

# SECTION Y.

## CONTROL OF PROBLEM WEEDS

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This section gives information about specific weeds that may be troublesome to control. Herbicides and/or rates listed cannot necessarily be used on cropland. Rates of application and restrictions vary depending on crop or site. Do not apply to a crop or site not listed on the label.

Non-cropland is greenspace where plants are not harvested by humans or animals for food, feed, or fiber; roadsides, for example.

Highly volatile esters of 2,4-D are not permitted. Low-volatile (LV) esters are restricted in some parts of Washington.

**Caution** This handbook is not intended to be a complete guide to herbicide use. Before using any chemical, read the label recommendations on the container. Before a chemical can be recommended for a specific use, it must be thoroughly tested. Following the recommendation on the manufacturer's label can prevent many problems arising from the incorrect use of a chemical.

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### Alyssum, hoary (*Berteroa incana*)

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#### **2,4-D amine**

**Rate** Broadcast treatment: 3 to 4 lb ae/A

**Time** Apply in spring to rosettes prior to bolting.

**Remarks** Repeated applications will be needed to fully control plants arising from the seedbank.

**Caution** Avoid drift to sensitive crops.

**Site of action** Group 4: synthetic auxin

**Chemical family** Phenoxy acetic acid

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#### **metsulfuron (Escort and others)**

**Rate** 0.5 oz ai/A (0.5 to 1 oz/A)

**Time** Apply in spring to rosettes prior to bolting.

**Remarks** Add 0.25% by volume of nonionic surfactant to spray mixture. Application sites differ between products; consult labels.

**Caution** Avoid contacting sensitive crops. Apply only to pasture, rangeland, and non-crop sites.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Sulfonylurea

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### Archangel, yellow (*Lamium galeobdolon*)

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#### **glyphosate**

**Rate** Spot treatment at 2.5%: mix 3.2 fl oz of 3 lb ae glyphosate formulation with each gal of water in a backpack sprayer.

**Time** Apply to actively growing yellow archangel foliage.

**Remarks** Re-treatment may be necessary. Add nonionic surfactant if not included in the formulation. Rain within 6 hours after

application may reduce effectiveness. Allow at least 7 days after application before tillage or mowing of sprayed foliage. Combinations with imazapyr or triclopyr at the rates below have shown good results in testing in western Washington.

**Caution** Glyphosate is nonselective; spray will injure or kill vegetation contacted.

**Site of action** Group 9: inhibits EPSP synthase

**Chemical family** None generally accepted

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### **imazapyr (Arsenal, Habitat, or others)**

**Rate** Spot treatment at 1%: mix 1.5 fl oz of Habitat with each gal of water.

**Time** Apply to actively growing yellow archangel foliage.

**Remarks** Add 0.25% by volume of nonionic surfactant to spray mixture. Re-treatment may be necessary. Rain within 6 hr after application may reduce effectiveness. Allow at least 7 days after application before tillage or mowing of sprayed foliage.

**Caution** Imazapyr is nonselective; spray will injure or kill vegetation contacted.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Imidazolinone

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### **triclopyr ester (Garlon 4) or triclopyr amine (Garlon 3A) or triclopyr + 2,4-D (Crossbow)**

**Rate** Spot treatment at 1.5%: mix 2 fl oz of Garlon 4, Garlon 3A, or Crossbow with each gal of water.

**Time** Apply to actively growing yellow archangel foliage.

**Remarks** Re-treatment may be necessary. Rain within 6 hr after application may reduce effectiveness. Allow at least 7 days after application before tillage or mowing of sprayed foliage.

**Caution** Use on rights-of-way, industrial sites, and for forestry (release and site preparation). Crossbow can be used on permanent pasture and rangeland, up to 1.5 lb ae/A. Observe all grazing and harvesting restrictions.

**Site of action** (all) Group 4: synthetic auxin

**Chemical family** (triclopyr) pyridine; (2,4-D) phenoxy acetic acid

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### Arum, Italian (*Arum italicum*)

**Remarks** Although PNW data are preliminary, metsulfuron, sulfometuron, glyphosate, aminocyclopyrachlor, and imazapyr appear promising in initial trials.

**Site of action** (metsulfuron, sulfometuron, imazapyr) Group 2: acetolactate synthase (ALS) inhibitor; (glyphosate) Group 9: inhibits EPSP synthase; (aminocyclopyrachlor) Group 4: synthetic auxin

**Chemical family** (metsulfuron, sulfometuron) sulfonyleurea; (imazapyr) imidazolinone; (glyphosate) none generally accepted; (aminocyclopyrachlor) pyridine

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### Babysbreath (*Gypsophila paniculata*)

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### **aminopyralid + metsulfuron (Opensight, Chaparral)**

**Rate** 2.5 to 3 oz product/A

**Time** Apply preemergence in the fall or postemergence in spring to seedlings or rosettes.

**Site of action** (metsulfuron) Group 2: acetolactate synthase (ALS) inhibitor; (aminopyralid) Group 4: synthetic auxin

**Chemical family** (metsulfuron) sulfonyleurea; (aminopyralid) pyridine

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### **chlorsulfuron (Telar and others)**

**Rate** 0.75 to 0.195 oz ai/A (1 to 2.6 oz/A).

**Time** Apply in spring to rosettes or to bolting plants with green basal leaves.

**Remarks** Add 0.25% by volume of nonionic surfactant to spray mixture.

**Caution** Avoid drift to sensitive crops.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Sulfonylurea

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### **dicamba (Clarity and others)**

**Rate** 0.75 to 1.5 lb ae/A (1.5 to 3 pints/A)

**Time** Apply in spring to rosettes or to bolting plants with green basal leaves.

**Remarks** Dicamba is most effective at higher rates.

**Caution** Avoid drift to sensitive crops.

**Site of action** Group 4: synthetic auxin

**Chemical family** Benzoic acid

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### **glyphosate**

**Rate** 2.25 lb ae/A (3 quarts/A of 3 lb ae/gal product).

**Time** Apply in spring to rosettes or bolting plants with green basal leaves.

**Remarks** Add nonionic surfactant if not included in the formulation. Allow at least 7 days after application before tillage.

**Caution** Glyphosate is nonselective; spray will injure or kill vegetation contacted.

**Site of action** Group 9: inhibits EPSP synthase

**Chemical family** None generally accepted.

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### **imazapic (Plateau)**

**Rate** 0.125 to 0.188 lb ae/A (8 to 12 fl oz/A)

**Time** Apply in spring to rosettes or bolting plants with green basal leaves.

**Remarks** Add 0.25% by volume of nonionic surfactant or 1.5 to 2 pints/A methylated seed oil or crop oil concentrate to spray mixture.

**Caution** Avoid drift to sensitive crops.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Imidazolinone

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### **metsulfuron (Escort and others)**

**Rate** 0.6 to 1.2 oz ai/A (1 to 2 oz/A)

**Time** Apply in spring to rosettes or to bolting plants with green basal leaves.

**Remarks** Add 0.25% by volume of nonionic surfactant to spray mixture.

**Caution** Avoid drift to sensitive crops.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Sulfonylurea

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### Barberry, common (*Berberis vulgaris*)

**Remarks** Although PNW data are preliminary, foliar-applied imazapyr and cut-stem treatments of imazapyr, picloram, or triclopyr + 2,4-D gave good results in initial trials.

**Site of action** (imazapyr) Group 2: acetolactate synthase (ALS) inhibitor; (2,4-D, picloram, triclopyr) Group 4: synthetic auxin

**Chemical family** (imazapyr) imidazolinone; (2,4-D phenoxy acetic acid; (picloram, triclopyr) pyridine

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Beancaper, Syrian (*Zygophyllum fabago*)

**Remarks** Control is unknown, although metsulfuron appears promising in initial trials. Other data suggest glyphosate at 1.5 lb ae/A and picloram at 1 lb ae/A are effective.

**Site of action** (metsulfuron) Group 2: acetolactate synthase (ALS) inhibitor; (glyphosate) Group 9: inhibits EPSP synthase; (picloram) Group 4: synthetic auxin

**Chemical family** (metsulfuron) sulfonyleurea; (glyphosate) none generally accepted; (picloram) phenoxy acetic acid

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Bermudagrass (*Cynodon dactylon*)

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**fluazifop (Fusilade DX)**

**Rate** 0.25 to 0.375 lb ai/A (1 to 1.5 pints/A)

**Time** Apply to actively growing bermudagrass with 4- to 8-inch runners.

**Remarks** Apply with 1% (v/v) crop oil concentrate or 0.25% (v/v) nonionic surfactant. Acts very slowly, taking at least 2 weeks and often 4 weeks to show effectiveness. Do not apply to stressed grasses. If weeds regrow, reapply at 0.1875 to 0.375 lb ai/A.

**Caution** Do not use crop oil concentrate if treating bermudagrass in ornamentals. Do not apply if rain is expected within 1 hour.

**Site of action** Group 1: acetyl CoA carboxylase (ACCCase) inhibitor

**Chemical family** Aryloxyphenoxy propionate

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**glyphosate**

**Rate** 3.75 lb ae/A

**Time** Apply to actively growing bermudagrass with seed heads.

**Remarks** Re-treatment may be necessary. Rain within 6 hr after application may reduce effectiveness. Allow at least 7 days after application before tillage.

**Caution** Glyphosate is nonselective; spray will injure or kill vegetation contacted.

**Site of action** Group 9: inhibits EPSP synthase

**Chemical family** None generally accepted.

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Biddy-biddy (*Acaena novae-zelandiae*)

**Remarks** Control is unknown. No herbicides are currently recommended.

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Bindweed, field or perennial morningglory  
(*Convolvulus arvensis*)

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**2,4-D (for suppression) amine**

**Rate** Broadcast treatment: 2 to 3 lb ae/A

**Time** Apply at bud growth stage or at summer fallow in early August.

**Remarks** Use 2,4-D to help reduce bindweed stand 60 to 80% and prevent seedling establishment. It is important to apply 2,4-D every year; skipping an application gives bindweed a chance to recover. During the grain year, apply 2,4-D to growing winter wheat. After wheat matures, apply 2,4-D with a sprayer mounted on the combine, or apply after combining.

**Caution** Avoid drift to sensitive crops.

**Site of action** Group 4: synthetic auxin

**Chemical family** Phenoxy acetic acid

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### **aminocyclopyrachlor + chlorsulfuron (Perspective)**

**Rate** 1.8 to 3.2 oz/A aminocyclopyrachlor + 0.7 to 1.3 oz/A chlorsulfuron (4.5 to 8 oz/A of product)

**Time** Apply to broadleaf weeds in spring.

**Remarks** Adjuvants can be used, these include methylated seed oils 0.5 to 1% v/v, nonionic surfactants at 0.25 to 1% v/v, and crop oil concentrates at 1% v/v. Can be applied using an invert emulsion rather than water.

**Caution** Even low rates can kill nontarget tree and shrub species, so avoid application within a distance equal to the tree height of the sensitive species. Do not allow spray to drift off target. Can injure several grass species including bromes, as well as basin wildrye.

**Site of action** (aminocyclopyrachlor) Group 4: Synthetic auxin; (chlorsulfuron) Group 2: ALS inhibitor

**Chemical family** (aminocyclopyrachlor) Pyrimidine carboxylic acid; (chlorsulfuron) Sulfonylurea

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### **dicamba (Rifle or Clarity) or dicamba + 2,4-D (for suppression)**

**Rate** 0.5 to 1 lb ae/A dicamba; or 0.5 to 1 lb ae/A dicamba + 1 to 2 lb ae/A 2,4-D

**Time** Apply during fallow, before planting and when weeds are actively growing.

**Remarks** Rates are to suppress field bindweed.

**Caution** Refer to label for crop rotation restrictions. Avoid drift to sensitive crops.

**Site of action** (both) Group 4: synthetic auxin

**Chemical family** (dicamba) benzoic acid; (2,4-D) phenoxy acetic acid

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### **dicamba (Rifle or Clarity) or dicamba + 2,4-D (for control)**

**Rate** 1 to 2 lb ae/A dicamba; or 1 to 2 lb ae/A dicamba + 1 to 2 lb ae/A 2,4-D

**Time** Apply in late summer or fall before killing frost.

**Remarks** Control is best when weeds are actively growing and in postbloom stage. Make follow-up application in spring to control seedlings.

**Caution** See label for in-crop use and rotation restrictions. Avoid drift to sensitive crops.

**Site of action** (both) Group 4: synthetic auxin

**Chemical family** (dicamba) benzoic acid; (2,4-D) phenoxy acetic acid

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### **glyphosate**

**Rate** 3 to 3.75 lb ae/A

**Time** Apply at full bloom to early seed stage of maturity. Application on fall regrowth may provide some control.

**Remarks** Cover foliage thoroughly but avoid spray runoff. Re-treatments may be needed for complete control. Control improves if the treated area is tilled 2 to 3 weeks after treatment.

**Caution** Glyphosate controls grasses as well as other vegetation in treated areas.

**Site of action** Group 9: inhibits EPSP synthase

**Chemical family** None generally accepted

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### **glyphosate + 2,4-D (Landmaster BW)**

**Rate** 0.378 to 0.67 lb ae/A (54 oz/A Landmaster)

**Time** Apply in fallow or postharvest to bindweed runners at least 10 inches long. Use 1% solution to spot treat with high-volume, spray-to-wet applications. Tilling after treatment may improve control.

**Remarks** In fallow, cultivate until July 1; then allow weeds to grow to treatment stage.

**Caution** Avoid drift to sensitive crops.

**Site of action** (glyphosate) Group 9: inhibits EPSP synthase; (2,4-D) Group 4: synthetic auxin

**Chemical family** (glyphosate) none generally accepted; (2,4-D) phenoxy acetic acid

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### **glyphosate + dicamba (Rifle or Clarity)**

**Rate** 1.5 lb ae/A glyphosate + 0.5 lb ae/A dicamba

**Time** Apply mid- to late-bloom but before seed matures. Applying to fall regrowth may give some control.

**Remarks** Use this tank-mix during summer fallow before planting small grains.

**Caution** Crop may be somewhat injured if dicamba is applied within 45 days of planting. Glyphosate controls grasses as well as other vegetation in treated areas.

**Site of action** (glyphosate) Group 9: inhibits EPSP synthase; (2,4-D) Group 4: synthetic auxin

**Chemical family** (glyphosate) none generally accepted; (dicamba) benzoic acid

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### **imazapic (Plateau)**

**Rate** 0.125 to 0.188 lb ai/A

**Time** Apply after 25% bloom through fall to actively growing bindweed.

**Remarks** Add 1 quart/A methylated seed oil.

**Caution** Note crop rotation restrictions before using.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Imidazolinone

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### **metsulfuron (Escort)**

**Rate** 0.6 to 1.2 oz ai/A (1 to 2 oz/A)

**Time** Apply to actively growing bindweed in bloom stage.

**Remarks** Treatment is suppressive. Use a nonionic or silicone surfactant to improve control.

**Caution** Do not allow spray drift to sensitive crops. This rate is only for non-crop sites.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Sulfonylurea

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### **picloram (Tordon)**

**Rate** 1 lb ae/A

**Time** Apply in the growing season on non-cropland when bindweed is visible. Timing is not critical, but results are most consistent if bindweed is in early bud to full bloom.

**Remarks** Apply as a coarse, low-pressure spray in sufficient volume to cover adequately. For control in fallow, refer to Winter Wheat—Nonirrigated East of the Cascades in this handbook.

**Caution A restricted-use herbicide.** Picloram is registered only on rangeland and permanent pastures and on fallow grainland east of the Cascades. Do not contaminate water. Potatoes, beans, and many other broadleaf crops are sensitive to picloram. Do not plant these crops until an adequately sensitive bioassay or chemical test shows that no picloram is detectable in the soil. Extend treatment 10 ft beyond the infestation. Do not use in diversified cropping areas.

**Site of action** Group 4: synthetic auxin

**Chemical family** Pyridine

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### **quinclorac (Paramount)**

**Rate** 6 oz ai/A (8 oz/A)

**Time** Apply in fall before frost to actively growing bindweed with stems at least 4 inches long.

**Remarks** Must add methylated seed oil at 1 to 2 pints/A or crop oil concentrate at 2 pints/A. Plant uptake is through foliage and roots. Rain after application is important for soil uptake.

**Caution** Note crop rotation restrictions before using. Do not exceed 12 oz ai/A per calendar year.

**Site of action** Group 4: synthetic auxin

**Chemical family** Quinoline carboxylic acid

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Blackberry vines, wild (*Rubus* spp.)

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### **aminocyclopyrachlor + metsulfuron methyl (Streamline)**

**Rate** 3.8 to 4.5 oz/A aminocyclopyrachlor + 1.2 to 1.4 oz/A metsulfuron (9.5 to 11.5 oz/A of product)

**Time** Apply to actively growing woody plants.

**Remarks** Adjuvants can be used; these include methylated seed oils 0.5 to 1% v/v, nonionic surfactants at 0.25 to 1% v/v, and crop oil concentrates at 1% v/v. Can be applied using an invert emulsion rather than water. There are several application methods that dictate the amount of product to be mixed with the carrier, so consult the label. Controls many herbaceous species, in addition to woody species.

**Caution** Even low rates can kill nontarget tree and shrub species, so avoid application within a distance equal to the tree height of the sensitive species. Conifers can be injured, these include ponderosa pine, Douglas fir, Norway spruce, and white pine. Other trees that can be injured include aspen, Chinese tallow, cottonwoods, honey locust, magnolia, poplars, redbud, silver maple, and willow. Applications to stressed plants may reduce control. Do not allow spray to drift off target.

**Site of action** Group 4 synthetic auxin (aminocyclopyrachlor) Group 2: ALS inhibitor (metsulfuron methyl)

**Chemical family** (aminocyclopyrachlor) Pyrimidine carboxylic acid; (metsulfuron methyl) Sulfonylurea

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### **glyphosate**

**Rate** Broadcast: use 2.25 to 3 lb ae/A. Spot treat: use 1% to 1.5% solutions.

**Time** Apply in September to October when canes are actively growing and after berries are formed. Fall treatments must be made before a killing frost.

**Remarks** Fall spray treatment symptoms may not show before frost. Re-treatment may be necessary for complete control. Trailing blackberry is more difficult to control.

**Caution** Glyphosate controls grasses in the treated area as well as other vegetation.

**Site of action** Group 9: inhibits EPSP synthase

**Chemical family** None generally accepted

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### **metsulfuron (Escort and others)**

**Rate** 0.3 to 0.6 oz ai/A (0.5 to 1 oz/A)

**Time** Apply to fully leafed-out vegetation before fall leaf coloration.

**Remarks** Constantly agitate while mixing product in water. Add 0.25% by volume of nonionic or silicone surfactant to spray mixture. Good coverage is essential. Application sites differ between products; consult labels.

**Caution** Avoid contacting sensitive crops. Apply only to pasture, rangeland, and non-crop sites.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Sulfonylurea

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### **picloram (Tordon)**

**Rate** 1 lb ae with 50 gal of water for spot treatment sprays

**Time** Apply in late spring after leaves are fully developed.

**Remarks** Foliage must be thoroughly wet. Reapplication will be required as regrowth occurs.

**Caution** **Most formulations are restricted-use herbicides.** Do not contaminate water. Potatoes, beans, and many other broadleaf crops are sensitive to picloram. Do not use picloram in diversified cropping areas.

