

## Weed Control in Right-of-Way and Non-Crop Areas

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The treatments given in this section are not for use in crop land unless otherwise indicated under a given crop section. Note: Most of the chemicals listed perform better when wetting agents are added at 0.25% of the total volume. Use nonionic substances such as Induce, Cide Kick, or other suitable wetting agents. Glyphosate, the active ingredient in the well known product Roundup, is now available under a wide range of product names with varying amounts of active ingredient per gallon. When using one of these products, consult the label closely for proper mixing and use instructions.

Avoid spraying in close proximity to desirable plants or streams. Do not allow products to contaminate water used for consumption or irrigation. **Dicamba and picloram are very soil mobile and active. They can move down slopes for considerable distances. Do not apply imazapyr where roots of desirable plants extend into the spray zone.**

**Table 7.22 - Brush Control**

Problem and Application Technique	Chemical and Application Rate	Remarks
<b>Foliage Spray - Brush</b>		
Ground applications often use volumes ranging from 100-500 gpa. Our research has shown good results with volumes as low as 30-60 gpa if uniform coverage can be obtained. Note: Drift control agents such as Nalcotrol or Polycontrol at labeled rates greatly reduce risk of off Right-of-Way damage.  Use controlled size droplets to reduce risk off of the Right-of-Way damage wherever practical.	2,4-D + 2,4-DP + dicamba (Bk-800) 2.0-3.0 gal + surfactant 0.25% v/v	Apply as a coarse spray. Use higher rates for larger or more dense stands. <b>DO NOT APPLY WHEN DAILY TEMP. IS EXPECTED TO EXCEED 85° F.</b>
	fosamine (Krenite S) 8.0-12.0 lb/A (2.0-3.0 gal in 50.0-300.0 gal of water)	Apply from mid June to early fall (prior to leaf coloration) to species listed on label. Susceptible species fail to leaf out the next spring and subsequently die. If rainfall occurs within 24 hours, effectiveness will be reduced. Thorough coverage is imperative for complete control.
	fosamine (Krenite S) 2.0 gal + imazapyr (Arsenal) 0.5-1.0 pt in 25.0-50.0 gal water	Apply from mid June to early fall with a Radiarc or other CD sprayer. For use where certain legumes and other Krenite S resistant species occur.
	fosamine (Krenite S) 2.0 gal + glyphosate (Accord XRT) 1.0 gal in 25.0-50.0 gal water	Apply from mid June to early fall prior to leaf color change.
	picloram + 2,4-D (Tordon 101) 1.0 gal/100 gal of water + surfactant 0.25% v/v	Apply uniformly over top of brush as a coarse spray. Use on all species during June and July.
	glyphosate (Roundup Pro or Accord XRT) 1.0-2.0 gal/100.0 gal of water	Wet foliage thoroughly after full leaf development. Do not store diluted chemical in metal containers or for more than 12 months before using.
	triclopyr amine (Garlon 3A) 0.5-1.0 gal + 2,4-D amine 2.0 gal/ 100.0 gal water + surfactant 0.25% v/v	Apply 100.0-400.0 gal/A when plants are actively growing. Use higher rates on resistant species or late in growing season applications.
	imazapyr (Arsenal) 0.5-1.0 lb ai/A	Apply in 50.0-200.0 gal water/A.
Metsulfuron (Escort) 4.0 oz + Fosamine (Krenite S) 1.0-1.5 gal	Apply in 50.0-100.0 gal water. Insure thorough coverage.	

