VH 1 pellet per 3 ft. of height or canopy diameter (whichever is greater)			
	Velpar L (plants more than 6 ft. tall)		H 4 ml. per 3 ft. of height or canopy diameter (whichever is greater)			
	Pronone Power Pellet (plants more than 6 ft. tall)		H 2 pellets per 3 ft. of height or canopy diameter (whichever is greater)			

*See Guide to Quantity of Herbicide Fromulation for Total Volume of Spray Mix on page 5 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*			
Redberry juniper (redberry cedar) (continued)	Tordon 22K		VH** 4 ml. per 3 ft. of height or canopy diameter (whichever is greater)		Spring through fall, before expected rainfall.	Apply undiluted Tordon 22K 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)	Tordon 22K		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 1 to 2 qts. surfactant to 100 gals. 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 1 to 2 qts. surfactant per 100 gals. of water.
Running Live Oak	Spike 20P	VH 5 to 10 lbs. of pellets (1 to 2 lbs.)	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.	Use low rate on brush 2 to 8 ft. tall. Use 7.5 lbs. 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 lbs. 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	Spike 20P		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.

*See Guide to Quantity of Herbicide Fromulation for Total Volume of Spray Mix on page 5 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*			
Saltcedar	Arsenal	VH** 2 qts. (1 lb.)	VH 1%	Minimum 10 gals./acre for aerial or ground broadcast sprays. Thoroughly wet foliage for individual plant treatment. Add 1 to 2 qts. surfactant per 100 gals. of water.	July through September, or until leaves begin to turn yellow.	When exposure to aquatic environments is possible and tank mixes of Arsenal herbicide and glyphosate are desirable, use the Rodeo brand of glyphosate. Check Arsenal label for special restrictions on use related to endangered species and grazing restrictions. Arsenal alone or in combination with Rodeo or Roundup will cause damage to grasses, forbs and other desirable trees. These treatment recommendations should only be used to control saltcedar north of Hwy. 90.
	Tank mix Arsenal with Roundup (glyphosate)	VH 1 qt. (½ lb.) Arsenal + 1 pt. (½ lb.) Roundup	VH ½% Arsenal + ½% Roundup			
	Tank mix Arsenal with Rodeo (glyphosate)	VH 1 qt. (½ lb.) Arsenal + 3/4 pt. (½ lb.) Rodeo	VH ½% Arsenal + ½% Rodeo			
	Remedy		VH 25% in diesel fuel oil	Apply to lower 12 to 18 inches of trunk to wet the trunk; do not spray to point of runoff. Apply completely around the trunk.	Growing season when plants have mature leaves.	This is commonly called the low volume basal application method. Use a hollow cone nozzle.
Sand sagebrush	2,4-D low volatile ester	H 1 qt. (1 lb.) 4 lbs./gal. product {up to 2 qts. (2 lbs.) for ground broadcast}	VH 1% (4 lbs./gal. product)	2 to 4 gals. oil-in-water emulsion as aerial spray (1 pt. to 1 gal. diesel fuel oil and water to make 2 to 4 gals./acre; a 1 to 5 oil to water ratio is considered optimum). Ground broadcast 20 to 25 gals. oil-in-water emulsion (1 gal. diesel fuel oil and water to make 20 to 25 gals./acre) or 20 to 25 gals. of water/acre with 1 to 2 qts. of surfactant per 100 gals of water. Thoroughly wet foliage for individual plant treatment. Add 1 to 2 qts. surfactant per 100 gals. of water or 5 gals. of diesel fuel oil per 100 gals. 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.
	Cimarron Max + 2,4-D low volatile ester	H Rate 1 Cimarron Max + 1 pt. (0.5 lb.) 2, 4-D 4 lbs./gal. product				

*See Guide to Quantity of Herbicide Fromulation for Total Volume of Spray Mix on page 5 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*			
Sand shinnery oak	Spike 20P	VH 3.75 to 5 lbs. 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 lbs. of pellets/acre in southern High Plains and Rolling Plains. Use 5 lbs. 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.
Whitebrush (beebrush, beebush)	Spike 20P	VH** 5 to 7.5 lbs. of pellets (1 to 1 ½ lbs.)	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 lbs. of pellets/acre on sand, loamy sand or sandy loam soils. Use 6.25 lbs. of pellets/acre on soils with 20 to 30 percent clay. Use 7.5 lbs. of pellets/acre on areas with grass production greater than 1,500 lbs./ 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	Remedy		H 2% in diesel fuel oil	Spray the center of each individual whorl of leaves to the point of runoff.	Anytime.	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	Spray the center of each individual whorl of leaves to the point of runoff.	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.
	Remedy		VH 15% in diesel fuel oil	Use an adjustable cone nozzle (X1 orifice), spray a 2 second burst.	Spring and summer.	Direct spray into the center of each plant whorl.
	Pathfinder II		VH Undiluted			
	Remedy		H Undiluted 2 to 4 ml. per plant whorl	Use an exact delivery handgun set at 2 or 4 ml. per dose.		Using an exact delivery handgun applicator, apply the recommended amount of undiluted Remedy into the center of each plant whorl.

*See Guide to Quantity of Herbicide Fromulation for Total Volume of Spray Mix on page 5 for mixing information.
**Treatment control ratings: VH – Very High; H – High; M – Moderate; L – Low

Funding for this publication was provided in part by Dow AgroSciences, Dupont Agricultural Products and BASF.

Produced by Agricultural Communications, The Texas A&M System
Extension publications can be found on the Web at: *http:/agrilifebookstore.org*

Visit AgriLife Extension at *http://agrilifeextension.tamu.edu*

Issued in furtherance of Cooperative Extension Work in Agriculture and Home Economics, Acts of Congress of May 8, 1914, as amended, and June 30, 1914, in cooperation with the United States Department of Agriculture. Edward G. Smith, Director, Texas AgriLife Extension Service, The Texas A&M System.

10M, Revision