**Site of action** Group 4: synthetic auxin

**Chemical family** Pyridine

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### **triclopyr ester (Garlon 4) or triclopyr amine (Garlon 3A) or triclopyr + 2,4-D (Crossbow)**

**Rate** Spot treatment: mix 3 lb ae Garlon 4 or 3.75 lb ae Garlon 3A with 100 gal water, or 1 pint Crossbow in 12 gal water. Broadcast: use 1 to 4 lb ae/A Garlon 4, or 1.5 to 4.5 lb ae/A Garlon 3A, or 1 to 2 gal/A Crossbow.

**Time** Apply when plants are actively growing. For dormant application, mix Garlon 4 in diesel oil or in water with 3% of an oil substitute.

**Remarks** Foliage must be thoroughly wet.

**Caution** Use on rights-of-way, industrial sites, and for forestry (release and site preparation). Crossbow can be used on permanent pasture and rangeland, up to 1.5 lb ae/A. Observe all grazing and harvesting restrictions.

**Site of action** (all) Group 4: synthetic auxin

**Chemical family** (triclopyr) pyridine; (2,4-D) phenoxy acetic acid

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### Blackgrass (*Alopecurus myosuroides*)

**Remarks** Fenoxaprop, flufenacet, pendimethalin, pinoxaden, pyroxulam, and triallate are used in cereal crops. Grass herbicides (clethodim, fluazifop, quizalofop, and sethoxydim) and glyphosate may also be effective. See specific crop section for these herbicides in cropland recommendations.

**Site of action** (clethodim, fenoxaprop, fluazifop, pinoxaden, quizalofop, sethoxydim) Group 1: acetyl CoA carboxylase (ACCase) inhibitors; (pyroxulam) Group 2: acetolactate synthase (ALS) inhibitor; (pendimethalin) Group 3: microtubule assembly inhibitor; (triallate) Group 8: lipid synthesis inhibitor (not ACCase); (glyphosate) Group 9: inhibits EPSP synthase; (flufenacet) Group 15: inhibits very long chain fatty acids

**Chemical family** (clethodim, sethoxydim) cyclohexanedione; (fenoxaprop, fluazifop, quizalofop) aryloxyphenoxy propionate; (flufenacet) oxyacetamide; (glyphosate) none generally accepted; (pendimethalin) dinitroaniline; (pinoxaden) phenylpyrazolin; (pyroxulam) triazolopyrimidine sulfonamide; (triallate) thiocarbamate

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### Blueweed or viper's bugloss (*Echium vulgare*) and Paterson's curse (*Echium plantagineum*)

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#### **2,4-D amine**

**Rate** Broadcast treatment: 2 lb ae/A (2.1 quarts/A)

**Time** Apply in spring to seedlings. Treatments from mid-summer to autumn may help control more established plants.

**Remarks** 2,4-D is usually not able to fully control these species, so combining with other products is generally recommended for full control.

**Caution** Avoid drift to sensitive crops.

**Site of action** Group 4: synthetic auxin

**Chemical family** Phenoxy acetic acid

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#### **chlorsulfuron (Telar and others)**

**Rate** Escort: 0.75 to 1.125 oz ai/A (1 to 1.5 oz/A)

**Time** Apply preemergence in autumn, or postemergence to seedlings in spring. Treatments from mid-summer to autumn may

help control more established plants.

**Remarks** Add 0.25% by volume of nonionic surfactant to spray mixture. Resistance of blueweed to sulfonylurea herbicides has been documented in Australia, so combination with other herbicides of different mode of action is recommended to delay onset of resistance.

**Caution** Avoid contacting sensitive crops. Apply only to pasture, rangeland, and non-crop sites.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Sulfonylurea

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### glyphosate

**Rate** Broadcast: 0.21 to 0.77 lb ae/A (6 to 22 fl oz/A). Spot treat: use 1% to 2% solutions.

**Time** Apply from late spring to midsummer prior to flowering.

**Remarks** Treat all emerged foliage, but prior to runoff. Add nonionic surfactant if not included in the formulation.

**Caution** Glyphosate is nonselective and other vegetation will be injured or killed.

**Site of action** Group 9: inhibits EPSP synthase

**Chemical family** None generally accepted

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### metsulfuron (Escort and others)

**Rate** 0.3 to 0.6 oz ai/A (0.5 to 1 oz/A)

**Time** Apply in spring to seedlings. Treatments from mid-summer to autumn may help control more established plants.

**Remarks** Add 0.25% by volume of nonionic surfactant to spray mixture. Repeat applications will likely be necessary to achieve full control. Resistance of blueweed to sulfonylurea herbicides has been documented in Australia, so combination with other herbicides of different mode of action is recommended to delay onset of resistance.

**Caution** Avoid contacting sensitive crops. Apply only to pasture, rangeland, and non-crop sites.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Sulfonylurea

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### picloram (Tordon)

**Rate** 4 to 8 fl oz ae/A (1 to 2 pints/A)

**Time** Apply preemergence in autumn, or postemergence to seedlings in spring. Treatments from mid-summer to autumn may help control more established plants.

**Remarks** Treat all emerged foliage, but prior to runoff.

**Caution** **Most formulations are restricted-use herbicides.** Do not contaminate water. Potatoes, beans, and many other broadleaf crops are sensitive to picloram. Do not use picloram in diversified cropping areas.

**Site of action** Group 4: synthetic auxin

**Chemical family** Pyridine

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### Blueweed, Texas (*Helianthus ciliaris*)

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### dicamba (Rifle or Clarity)

**Rate** 2 to 4 lb ae/A

**Remarks** Reported to control this plant, although data are lacking in the Pacific Northwest. Follow label instructions.

**Site of action** Group 4: synthetic auxin

**Chemical family** Benzoic acid

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**clopyralid (Stinger or Transline) or glyphosate or MCPA (various products) or picloram (Tordon) or 2,4-D (various trade names)**

**Remarks** Reported to control this plant, although data are lacking in the Pacific Northwest. Follow label instructions.

**Site of action** (clopyralid, MCPA, 2,4-D, and picloram) Group 4: synthetic auxin; (glyphosate) Group 9: inhibits EPSP synthase

**Chemical family** (clopyralid and picloram) pyridine; (glyphosate) none generally accepted; (MCPA and 2,4-D) phenoxy acetic acid

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**imazapyr (Arsenal)**

**Rate** 1 lb ae/A

**Remarks** Reported to control this plant, although data are lacking in the Pacific Northwest. Follow label instructions.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Imidazolinone

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Brackenfern, western (*Pteridium aquilinum*)

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**asulam (Asulox)**

**Rate** 1.6 to 3.3 lb ai/A

**Time** When bracken is in full frond.

**Remarks** Apply on uncultivated land, reforestation sites, and Christmas tree plantations only. Asulam has a half-life of 6 to 14 days in soil.

**Caution** See label for precautions.

**Site of action** Group 18: inhibits DHP synthase step

**Chemical family** Carbamate

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**dicamba (Rifle or Clarity)**

**Rate** 4 to 8 lb ae/A

**Time** Apply in late winter before fronds emerge.

**Remarks** Management for maximum crop competition aids control. Will not control grasses.

**Caution** Avoid drift to sensitive crops. Clover stands may be reduced or eliminated in pastures.

**Site of action** Group 4: synthetic auxin

**Chemical family** Benzoic acid

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**glyphosate**

**Rate** 2.25 to 3 lb ae/A or a 1 to 1.5% solution when using hand-held equipment

**Time** When bracken fronds are at least 18 inches long.

**Remarks** Adequate foliar coverage is necessary.

**Caution** Glyphosate controls grasses in the treated area as well as other vegetation.

**Site of action** Group 9: inhibits EPSP synthase

**Chemical family** None generally accepted

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Brome, false (*Brachypodium sylvaticum*)

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### fluazifop (Fusilade)

**Rate** 2 to 4 oz ai/A (8 to 16 fl oz/A)

**Time** Apply in spring to control seedlings, and treat established plants through summer until fall.

**Remarks** Two to three years of treatment will be necessary to achieve control. Fine leaf fescues are tolerant to fluazifop. Native broadleaves should not be injured by fluazifop.

**Site of action** Group 1: acetyl CoA carboxylase (ACCase) inhibitor

**Chemical family** Cyclohexanedione

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### glyphosate

**Rate** Broadcast: 2.25 to 3.7 lb ae/A; spot treatment: 1.5% solution

**Time** Apply to green leaves in midsummer to autumn.

**Remarks** Adequate foliar coverage of false-brome is necessary, and repeat applications may be required to achieve full control. Add nonionic surfactant if not included in the formulation. Late summer treatments after native plants are dormant are preferred to minimize injury.

**Caution** Glyphosate is nonselective and injures or kills other vegetation in the treated area.

**Site of action** Group 9: inhibits EPSP synthase

**Chemical family** None generally accepted

---

### hexazinone (Velpar)

**Rate** Broadcast: 2 lb ai/A (1 gal/A)

**Time** Apply preemergence in the spring.

**Remarks** Hexazinone is normally used in sequence with glyphosate applied in late summer (see above). Early spring hexazinone application controls newly germinating seedlings.

**Caution** **Hexazinone is a restricted-use herbicide.** Do not contaminate water.

**Site of action** Group 5: photosystem II inhibitor

**Chemical family** Triazinone

---

### sethoxydim (Poast)

**Rate** 3 to 4.5 oz ai/A (1 to 1.5 pints/A)

**Time** Apply in spring to control seedlings, and treat established plants through summer until fall.

**Remarks** Two to three years of treatment will be necessary to achieve control. Fine leaf fescues are tolerant to sethoxydim. Native broadleaves should not be injured by sethoxydim.

**Site of action** Group 1: acetyl CoA carboxylase (ACCase) inhibitor

**Chemical family** Aryloxyphenoxy propionate

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Broom, Scotch (*Cytisus scoparius*), French (*Genista monspessulana*), Portuguese (*Cytisus striatus*), and Spanish (*Spartium junceum*)

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### glyphosate

**Rate** 1.5 to 3 lb ae/A or 1.5 to 2% solution for handgun sprayer application.

**Time** Apply to actively growing plants in the spring.

**Remarks** See Forestry section of this handbook for information on control in conifers. Adding a recommended surfactant improves results.

**Caution** Also controls grasses and other plants needed to compete with Scotch broom seedlings.

**Site of action** Group 9: inhibits EPSP synthase

**Chemical family** None generally accepted

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### **triclopyr ester (Garlon 4) or triclopyr amine (Garlon 3A) or triclopyr + 2,4-D LV ester (Crossbow)**

**Rate** 0.5 to 1.5% concentration of Garlon 4 or Crossbow, or 1 to 1.5% concentration of Garlon 3A

**Time** Apply any time plants are actively growing. Garlon 4 and Crossbow can be used for basal bark applications any time of year.

**Remarks** Foliage must be thoroughly wet. For Garlon 3A, it is especially important to use a high volume of water (100 gal/A or more).

**Caution** Garlon products are registered for use on rights-of-way, industrial sites, and forestry (release and site preparation). Crossbow can be used on permanent pastures and rangeland up to 1.5 lb ae/A. Observe all grazing and harvesting restrictions.

**Site of action** (all) Group 4: synthetic auxin

**Chemical family** (triclopyr) pyridine; (2,4-D) phenoxy acetic acid

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### Bryony, white (*Bryonia alba*)

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#### **glyphosate**

**Rate** Full strength for cut stem treatments.

**Time** Apply any time of year, including when plants are dormant or actively growing.

**Remarks** Cut plants at 3 to 4 inches below the crown and apply adequate product to wet the freshly-cut surface of the root. Foliar treatment of white bryony is difficult because it twines over desirable vegetation. If white bryony vines are separated from supporting vegetation, it may allow for selective foliar treatment with glyphosate.

**Caution** Glyphosate is nonselective, so other vegetation coming into contact with the herbicide may be injured or killed.

**Site of action** Group 9: inhibits EPSP synthase

**Chemical family** None generally accepted

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### Buffalobur (*Solanum rostratum*)

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#### **diflufenzopyr + dicamba (Overdrive)**

**Rate** 0.175 to 0.35 lb ae/A (4 to 8 oz/A)

**Time** Apply to actively growing plants.

**Remarks** For improved uptake if weeds are under moisture or temperature stress, use a nonionic surfactant or a methylated seed oil.

**Caution** Do not plant any crop within 30 days of application. Do not exceed 10 oz/A of Overdrive per season.

**Site of action** (diflufenzopyr) Group 19: inhibits indoleacetic acid transport; (dicamba) Group 4: synthetic auxin

**Chemical family** (diflufenzopyr) semicarbazone; (dicamba) benzoic acid

---

#### **glyphosate or clopyralid (Stinger or Transline) or picloram (Tordon)**

**Remarks** Reported to control this plant, although data are lacking in the Pacific Northwest. Follow label instructions.

**Site of action** (glyphosate) Group 9: inhibits EPSP synthase; (clopyralid and picloram) Group 4: synthetic auxin

**Chemical family** (glyphosate) none generally accepted; (clopyralid and picloram) pyridine

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### Bugloss, annual (*Anchusa arvensis*) and small or common (*Anchusa officinalis*)

**Remarks** Although PNW data are preliminary, initial data indicate that 2,4-D and 2,4-D + dicamba may provide some control when applied prior to flowering and mixed with nonionic surfactant.

**Site of action** (2,4-D, dicamba) Group 4: synthetic auxin

**Chemical family** (2,4-D) phenoxy acetic acid; (dicamba) benzoic acid

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Bulrush, small-fruited (*Scirpus microcarpus*), softstem (*Scirpus validus*), and ricefield (*Schoenoplectus mucronatus*)

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### **2,4-D LV ester**

**Rate** 3 lb ae of 2,4-D ester in 100 gal water. Use LV ester formulation plus 3 gal diesel or stove oil for spot treatment.

**Time** Apply to growing plants. Respraying is necessary for complete control.

**Remarks** Foliage must be thoroughly wet.

**Caution** Avoid drift to sensitive crops and desirable vegetation.

**Site of action** Group 4: synthetic auxin

**Chemical family** Phenoxy acetic acid

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Burdock, common (*Arctium minus*)

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### **2,4-D LV ester or 2,4-D amine**

**Rate** 2 lb ae/A

**Time** Before flower buds develop.

**Remarks** Plants should be actively growing at time of treatment.

**Caution** Avoid drift to sensitive crops.

**Site of action** Group 4: synthetic auxin

**Chemical family** Phenoxy acetic acid

---

### **aminopyralid (Milestone)**

**Rate** 1 to 1.5 oz ae/A (4 to 6 fl oz/A Milestone)

**Time** Apply to actively growing plants in the rosette.

**Remarks** A nonionic surfactant at 1 to 2 quarts per 100 gal of spray enhances control under adverse environmental conditions.

**Caution** Do not allow drift to desirable vegetation. Many forbs (desirable broadleaf plants) can be seriously injured or killed. Do not exceed 7 fl oz/A Milestone per year.

**Site of action** Group 4: synthetic auxin

**Chemical family** Pyridine

---

### **diflufenzopyr + dicamba (Overdrive)**

**Rate** 0.175 to 0.35 lb ae/A (4 to 8 oz/A)

**Time** Apply to actively growing plants.

**Remarks** For improved uptake if weeds are under moisture or temperature stress, use a nonionic surfactant or a methylated seed oil.

**Caution** Do not plant any crop within 30 days of application. Do not exceed 10 oz/A of Overdrive per season.

**Site of action** (diflufenzopyr) Group 19: inhibits indoleacetic acid transport; (dicamba) Group 4: synthetic auxin

**Chemical family** (diflufenzopyr) semicarbazone; (dicamba) benzoic acid

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### triclopyr + clopyralid (Redeem R&P)

**Rate** 1.5 to 2 pints/A

**Time** Apply when weeds are actively growing.

**Remarks** Add a nonionic surfactant at the surfactant manufacturer's recommended rate. Apply in at least 10 gal/A water by ground.

**Caution** Do not exceed 4 pints/A per year. Avoid drift to desirable vegetation. Note label restrictions on overseeding or reseeding.

**Site of action** (both) Group 4: synthetic auxin

**Chemical family** (both) pyridine

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### Bursage, skeletonleaf (*Ambrosia tomentosa*)

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#### 2,4-D

**Rate** 1.5 to 2 lb ae/A

**Time** Apply after tilling 3 to 4 inches deep and when regrowth is 4 to 6 inches tall.

**Remarks** If not tilled, treat in spring and fall. Two to three annual re-treatments may be needed for complete control.

**Caution** Avoid drift to sensitive crops.

**Site of action** Group 4: synthetic auxin

**Chemical family** Phenoxy acetic acid

---

#### picloram (Tordon)

**Rate** 1 lb ae/A

**Time** Apply when plants are fully leaved and actively growing.

**Caution** **Most formulations are restricted-use herbicides.** See label for grazing restrictions. Do not contaminate water. Potatoes, beans, and many other crops are very sensitive to picloram. Do not use in diversified cropping areas. At rates above 0.5 lb ae/A (1 quart/A), apply only as spot treatment not to exceed 25% of a landowner's acreage in a given watershed in a single season.

**Site of action** Group 4: synthetic auxin

**Chemical family** Pyridine

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### Bursage, woolyleaf (*Ambrosia grayi*)

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#### dicamba (Rifle or Clarity)

**Rate** 2 to 4 lb ae/A

**Remarks** Reported to control this plant, although data are lacking in the Pacific Northwest. Follow label instructions.

**Site of action** Group 4: synthetic auxin

**Chemical family** Benzoic acid

---

#### imazapyr (Arsenal)

**Rate** 1 lb ae/A

**Remarks** Reported to control this plant, although data are lacking in the Pacific Northwest. Follow label instructions.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Imidazolinone

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Buttercup, creeping (*Ranunculus repens*)

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**aminocyclopyrachlor + chlorsulfuron (Perspective)**

**Rate** 1.2 to 1.8 oz/A aminocyclopyrachlor + 0.5 to 0.7 oz/A chlorsulfuron (3 to 4.5 oz/A of product)

**Time** Apply to actively growing vegetation.

**Remarks** Adjuvants can be used; these include methylated seed oils 0.5 to 1% v/v, nonionic surfactants at 0.25 to 1% v/v, and crop oil concentrates at 1% v/v. Can be applied using an invert emulsion rather than water.

**Caution** Even low rates can kill nontarget tree and shrub species, so avoid application within a distance equal to the tree height of the sensitive species. Do not allow spray to drift off target. Can injure several grass species including bromes, as well as basin wildrye.

**Site of action** (aminocyclopyrachlor) Group 4 synthetic auxin; (chlorsulfuron) Group 2: ALS inhibitor

**Chemical family** (aminocyclopyrachlor) Pyrimidine carboxylic acid; (chlorsulfuron) Sulfonylurea

---

**diflufenzopyr + dicamba (Overdrive)**

**Rate** 0.175 to 0.35 lb ae/A (4 to 8 oz/A)

**Time** Apply to actively growing plants.

**Remarks** For improved uptake if weeds are under moisture or temperature stress, use a nonionic surfactant or a methylated seed oil.

**Caution** Do not plant any crop within 30 days of application. Do not exceed 10 oz/A of Overdrive per season.

**Site of action** (diflufenzopyr) Group 19: inhibits indoleacetic acid transport; (dicamba) Group 4: synthetic auxin

**Chemical family** (diflufenzopyr) Semicarbazone; (dicamba) Benzoic acid

---

**MCPA LV ester or MCPA amine**

**Rate** 1.5 lb ae/A

**Time** Apply when the buttercup is growing well.

**Remarks** Avoid drift to sensitive crops and desirable vegetation.

**Site of action** Group 4: synthetic auxin

**Chemical family** Phenoxy acetic acid

---

Butterflybush (*Buddleja davidii*)

**Remarks** Although PNW data are preliminary, imazapyr and glyphosate provided good control in initial trials when applied as cut stem treatments.