**Table 7.22 - Brush Control (cont.)**

Problem and Application Technique	Chemical and Application Rate	Remarks
<b>Foliage Spray - Brush (cont.)</b>		
<b>Low-volume</b> application to foliage aerial or ground. Note: Use wetting agents and drift control agents. Follow label recommendations. Use CDA sprayer such as Radiarc for ground sprays to help reduce drift. Thickeners such as Nalcontrol or Polycontrol help prevent drift.	picloram + 2,4-D (Tordon 101) 1.0-3.0 qt in 20.0-50.0 gal water/A + surfactant 0.25% v/v	Apply during the growing season.
	triclopyr (Garlon 3A, Garlon 4, or Garlon 4 Ultra) 2.0-3.0 gal/A + surfactant 0.25% v/v/A	Apply in 20.0-100.0 gal water. <b>Do not apply Garlon 4 when temperatures are expected to exceed 85°F.</b> For aerial application consult label.
	triclopyr (Garlon 3A, Garlon 4, or Garlon 4 Ultra) 0.5- 1.0 gal + 1.0-2.0 gal 2,4-D or Tordon 101 (Picloram + 2,4-D) + surfactant 0.25 %v/v	Same as above. Do not apply Garlon 4 when daily temperature is expected to exceed 85°F.
	imazapyr (Arsenal) 0.5-1.0 lb ai/A	Apply low-volume spray in 10.0-25.0 gal of water/A
	glyphosate (Accord XRT) 4.0% + imazapyr (Arsenal) 0.5% + water 95.5%	Apply at 8.0-10.0 gal/A.
<b>Dormant Stems or Basal</b>		
	dicamba (Banvel) 2.0-3.0 lb ai + 2,4-D 3.0-6.0 lb ai + 10.0-15.0 gal mineral oil emulsifier + enough water to make 100 gal total solution. Garlon 4 0.5-0.75 gal may be substituted for dicamba depending on species present.	Apply as broadcast treatment to dormant stems. Good control of most species. Oil-water emulsions require constant agitation.
	Garlon 4 Ultra 0.5 gal + Bk-800 1.5-2.0 gal + Cide Kick 2.0 gal/100.0 gal of water	Apply in late winter or early spring when temperatures are expected to remain above 34°F. Apply as a full stem spray.
	Garlon 4 Ultra 1.0 gal + Bk-800 2.0 gal + basal oil 7.0 gal (such as Hygrade, Arborchem, or similar products).	Apply any time (except when temperatures will exceed 85°F). Wet lower 2 ft of stems completely. Do not use near sensitive crops. Contains dicamba which may move considerable distances down slopes.
	Garlon 4 Ultra 1.0 gal + Bk-800 2.0 gal + 5.0 gal refined oil (such as Hygrade or Rite-way) + 93.0 gal water.	Apply as a dormant spray covering all stems completely. Contains dicamba which may move considerable distances down slopes.
<b>Stump Treatment</b>		
	picloram + 2,4-D (Tordon 101-R) dicamba (Banvel CST) imazapyr (Stalker) garlon 4 (Pathfinder II)	Spray to wet the cut surface, especially the cambium area.

**Table 7.22 - Brush Control (cont.)**

Problem and Application Technique	Chemical and Application Rate	Remarks
<b>Soil Application</b>		
(Dry material)	Tebuthiuron (Spike) as directed by label	Apply on all species during any season, except when ground is frozen, at base of clumps. Any tree with roots extending into treated area may be killed. <b>Do not apply within 400 ft of desired plants or allow material to contaminate water used for irrigation or other domestic purposes.</b> These materials may move down slopes for considerable distances. Apply broadcast spray between late winter and early summer. Consult the Spike label for specific application methods.
	hexazone (Velpar)	Apply 10.0-20.0 lb/A as directed on label.

**General Weed Control - Mixture of Annual Grasses and Broadleaf Weeds**

**Caution.** All use recommendations of herbicides as listed under this category must be regarded as **non-selective**. Therefore, do not use in crop areas except as shown under **Selective Chemical Weed Control Recommendations**. When treating land that will later be used to grow crops, observe all label precautions with respect to critical dosages, waiting intervals before cropping, and residue tolerances in the crops. Avoid spray drift onto crops and ornamentals to prevent injury and illegal residues. Do not apply soil sterilants within the root development area of adjoining crops, ornamentals, or other desirable species, also avoid use in areas where there is danger of chemical runoff.

**Table 7.23 - Apply these Herbicides during the Growing Season as a Foliar Spray for General Weed Control**

Herbicide	Application Rate ai/acre	Remarks
2,4-D amine + wetting agent (broadleaf weeds only)	2.0-4.0 qt/A + surfactant 0.25%v/v	Spray to wet all foliage; volume of spray/A will depend on height and density of growth. Apply when weeds are 3-4 inches high. Repeat applications when additional weeds appear.
glyphosate (Roundup Pro) (Accord XRT)	2.0-4.0 qt/A	Apply in 20.0-30.0 gal of water/A. Glyphosate is slow acting and may require 5-10 days before visible results occur. If rainfall occurs within 6 hours, effectiveness may be reduced. Do not use with galvanized spray equipment. Use of mechanical agitation or additional wetting agent will cause excessive foaming. Do not allow spray to drift to contact desirable plants. Glyphosate leaves no soil residue.
glyphosate (Roundup Pro) (Accord XRT) + sulfometuron (Oust) + wetting agent	1.0-2.0 qt + 2.0-4.0 oz of product	Gives season long control.
imazapyr (Arsenal)	0.5-1.0 pt product	Do not use near desired vegetation.

**Table 7.24 - Apply these Herbicides when They Will Be Leached into the Soil by Precipitation or by Supplemental Irrigation**

bromacil	2.4-4.8 lb/50-100 gal/A	Apply before or just after weeds emerge. Adequate rainfall must follow to move chemicals into root zone of weeds. Use lower volume for boom spraying, higher volume for offset nozzles. Continuous agitation of spray mixture is necessary to avoid settling-out in the spray tank. Nozzle screens of 50 mesh are desirable. Finer screens may clog. Where weeds are up, add 2 qt Roundup/acre to monuron and diuron; add to bromacil if weeds are over 6 inches high. Do not apply near desired plants.
diuron	2.4-4.8 lb/50-100 gal/A	
hexazone (Velpar )	2.0-12.0 lb/ 50-100 gal/A	
imazapyr (Arsenal)	0.5-1.0 pt/50-100 gal/A	
monuron	2.4-4.8 lb/50-100 gal/A	
surflometuron (Oust)	2.0-4.0 oz/50-100 gal/A	
Surflan AS	2.0-4.0 qt/50-100 gal/A	
Sahara	10.0-15.0 lb/50-100 gal/A	
Borate and mixture of borate with other herbicides, e.g., chlorate, monuron, bromacil, etc.	Variable, depending on the formulation	Several products are available. Follow manufacturer's directions.
hexazinone (Velpar L)	3.0-6.0 gal/A	Consult label for species controlled.

**Table 7.25 - Specific Perennial Weeds (Except Woody Plants)***(See also SOIL STERILIZATION below for general nonselective control, including perennial weeds.)*

Weed	Chemical Rate ai/acre	Remarks
<b>Bermudagrass</b> (wiregrass)	glyphosate 3.0-4.0 lb ai/A (Roundup or Accord XRT 3.0-4.0 qt)	Best control is obtained when treatment is made at late stages of growth but prior to seed head emergence. See remarks for glyphosate under annual grasses and broadleaf weeds above. Repeat as needed.
<b>Canada Thistle</b>	clopyralid (Transline) 1.0-1.25 pt/A + surfactant 0.25%	Best control is obtained when treatment is applied at bloom.
	chlorosulfuron (Telar) 0.5-1.0 oz product/A + 0.25% surfactant	Apply to fall rosettes in 20.0-40.0 gal water/A. Significant grass damage may occur.
	aminopyralid (Milestone) 5.0-7.0 oz/A + 0.25% v/v nonionic surfactant	Apply late spring to early summer in 20.0-40.0 gal water/A.
<b>Johnsongrass</b>	glyphosate (Roundup Pro or Glypro Plus) 1.0-2.0 qt/A	Best control is obtained when applied in 20.0-25.0 gal water/A during late stages of growth, but prior to seedhead emergence.
	fenoxaprop + fluazifop (Fusion) 7.0- 9.0 oz + 0.25% surfactant/100.0 gal water	Apply when johnsongrass is up to 18 inches but prior to seedhead formation. Drought stress may reduce efficacy.
	fluazifop (Fusilade 2000) 1.0-1.5 qt/A with either 1.0% crop oil concentrate or 0.25% nonionic surfactant.	Apply when johnsongrass is 8-18 inches tall and before boot stage.
	glyphosate (Roundup Pro or Accord XRT) 1.0 qt +sulfometuron (Oust) 0.125 oz + 10.0-50.0 gal water/A	Apply at time of seedhead formation.
<b>Honeysuckle</b>	2,4-D 2.0-3.0 qt/100 gal water + 0.25% surfactant v/v	Apply in spring or early summer when plants are in full leaf and actively growing. Thoroughly wet all foliage and stems. Do not allow drift to desirable plants. Dicamba may move down slopes for considerable distances.
	glyphosate (Roundup Pro or Accord XRT) 3.0-4.0 qt/100.0 gal water	
	2,4-D 3.0 lb + dicamba 1.5 lb (1.5 gal Banvel 720)/100.0 gal water + 0.25% surfactant v/v	
	2,4-D 2.0 lb + triclopyr 1.0 lb (1.0 gal Crossbow)/ 100 gal water + 0.25% surfactant v/v	