**Site of action** (imazapyr) Group 2: acetolactate synthase (ALS) inhibitor; (glyphosate) Group 9: inhibits EPSP synthase

**Chemical family** (imazapyr) imidazolinone; (glyphosate) none generally accepted

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Camelthorn (*Alhagi maurorum*)

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**aminocyclopyrachlor + metsulfuron (Streamline)**

**Rate** 7.5 to 11.5 oz/A

**Time** Apply to actively growing vegetation.

**Remarks** Adjuvants can be used; these include methylated seed oils 0.5 to 1% v/v, nonionic surfactants at 0.25 to 1% v/v, and crop oil concentrates at 1% v/v.

**Caution** Do not apply to the root zone of desirable trees and shrubs. May injure or kill some grass species.

**Site of action** (aminocyclopyrachlor) Group 4 Synthetic auxin; (metsulfuron) Group 2: Acetolactate synthase (ALS) inhibitor

**Chemical family** (aminocyclopyrachlor) Pyridine; (metsulfuron) Sulfonylurea

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### **aminocyclopyrachlor + imazapyr + metsulfuron (Viewpoint)**

**Rate** 16 to 20 oz/A

**Time** Apply to actively growing vegetation.

**Remarks** Adjuvants can be used; these include methylated seed oils 0.5 to 1% v/v, nonionic surfactants at 0.25 to 1% v/v, and crop oil concentrates at 1% v/v.

**Caution** Do not apply to the root zone of desirable trees and shrubs. May injure or kill some grass species.

**Site of action** (aminocyclopyrachlor) Group 4 synthetic auxin; (imazapyr, metsulfuron) Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** (aminocyclopyrachlor) Pyridine; (imazapyr) Imidazolinone; (metsulfuron) Sulfonylurea

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### **imazapyr (Arsenal)**

**Rate** 0.5 to 1 lb ae/A (3 to 4 pints/A)

**Time** Apply to actively growing vegetation.

**Remarks** Add 0.25% by volume of nonionic surfactant, or 1 to 2 pints/A methylated seed soil or crop oil concentrate to spray mixture. Re-treatment may be necessary.

**Caution** Imazapyr is nonselective; spray will injure or kill vegetation contacted.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Imidazolinone

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### **metsulfuron (Escort and others)**

**Rate** 0.6 to 1.8 oz ai/A (1 to 3 oz/A)

**Time** Apply to actively growing vegetation.

**Remarks** Add 0.25% by volume of nonionic surfactant to spray mixture. Application sites differ between products; consult labels.

**Caution** Avoid contacting sensitive crops. Apply only to pasture, rangeland, and non-crop sites.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Sulfonylurea

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### **picloram (Tordon)**

**Rate** 0.5 to 1 lb ae/A

**Time** Apply when plants are fully leaved and actively growing.

**Caution** **Most formulations are restricted-use herbicides.** See label for grazing restrictions. Do not contaminate water. Potatoes, beans, and many other crops are very sensitive to picloram. Do not use in diversified cropping areas. At rates above 0.5 lb ae/A (1 quart/A), apply only as spot treatment not to exceed 25% of a landowner's acreage in a given watershed in a single season.

**Site of action** Group 4: synthetic auxin

**Chemical family** Pyridine

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Canarygrass, reed (*Phalaris arundinacea*) and ribbongrass (*Phalaris arundinacea* var. *picta*)

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### **fluazifop (Fusilade DX)**

**Rate** 0.25 to 0.375 lb ai/A (1 to 1.5 pints/A)

**Time** Apply to actively growing reed canarygrass.

**Remarks** Apply with 1% v/v crop oil concentrate or 0.25% v/v nonionic surfactant. Acts very slowly, taking at least 2 weeks and often 4 weeks to show effectiveness. Do not apply to stressed grasses. If weed regrows, repeat application.

**Caution** Do not use crop oil concentrate if treating reed canarygrass in ornamentals. Do not apply if rain is expected within 1 hour.

**Site of action** Group 1: acetyl CoA carboxylase (ACCase) inhibitor

**Chemical family** Aryloxyphenoxy propionate

---

### glyphosate

**Rate** 1.2 to 2.25 lb ae/A

**Time** Apply to actively growing plants at early heading or in fall from mid-September to after first light frost.

**Remarks** Check label regarding using a surfactant.

**Caution** Glyphosate controls other vegetation in the treated area.

**Site of action** Group 9: inhibits EPSP synthase

**Chemical family** None generally accepted

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### imazapyr (Habitat or Arsenal)

**Rate** 0.5 to 1 lb ae/A

**Time** Apply in boot stage through fall, when plant is actively growing.

**Remarks** Habitat is labeled for aquatic sites. Arsenal is labeled for rangeland, pasture and non-cropland use only. Always add the appropriate surfactant.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Imidazolinone

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### sulfometuron (Oust)

**Rate** 2.25 to 3.75 ai/A (3 to 5 oz/A)

**Time** Preemergence to early postemergence.

**Remarks** Recommended for use on non-cropland only. Do not apply to frozen ground. Constantly agitate while mixing in spray solution. Add 0.25% v/v nonionic surfactant to increase activity of postemergence applications. Apply with ground equipment in at least 15 gal/A carrier.

**Caution** Keep sulfometuron out of cropland. Use equipment dedicated to non-cropland uses only. Do not treat powdery, dry soils or light, sandy soils if rain is not likely after treatment.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Sulfonylurea

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### Cape-ivy (*Delairea odorata*)

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### clopyralid (Transline)

**Rate** Spot treatment: 0.5% solution.

**Time** Apply to actively growing vegetation.

**Remarks** Mix with 0.25% by volume nonionic surfactant and apply to all exposed foliage. Repeat applications may be required to achieve full control.

**Caution** Do not contaminate water. Potatoes, beans, and many other crops are very sensitive to clopyralid. Do not use in

diversified cropping areas.

**Site of action** Group 4 synthetic auxin

**Chemical family** Pyridine

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### glyphosate

**Rate** Spot treatment: 1 to 2% solution of 3 lb ae/gal product.

**Time** Apply to green foliage in late summer to early fall.

**Remarks** Adequate foliar coverage of cape-ivy is necessary, and repeat applications may be required to achieve full control. Add nonionic surfactant if not included in the formulation. Late summer treatments after native plants are dormant are preferred to minimize injury.

**Caution** Glyphosate is nonselective and injures or kills other vegetation in the treated area.

**Site of action** Group 9: inhibits EPSP synthase

**Chemical family** None generally accepted

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### triclopyr (Garlon 4)

**Rate** Spot treatment: 0.5 to 1% solution.

**Time** Apply to actively growing vegetation.

**Remarks** Mix with 0.25 to 0.5% by volume nonionic surfactant and apply to all exposed foliage. Repeat applications may be required to achieve full control.

**Caution** Garlon 4 is an ester formulation; do not drift onto sensitive crops. Do not contaminate water.

**Site of action** Group 4 synthetic auxin

**Chemical family** Pyridine

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### Carrot, wild or Queen Anne's lace (*Daucus carota*)

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### chlorsulfuron (Telar)

**Rate** 0.75 oz ai/A (1 oz/A of the 75% Telar)

**Time** Apply early postemergence to actively growing plants.

**Remarks** Using a nonionic surfactant increases effectiveness.

**Caution** Apply only to pasture, range, Conservation Reserve Program (CRP), and non-crop sites.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Sulfonylurea

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### flazasulfuron (Mission)

**Rate** 0.033 to 0.045 lb ai/A (2.14 to 2.85 oz/A Mission)

**Time** Pre- and postemergence. Apply to plants less than 4 inches tall.

**Remarks** Must be activated with 0.25 to 0.5 inch of water for preemergence control. Preemergence efficacy is best when applied to bare soil. Do not disturb the soil after activation. Use an adjuvant for postemergent applications.

**Caution** A 25-foot buffer must be maintained between the point of direct application and the closest downwind edge of sensitive terrestrial habitats (forested areas, riparian areas), freshwater habitats (lakes, rivers, sloughs), and estuarine/marine habitats.

**Site of action** Group 2: inhibition of the enzyme acetolactate synthase

**Chemical family** Sulfonylurea

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## MCPA

**Rate** 1 lb ae/A

**Time** Apply in spring or fall when wild carrot is actively growing but before bolting.

**Remarks** Seedlings are easier to control than older plants. Treat annually to control seedlings.

**Caution** Avoid spray drift to sensitive crops.

**Site of action** Group 4: synthetic auxin

**Chemical family** Phenoxy acetic acid

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## metsulfuron (Ally and others)

**Rate** Ally: 0.12 to 0.18 oz ai/A (0.2 to 0.3 oz/A)

**Time** Apply early postemergence to actively growing plants.

**Remarks** Using a nonionic or silicone surfactant increases effectiveness.

**Caution** Consult labels for crops on which each product can be used.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Sulfonylurea

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## Cattail, common (*Typha latifolia* and related species)

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### 2,4-D ester

**Rate** 6 lb ae per 100 gal of spray solution for spot treatments. Add crop oil, diesel oil, or surfactant to increase wetting.

**Time** Apply before cattail heads appear in spring.

**Remarks** Foliage must be thoroughly wet. 2,4-D does not control as well as glyphosate but is less expensive. 2,4-D must be reapplied to give satisfactory control.

**Caution** Avoid drift to sensitive crops.

**Site of action** Group 4: synthetic auxin

**Chemical family** Phenoxy acetic acid

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### glyphosate

**Rate** 3 lb ae/A

**Time** Apply to mature cattails after heads are formed and before frost.

**Remarks** Allow 7 days or longer before clipping or tillage operations. Use additional surfactant.

**Caution** Glyphosate controls grasses as well as other vegetation in treated areas.

**Site of action** Group 9: inhibits EPSP synthase

**Chemical family** None generally accepted

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### imazapyr (Habitat)

**Rate** 0.5 to 1 lb ae/A

**Time** Apply after cattail head appears in the boot or after head emerges and before killing frost.

**Remarks** Add suitable adjuvant to spray solution.

**Caution** Do not apply in the root zone of desirable trees. Treated water cannot be used for irrigation for 120 days.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Imidazolinone

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Celedine, lesser (*Ficaria verna*)

**Remarks** Although PNW data are preliminary, metsulfuron, glyphosate, and imazapyr appear promising in initial trials. Must be treated in early spring as lesser celedine goes dormant by late spring.

**Site of action** (imazapyr, metsulfuron) Group 2: acetolactate synthase (ALS) inhibitor; (glyphosate) Group 9: inhibits EPSP synthase

**Chemical family** (imazapyr) imidazolinone; (metsulfuron) sulfonyleurea; (glyphosate) none generally accepted

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Chervil, bur (*Anthriscus caucalis*)

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**aminocyclopyrachlor + chlorsulfuron (Perspective)**

**Rate** 1.2 to 1.8 oz/A aminocyclopyrachlor + 0.5 to 0.7 oz/A chlorsulfuron (3 to 4.5 oz/A of product)

**Time** Apply to actively growing vegetation.

**Remarks** Adjuvants can be used; these include methylated seed oils 0.5 to 1% v/v, nonionic surfactants at 0.25 to 1% v/v, and crop oil concentrates at 1% v/v. Can be applied using an invert emulsion rather than water.

**Caution** Even low rates can kill nontarget tree and shrub species so avoid application within a distance equal to the tree height of the sensitive species. Do not allow spray to drift off target. Can injure several grass species including bromes, as well as basin wildrye.

**Site of action** (aminocyclopyrachlor) Group 4: Synthetic auxin; (chlorsulfuron) Group 2: ALS inhibitor

**Chemical family** (aminocyclopyrachlor) Pyrimidine carboxylic acid; (chlorsulfuron) Sulfonyleurea

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**metsulfuron (Escort and others)**

**Rate** 0.3 to 0.6 oz ai/A (0.5 to 1 oz/A)

**Time** Apply to fully leafed-out vegetation before fall leaf coloration.

**Remarks** Constantly agitate while mixing product in water. Add 0.25% by volume of nonionic or silicone surfactant to spray mixture. Good coverage is essential. Application sites differ between products; consult labels.

**Caution** Avoid contacting sensitive crops. Apply only to pasture, rangeland, and non-crop sites.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Sulfonyleurea

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**triasulfuron (Amber)**

**Rate** 0.28 to 0.56 oz/A Amber

**Time** Apply to actively growing plants in the fall or spring.

**Remarks** If native perennial species in the carrot family are present, consider a fall application at the lower rate.

**Caution** Orchardgrass, red fescue and ryegrasses can be injured by triasulfuron. Preharvest interval is 30 days for hay. There are crop rotational restrictions, see label.

**Site of action** Group 2: inhibits Acetolactate synthase

**Chemical family** Sulfonyleurea

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Chervil, wild (*Anthriscus sylvestris*)

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**glyphosate**

**Rate** 2.25 lb ae/A

**Time** Apply to actively growing plants from bud to early flower.

**Remarks** Glyphosate is nonselective and will kill or injure vegetation that might compete with new chervil seedlings.

**Site of action** Group 9: inhibits EPSP synthase

**Chemical family** None generally accepted

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### **imazapyr (Arsenal)**

**Rate** 0.75 lb ai/A

**Time** Apply to actively growing plants from bud to early flower.

**Remarks** Add an appropriate surfactant

**Caution** Use on rangeland, pasture, and non-cropland only.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Imidazolinone

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### Cinquefoil, sulfur (*Potentilla recta*)

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### **aminocyclopyrachlor + chlorsulfuron (Perspective)**

**Rate** 4.75 to 8 oz/A

**Time** Apply to sulfur cinquefoil in the pre-bud stage of growth.

**Remarks** Adjuvants can be used; these include methylated seed oils 0.5 to 1% v/v, nonionic surfactants at 0.25 to 1% v/v, and crop oil concentrates at 1% v/v.

**Caution** Do not apply to the root zone of desirable trees and shrubs. May injure or kill some grass species.

**Site of action** (aminocyclopyrachlor) Group 4 synthetic auxin; (chlorsulfuron) Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** (aminocyclopyrachlor) Pyridine; (chlorsulfuron) Sulfonylurea

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### **aminocyclopyrachlor + metsulfuron (Streamline)**

**Rate** 4.75 to 9 oz/A

**Time** Apply to sulfur cinquefoil in the pre-bud stage of growth.

**Remarks** Adjuvants can be used; these include methylated seed oils 0.5 to 1% v/v, nonionic surfactants at 0.25 to 1% v/v, and crop oil concentrates at 1% v/v.

**Caution** Do not apply to the root zone of desirable trees and shrubs. May injure or kill some grass species.

**Site of action** (aminocyclopyrachlor) Group 4 synthetic auxin; (metsulfuron) Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** (aminocyclopyrachlor) Pyrimidine carboxylic acid ; (metsulfuron) Sulfonylurea

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### **aminopyralid (Milestone)**

**Rate** 1 to 1.75 oz ae/A (4 to 7 fl oz/A)

**Time** Apply to actively growing plants before the bud stage of growth.

**Remarks** A nonionic surfactant at a volume of 0.25% enhances control under adverse environmental conditions.

**Caution** Do not let spray drift onto desirable vegetation. Many forbs (desirable broadleaf plants) can be seriously injured or killed. Do not exceed 7 fl oz/A Milestone per year.

**Site of action** Group 4: synthetic auxin

**Chemical family** Pyridine

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### **glyphosate**

**Rate** 1.1 to 2.25 lb ae/A.

**Time** Apply to sulfur cinquefoil in the pre-bud stage of growth.

**Remarks** Adequate foliar coverage of sulfur cinquefoil is necessary, and repeat applications may be required to achieve full control. Add nonionic surfactant if not included in the formulation.

**Caution** Glyphosate is nonselective and injures or kills other vegetation in the treated area.

**Site of action** Group 9: inhibits EPSP synthase

**Chemical family** None generally accepted

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### **metsulfuron (Escort and others)**

**Rate** 0.6 to 1.2 oz ai/A (1 to 2 oz/A)

**Time** Apply in spring during the rosette stage of growth.

**Remarks** Add 0.25% by volume of nonionic surfactant to spray mixture. Application sites differ between products; consult labels.

**Caution** Avoid contacting sensitive crops. Apply only to pasture, rangeland, and non-crop sites.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Sulfonylurea

---

### **picloram (Tordon)**

**Rate** 0.4 oz ae/A

**Time** Apply when plants are fully leaved and actively growing or in late fall.

**Caution** **Most formulations are restricted-use herbicides.** See label for grazing restrictions. Do not contaminate water. Potatoes, beans, and many other crops are very sensitive to picloram. Do not use in diversified cropping areas. At rates above 0.5 lb ae/A (1 quart/A), apply only as spot treatment not to exceed 25% of a landowner's acreage in a given watershed in a single season.

**Site of action** Group 4: synthetic auxin

**Chemical family** Pyridine

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### **triclopyr (Garlon 4)**

**Rate** 0.5 to 1 lb ae/A (1 to 2 pints/A).

**Time** Apply in spring during the rosette stage of growth.

**Remarks** Mix with 0.25 to 0.5% by volume nonionic surfactant and apply to all exposed foliage.

**Caution** Garlon 4 is an ester formulation; do not drift onto sensitive crops. Do not contaminate water.

**Site of action** Group 4 synthetic auxin

**Chemical family** Pyridine

---

### Clematis (*Clematis orientalis*) and old man's beard (*Clematis vitalba*)

**Remarks** Although PNW data are preliminary, imazapyr, picloram, and glyphosate appear promising in initial trials.

**Site of action** (imazapyr) Group 2: acetolactate synthase (ALS) inhibitor; (glyphosate) Group 9: inhibits EPSP synthase; (picloram) Group 4: synthetic auxin

**Chemical family** (imazapyr) imidazolinone; (glyphosate) none generally accepted; (picloram) pyridine

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### Cocklebur, common (*Xanthum strumarium*) and spiny (*Xanthium spinosum*)

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**Rate** 0.95 to 1.9 lb ae/A (2 to 4 pints/A)

**Time** Apply to seedlings in spring when plants are growing rapidly.

**Remarks** Good coverage is necessary to achieve control.

**Caution** Do not drift to sensitive crops.

**Site of action** Group 4 synthetic auxin

**Chemical family** Phenoxy acetic acid

---

### **aminopyralid (Milestone)**

**Rate** 0.75 to 1.25 oz ae/A (3 to 5 fl oz/A)

**Time** Apply to seedlings in spring when plants are actively growing.

**Remarks** Manure management of grazing animals may be necessary depending on the site; see label for details.

**Site of action** Group 4: synthetic auxin

**Chemical family** Pyridine

---

### **clopyralid (Transline)**

**Rate** 1.5 to 3.75 oz ae/A (4 to 10 fl oz/A).

**Time** Apply to seedlings in spring when plants are actively growing.

**Caution** Do not contaminate water. Potatoes, beans, and many other crops are very sensitive to clopyralid. Do not use in diversified cropping areas.

**Site of action** Group 4 synthetic auxin

**Chemical family** Pyridine

---

### **dicamba (Clarity and others)**

**Rate** 0.25 to 0.75 lb ae/A (0.5 to 1.5 pints/A)

**Time** Apply to seedlings in spring when plants are actively growing.

**Caution** Avoid drift to sensitive crops.

**Site of action** Group 4: synthetic auxin

**Chemical family** Benzoic acid

---

### **fluroxypyr (Vista)**

**Rate** 3.4 oz ae/A (11 oz/A)

**Time** Apply to seedlings in spring when plants are actively growing.

**Caution** Avoid drift to sensitive crops.

**Site of action** Group 4: synthetic auxin

**Chemical family** Pyridine

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### **glyphosate**

**Rate** 1.1 to 2.25 lb ae/A.

**Time** Apply to seedlings in spring when plants are actively growing.

**Remarks** Adequate foliar coverage of cocklebur is necessary. Add nonionic surfactant if not included in the formulation.

**Caution** Glyphosate is nonselective and injures or kills other vegetation in the treated area.

**Site of action** Group 9: inhibits EPSP synthase

**Chemical family** None generally accepted

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### **imazapic (Plateau)**

**Rate** 1 to 1.5 oz ae/A (4 to 6 fl oz/A)

**Time** Apply preemergence or postemergence to actively growing cocklebur.

**Remarks** Add 0.25% by volume of nonionic surfactant, or 1.5 to 2 pints/A methylated seed soil or crop oil concentrate to spray mixture.

**Caution** Some grass species are sensitive to imazapic; see label for details.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Imidazolinone

---

### **imazapyr (Arsenal, Habitat)**

**Rate** 0.75 to 1 lb ae/A (3 to 4 pints/A)

**Time** Apply preemergence or postemergence to actively growing cocklebur.

**Remarks** Add 0.25% by volume of nonionic surfactant, or 1 to 2 pints/A methylated seed soil or crop oil concentrate to spray mixture.

**Caution** Imazapyr is nonselective; spray will injure or kill vegetation contacted.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Imidazolinone

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### **metsulfuron (Escort and others)**

**Rate** 0.2 to 0.3 oz ai/A (0.33 to 0.5 oz/A)

**Time** Apply to seedlings in spring when plants are actively growing.

**Remarks** Add 0.25% by volume of nonionic surfactant to spray mixture. Application sites differ between products; consult labels.

**Caution** Avoid contacting sensitive crops. Apply only to pasture, rangeland, and non-crop sites.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Sulfonylurea

---

### **picloram (Tordon)**

**Rate** 4 to 8 fl oz ae/A

**Time** Apply to seedlings in spring when plants are actively growing.

**Caution** **Most formulations are restricted-use herbicides.** See label for grazing restrictions. Do not contaminate water. Potatoes, beans, and many other crops are very sensitive to picloram. Do not use in diversified cropping areas. At rates above 0.5 lb ae/A (1 quart/A), apply only as spot treatment not to exceed 25% of a landowner's acreage in a given watershed in a single season.

**Site of action** Group 4: synthetic auxin

**Chemical family** Pyridine

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### **sulfosulfuron (Outrider)**

**Rate** 0.56 to 1 oz ai/A (0.75 to 1.33 oz/A)

**Time** Apply to seedlings in spring when plants are actively growing.

**Remarks** Add 0.25% by volume of nonionic surfactant to spray mixture.

**Caution** Avoid contacting sensitive crops.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Sulfonylurea

---

### **triclopyr (Garlon 3A or 4)**

**Rate** 1 lb ae/A.

**Time** Apply to seedlings in spring when plants are actively growing.

**Caution** Garlon 4 is an ester formulation; do not drift onto sensitive crops. Do not contaminate water.

**Site of action** Group 4 synthetic auxin

**Chemical family** Pyridine

---

### Coltsfoot, European (*Tussilago farfara*)

**Remarks** Although PNW data are lacking, some reports suggest glyphosate at 2% is effective.

**Site of action** Group 9: inhibits EPSP synthase

**Chemical family** None generally accepted

---

### Comfrey (*Symphytum officinale*)

Comfrey was a food and feed crop, but has become weedy in gardens and fields of the Pacific Northwest. Naturally aggressive spread is accelerated by tillage that moves plant parts. A 1970s experiment in western Oregon determined the activity of several herbicides on comfrey. Relatively high rates were used, but only a few herbicides were effective. Most problems with comfrey are in gardens, so use caution in recommending any herbicide. One of the few options is to repeatedly (about every 3 weeks) remove plants down as far as practical below the soil surface.

Herbicides that gave good control were bromacil and terbacil at 6 lb ai/A; picloram at 1 lb ae/A; 2,4-D ester at 2 lb ae/A; triclopyr at 2 lb ae/A; and clopyralid at 4 lb ae/A. These rates gave nearly complete control of a new planting. Older plants might be more difficult to control.

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### Cordgrass, common (*Spartina anglica*), dense-flowered (*Spartina densiflora*), saltmeadow (*Spartina patens*), and smooth (*Spartina alterniflora*)

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#### **glyphosate (Rodeo and others)**

**Rate** 2 to 3.75 lb ae/A broadcast, 2% to 5% solution through hand-held equipment, or 33% solution with wiper applicators

**Time** Apply to actively growing cordgrass any time from late June until first killing frost.

**Remarks** Treat at least 6 hr before tidewater will cover plants. Debris and silt on cordgrass reduce performance. It may be necessary to wash plants before application. Add approved nonionic surfactant at 1 to 2 quarts/100 gal spray mix or 10% by volume with wiper applicators.

**Caution** With hand-held equipment, do not spray to point of runoff.

**Site of action** Group 9: inhibits EPSP synthase

**Chemical family** None generally accepted

---

#### **imazapyr (Habitat and others)**

**Rate** 1 to 1.5 lb ae/A

**Time** Apply to actively growing cordgrass, usually mid-June until killing frost.

**Remarks** Add suitable adjuvant to spray solution.

**Caution** Do not apply in the root zone of desirable trees. Treated water cannot be used for irrigation for 120 days.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Imidazolinone

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Crazyweed (*Oxytropis* spp.)

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### **metsulfuron (Escort and others)**

**Rate** Escort: 0.3 oz ai/A (0.5 oz/A)

**Time** Apply to actively growing plants.

**Remarks** Using a nonionic or silicone surfactant increases effectiveness. Application sites differ between products, see label.

**Caution** Apply only to pasture, rangeland, and non-crop sites.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Sulfonylurea

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### **picloram (Tordon)**

**Rate** 0.25 lb ae/A

**Time** Apply from early bud to bloom. Plants should be actively growing at the time of application.

**Remarks** Plants are poisonous to livestock. To be used on rangeland or permanent grass pastures.

**Caution** **Most formulations are restricted-use herbicides.** Do not graze until plants dry up after application. Avoid drift to sensitive crops. Do not contaminate water. Potatoes, beans, and many other broadleaf crops are sensitive to these herbicides. Do not use picloram in diversified crop areas.

**Site of action** Group 4: synthetic auxin

**Chemical family** Pyridine

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Cress, hoary or whitetop (*Lepidium draba*), hairy (*Lepidium appelianum*), and lens-podded (*Lepidium chalepensis*)

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### **2,4-D LV ester or 2,4-D amine**

**Rate** 2 to 3 lb ae/A in non-cropland and 1 lb ae/A as a selective treatment

**Time** Apply early in cress growth stage; control is minor after bud stage. In cereals, apply 2,4-D before weeds reach boot stage.

**Remarks** When possible, use 2,4-D on whitetop plants before plowing fields in spring. Re-spray in fall if new growth appears.

**Caution** Avoid drift to sensitive crops.

**Site of action** Group 4: synthetic auxin

**Chemical family** Phenoxy acetic acid

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### **aminocyclopyrachlor + chlorsulfuron (Perspective)**

**Rate** 1.2 to 1.8 oz/A aminocyclopyrachlor + 0.5 to 0.7 oz/A chlorsulfuron (3 to 4.5 oz/A of product)

**Time** Apply to actively growing vegetation.

**Remarks** Adjuvants can be used; these include methylated seed oils 0.5 to 1% v/v, nonionic surfactants at 0.25 to 1% v/v, and crop oil concentrates at 1% v/v. Can be applied using an invert emulsion rather than water.

**Caution** Even low rates can kill nontarget tree and shrub species so avoid application within a distance equal to the tree height of the sensitive species. Do not allow spray to drift off target. Can injure several grass species including bromes, as well as basin wildrye.

**Site of action** (aminocyclopyrachlor) Group 4: Synthetic auxin; (chlorsulfuron) Group 2: ALS inhibitor

**Chemical family** (aminocyclopyrachlor) Pyrimidine carboxylic acid; (chlorsulfuron) Sulfonylurea

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### chlorsulfuron (Telar)

**Rate** 0.75 oz ai/A (1 oz/A of 75% ai Telar)

**Time** Apply at prebloom to bloom growth stage or to rosettes in fall.

**Remarks** Using an 80% ai surfactant increases effectiveness.

**Caution** Apply only to pasture, range, Conservation Reserve Program (CRP), and non-crop sites.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Sulfonylurea

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### imazapic (Plateau)

**Rate** 0.125 to 0.188 lb/A

**Time** Apply after blossoms open (full bloom) until plants desiccate. Fall rosettes also may be treated.

**Remarks** Add 1 quart/A methylated seed oil.

**Caution** Before using, note crop rotation restrictions.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Imidazolinone

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### metsulfuron (Escort and others)

**Rate** Escort: 0.6 oz ai/A (1 oz/A) of the 60% ai

**Time** Apply at prebloom to bloom growth stage or to rosettes in fall.

**Remarks** Using a nonionic or silicone surfactant increases effectiveness. Application sites differ between products; consult label.

**Caution** Apply only to pasture, rangeland, and non-crop sites.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Sulfonylurea

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### Crupina, common (*Crupina vulgaris*)

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### aminocyclopyrachlor + chlorsulfuron (Perspective)

**Rate** 4.75 to 8 oz/A

**Time** Apply to seedlings in spring when plants are actively growing.

**Remarks** Adjuvants can be used; these include methylated seed oils 0.5 to 1% v/v, nonionic surfactants at 0.25 to 1% v/v, and crop oil concentrates at 1%v/v.

**Caution** Do not apply to the root zone of desirable trees and shrubs. May injure or kill some grass species.

**Site of action** (aminocyclopyrachlor) Group 4 synthetic auxin; (chlorsulfuron) Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** (aminocyclopyrachlor) Pyrimidine carboxylic acid ; (chlorsulfuron) Sulfonylurea

---

### aminopyralid + metsulfuron (Opensight)

**Rate** 3 to 3.3 oz/A

**Time** Apply to seedlings in spring when plants are actively growing.

**Remarks** Adjuvants can be used; these include methylated seed oils 0.5 to 1% v/v, nonionic surfactants at 0.25 to 1% v/v, and crop oil concentrates at 1%v/v.

**Caution** May injure or kill some grass species.

**Site of action** (aminopyralid) Group 4 synthetic auxin; (metsulfuron) Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** (aminopyralid) Pyrimidine carboxylic acid ; (metsulfuron) Sulfonylurea

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### **chlorsulfuron (Telar and others)**

**Rate** 0.75 to 0.195 oz ai/A (1 to 2.6 oz/A).

**Time** Apply to seedlings in spring when plants are actively growing.

**Remarks** Add 0.25% by volume of nonionic surfactant to spray mixture.

**Caution** Avoid drift to sensitive crops.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Sulfonylurea

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### **clopyralid (Transline)**

**Rate** 2 oz ae/A (0.33 pints/A).

**Time** Apply as a split application to common crupina foliage in fall and spring.

**Remarks** **Most effective on young plants.**

**Caution** Do not contaminate water. Potatoes, beans, and many other crops are very sensitive to clopyralid. Do not use in diversified cropping areas.

**Site of action** Group 4 synthetic auxin

**Chemical family** Pyridine

---

### **dicamba (Clarity and others)**

**Rate** 0.5 lb ae/A (1 pint/A)

**Time** Apply to seedlings in spring when plants are actively growing.

**Caution** Avoid drift to sensitive crops.

**Site of action** Group 4: synthetic auxin

**Chemical family** Benzoic acid

---

### **metsulfuron (Escort and others)**

**Rate** 0.3 to 0.6 oz ai/A (0.5 to 1 oz/A)

**Time** Apply to seedlings in spring when plants are actively growing.

**Remarks** Add 0.25% by volume of nonionic surfactant to spray mixture. Application sites differ between products; consult labels.

**Caution** Avoid contacting sensitive crops. Apply only to pasture, rangeland, and non-crop sites.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Sulfonylurea

---

### **picloram (Tordon)**

**Rate** 4 to 8 oz ae/A

**Time** Apply to seedlings in spring when plants are actively growing.

**Caution** **Most formulations are restricted-use herbicides.** See label for grazing restrictions. Do not contaminate water. Potatoes, beans, and many other crops are very sensitive to picloram. Do not use in diversified cropping areas. At rates above 0.5 lb ae/A (1 quart/A), apply only as spot treatment not to exceed 25% of a landowner's acreage in a given watershed in a single season.

**Site of action** Group 4: synthetic auxin

**Chemical family** Pyridine

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Cucumber, wild (*Marah oreganus*)

Wild cucumber is a perennial vine that regrows each year from an enormous root. The plant spreads by seed, not by root fragments. The harmful effect of wild cucumber is mostly a result of the top growth that crowds, shades, and deforms the crops. Any type of physical control has temporary results because of the food storage in the root. This food reserve also means that if herbicides are to be effective, they must move to the root and block production of new shoots. Any control plan should call for treatment for several years. Recommendations that follow are based on limited research at Oregon State University.

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**dicamba (Clarity, Rifle)**

**Rate** 1 to 2 lb ae/A or 1% concentration for application with a handgun sprayer.

**Time** Apply when cucumber is growing rapidly in late spring or early summer.

**Remarks** Expect 80 to 100% control 1 year after treatment.

**Caution** Dicamba seriously reduces seed production of grasses or grain crops if applied at the wrong growth stage. Do not use 2-lb rate on large areas if a crop is growing in the field.

**Site of action** Group 4: synthetic auxin

**Chemical family** Benzoic acid

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**glyphosate**

**Rate** 1.5 lb ae/A or 0.5 to 1% solution for application with a handgun sprayer.

**Time** Apply when the cucumber is growing rapidly in late spring or early summer.

**Remarks** In two experiments, plants treated with glyphosate had no regrowth 1 year later.

**Caution** Glyphosate is a nonselective herbicide.

**Site of action** Group 9: inhibits EPSP synthase

**Chemical family** None generally accepted

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**picloram (Tordon)**

**Rate** 0.5 lb ae/A or 0.5% concentration for application with a handgun sprayer.

**Time** Apply when cucumber is growing rapidly in the late spring or early summer.

**Remarks** Expect 80 to 100% control 1 year after treatment.

**Caution** Most formulations are restricted-use herbicides.

**Site of action** Group 4: synthetic auxin

**Chemical family** Pyridine

---

**triclopyr (Garlon)**

**Rate** 1 lb ae/A or 0.5% concentration for application with a handgun sprayer.

**Time** Apply when cucumber is growing rapidly in late spring or early summer.

**Remarks** Tests with the ester form had excellent results 1 year later. At 0.5 lb ae/A, results were less clear, but two of three plots had good results.

**Caution** See label for registered sites for triclopyr products' use.

**Site of action** Group 4: synthetic auxin

**Chemical family** Pyridine

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### triclopyr + 2,4-D (Crossbow)

**Rate** 0.5 lb + 1 lb ae/A (2 quarts/A Crossbow) or 1% concentration for handgun sprayer application.

**Time** Apply when cucumber is growing rapidly in late spring or early summer.

**Remarks** In two of three plots, results were good 1 year after treatment. Results were poor in the third plot.

**Caution** Check the Crossbow label to determine registered sites and rates.

**Site of action** (both) Group 4: synthetic auxin

**Chemical family** (triclopyr) pyridine; (2,4-D) phenoxy acetic acid

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Daisy, oxeye (*Leucanthimum vulgare*)

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### aminopyralid (Milestone)

**Rate** 1 to 1.75 oz ae/A (4 to 7 fl oz/A)

**Time** Apply preemergence in winter to early spring, or in spring to actively growing plants before the bud stage of growth.

**Caution** Do not let spray drift onto desirable vegetation. Many forbs (desirable broadleaf plants) can be seriously injured or killed. Do not exceed 7 fl oz/A Milestone per year.

**Site of action** Group 4: synthetic auxin

**Chemical family** Pyridine

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### aminocyclopyrachlor + chlorsulfuron (Perspective)

**Rate** 3 to 4.5 oz/A

**Time** Apply in spring from rosette to flowering stage of growth.

**Remarks** Adjuvants can be used; these include methylated seed oils 0.5 to 1% v/v, nonionic surfactants at 0.25 to 1% v/v, and crop oil concentrates at 1%v/v.

**Caution** Do not apply to the root zone of desirable trees and shrubs. May injure or kill some grass species.

**Site of action** (aminocyclopyrachlor) Group 4 synthetic auxin; (chlorsulfuron) Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** (aminocyclopyrachlor) pyridine; (chlorsulfuron) sulfonyleurea

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### aminopyralid + metsulfuron (Opensight)

**Rate** 2.5 to 3.3 oz/A

**Time** Apply in spring from rosette to flowering stage of growth.

**Remarks** Adjuvants can be used; these include methylated seed oils 0.5 to 1% v/v, nonionic surfactants at 0.25 to 1% v/v, and crop oil concentrates at 1%v/v.

**Caution** May injure or kill some grass species.

**Site of action** (aminopyralid) Group 4 synthetic auxin; (metsulfuron) Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** (aminopyralid) Pyrimidine carboxylic acid ; (metsulfuron) Sulfonylurea

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### chlorsulfuron (Telar and others)

**Rate** 0.75 to 0.195 oz ai/A (1 to 2.6 oz/A).

**Time** Apply in autumn to new rosettes, or to rosettes in spring before bolting.

**Remarks** Add 0.25% by volume of nonionic surfactant to spray mixture.

**Caution** Avoid drift to sensitive crops.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Sulfonylurea

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**clopyralid (Transline)**

**Rate** 4 to 8 oz ae/A (0.67 to 1.33 pints/A).

**Time** Apply in spring from rosette to bud stage of growth.

**Caution** Do not contaminate water. Potatoes, beans, and many other crops are very sensitive to clopyralid. Do not use in diversified cropping areas.

**Site of action** Group 4 synthetic auxin

**Chemical family** Pyridine

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**clopyralid + 2,4-D amine (Curtail)**

**Rate** 2 to 3 quarts/A

**Time** Apply in spring from rosette to bud stage of growth.

**Remarks** Consult label for specific site registrations.

**Caution** Product injures or kills sensitive broadleaf forages. Do not contaminate water.

**Site of action** (both) Group 4: synthetic auxin

**Chemical family** (clopyralid) pyridine; (2,4-D) phenoxy acetic acid

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**dicamba (Clarity and others)**

**Rate** 0.5 to 1 lb ae/A (1 to 2 pints/A)

**Time** Apply in spring when plants are actively growing.

**Caution** Avoid drift to sensitive crops.

**Site of action** Group 4: synthetic auxin

**Chemical family** Benzoic acid

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**glyphosate**

**Rate** 1.5 to 3 lb ae/A.

**Time** Apply in spring from rosette to bud stage of growth.

**Remarks** Adequate foliar coverage of oxeye daisy is necessary. Add nonionic surfactant if not included in the formulation.