**Table 7.25 - Specific Perennial Weeds (Except Woody Plants)(cont.)**

(See also SOIL STERILIZATION below for general nonselective control, including perennial weeds.)

Weed	Chemical Rate ai/acre	Remarks
<b>Kudzu</b>	2,4-D + 2, 4-DP + dicamba (Bk-800) 2.0 gal/100.0 gal of water + 0.25% surfactant v/v	Apply at 50.0-100.0 gal solution/A. Dicamba may move down slopes considerable distances.
	glyphosate (Roundup Pro or Accord XRT) 4.0 qts/100.0 gal water	Apply when actively growing.
	triclopyr 2.0-3.0 lb/A (0.67-1.0 gal Garlon 3A or 0.5-0.75 gal Garlon 4) + 0.25% surfactant v/v	Apply when actively growing. Do not apply Garlon 4 when temperatures are expected to exceed 85° F.
	fosamine (Krenite S) 1.5-2.0 gal/100.0 gal water	Apply from mid summer to early fall.
	metsulfuron (Escort) 4.0 oz/100.0 gal water + 0.25% surfactant v/v	Apply when actively growing.
	dicamba (Vanquish) 2.0 qt/A in 20-30 gal water. Add 0.25% surfactant v/v.	Apply during late dormant season, March- April.
<b>Milkweed</b> (common And dogbane)	dicamba 1.5-2.0 lb (0.38-0.5 gal (Vanquish) + surfactant 0.25% v/v	Apply prior to flowering while plants are actively growing.
	dicamba 1.0 lb + 2,4-D 2.0 lb (1.0 gal Banvel 720)/A + surfactant 0.25% v/v	
	picloram 0.5 lb + 2,4-D 2.0 lb (1.0 gal Tordon 101)/A + surfactant 0.25% v/v	
	2,4-D 2.0 lb + triclopyr 1.0 lb (1.0 gal Crossbow)/A + 0.25% surfactant v/v	
<b>Mugwort</b> (wild chrysanthemum)	picloram (Tordon) 0.25 lb ai/A	<b>Do not apply picloram within 100 ft of desirable plants or allow it to contaminate water.</b> Picloram can move down slopes for considerable distances.
<b>Mullen</b>	2,4-D 2.0 lb/A + surfactant 0.25% v/v	Apply in early summer when in rosette stage. The hairy leaf surface makes this plant difficult to wet; therefore, the use of a surfactant is important.
<b>Musk And Curled Thistles</b>	2,4-D ester 2.0-3.0 lb/50.0-100.0 gal water + surfactant 0.25% v/v	Apply in mid spring. Midday temperatures should be above 60° F for 2-3 days after application.
	dicamba 1.5 lb (0.38 gal Vanquish)/A+ surfactant 0.25% v/v	Observe above mentioned precautions vwhen using dicamba.
	dicamba 1.0 lb + 2,4-D 2.0 lb (1.0 gal Banvel 720)/A + surfactant 0.25% v/v	
	chlorosulfuron (Telar) 0.25-0.5 oz product + surfactant 0.25% v/v	Apply in early spring. Will inhibit grass growth. Not for pastures. Add 0.5% Cide Kick or other wetting agent.
	clopyralid (Transline) 1.0-1.25 pts/A + surfactant 0.25% v/v	Apply from rosette to bud in 25.0-50.0 gal water/A.
	aminopyralid (Milestone) 5.0-7.0 oz/A + 0.25% v/v nonionic surfactant	Apply late spring to early summer in 20.0-40.0 gal water/A.
<b>Poison Ivy</b>	fosamine 6.0-8.0 lb (1.5-2.0 gal Krenite S)/100.0 gal water dicamba 1.0 lb + 2,4-D 2.0 lb (1.0 gal Banvel 720)/A + surfactant 0.25% v/v	Apply in late summer before leaf coloration. Thorough coverage is imperative. Apply during periods of active growth. <b>Do not apply within 100 ft of desirable plants or allow dicamba to contaminate water used for irrigation or other domestic purposes.</b> Dicamba may move down slopes for considerable distances.
	2,4-D 2.0-3.0 lb/100.0 gal water + surfactant 0.25% v/v.	