**Caution** Glyphosate is nonselective and injures or kills other vegetation in the treated area.

**Site of action** Group 9: inhibits EPSP synthase

**Chemical family** None generally accepted

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**imazapyr (Arsenal, Habitat)**

**Rate** 0.5 to 0.75 lb ae/A (2 to 3 pints/A)

**Time** Apply preemergence or postemergence to actively growing oxeye daisy.

**Remarks** Add 0.25% by volume of nonionic surfactant, or 1 to 2 pints/A methylated seed soil or crop oil concentrate to spray mixture.

**Caution** Imazapyr is nonselective; spray will injure or kill vegetation contacted.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Imidazolinone

---

**metsulfuron (Escort and others)**

**Rate** 0.3 to 0.6 oz ai/A (0.5 to 1 oz/A)

**Time** Apply in spring to actively growing plants, or to new rosettes in the fall.

**Remarks** Add 0.25% by volume of nonionic surfactant to spray mixture. Application sites differ between products; consult labels.

**Caution** Avoid contacting sensitive crops. Apply only to pasture, rangeland, and non-crop sites.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Sulfonylurea

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### **picloram (Tordon)**

**Rate** 6 to 8 oz ae/A

**Time** Apply in spring to actively growing plants, or to new rosettes in the fall.

**Caution** **Most formulations are restricted-use herbicides.** See label for grazing restrictions. Do not contaminate water. Potatoes, beans, and many other crops are very sensitive to picloram. Do not use in diversified cropping areas. At rates above 0.5 lb ae/A (1 quart/A), apply only as spot treatment not to exceed 25% of a landowner's acreage in a given watershed in a single season.

**Site of action** Group 4: synthetic auxin

**Chemical family** Pyridine

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### Devil's-claw (*Proboscidea louisiana*)

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### **2,4-D (various products)**

**Remarks** Reported to control this plant, although data are lacking in the Pacific Northwest.

**Site of action** Group 4: synthetic auxin

**Chemical family** Phenoxy acetic acid

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### Dock, curly (*Rumex crispus*) and broadleaf (*Rumex obtusifolius*)

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### **2,4-D or dicamba (Clarity, Rifle) or picloram (Tordon)**

**Rate** A mixture of each product 1 lb ae/50 gal of water for spot treatments

**Time** Apply before flower elongation.

**Remarks** Repeated treatments needed to control regrowth. Dicamba is effective on curly dock but not on broadleaf dock. Picloram is effective on both species and is registered for use on grazing and non-cropland.

**Caution** **Most formulations are restricted-use herbicides.** Do not contaminate water. Potatoes, beans, and many other broadleaf crops are sensitive to these herbicides. Do not use picloram in diversified crop areas.

**Site of action** (all) Group 4: synthetic auxin

**Chemical family** (2,4-D) phenoxy acetic acid; (dicamba) benzoic acid; (picloram) pyridine

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### **2,4-DB amine or 2,4-D ester (Butyrac or Butoxone)**

**Rate** 1 to 1.5 lb ae/A

**Time** Apply before flower stalk elongates. Repeated applications are necessary.

**Remarks** This treatment is selective on legumes and grass crops.

**Caution** Spray 30 days before feeding forage. Avoid drift to sensitive crops.

**Site of action** Group 4: synthetic auxin

**Chemical family** Phenoxy acetic acid

---

### aminopyralid (Milestone)

**Rate** 1 to 1.5 oz ae/A (4 to 6 fl oz/A)

**Time** Apply to actively growing plants before the bud stage of growth.

**Remarks** A nonionic surfactant at 1 to 2 quarts/100 gal of spray enhances control under adverse environmental conditions.

**Caution** Do not let spray drift onto desirable vegetation. Many forbs (desirable broadleaf plants) can be seriously injured or killed. Do not exceed 7 fl oz/A Milestone per year.

**Site of action** Group 4: synthetic auxin

**Chemical family** Pyridine

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### chlorsulfuron (Telar)

**Rate** 0.75 oz ai/A (1 oz/A)

**Time** Apply to young, actively growing weeds.

**Remarks** Do not apply to frozen ground. Constantly agitate while mixing in spray solution. Add 0.25% v/v nonionic surfactant to the spray mixture. Apply with ground equipment in at least 10 gal/A carrier.

**Caution** Avoid contact with sensitive crops. Labeled for pasture, range, Conservation Reserve Program (CRP), and non-cropland use only. Do not treat powdery, dry soils or light, sandy soils unless rain is likely after treatment.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Sulfonylurea

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### glyphosate

**Rate** 2.25 to 3.75 lb ae/A

**Time** Apply at early heading.

**Remarks** Glyphosate is a foliar-active herbicide.

**Caution** Glyphosate controls grasses as well as other vegetation in treated areas.

**Site of action** Group 9: inhibits EPSP synthase

**Chemical family** None generally accepted

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### metsulfuron (Ally and others)

**Rate** Ally: 0.06 to 0.12 oz ai/A (0.1 to 0.2 oz/A)

**Time** Apply to young, actively growing weeds.

**Remarks** Do not apply to frozen ground. Constantly agitate while mixing in spray solution. Add 0.25% v/v nonionic or silicone surfactant to the spray mixture.

**Caution** Avoid contacting sensitive crops. Consult labels for crops on which each product can be used. Do not treat powdery, dry soils or light, sandy soils unless rain is likely after treatment.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Sulfonylurea

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### sulfometuron (Oust)

**Rate** 2.25 oz ai/A (3 oz/A)

**Time** Apply preemergence to early postemergence.

**Remarks** Recommended for use on non-cropland only. Rate depends on annual rainfall. Do not apply to frozen ground. Constantly agitate while mixing in spray solution. Add 0.25% v/v nonionic surfactant to increase activity of postemergence applications. Apply with ground equipment in at least 15 gal/A carrier.

**Caution** Keep sulfometuron methyl out of cropland. Equipment used to apply this material should be dedicated to non-cropland uses only. Do not treat powdery, dry soils or light, sandy soils unless rain is likely after treatment.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Sulfonylurea

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Dodder (*Cuscuta* spp.)—in forage alfalfa

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### **pendimethalin (Prowl H<sub>2</sub>O)**

**Rate** 1.9 to 3.8 lb ai/A

**Time** Apply to dormant, established alfalfa before dodder germinates.

**Remarks** Besides dodder, treatment controls most annual grasses and certain broadleaf weeds as they germinate. Controls most annual grasses and several broadleaf weeds, including dodder, as they germinate. Incorporation with rain or sprinkler irrigation enhances control. Will not control emerged weeds.

**Caution** Do not apply to seedling alfalfa. Preharvest interval is 50 days for hay or forage. Do not exceed 4 quarts/A product per year. Refer to label for crop rotation restrictions.

**Site of action** Group 3: microtubule assembly inhibitor

**Chemical family** Dinitroaniline

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Dodder (*Cuscuta* spp.)—general infestations in seed alfalfa fields

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### **pendimethalin (Prowl, Prowl H<sub>2</sub>O, Stealth)**

*Alfalfa for seed only*

**Rate** 2 to 4 lb ai/A

**Time** Apply to established alfalfa between January 15 and April 30 but before dodder germinates.

**Remarks** Active special local needs labels include ID-140003 and OR-140006 for Prowl H<sub>2</sub>O. Besides dodder, treatment controls most annual grasses and certain broadleaf weeds as they germinate. Processed seed must be labeled “Not for human or animal consumption” at the processing plant, and all seed screenings must be disposed of in a way that they cannot be distributed or used for food or feed.

**Caution** Use only on alfalfa grown for seed. Do not apply to seedling alfalfa. Do not graze or harvest alfalfa for hay after application. Do not use screenings from seed processing as feed for livestock. Do not use harvested seed for sprouting.

**Site of action** Group 3: microtubule assembly inhibitor

**Chemical family** Dinitroaniline

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### **pronamide (Kerb)**

**Rate** 1 to 2 lb ai/A. Apply 1.5 to 2 lb ai/A in furrow-irrigated or rill-irrigated fields and 1 to 1.5 lb ai/A in flood-irrigated fields.

**Time** Apply in spring before dodder germinates. On furrow-irrigated fields, follow a shallow incorporation by irrigation within 7 days. On flood-irrigated fields, follow application by flooding within 1 to 3 days.

**Remarks** Field treatment seldom controls dodder 100%. Scout fields for dodder patches and spot treated them.

**Caution** **A restricted-use herbicide.** Pronamide controls grasses in alfalfa fields.

**Site of action** Group 3: microtubule assembly inhibitor

**Chemical family** Benzamide

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Dodder (*Cuscuta* spp.)—general infestations in carrot seed fields

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### **pendimethalin (Prowl H<sub>2</sub>O)**

*Carrots for seed only*

**Rate** 0.5 to 2 lb ai/A

**Time** Apply after the last normal cultivation (layby) as a directed spray.

**Remarks** Use 3 to 4 pints/A to control dodder. Apply directly to soil between rows. Spray should not contact carrot plants. Lay-by applications can be in carrots previously treated with herbicides registered for use in carrots. Prowl most effectively controls weeds if adequate rain or irrigation follows within 7 days.

**Caution** Do not use on peat or muck soils. Do not plant winter wheat or winter barley in fall after Prowl application at rates above 3 pints/A. Do not feed or graze carrots after application. Do not use screenings from seed processing as feed for livestock.

**Site of action** Group 3: microtubule assembly inhibitor

**Chemical family** Dinitroaniline

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Fennel, common (*Foeniculum vulgare*)

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**2,4-D amine**

**Rate** Spot treatment: 0.25 to 0.5% solution

**Time** Apply in spring to fully-grown leaves but prior to flowering.

**Remarks** 2,4-D is usually not able to fully control common fennel, so combining with other products is generally recommended. Retreatment will likely be necessary.

**Caution** Avoid drift to sensitive crops.

**Site of action** Group 4: synthetic auxin

**Chemical family** Phenoxy acetic acid

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**glyphosate**

**Rate** 2.8 lb ae/A.

**Time** Apply in spring to fully-grown leaves but prior to flowering.

**Remarks** Adequate foliar coverage of fennel foliage is necessary. Add nonionic surfactant if not included in the formulation.

**Caution** Glyphosate is nonselective and injures or kills other vegetation in the treated area.

**Site of action** Group 9: inhibits EPSP synthase

**Chemical family** None generally accepted

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**triclopyr (Garlon 3A or 4)**

**Rate** Broadcast treatment: 1 to 2 lb ae/A; spot treatment: 0.5 to 1% solution.

**Time** Apply in spring to fully-grown leaves but prior to flowering.

**Caution** Garlon 4 is an ester formulation; do not drift onto sensitive crops. Do not contaminate water.

**Site of action** Group 4 synthetic auxin

**Chemical family** Pyridine

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Fieldcress, Austrian (*Rorippa austriaca*)

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**2,4-D (various products)**

**Remarks** Reported to control this plant, although data are lacking in the Pacific Northwest. Follow label instructions.

**Site of action** Group 4: synthetic auxin

**Chemical family** Phenoxy acetic acid

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Fluvelin, sharpshoot (Kickxia elatine)

Seedlings of this soft, hairy annual are upright, but as plants mature they develop prostrate stems. Leaves on stems resemble those of bindweed, but fluvelin is in the snapdragon family. It has pale yellow flowers with a narrow spur and a purple upper lip. This weed is spreading into cropland throughout the Willamette Valley of Oregon and is of particular concern in spring-planted tall fescue grown for seed among other grass grown for seed species. Roundleaf fluvelin (*Kickxia spuria*) is present in southern Oregon and may be more invasive than sharpshoot fluvelin. Both species probably react similarly to herbicides.

**Remarks** Control is difficult, although tribenuron methyl tank mixes with oxyfluorfen or 2,4-D plus dicamba appear promising in grass grown for seed efficacy trials. Use only the 0.008 lb ai/A rate on tall fescue and perennial ryegrass and low rates of oxyfluorfen ranging from 0.03 to 0.046 lb ai/A (2 to 3 oz/A Goal 2XL or Galigan 2E). Apply when the sharpshoot fluvelin is no larger than a half-dollar in size and prior to stem elongation.

**Site of action** (tribenuron) Group 2: acetolactate synthase (ALS) inhibitor; (oxyfluorfen) Group 14: protoporphyrinogen oxidase inhibitor; (dicamba and 2,4-D) Group 4: synthetic auxin.

**Chemical family** (tribenuron methyl) sulfonylurea; (oxyfluorfen) diphenylether; (dicamba) benzoic acid; (2,4-D and MCPA) phenoxy acetic acid;

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Four-O'Clock, wild (Mirabilis nyctaginea)

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**2,4-D (various products)**

**Remarks** Reported to control this plant, although data are lacking in the Pacific Northwest. Follow label instructions.

**Site of action** Group 4: synthetic auxin

**Chemical family** Phenoxy acetic acid

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**imazapic (Plateau)**

**Rate** 0.5% solution as a spot treatment

**Remarks** Use a 1% v/v methylated seed oil as an adjuvant.

**Caution** Before using, note crop rotation restrictions.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Imidazolinone

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Garlic, wild (Allium vineale)

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**2,4-D LV ester**

**Rate** 1 to 2 lb ae/A

**Time** Early spring, preferably mid-April, before garlic is more than 8 inches tall. Re-spray annually to achieve effective control.

**Remarks** 2,4-D LV ester is selective in cereals and grasses. It is very important to re-spray annually for several years to effectively reduce the garlic stand. This plant produces small dormant bulbs that germinate over several years.

**Caution** Avoid drift to sensitive crops.

**Site of action** Group 4: synthetic auxin

**Chemical family** Phenoxy acetic acid

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**aminocyclopyrachlor + chlorsulfuron (Perspective)**

**Rate** 1.2 to 1.8 oz/A aminocyclopyrachlor + 0.5 to 0.7 oz/A chlorsulfuron (3 to 4.5 oz/A of product)

**Time** Apply to actively growing vegetation.

**Remarks** Adjuvants can be used, these include methylated seed oils 0.5 to 1% v/v, nonionic surfactants at 0.25 to 1% v/v, and

crop oil concentrates at 1%v/v. Can be applied using an invert emulsion rather than water.

**Caution** Even low rates can kill nontarget tree and shrub species, so avoid application within a distance equal to the tree height of the sensitive species. Do not allow spray to drift off target. Can injure several grass species including bromes and also basin wildrye.

**Site of action** Group 4 synthetic auxin (aminocyclopyrachlor) Group 2: ALS inhibitor (chlorsulfuron)

**Chemical family** Phenoxy acetic acid (aminocyclopyrachlor); sulfonyleurea (chlorsulfuron)

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### **chlorsulfuron (Telar)**

**Rate** 0.75 oz ai/A (1 oz/A)

**Time** Apply preemergence or early postemergence in the spring.

**Remarks** Use a surfactant for postemergence sprays.

**Caution** Do not let spray drift onto sensitive crops. Labeled for use on pasture, range, Conservation Reserve Program (CRP), and non-crop sites only.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Sulfonyleurea

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### **dicamba (Clarity, Rifle)**

**Rate** 1 to 2 lb ae/A

**Time** Early spring, preferably March or early April.

**Remarks** Dicamba at the 1-lb rate usually will not seriously injure seed production of grass or grain crops. The 2-lb treatment gives more complete garlic control.

**Caution** Dicamba may temporarily sterilize soil west of the Cascades.

**Site of action** Group 4: synthetic auxin

**Chemical family** Benzoic acid

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### **metsulfuron (Ally and others)**

**Rate** Ally: 0.3 oz ai/A (0.5 oz/A)

**Time** Apply to actively growing plants in spring when wild garlic is less than 12 inches tall with 2 to 4 inches of new growth.

**Remarks** Using a nonionic or silicone surfactant will increase effectiveness.

**Caution** Consult labels for crops where each product can be used.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Sulfonyleurea

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### **thifensulfuron + tribenuron (Harmony Extra)**

**Rate** 0.38 to 0.45 oz ai/A (0.5 to 0.6 oz/A)

**Time** When wild garlic is less than 12 inches tall.

**Remarks** Control is best on actively growing wild garlic plants when air temperature is 60°F or warmer.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Sulfonyleurea

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### Mustard, garlic (*Alliaria petiolata*)

**Remarks** A biennial plant, garlic mustard forms a basal rosette of leaves the first season and sends up a flower stalk producing

hundreds of seeds in the second season. It begins spring growth at low temperatures, earlier than many other plants. Preventing seed production from mature bolted plants should be the primary focus of control measures. Hand-pulling plants is an effective control method and should be used to as a follow-up to chemical methods whenever possible. After working in an area where this plant is growing, boots, clothing, equipment, and vehicles should be cleaned to avoid transporting seeds.

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### **glyphosate**

**Rate** 2.0% solution of 3 lb ae/gal product, with 1.0% by volume nonionic surfactant

**Time** Apply in spring prior to flowering or in late fall.

**Remarks** To control seedlings and rosettes, a 1.0 to 2.0% solution is adequate; the higher rate should be used on plants that have bolted. Glyphosate will not control garlic mustard plants that are well into or beyond flowering stage; these plants will have time to develop mature seed before the herbicide stops their growth.

**Site of action** Group 9: inhibits EPSP synthase

**Chemical family** None generally accepted

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### **triclopyr (Garlon 3A, Vastlan and others)**

**Rate** 1.0 to 2.0% solution of 3 lb/gal product or 1.5% solution of 4 lb/gal product, with 1.0% by volume nonionic surfactant or crop oil concentrate

**Time** Apply spring or fall.

**Remarks** Triclopyr is more effective than glyphosate on already-flowering plants.

**Site of action** Group 4: synthetic auxin

**Chemical family** Pyridine

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### **metsulfuron (Escort and others)**

**Rate** 0.5 to 1.0 ounce/A of 60% ai product (0.3 to 0.6 oz ai/A) or 1.0 gram product/gal for spot treatment.

**Time** Apply spring or fall, when plants are actively growing.

**Remarks** For use on pasture and rangeland, conifer and hardwood plantations, and non-crop sites such as rights-of-way, ditchbanks of dry drainage ditches, and industrial sites. Metsulfuron may be used alone or in a tank-mix with either glyphosate or triclopyr, each at its labeled rate. Application sites differ between products; consult labels.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Sulfonylurea

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### **imazapic (Plateau)**

**Rate** 4 to 6 oz of product/A or for spot treatments a 0.25 to 1.5% solution (0.3 to 1.9 oz product/gal)

**Time** May be applied preemergence or postemergence.

**Remarks** For use on native grasses and wildflowers, pastures, rangeland, non-crop areas including rights-of-way, and conifer site preparation. Many wildflowers are tolerant to the 4.0 oz/A rate.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Imidazolinone

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### **imazapyr (Arsenal, Habitat and others)**

**Rate** 1% solution of 2 lbs ae/gal product for spot application (1.3 oz product/gal)

**Time** Apply when plants are actively growing.

**Remarks** For use on forestry sites, grass pasture and rangeland, non-crop agricultural areas, industrial sites, non-agricultural areas (such as airports, highway, railroad and utility rights-of-way, sewage disposal areas, etc.), and natural areas (such as wildlife habitats, recreation areas, campgrounds trailheads, and trails). Application sites differ between products; consult labels.

Habitat is for use on specified aquatic sites, but only by federal or state agency personnel or applicators who are certified for aquatic pest control and are authorized by the state or local government.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Imidazolinone

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### **imazapyr + metsulfuron (Lineage Clearstand)**

**Rate** 3 to 6 oz/A

**Time** Apply when plants are actively growing.

**Remarks** For use on conifer plantations, pasture and rangeland, wildlife management areas, and non-agricultural areas including ditch banks or dry drainage ditches, rights-of-way, and industrial sites.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** (imazapyr) Imidazolinone; (metsulfuron) sulfonylurea

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### **aminopyralid + metsulfuron (Opensight, Chaparral)**

**Rate** 3.3 oz product/A

**Time** Apply in the spring and early summer to rosette or bolting plants or in the fall to seedlings and rosettes.

**Remarks** For use on grass pastures, rangeland, natural areas (such as wildlife management areas, wildlife openings, wildlife habitats, recreation areas, campgrounds, trailheads and trails) and grazed areas around these sites. Do not use plant material treated with this product for mulch or compost.

**Site of action** Group 4: synthetic auxin; Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** (aminopyralid) Pyridine; (metsulfuron) Sulfonylurea

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### **MCPA + fluroxypyr + dicamba (Change Up)**

**Rate** 1.25 to 3 pints product/A or 0.46 to 1.10 fl oz product/1,000 sq ft or 0.75 to 2.0 oz product/gal for spot spray to wetting

**Time** Apply when plants are actively growing.

**Remarks** For use on ornamental lawns and turf, sod, and non-crop areas such as fencerows, hedgerows, roadsides, ditches, rights-of-way, utility power lines, railroads, airports and industrial sites.

**Site of action** Group 4: synthetic auxin

**Chemical family** (MCPA) Phenoxy acetic acid; (fluroxypyr) Pyridine; (dicamba) Benzoic acid

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### **MCPA + fluroxypyr + triclopyr (Battleship III)**

**Rate** 3 to 4 pints product/A or 1.1 to 1.5 oz product per 1,000 sq ft

**Time** Apply when plants are actively growing.

**Remarks** For use in ornamental turf, including residential turf, golf courses, sod farms and grass grown for seed.

**Site of action** Group 4: synthetic auxin

**Chemical family** (MCPA) Phenoxy acetic acid; (fluroxypyr and triclopyr) Pyridine

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### **2,4-D + fluroxypyr + dicamba (Escalade and E-2)**

**Rate** 2 to 5 pints product/A for non-turf areas (2 to 3 pints product/A for turfgrass) or 2.25 fl oz product/1,000 sq ft (0.75 to 1.10 fluid oz product/1,000 sq ft)

**Time** Apply anytime between the time when plants come into full leaf (spring) to when plants begin to go dormant. Best results are obtained when plants are young and actively growing.

**Remarks** For use in ornamental lawns and turf grasses, including sod farms, and non-crop sites such as rights-of-way, roadsides, industrial sites, fence rows, non-irrigation ditch banks, farmstead, recreational areas, and parks. E-2 is also for use on

pastures, including those grown for hay or silage, and rangelands.

**Site of action** Group 4: synthetic auxin

**Chemical family** (2,4-D) Phenoxy acetic acid; (fluroxypyr) Pyridine; (dicamba) Benzoic acid

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### **2,4-D + MCPP + 2,4-DP (Spoiler)**

**Rate** 3 to 4 pints product/A or 1.1 to 1.5 fl oz product/1,000 sq ft (on cool season grasses)  
2.5 to 3.5 pints product/A (on non-crop)

**Time** Apply from when plants come into full leaf until they start to go dormant. Best results when weeds are young and actively growing

**Remarks** For use on ornamental turf such as lawns, parks, cemeteries and golf courses; on sod farms; and on non-crop areas such as fencerows, hedgerows, roadsides, ditches, rights-of-way, utility power lines, railroads, airports and industrial sites.

**Site of action** Group 4: synthetic auxin

**Chemical family** (all) Phenoxy acetic acid

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### **triclopyr + MCPA + 2,4-DP (Vengeance Plus)**

**Rate** 1.6 to 3.2 pints product/A or 0.73 to 1.10 fl oz product/1,000 sq ft

**Time** Apply to plants that are actively growing.

**Remarks** For use in ornamental lawns and turf grasses, sod farms, and non-crop areas including rights-of-way, roadsides, fencerows, hedgerows, non-irrigation ditch banks, railroads, industrial management sites, and airports.

**Site of action** Group 4: synthetic auxin

**Chemical family** (triclopyr) Pyridine; (MCPA and 2,4-DP) Phenoxy acetic acid

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### **2,4-D + quinclorac + dicamba (Quincept)**

**Rate** 7 to 8 pints product/A or 2.6 to 2.9 fl oz product/1,000 sq ft

**Time** Apply to plants that are actively growing.

**Remarks** For use on ornamental turf including lawns or grounds around residential and commercial establishments, multi-family dwellings, military and other institutions, parks, airports, roadsides, schools, picnic grounds, athletic fields, houses of worship, cemeteries, golf courses and sod farms.

**Site of action** Group 4: synthetic auxin

**Chemical family** (2,4-D) Phenoxy acetic acid ; (quinclorac) Quinoline carboxylic acid; (dicamba) Benzoic acid

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### **imazapyr + aminocyclopyrachlor + metsulfuron (Viewpoint)**

**Rate** 13 to 20 oz product/A or for spot application 2.6 to 4.0 oz product/5 gal

**Time** Apply preemergence or early postemergence when plants are actively germinating or growing.

**Remarks** For use on non-agricultural areas (such as airports, highway, railroad and utility rights-of-way, sewage disposal areas, etc.); uncultivated agricultural areas (such as farmyards, fuel storage areas, fencerows, non-irrigation ditchbanks, barrier strips, etc.); industrial sites (such as lumberyards, pipeline and tank farms, etc.); and natural areas (such as wildlife habitats). Do not use plant material treated with this product for mulch or compost.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor (imazapyr and metsulfuron); Group 4: synthetic auxin (aminocyclopyrachlor)

**Chemical family** (imazapyr) Imidazolinone; (aminocyclopyrachlor) Pyrimidine; (metsulfuron) Sulfonylurea

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### **aminocyclopyrachlor + metsulfuron (Streamline)**

**Rate** 4.75 to 9.5 oz product/A or for spot application 0.95 to 1.9 oz product/5 gal

**Time** Apply preemergence or early postemergence when seeds are germinating and seedlings are actively growing.

**Remarks** For non-crop use, including industrial turfgrass. Do not use plant material treated with this product for mulch or compost.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor (metsulfuron); Group 4: synthetic auxin (aminocyclopyrachlor)

**Chemical family** (aminocyclopyrachlor) Pyrimidine; (metsulfuron) Sulfonylurea

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Geranium, shiny (*Geranium lucidum*) and herb Robert (*Geranium robertianum*)

**Remarks** Although PNW data are preliminary, glufosinate, glyphosate, imazapic, imazapyr, metsulfuron, sulfometuron, and triclopyr + 2,4-D gave promising results in initial trials.

**Site of action** (imazapyr, imazapic, metsulfuron, sulfometuron) Group 2: acetolactate synthase (ALS) inhibitor; (glyphosate) Group 9: inhibits EPSP synthase; (triclopyr, 2,4-D) Group 4, synthetic auxin; Group 10: glutamine synthase inhibitor

**Chemical family** (imazapyr, imazapic) imidazolinone; (metsulfuron, sulfometuron) sulfonylurea; (glyphosate) none generally accepted; (2,4-D) Phenoxy acetic acid; (triclopyr) Pyridine; (glufosinate) Phosphinic acid

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Goatgrass, jointed (*Aegilops cylindrica*), barbed (*Aegilops triuncialis*), and ovate (*Aegilops ovata*)

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### glyphosate

**Rate** 0.38 to 0.75 lb ae/A

**Time** Apply to actively growing plants emerged before boot stage.

**Remarks** Use along field edges and other non-cropped areas to prevent spread into bordering fields. Can be used as a spot treatment in certain crops (refer to label).

**Caution** Glyphosate is not selective.

**Site of action** Group 9: inhibits EPSP synthase

**Chemical family** None generally accepted

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### imazapic (Plateau)

**Rate** 0.063 to 0.188 lb/A

**Time** Apply preemergence for best results.

**Remarks** Use lower rates for dry climates and low leaf litter and higher rates as moisture increases and/or leaf litter increases. Selective to most native grasses. Higher rates may suppress seed of some cool-season grasses.

**Caution** Before using, note crop rotation restrictions.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Imidazolinone

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### sulfometuron (Oust)

**Rate** 1 to 1.5 oz ai/A (1.33 to 2 oz/A)

**Time** Apply in fall or in late winter before jointed goatgrass is 3 inches tall.

**Remarks** Selective to wheatgrass and smooth brome. Other desirable grasses may be stunted, stressed, or injured. Consult the label before using.

**Caution** Use on non-cropland such as roadsides. Do not let spray to drift onto sensitive crops.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Sulfonylurea

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Goatsrue (*Galega officinalis*)

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## 2,4-D amine or LV ester

**Rate** 1.9 lb ae/A (2 quarts/A)

**Time** Apply in early to midsummer when plants are in bud stage to full flower stage of growth.

**Remarks** 2,4-D is usually not able to fully control goatsrue, so combining with other products is generally recommended. Retreatment will likely be necessary.

**Caution** Avoid drift to sensitive crops.

**Site of action** Group 4: synthetic auxin

**Chemical family** Phenoxy acetic acid

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## aminopyralid (Milestone)

**Rate** 1.25 oz ae/A (5 fl oz/A)

**Time** Apply in early to midsummer when plants are in bud stage to full flower stage of growth.

**Caution** Do not let spray drift onto desirable vegetation. Many forbs (desirable broadleaf plants) can be seriously injured or killed. Do not exceed 7 fl oz/A Milestone per year.

**Site of action** Group 4: synthetic auxin

**Chemical family** Pyridine

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## aminocyclopyrachlor + chlorsulfuron (Perspective)

**Rate** 4 to 6 oz/A

**Time** Apply in early to midsummer when plants are in bud stage to full flower stage of growth.

**Remarks** Adjuvants can be used; these include methylated seed oils 0.5 to 1% v/v, nonionic surfactants at 0.25 to 1% v/v, and crop oil concentrates at 1% v/v.

**Caution** Do not apply to the root zone of desirable trees and shrubs. May injure or kill some grass species.

**Site of action** (aminocyclopyrachlor) Group 4 synthetic auxin; (chlorsulfuron) Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** (aminocyclopyrachlor) pyridine; (chlorsulfuron) sulfonyleurea

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## aminopyralid + metsulfuron (Opensight)

**Rate** 2.5 to 3.3 oz/A

**Time** Preemergence in autumn, or in spring to rosettes.

**Remarks** Adjuvants can be used; these include methylated seed oils 0.5 to 1% v/v, nonionic surfactants at 0.25 to 1% v/v, and crop oil concentrates at 1% v/v.

**Caution** May injure or kill some grass species.

**Site of action** (aminopyralid) Group 4 synthetic auxin; (metsulfuron) Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** (aminopyralid) Pyridine; (metsulfuron) Sulfonyleurea

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## chlorsulfuron (Telar and others)

**Rate** 0.75 oz ai/A (1 oz/A).

**Time** Apply in early to midsummer when plants are in bud stage to full flower stage of growth.

**Remarks** Add 0.25% by volume of nonionic surfactant to spray mixture.

**Caution** Avoid drift to sensitive crops.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Sulfonyleurea

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### **dicamba (Clarity and others)**

**Rate** 2 lb ae/A (2 quarts/A)

**Time** Apply in early to midsummer when plants are in bud stage to full flower stage of growth.

**Caution** Avoid drift to sensitive crops.

**Site of action** Group 4: synthetic auxin

**Chemical family** Benzoic acid

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### **imazapyr (Arsenal, Habitat)**

**Rate** 8 oz ae/A (2 pints/A)

**Time** Apply in early to midsummer when plants are in bud stage to full flower stage of growth.

**Remarks** Add 0.25% by volume of nonionic surfactant, or 1 to 2 pints/A methylated seed soil or crop oil concentrate to spray mixture.

**Caution** Imazapyr is nonselective; spray will injure or kill vegetation contacted.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Imidazolinone

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### **metsulfuron (Escort and others)**

**Rate** 0.6 oz ai/A (1 oz/A)

**Time** Apply in early to midsummer when plants are in bud stage to full flower stage of growth.

**Remarks** Add 0.25% by volume of nonionic surfactant to spray mixture. Application sites differ between products; consult labels.

**Caution** Avoid contacting sensitive crops. Apply only to pasture, rangeland, and non-crop sites.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Sulfonylurea

---

### **picloram (Tordon)**

**Rate** 0.5 oz ae/A

**Time** Apply in early to midsummer when plants are in bud stage to full flower stage of growth.

**Caution** **Most formulations are restricted-use herbicides.** See label for grazing restrictions. Do not contaminate water. Potatoes, beans, and many other crops are very sensitive to picloram. Do not use in diversified cropping areas. At rates above 0.5 lb ae/A (1 quart/A), apply only as spot treatment not to exceed 25% of a landowner's acreage in a given watershed in a single season.

**Site of action** Group 4: synthetic auxin

**Chemical family** Pyridine

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### Gorse (*Ulex europeaus*)

Control gorse in two stages. First, control established plants. Second, control new plants emerging from seeds that may have been resting in the soil for as long as 30 years. The most effective control program usually combines herbicides, burning, and cultivation or mowing. Establishing competitive pasture species, forest trees, or other crops helps resist gorse invasion as well as other weeds. A publication on the biology and control of gorse (*Gorse*, PNW 379, revised July 2001) is available from the Extension Service. When using herbicides, it is crucial to thoroughly wet foliage. Best timing is after bloom drop, but applications at other times usually give good control also.

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### **2,4-D LV ester (several products)**

**Rate** 0.75 to 1.5 lb ae/A or 0.5 to 1% concentration for handgun sprayer application.

**Time** Apply to actively growing plants after bloom drop in the spring.

**Caution** Do not let spray drift onto agricultural crops. Do not graze dairy animals within 7 days after application.

**Site of action** Group 4: synthetic auxin

**Chemical family** Phenoxy acetic acid

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### **aminocyclopyrachlor + metsulfuron methyl (Streamline)**

**Rate** 3.8 to 4.5 oz/A aminocyclopyrachlor + 1.2 to 1.4 oz/A metsulfuron (9.5 to 11.5 oz/A of product)

**Time** Apply to actively growing woody plants.

**Remarks** Adjuvants can be used; these include methylated seed oils 0.5 to 1% v/v, nonionic surfactants at 0.25 to 1% v/v, and crop oil concentrates at 1% v/v. Can be applied using an invert emulsion rather than water. There are several application methods that dictate the amount of product to be mixed with the carrier, so consult the label. In addition to woody species, controls many herbaceous species.

**Caution** Even low rates can kill nontarget tree and shrub species, so avoid application within a distance equal to the tree height of the sensitive species. Conifers can be injured, these include ponderosa pine, Douglas fir, Norway spruce, and white pine. Other trees that can be injured include aspen, Chinese tallow, cottonwoods, honey locust, magnolia, poplars, redbud, silver maple, and willow. Applications to stressed plants may reduce control. Do not allow spray to drift off target.

**Site of action** Group 4 synthetic auxin (aminocyclopyrachlor) Group 2: ALS inhibitor (metsulfuron methyl)

**Chemical family** Phenoxy acetic acid (aminocyclopyrachlor); sulfonyleurea (metsulfuron methyl)

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### **dicamba (Clarity, Rifle)**

**Rate** 0.75 to 1.5 lb ae/A or 0.5% to 1% concentration for handgun sprayer application.

**Time** Apply to actively growing plants after bloom drop in the spring.

**Caution** No waiting period between treatment and grazing for nonlactating animals (see label for restrictions on dairy animals). Remove meat animals from treated areas 30 days before slaughter. Rates above 2 lb ai/A may temporarily injure many grass species. Newly seeded grass (see label) may be injured at rates above 0.75 lb ai/A. Do not exceed 8 lb ai/A per season. Kills legumes.

**Site of action** Group 4: synthetic auxin

**Chemical family** Benzoic acid

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### **glyphosate**

**Rate** 1.5 to 3 lb ae/A or 1.5 to 2% solution for handgun sprayer application.

**Time** Apply to actively growing plants after bloom drop in the spring.

**Remarks** Adding a recommended surfactant improves results.

**Caution** Glyphosate kills grasses and most other desirable species needed to compete with new gorse plants.

**Site of action** Group 9: inhibits EPSP synthase

**Chemical family** None generally accepted

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### **metsulfuron (Escort and others)**

**Rate** Escort: use 0.6 oz ai/A (1 oz/A)

**Time** Apply to actively growing plants after bloom drop in spring.

**Remarks** Include a silicon-based surfactant. Application sites differ among products; consult labels.

**Caution** Do not let spray drift onto agricultural crops. Apply only to pasture, rangeland, and non-crop sites.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Sulfonylurea

---

### **picloram (Tordon)**

**Rate** 0.5% concentration for application with a handgun sprayer.

**Time** Apply to actively growing plants after bloom drop in the spring.

**Remarks** Adding a suitable surfactant at 0.25 to 0.5% will improve results.

**Caution** **Most formulations are restricted-use.** Refer to labels for grazing restrictions. Avoid drift to sensitive crops.

**Site of action** Group 4: synthetic auxin

**Chemical family** Pyridine

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### **triclopyr ester (Garlon 4 or Remedy) or triclopyr amine (Garlon 3A) or triclopyr + 2,4-D ester (Crossbow)**

**Rate** 0.5% to 2% concentration for application with a handgun sprayer.

**Time** Apply to actively growing plants after bloom drop in the spring. Garlon 4 and Crossbow can be used for basal bark applications any time of year.

**Remarks** Adding 0.25% to 0.5% of a suitable surfactant to Garlon 3A improves results. No surfactant is needed with Garlon 4 or Remedy. Use the higher rates on larger plants and on solid stands of old plants.

**Caution** Garlon products are registered for use on rights-of-way, industrial sites, and forestry (release and site preparation). Crossbow and Remedy can be used on permanent pastures and rangeland up to 1.5 lb ae/A. Observe all grazing and harvesting restrictions.

**Site of action** Group 4: synthetic auxin

**Chemical family** (triclopyr) Pyridine; (2,4-D) Phenoxy acetic acid

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### Gumweed (*Grindelia squarrosa*)

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#### **2,4-D LV ester**

**Rate** 2 lb ae/A

**Time** Apply in early spring when new growth and seedlings are fully emerged.

**Remarks** After plants reach the bloom stage, control decreases.

**Caution** Avoid drift to sensitive crops.

**Site of action** Group 4: synthetic auxin

**Chemical family** Phenoxy acetic acid

---

#### **dicamba (Clarity, Rifle)**

**Rate** 0.5 lb ae/A

**Time** Apply in early spring from emergence to flower bud stage.

**Remarks** May be mixed with 2,4-D to get better control.

**Caution** Avoid drift to sensitive crops.

**Site of action** Group 4: synthetic auxin

**Chemical family** Benzoic acid

---

#### **metsulfuron (Escort and others)**

**Rate** Escort: use 0.6 to 1.2 oz ai/A (1 to 2 oz/A)

**Time** Apply to actively growing gumweed in the spring.

**Remarks** Using a silicone or nonionic surfactant enhances control. Application sites differ among products at the above rates; consult labels.