**Table 7.25 - Specific Perennial Weeds (Except Woody Plants)(cont.)***(See also SOIL STERILIZATION below for general nonselective control, including perennial weeds.)*

Weed	Chemical Rate ai/acre	Remarks
	triclopyr 4.0 lb (1.0 gal Garlon 4 Ultra)/100.0 gal of water + surfactant 0.25% v/v	Thoroughly wet all foliage and stems. Density of cover will determine volume of spray /A. Spot treat regrowth as required. Thorough coverage and the use of a surfactant is imperative for good control.
	glyphosate 4.0 lb (1.0 gal Roundup Pro or Accord XRT)/100.0 gal water.	
<b>Multiflora Rose</b>	2,4-D 2.0 lb + triclopyr 1.0 lb (Crossbow 1.0 gal)/100.0 gal water + 0.25% surfactant.	Apply when actively growing.
	glyphosate 2.0-3.0 lb (0.50-0.75 gal Roundup Pro or Accord XRT )/100.0 gal water	
	metsulfuron (Escort) 0.75-1.0 oz product in 50.0 gal water/A + 0.25% surfactant	
	triclopyr amine (Garlon 3A) 1.5-3.0 lb (0.5-1.0 gal)/A + 0.25% surfactant	
	2,4-D + 2,4-DP + dicamba (BK-800) 2.0-2.5 gal/100.0 gal water + 0.25% surfactant	Apply when actively growing. Do not apply near desirable plants. Dicamba may move down slopes considerable distances.
	fosamine 8.0-12.0 lb (2.0-3.0 gal Krenite S)/100.0 gal water.	Apply from mid-summer to early fall prior to leaf color change. Thorough coverage is imperative.
<b>Cedar</b>	hexazinone 1.0 lb/10.0 gal water (1.0 lb Velpar 90% SP or 0.5 gal Velpar L)	When preparing the liquid mixture, with Velpar 90% SP, the water should be at room temperature to completely dissolve the powder. Spray 3.0 oz of the solution/ 2-inch basal diameter on the soil near the base of the stem. <b>For spot control only. Do not treat large areas or every stem in dense stands because erosion may result.</b> Hexazinone may move down slopes for considerable distances. Do not use near desirable plants.
	Krenite 3.0 gal/100.0 gal water	Apply after July 15. Wet foliage thoroughly.
	2,4-D 4.0-6.0 lb + dicamba 2.0-3.0 lb (2.0-3.0 gal Banvel 720)/100.0 gal water + 2.0 gal Cide Kick	Wet foliage thoroughly. Dicamba may move down slopes considerable distances.

## Soil Sterilization

Soil sterilant chemicals, by definition, render the soil incapable of supporting plant growth for varying periods. The effect may be temporary, as with fumigants, or for an extended period (semi-permanent). In either case, the action is nonselective at rates specified for use as soil sterilants. Therefore, do not apply within the root development area of adjoining crops or desirable species. Do not use in crops or where there is danger of chemical runoff. **Note:** Since effectiveness varies considerably with the weed species, degree of infestation, soil and environmental conditions, several herbicidal materials and a range of rates are provided to allow selection of product and dosage based on specific need.

**Lower rates (A)** apply to annuals, biennials, shallow-rooted perennials, and seedling perennials;

**Higher rates (B)** apply to established deep-rooted and other hard-to-kill perennials. Read and follow directions on the label for further details.