**Caution** Do not let spray drift onto sensitive crops. Apply only to pasture, rangeland, and non-crop sites.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Sulfonylurea

---

### picloram (Tordon)

**Rate** 0.25 lb ae/A

**Time** Apply in early spring after plants have emerged.

**Caution** **Most formulations are restricted-use herbicides.** See label for grazing restrictions. Avoid drift to potatoes, beans, and many other sensitive broadleaf crops. Do not contaminate water. Do not use picloram in diversified crop areas.

**Site of action** Group 4: synthetic auxin

**Chemical family** Pyridine

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### Halogeton (*Halogeton glomeratus*)

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#### 2,4-D LV ester

**Rate** 1 to 2 lb ae/A

**Time** Apply in early spring when plants are actively growing before bloom stage.

**Remarks** Halogeton is poisonous to livestock. Chemical control is effective but will be futile unless desirable plants occupy the site immediately.

**Caution** Following application, do not graze until after plants dry up.

**Site of action** Group 4: synthetic auxin

**Chemical family** Phenoxy acetic acid

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#### aminocyclopyrachlor + chlorsulfuron (Perspective)

**Rate** 1.2 to 1.8 oz/A aminocyclopyrachlor + 0.5 to 0.7 oz/A chlorsulfuron (3 to 4.5 oz/A of product)

**Time** Apply to actively growing vegetation.

**Remarks** Adjuvants can be used; these include methylated seed oils 0.5 to 1% v/v, nonionic surfactants at 0.25 to 1% v/v, and crop oil concentrates at 1% v/v. Can be applied using an invert emulsion rather than water.

**Caution** Even low rates can kill nontarget tree and shrub species, so avoid application within a distance equal to the tree height of the sensitive species. Do not allow spray to drift off target. Can injure several grass species including bromes, as well as basin wildrye.

**Site of action** (aminocyclopyrachlor) Group 4 synthetic auxin (chlorsulfuron) Group 2: ALS inhibitor

**Chemical family** (aminocyclopyrachlor) Pyrimidine carboxylic acid; (chlorsulfuron) Sulfonylurea

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#### imazapic (Plateau)

**Rate** 0.063 to 0.188 lb/A

**Time** Apply preemergence or early postemergence.

**Remarks** For postemergence timing, use at least 0.094 lb/A plus a surfactant. Selective to most native grasses. Higher rates may suppress seed of some cool-season grasses.

**Caution** Before using, note crop rotation restrictions.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Imidazolinone

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**metsulfuron (Escort and others)**

**Rate** Escort: 0.45 oz ai/A (0.75 oz/A)

**Time** Apply to actively growing halogeton.

**Remarks** Use a surfactant. Application sites differ among products at the above rate; consult labels.

**Caution** Do not let spray drift onto sensitive crops. Apply only to pasture, rangeland, and non-crop sites.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Sulfonylurea

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Hawkweed, mouseear (*Hieracium pilosella*)

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**2,4-D (various products) or MCPA (various products) or clopyralid (Transline)**

**Remarks** Reported to control this plant, although data are lacking in the Pacific Northwest. Follow label instructions.

**Site of action** (all) Group 4: synthetic auxin

**Chemical family** (2,4-D and MCPA) phenoxy acetic acid; (clopyralid) pyridine

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Hawkweed, orange (*Hieracium aurantiacum*), meadow (*Hieracium caespitosum*), and other non-native species and hybrids

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**2,4-D (various products)**

**Rate** 1.43 to 1.9 lb ae/A

**Time** Apply to growing hawkweed before buds form.

**Remarks** These species may need re-treating and/or the higher rate even under ideal conditions.

**Caution** Product injures or kills sensitive broadleaf forages. Do not contaminate water.

**Site of action** Group 4: synthetic auxin

**Chemical family** Phenoxy acetic acid

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**aminopyralid (Milestone)**

**Rate** 1 to 1.5 oz ae/A (4 to 6 fl oz/A Milestone)

**Time** Apply to actively growing plants in the bolting stage of growth. Fall treatments are not effective.

**Remarks** A nonionic surfactant at 1 to 2 quarts per 100 gal of spray enhances control under adverse environmental conditions.

**Caution** Do not allow drift to desirable vegetation. Many forbs (desirable broadleaf plants) can be seriously injured or killed. Do not exceed 7 fl oz/A Milestone per year.

**Site of action** Group 4: synthetic auxin

**Chemical family** Pyridine

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**clopyralid (Transline or Stinger)**

**Rate** 0.25 to 0.375 lb ae/A (0.66 to 1 pint/A)

**Time** Apply after most basal leaves emerge but before buds form. Fall treatments are not effective.

**Remarks** Consult labels for specific site registrations.

**Caution** Product injures or kills sensitive broadleaf forages. Do not contaminate water.

**Site of action** Group 4: synthetic auxin

**Chemical family** Pyridine

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**clopyralid + 2,4-D amine (Curtail)**

**Rate** 2 quarts/A Curtail

**Time** Apply after most basal leaves emerge but before buds form. Fall treatments are not effective.

**Remarks** Consult label for specific site registrations.

**Caution** Product injures or kills sensitive broadleaf forages. Do not contaminate water.

**Site of action** (both) Group 4: synthetic auxin

**Chemical family** (clopyralid) pyridine; (2,4-D) phenoxy acetic acid

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**dicamba (Clarity)**

**Rate** 2 lb ae/A (2 quarts/A)

**Time** Apply to growing hawkweed before flowering.

**Remarks** Re-treat as needed but do not exceed 2 lb ae/A per season.

**Caution** This product will injure or kill sensitive broadleaf forages. Do not contaminate water. See label for timing restrictions for lactating dairy animals. Remove animals for slaughter from treated areas at least 30 days before slaughter.

**Site of action** Group 4: synthetic auxin

**Chemical family** Benzoic acid

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**picloram (Tordon 22K)**

**Rate** 0.25 lb ae/A (1 pint/A)

**Time** Apply after most basal leaves emerge but before buds form. Fall treatments also may be effective, but research is limited.

**Remarks** Consult label for specific site registrations.

**Caution** Product will injure or kill sensitive broadleaf forages. Do not contaminate water.

**Site of action** Group 4: synthetic auxin

**Chemical family** Pyridine

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**triclopyr + clopyralid (Redeem R&P)**

**Rate** 3 to 4 pints/A

**Time** Apply when weeds are actively growing.

**Remarks** Add a nonionic surfactant at surfactant manufacturer's recommended rate. Apply in at least 10 gal/A water by ground.

**Caution** Do not exceed 4 pints/A per year. Do not allow drift to desirable vegetation. Note label restrictions on overseeding or reseeding.

**Site of action** (both) Group 4: synthetic auxin

**Chemical family** (both) Pyridine

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Hawthorn, English (*Crataegus monogyna*)

**Remarks** Although PNW data are lacking, cut stem applications with glyphosate, triclopyr, or imazapyr will likely be effective.

**Site of action** (imazapyr) Group 2: acetolactate synthase (ALS) inhibitor; (glyphosate) Group 9: inhibits EPSP synthase; (triclopyr) Group 4: synthetic auxin

**Chemical family** (imazapyr) imidazolinone; (glyphosate) none generally accepted; (triclopyr) pyridine

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Heath, Spanish (*Erica lusitanica*)

**Remarks** Although PNW data are lacking, glyphosate, metsulfuron, picloram, and triclopyr are used for control of Spanish heath in New Zealand.

**Site of action** (metsulfuron) Group 2: acetolactate synthase (ALS) inhibitor; (glyphosate) Group 9: inhibits EPSP synthase; (picloram, triclopyr) Group 4: synthetic auxin

**Chemical family** (metsulfuron) Sulfonylurea; (glyphosate) none generally accepted; (picloram, triclopyr) Pyridine

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### Hemlock, poison (*Conium maculatum*)

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#### **2,4-D or MCPA**

**Rate** 1.5 lb ae/A

**Time** Apply in seedling to rosette stage of growth.

**Remarks** Most effective soon after plants emerge. Adding a wetting agent may enhance control.

**Caution** Do not graze treated area until plants have dried up after spraying.

**Site of action** Group 4: synthetic auxin

**Chemical family** Phenoxy acetic acid

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#### **aminocyclopyrachlor + chlorsulfuron (Perspective)**

**Rate** 1.8 to 3.2 oz/A aminocyclopyrachlor + 0.7 to 1.3 oz/A chlorsulfuron (4.5 to 8 oz/A of product)

**Time** Apply to broadleaf weeds in spring.

**Remarks** Adjuvants can be used; these include methylated seed oils 0.5 to 1% v/v, nonionic surfactants at 0.25 to 1% v/v, and crop oil concentrates at 1%v/v. Can be applied using an invert emulsion rather than water.

**Caution** Even low rates can kill nontarget tree and shrub species, so avoid application within a distance equal to the tree height of the sensitive species. Do not allow spray to drift off target. Can injure several grass species including bromes, as well as basin wildrye.

**Site of action** (aminocyclopyrachlor) Group 4 synthetic auxin; (chlorsulfuron) Group 2: ALS inhibitor

**Chemical family** (aminocyclopyrachlor) Pyrimidine carboxylic acid; (chlorsulfuron) Sulfonylurea

---

#### **glyphosate**

**Rate** 0.75 lb ae/A

**Time** Apply to actively growing plants before they begin to bolt.

**Remarks** Glyphosate is nonselective and will injure or kill grass that might compete with new hemlock seedlings.

**Site of action** Group 9: inhibits EPSP synthase

**Chemical family** None generally accepted

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#### **glyphosate (Roundup Pro Concentrate)**

**Rate** Inject 5 ml of a 5% v/v solution into each leaf cane

**Time** Inject with a hand-held device into one leaf cane per plant, 10 to 12 inches above root crown.

**Remarks** Mark each plant when injecting it, to avoid re-treating.

**Caution** Non-Crop use only. Total of all treatments must not exceed 8.5 quarts/A of Roundup Pro Concentrate or 1,600 plants/A.

**Site of action** Group 9: inhibits EPSP synthase

**Chemical family** None generally accepted

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#### **metsulfuron (Escort and others)**

**Rate** Escort: 0.6 oz ai/A (1 oz/A)

**Time** Apply to actively growing plants.

**Remarks** Use a nonionic surfactant or silicone surfactant. Application sites differ between products; consult labels.

**Caution** Prevent drift to sensitive plants. Apply only to pasture, rangeland, and non-crop sites.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Sulfonylurea

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Henbane, black (*Hyocycamus niger*)

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### **dicamba (Clarity)**

*Idaho only*

**Rate** 0.125 to 0.375 lb ai/A (1 to 3 pints/A Clarity)

**Time** Apply when plants are in rosette stage of growth. Use higher rates when treating dense or tall vegetative growth.

**Remarks** This is a Sandoz Agro, Inc. 2(ee) recommendation for use only within Idaho.

**Caution** Avoid drift to sensitive crops.

**Site of action** Group 4: synthetic auxin

**Chemical family** Benzoic acid

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### **metsulfuron (Escort and others)**

**Rate** Escort: 0.3 to 0.45 oz ai/A (0.5 to 0.75 oz/A)

**Time** Apply to actively growing plants.

**Remarks** Using a nonionic or silicone surfactant will increase effectiveness. Application sites differ between products; consult label.

**Caution** Apply only to pasture, rangeland, and non-crop sites.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Sulfonylurea

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### **picloram (Tordon)**

**Rate** 0.25 to 0.5 lb ai/A (1 to 2 pints/A Tordon)

**Time** Apply in spring when actively growing before full bloom, or in late summer.

**Remarks** Tank mix 1 lb ae/A of 2,4-D with the lower rate of picloram.

**Caution** **Most formulations are restricted-use herbicides.** Do not apply if circumstances favor movement from treatment site.

**Site of action** Group 4: synthetic auxin

**Chemical family** Pyridine

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Hogweed, giant (*Heracleum mantegazzianum*)

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### **glyphosate**

**Rate** 1.5 lb ae/A

**Time** Apply in spring during the bolting stage.

**Remarks** Avoid physical contact with the plant.

**Caution** Controls grasses as well as other vegetation in treated area.

**Site of action** Group 9: inhibits EPSP synthase

**Chemical family** None generally accepted

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### **glyphosate (Roundup Pro Concentrate)**

**Rate** Inject 5 ml of a 5% v/v solution into each leaf cane.

**Time** Inject with a hand-held device, into one leaf cane per plant 12 inches above root crown.

**Remarks** Mark each plant when injecting it, to avoid re-treating the same plant.

**Caution** Non-crop use only. Total of all treatments must not exceed 8.5 quarts/A of Roundup Pro Concentrate or 1,600 plants/A.

**Site of action** Group 9: inhibits EPSP synthase

**Chemical family** None generally accepted

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### **imazapic (Plateau)**

**Rate** 0.188 lb ai/A

**Time** Apply in spring during the bolting stage.

**Remarks** Avoid physically contacting plant when applying. Add an appropriate adjuvant to spray mix.

**Caution** Consult label on where Plateau can be used. Before using, note crop rotation restrictions.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Imidazolinone

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### Holly, English (*Ilex aquifolium*)

Methods of control include pulling, and herbicides applied to cut stumps, cut surfaces (such as hack and squirt), by injection into the stem, and as (topical) basal bark/stem treatments (12 to 15 inches above ground cut). Pulling is partially effective if stems are very small. Refer to the forestry section (M) in this handbook for more complete discussion about specific application methods and rates..

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### **glyphosate**

**Rate** 0.75 to 1.5 lb ae/A

**Time** Fall and late spring

**Remarks** 50% control if applied to frilled stems. Cut stump treatments may result in excessive sprouting with very poor long-term control. Fall treatment most effective. Injection and hack and squirt applications of glyphosate into stems may be more effective in the spring than in the fall

**Site of action** Group 9: inhibits EPSP synthase

**Chemical family** Glycine

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### **imazapyr (Arsenal, Chopper, Ez-Ject Copperhead Herbicide Shells)**

**Rate** Cut stump treatment: undiluted

Cut Surface Applications (hack and squirt): 1 ml of 50% solution at intervals of 3 to 4 inches between cuts

**Injection:** 1 ml of dilute solution in each injection, separated by no more than 3 inches.

**Time** Fall or late spring

**Remarks** Very effective If injected into stem. No more than 1.5 lb ae/A/yr (96 fluid oz/A).

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Imidazolinone

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### triclopyr (Element 4, Garlon 4 or Garlon 3A)

**Rate** Cut stump treatment: Undiluted

**Cut Surface Applications (hack and squirt):** 1 ml of 50 to 100% solution at intervals of 3 to 4 inches between cuts.

**Basal bark treatment:** 20 to 30% solution in oil (low volume) or 1 to 5 % solution in oil (high volume)

**Injection:** 1/2 to 1 ml of undiluted Garlon 3A at intervals of 3 to 4 inches between centers of the injector wound

**Time** Fall and late spring

**Remarks** Applying triclopyr to frilled stems is very effective in both seasons. May be applied at a rate of up to 6 lb ae of triclopyr per acre per year.

**Site of action** Group 4: synthetic auxin

**Chemical family** Pyridine

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Horsebrush, gray or spineless (*Tetradymia canescens*)

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### 2,4-D LV ester

**Rate** 2.5 lb ae/A

**Time** Apply in early spring when plants are actively growing.

**Remarks** Spot treatment only. Re-treatments are necessary to control this resprouting species. Mechanical treatments must control roots 4 to 6 inches deep.

**Caution** This plant is poisonous. Do not graze treated areas until plants have dried up after 2,4-D application.

**Site of action** Group 4: synthetic auxin.

**Chemical family** Phenoxy acetic acid

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Horsetail, field (*Equisetum arvense*)

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### aminocyclopyrachlor + chlorsulfuron (Perspective)

**Rate** 1.8 to 3.2 oz/A aminocyclopyrachlor + 0.7 to 1.3 oz/A chlorsulfuron (4.5 to 8 oz/A of product)

**Time** Apply to actively growing plants in spring.

**Remarks** Adjuvants can be used; these include methylated seed oils 0.5 to 1% v/v, nonionic surfactants at 0.25 to 1% v/v, and crop oil concentrates at 1%v/v. Can be applied using an invert emulsion rather than water.

**Caution** Even low rates can kill nontarget tree and shrub species, so avoid application within a distance equal to the tree height of the sensitive species. Do not allow spray to drift off target. Can injure several grass species including bromes, as well as basin wildrye.

**Site of action** (aminocyclopyrachlor) Group 4: Synthetic auxin; (chlorsulfuron) Group 2: ALS inhibitor

**Chemical family** (aminocyclopyrachlor) Pyrimidine carboxylic acid; (chlorsulfuron) Sulfonylurea

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### chlorsulfuron (Telar)

**Rate** 1 to 1.5 oz ai/A (1.33 to 2 oz/A)

**Time** May be applied preemergence or early postemergence.

**Remarks** Do not apply to frozen ground. Maintain constant agitation while mixing in spray solution. Add 0.25% v/v nonionic surfactant to the spray mixture. Application rates up to 1 oz ai/A (1.33 oz/A allowed on pasture, rangeland, and Conservation Reserve Program (CRP) sites. Rates above 1 oz ai/A (1.33 oz/A) allowed only on non-cropland.

**Caution** Avoid contact with sensitive crops. Do not treat powdery, dry soils and light, sandy soils unless rain is likely after treatment.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Sulfonylurea

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### **dichlobenil (Casoron)**

**Rate** 4 lb ai/A granular formulation

**Time** Apply in winter or early spring, when moisture is available to leach chemical into soil. In landscape plantings, apply any time and place bark mulch over the treated area to reduce volatilization.

**Remarks** Good selective control in many fruits and ornamental plants. Use as a follow-up, supplemental treatment if horsetail resists many soil-applied herbicides. Can apply over labeled ornamental plants or conifer tree nurseries. Apply midwinter immediately before a cold rain to reduce volatility and enhance weed suppression. Weigh and distribute uniformly exact quantities over precisely measured areas. Oregon results over 9 years suggest that perennial weeds can be suppressed with 4-, 3-, and 2-lb ai/A rates applied in 3 consecutive years. Grazing livestock is prohibited. (Inhibits cellulose and cell wall formation.)

**Caution** See label for precautions on ornamental species and varieties tolerant of dichlobenil.

**Site of action** Group 20: inhibits cell wall synthesis Site A

**Chemical family** Nitrile

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### **MCPA**

**Rate** 1 to 2 lb ae/A

**Time** Apply when horsetail fully emerges and before grain or grass is in boot stage.

**Remarks** Gives 20 to 30% reduction in field horsetail stands with each spray application. Re-treatments are necessary and may be most effective with more than one application per year. The second application can be to the stubble after harvesting grain fields.

**Caution** Apply once or twice per year until horsetail is controlled. Skipping a year means losing the control gained up to that time.

**Site of action** Group 4: synthetic auxin

**Chemical family** Phenoxy acetic acid

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### Horseweed (Marestail) (*Conyza canadensis*)

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#### **2,4-D LV ester**

**Rate** 1 lb ae/A

**Time** Apply when horseweed is in the seedling to rosette stage of growth.

**Remarks** Plants should be actively growing at time of treatment.

**Caution** Avoid drift to sensitive crops and desirable vegetation. This product will injure or kill sensitive broadleaf plants.

**Site of action** Group 4: synthetic auxin

**Chemical family** Phenoxy acetic acid

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#### **aminocyclopyrachlor + chlorsulfuron (Perspective)**

**Rate** 1.8 to 3.2 oz/A aminocyclopyrachlor + 0.7 to 1.3 oz/A chlorsulfuron (4.5 to 8 oz/A of product)

**Time** Apply to actively growing plants in spring.

**Remarks** Adjuvants can be used; these include methylated seed oils 0.5 to 1% v/v, nonionic surfactants at 0.25 to 1% v/v, and crop oil concentrates at 1%v/v. Can be applied using an invert emulsion rather than water.