**Table 7.26 - Chemicals and Recommended Use**

Soil sterilants are very potent plant killers and should not be used around the home grounds or near desirable plants, as with all pesticides, consult the label before use.

Herbicide	Application Rate ai/acre	Remarks
borate mixtures with sodium chlorate and/or other chemicals	variable	Follow instructions on the label. Apply as a spray on early growth to first bloom or broadcast as a soil treatment.
bromacil	(A) 3.0-6.0 (B) 10.0-25.0	If dense growth is present, results will be improved if vegetation is removed prior to treatment. Do not apply to frozen ground.
chlorate mixtures with borates or other chemicals	variable	Follow instructions on label. Fire hazard usually less than pure sodium chlorate but caution still is necessary.
diuron or monuron	(A) 5.0-20.0 (B) 20.0-80.0	Diuron gives somewhat longer soil sterility. Monuron is more effective on deep-rooted weeds.
hexazinone (Velpar)	(A) 1.8-4.5 (B) 5.4-10.8	Apply in early spring. Do not apply near desirable vegetation. Consult label for specific rates on different soil types.
imazapyr (Arsenal) (Topsoil)	0.5-1.0 lb ai/A 200-300 lb product/A	Do not apply near trees or other desired vegetation.
methyl bromide	1.0-1.5 lb/100 sq ft	Soil fumigant. Apply in concentrated form under vaporproof cover, when soil is moist, not wet, and in good till. Remove cover after 24-48 hours. <b>Warning: methyl bromide is poisonous.</b>
prometon (Pramitol)	(A) 10.0-15.0 (B) 20.0-60.0	Mix in water or oil. Provides quicker contact kill of top growth with oil. Apply to early growth up to first heading.
tebuthiuron (Spike) (Sprakil S-5)	(A) 4.0-6.0 (B) 6.0-16.0 40-120 lb product/A	Follow label directions. Do not apply near desirable vegetation. Tebuthiuron can move considerable distance down slopes.
diuron + imazapyr (Sahara)	10-15 lb product/A	Mix in 50-100 gal water.
diuron + tebuthiuron (Sprakil 13) (Sprakil 26)	150-400 lb product/A 150-300 lb product/A	Apply granules uniformly over area to be treated.
<b>Bermudagrass Release, Rights-of-Way Only</b>		
glyphosate + sulfometuron	(Roundup Pro) 1.0 qt + (Oust) 1.0 oz + Cide Kick 1.0 qt	Apply in early spring or October for control of cool-season grasses (Ky 31 fescue, etc.) and weeds.
<b>Summer Grasses in Bermudagrass, Rights-of-Way Only</b>		
sulfometuron + glyphosate	(Oust) 0.25-0.5 oz + (Roundup Pro) 1.0-2.0 pt + Cide Kick 1.0 qt	Apply in June for control of dallis, broomsedge, johnson, and annual grasses in 50.0 gal of water.

**Table 7.26 - Chemicals and Recommended Use (cont.)**

Soil sterilants are very potent plant killers and should not be used around the home grounds or near desirable plants, as with all pesticides, consult the label before use.

<b>Herbicide</b>	<b>Application Rate ai/acre</b>	<b>Remarks</b>
<b>Stabilized Shoulders and Guard Rails</b>		
glyphosate + diuron	(Roundup Pro) 2.0-4.0 qt + Karmex 2.0-4.0 lb ai/A	Apply in 50.0 gal of water in spring. Repeat if necessary. Keep off of desired vegetation. Do not apply more than 2 ft past guard rail or edge of shoulder to prevent erosion of soil. Will not control bermudagrass.
glyphosate + surflan	(Roundup Pro) 2.0-4.0 qt + Surflan 4.0 lb ai/A	
glyphosate + pendimethalin	(Roundup Pro) 2.0-4.0 qt + Pendulum 4.0 lb ai/A	

Always read the label before applying any pesticide. Use caution when applying herbicides on windy days or when temperature is above 85° F. Many herbicides exhibit soil activity and may cause damage or death to desirable plants if they contact the roots of such plants. This problem is compounded on steep terrain. Always use adequate personal protection clothing or devices as suggested or required by the label.