**Caution** Even low rates can kill nontarget tree and shrub species, so avoid application within a distance equal to the tree height of the sensitive species. Do not allow spray to drift off target. Can injure several grass species including bromes, as well as basin wildrye.

**Site of action** (aminocyclopyrachlor) Group 4 synthetic auxin; (chlorsulfuron) Group 2: ALS inhibitor

**Chemical family** (aminocyclopyrachlor) Pyrimidine carboxylic acid; (chlorsulfuron) Sulfonylurea

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### **aminopyralid (Milestone)**

**Rate** 1 to 1.5 oz ae/A (4 to 6 fl oz/A Milestone)

**Time** Apply to actively growing plants.

**Remarks** A nonionic surfactant at 1 to 2 quarts per 100 gal of spray enhances control under adverse environmental conditions

**Caution** Do not allow drift to desirable vegetation. Many forbs (desirable broadleaf plants) can be seriously injured or killed. Do not exceed 7 fl oz/A Milestone per year.

**Site of action** Group 4: synthetic auxin

**Chemical family** Pyridine

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### **clopyralid (Stinger or Transline)**

**Rate** 0.125 to 0.188 lb ae/A

**Time** Apply to actively growing plants up to the five-leaf stage.

**Remarks** See label for registered sites.

**Caution** Consult label for crop rotation restrictions before using these products. Several crops may be injured up to 4 years after application.

**Site of action** Group 4: synthetic auxin

**Chemical family** Pyridine

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### **dicamba (Clarity)**

**Rate** 0.25 lb ae/A

**Time** Apply in the seedling to rosette stage.

**Remarks** Plants should be actively growing at time of application.

**Caution** Avoid drift to sensitive crops and desirable vegetation. This product will injure or kill sensitive broadleaf plants.

**Site of action** Group 4: synthetic auxin

**Chemical family** Benzoic acid

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### **diflufenzopyr + dicamba (Distinct)**

**Rate** 4 oz/A

**Time** Apply in the seedling to rosette stage.

**Remarks** Plants should be actively growing at time of application.

**Caution** Avoid drift to sensitive crops and desirable vegetation. This product will injure or kill sensitive broadleaf plants.

**Site of action** (diflufenzopyr) Group 19: inhibits indole acetic acid transport; (dicamba) Group 4: synthetic auxin

**Chemical family** (diflufenzopyr) Semicarbazone; (dicamba) Benzoic acid

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### **flumioxazin (Chateau or Payload)**

**Rate** 2 to 6 oz ai/A (4 to 12 oz/A). Rate depends on application timing and soil type and organic matter.

**Time** May be applied preemergence or postemergence to small, actively growing horseweed.

**Remarks** Preemergence treatments require rain to move into the soil. Can be used in several crops.

**Caution** Note recropping restriction intervals on the label.

**Site of action** Group 14: protoporphyrinogen oxidase inhibitor

**Chemical family** N-phenylphthalimide

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### glyphosate

**Rate** 0.75 to 1.5 lb ae/A

**Time** Apply while horseweed is actively growing and less than 12 inches tall.

**Remarks** Glyphosate-resistant horseweed is reported throughout the United States.

**Caution** Controls grasses as well as other vegetation in treated area.

**Site of action** Group 9: inhibits EPSP synthase

**Chemical family** None generally accepted

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### Houndstongue (*Cynoglossum officinale*)

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#### 2,4-D LV ester

**Rate** 2 lb ae/A

**Time** Early spring to actively growing plants before they bloom.

**Remarks** Sticky seeds can contaminate wool. Mowing before seed production helps alleviate wool contamination.

**Caution** Avoid drift to sensitive crops.

**Site of action** Group 4: synthetic auxin

**Chemical family** Phenoxy acetic acid

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#### aminocyclopyrachlor + chlorsulfuron (Perspective)

**Rate** 1.8 to 3.2 oz/A aminocyclopyrachlor + 0.7 to 1.3 oz/A chlorsulfuron (4.5 to 8 oz/A of product)

**Time** Apply to actively growing plants in spring.

**Remarks** Adjuvants can be used; these include methylated seed oils 0.5 to 1% v/v, nonionic surfactants at 0.25 to 1% v/v, and crop oil concentrates at 1% v/v. Can be applied using an invert emulsion rather than water.

**Caution** Even low rates can kill nontarget tree and shrub species so avoid application within a distance equal to the tree height of the sensitive species. Do not allow spray to drift off target. Can injure several grass species including bromes, as well as basin wildrye.

**Site of action** (aminocyclopyrachlor) Group 4: synthetic auxin; (chlorsulfuron) Group 2: ALS inhibitor

**Chemical family** (aminocyclopyrachlor) Pyrimidine carboxylic acid; (chlorsulfuron) Sulfonylurea

---

#### imazapic (Plateau)

**Rate** 0.125 to 0.188 lb/A

**Time** Apply to actively growing plants.

**Remarks** Use lower rates if rosettes are small; increase rate if rosettes are large or bolting. Selective to most native grasses. Higher rates may suppress seed of some cool-season grasses.

**Caution** Before using, note crop rotation restrictions.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Imidazolinone

---

#### metsulfuron (Escort and others)

**Rate** Escort: 0.6 oz ai/A (1 oz/A)

**Time** Any time plants are growing well.

**Remarks** Application sites differ between products; see labels.

**Caution** Apply only to pasture, rangeland, and non-crop sites.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Sulfonylurea

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### **picloram (Tordon)**

**Rate** 0.5 lb ae/A

**Time** Any time plants are growing well.

**Remarks** Reported to give fair to good control.

**Caution** Most formulations are restricted-use herbicides.

**Site of action** Group 4: synthetic auxin

**Chemical family** Pyridine

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### Indigobush (*Amorpha fruticosa*)

**Remarks** Although PNW data are preliminary, aminopyralid, clopyralid, glyphosate, imazapyr, and triclopyr + 2,4-D applied as cut stem treatments gave promising results in initial trials. Foliar application of clopyralid also resulted in excellent control.

**Site of action** (imazapyr) Group 2: acetolactate synthase (ALS) inhibitor; (glyphosate) Group 9: inhibits EPSP synthase; (2,4-D, aminopyralid, clopyralid, triclopyr) Group 4: synthetic auxin

**Chemical family** (imazapyr) imidazolinone; (glyphosate) none generally accepted; (2,4-D) phenoxy acetic acid; (aminopyralid, clopyralid, triclopyr) pyridine

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### Iris, wild (*Iris* spp.)

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### **2,4-D LV ester**

**Rate** 5 lb ae 2,4-D in 100 gal water

**Time** Apply in the early bloom stage.

**Remarks** Foliage must be thoroughly wet.

**Caution** Avoid drift to sensitive crops.

**Site of action** Group 4: synthetic auxin

**Chemical family** Phenoxy acetic acid

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### **glyphosate**

*Product labeled for aquatic sites*

**Rate** 5% solution of a 4 lb ae (5.4 lb ai) glyphosate

**Time** Apply prebloom or in the fall.

**Remarks** Use a nonionic surfactant recommended for aquatic sites

**Caution** Glyphosate is nonselective and may injure or kill desirable species.

**Site of action** Group 9: inhibits EPSP synthase

**Chemical family** None generally accepted

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### **imazapic (Plateau)**

**Rate** 0.188 lb ae/A

**Time** Apply postemergence at the late boot or bloom stage.

**Remarks** Use a methylated seed oil at 1 quart/A; do not exceed 25 gal/A spray volume.

**Caution** Before using, note crop rotation restrictions.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Imidazolinone

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### **imazapyr (Habitat)**

**Rate** 0.75% v/v product

**Time** Apply prebloom or in the fall.

**Remarks** Use a surfactant the label recommends.

**Caution** Before use, note rotation and other restrictions on label

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Imidazolinone

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### **metsulfuron (Escort and others)**

**Rate** Escort: 0.6 ai/A (1 oz/A)

**Time** Apply to actively growing plants.

**Remarks** Use a surfactant to increase effectiveness. Application sites differ among products; consult labels.

**Caution** Apply only to pasture, rangeland, and non-crop sites.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Sulfonylurea

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Ivy, common or English (*Hedera helix*)

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### **triclopyr amine (Garlon 3A, Brush-B-Gone, or Brush Killer) or triclopyr ester (Garlon 4, Pathfinder, or Vinex) or glyphosate (Accord, Glypro, or Rodeo)**

**Rate** at least 41% active ingredient (3 lb ae or 4 lb ai) glyphosate

**Remarks** Basal bark application: apply 33% dilution of triclopyr or glyphosate to exposed stems after stripping the leaves from stems near ground level.

Cut stem application (most effective method): cut each vine stem close to the ground and treat freshly cut surfaces (preferably within 5 minutes) with a 33% solution of triclopyr amine or glyphosate mixed in water. Do not dilute products such as Brush-B-Gone and Brush Killer. Roundup Pro Concentrate (50.2% formulation) may be diluted with water.

Foliar application From summer to fall, foliar-apply a 2 to 5% solution of triclopyr ester mixed in water with a nonionic surfactant. Fully coat foliage. Some control may be possible with glyphosate as a 2 to 4% dilution using at least a 41% (3 lb ae or 4 lb ai glyphosate), but repeat applications will probably be necessary. Broadcast applications of triclopyr will cause less damage to desirable grasses.

Manual and mechanical Pull vines on the ground by hand and discard. Cut vines will root easily. Cut climbing vines near the ground, then pry the vines from the tree or structure. Once the vines are cut they will eventually die and fall from the tree, usually after the first extended hot and dry period. Occasionally vines will be embedded in the trunk of the tree. This makes control by both hand and chemicals very difficult; continual removal of sprouts will be needed.

**Site of action** (triclopyr) Group 4: synthetic auxin; (glyphosate) Group 9: inhibits EPSP.

**Chemical family** (triclopyr) pyridine; (glyphosate) none generally accepted

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Jimsonweed (*Datura stramonium*)

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**2,4-DB (Butyrac) or  
alachlor (Lasso) or  
atrazine (AAtrex) or  
bromoxynil (Buctril) or  
clomazone (Command) or  
clopyralid (Stinger or Transline) or  
diuron (Karmex) or  
glyphosate or  
metolachlor (Dual) or  
metribuzin (Sencor)  
oxyfluorfen (Goal) or  
paraquat (Gramoxone Max) or  
picloram (Tordon) or  
terbacil (Sinbar)**

**Remarks** Reported to control this plant, although data are lacking in the Pacific Northwest. Follow label instructions.

**Site of action** (alachlor and metolachlor) Group 15: unknown; (atrazine, metribuzin, and terbacil) Group 5: photosystem II inhibitor; (bromoxynil) Group 6: photosystem II inhibitor; (clomazone) Group 13: inhibits DOXP synthase; (clopyralid, picloram, and 2,4-DB) Group 4: synthetic auxin; (diuron) Group 7: photosystem II inhibitor; (glyphosate) Group 9: inhibits EPSP synthase; (oxyfluorfen) Group 14: protoporphyrinogen oxidase inhibitor; (paraquat) Group 22: photosystem I electron diverter

**Chemical family** (alachlor and metolachlor) chloroacetamide; (atrazine) triazine; (bromoxynil) nitrile; (clomazone) isoxazolidone; (clopyralid and picloram) pyridine; (diuron) urea; (glyphosate) none generally accepted; (metribuzin) triazinone; (oxyfluorfen) diphenylether; (paraquat) bipyridilium; (terbacil) uracil; (2,4-DB) phenoxy acetic acid

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### Johnsongrass (*Sorghum halepense*)

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#### **fenoxaprop (Acclaim or Horizon)**

**Rate** 0.15 to 0.25 lb ai/A

**Time** Apply to actively growing seedlings with two to five leaves. Larger plants are more difficult to control. Apply to rhizome Johnsongrass that is 24 to 60 inches tall and growing actively.

**Remarks** Rhizome Johnsongrass is only suppressed. Do not apply within 3 weeks after mowing.

**Caution** Do not use a crop oil or surfactant.

**Site of action** Group 1: acetyl CoA carboxylase (ACCase) inhibitor

**Chemical family** Aryloxyphenoxy propionate

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#### **fluazifop (Fusilade DX)**

**Rate** 0.25 to 0.375 lb ai/A (2 to 3 pints/A)

**Time** Apply to actively growing Johnsongrass 8 to 18 inches tall but before boot stage.

**Remarks** Apply with 1% v/v crop oil concentrate or 0.25% v/v nonionic surfactant. Fluazifop acts very slowly, taking at least 2 weeks and often 4 weeks to show effectiveness. Do not apply to stressed grasses. If weed regrows, repeat application at 0.187 to 0.375 lb ai/A.

**Caution** Do not use crop oil concentrate if treating Johnsongrass in ornamentals. Do not apply if rain is expected within 1 hour.

**Site of action** Group 1: acetyl CoA carboxylase (ACCase) inhibitor

**Chemical family** Aryloxyphenoxy propionate

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## glyphosate

**Rate** 2.25 lb ae/A

**Time** Apply at heading time to actively growing plants.

**Remarks** Rain within 6 hr after application may reduce effectiveness. Spray to cover but not to point of runoff.

**Caution** Glyphosate controls other grasses and vegetation in treated areas.

**Site of action** Group 9: inhibits EPSP synthase

**Chemical family** None generally accepted

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## imazapic (Plateau)

**Rate** 0.188 lb ae/A

**Time** Apply postemergence, at the late-boot or bloom stage.

**Remarks** Use a methylated seed oil at 1 quart/A; do not exceed 25 gal/A spray volume.

**Caution** Before using, note crop rotation restrictions.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Imidazolinone

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## imazapic + glyphosate (Journey)

**Rate** 21 to 32 oz/A

**Time** Apply postemergence to grass when it is 18 to 24 inches at the whorl.

**Remarks** Add a suitable surfactant to the spray mix. See label for details.

**Caution** Before using, note crop rotation restrictions.

**Site of action** (imazapic) Group 2: acetolactate synthase (ALS) inhibitor; (glyphosate) Group 9: inhibits EPSP synthase

**Chemical family** (imazapic) imidazolinone; (glyphosate) none generally accepted

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## MSMA (Buena or Trans-Vert)

**Rate** 2.25 lb ai/A

**Time** This herbicide is foliar-active; apply to rapidly growing foliage.

**Remarks** Use with caution on or near ornamentals (see label). Can mix with 2,4-D for broader control on non-cropland. MSMA is inactivated by soil surface adsorption.

**Caution** Keep liquid or dust away from eyes. Wash eyes immediately with water if exposed.

**Site of action** Group 17: not well understood

**Chemical family** Organoarsenical

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## sethoxydim (Poast)

**Rate** 0.28 to 0.47 lb ai/A (1.5 to 2.5 pints/A)

**Time** Apply to actively growing Johnsongrass when the plant is 15 to 25 inches tall.

**Remarks** Apply with 2 pints/A crop oil concentrate. Sethoxydim acts very slowly, taking at least 2 week and often 4 week to show herbicide effectiveness. Do not apply to stressed grasses. If Johnsongrass regrows, repeat application when it is 6 to 8 inches tall.

**Caution** Do not apply if rain is expected within 1 hour.

**Site of action** Group 1: acetyl CoA carboxylase (ACCase) inhibitor

**Chemical family** Cyclohexanedione

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### Knapweeds (*Centaurea* spp. and *Acroptilon repens*)

The following herbicides usually control treated plants. Plants often regrow, so plan annual applications for several years. Control of regrowth and of new seedlings is much better if a competitive crop or sod is established. A perennial grass is the logical choice because, except for glyphosate, the herbicides listed here will not kill established grasses.

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#### **2,4-D**

**Rate** 1 to 2 lb ae/A (4 to 8 lb ae/A for Russian knapweed)

**Time** Apply at the early stage of flower stem elongation (late April to early May).

**Remarks** Treatment will control only plants emerged at time of spraying.

**Caution** Avoid drift to sensitive crops.

**Site of action** Group 4: synthetic auxin

**Chemical family** Phenoxy acetic acid

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#### **aminocyclopyrachlor + chlorsulfuron (Perspective)**

**Rate** 1.8 to 3.2 oz/A aminocyclopyrachlor + 0.7 to 1.3 oz/A chlorsulfuron (4.5 to 8 oz/A of product)

**Time** Apply to actively growing plants in spring.

**Remarks** Adjuvants can be used; these include methylated seed oils 0.5 to 1% v/v, nonionic surfactants at 0.25 to 1% v/v, and crop oil concentrates at 1%v/v. Can be applied using an invert emulsion rather than water.

**Caution** Even low rates can kill nontarget tree and shrub species, so avoid application within a distance equal to the tree height of the sensitive species. Do not allow spray to drift off target. Can injure several grass species including bromes, as well as basin wildrye.

**Site of action** (aminocyclopyrachlor) Group 4: Synthetic auxin; (chlorsulfuron) Group 2: ALS inhibitor

**Chemical family** (aminocyclopyrachlor) Pyrimidine carboxylic acid; (chlorsulfuron) Sulfonylurea

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#### **aminopyralid (Milestone)**

**Rate** 1 to 1.75 oz ae/A (4 to 7 fl oz/A Milestone). Rate of application will depend on knapweed species to be controlled.

**Time** Consult label for opintsimum timing. Diffuse and spotted knapweed: apply to actively growing plants in fall or in spring from rosette to bolting growth stages. Russian knapweed: apply in spring and summer to plants from bud to flowering stage; in fall, to dormant plants.

**Remarks** A nonionic surfactant at 1 to 2 quarts per 100 gal of spray enhances control under adverse environmental conditions.

**Caution** Do not allow drift to desirable vegetation. Many forbs (desirable broadleaf plants) can be seriously injured or killed. Do not exceed 7 fl oz/A Milestone per year.

**Site of action** Group 4: synthetic auxin

**Chemical family** Pyridine

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#### **clopyralid (Stinger or Transline)**

**Rate** 0.25 to 0.5 lb ae/A (0.66 to 1.33 pints/A). Labeled rates vary with crops.

**Time** Up to the bud stage of knapweeds.

**Remarks** Results are best if applied to actively growing weeds. See labels for registered sites.

**Caution** Consult label for crop rotation restrictions before using Stinger. Several crops may be injured up to 4 years after application.

**Site of action** Group 4: synthetic auxin

**Chemical family** Pyridine

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### **clopyralid + 2,4-D amine (Curtail)**

**Rate** 2 to 4 quarts/A Curtail

**Time** Apply after most rosettes emerge but before flower stem elongates.

**Remarks** Lower rate for in-crop cereal grain application; higher rates for fallow, postharvest, and Conservation Reserve Program (CRP) applications. Consult label for specific directions. CRP applications for established grass only. Apply in enough total spray volume to ensure good coverage for diffuse and spotted knapweed.

**Caution** Consult label for crop rotation restrictions before using product. Several crops may be injured up to 4 years after application.

**Site of action** Group 4: synthetic auxin

**Chemical family** (clopyralid) Pyridine; (2,4-D) Phenoxy acetic acid

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### **diflufenzopyr + dicamba (Overdrive)**

**Rate** 0.26 to 0.35 lb ae/A (6 to 8 oz/A)

**Time** Apply to rosettes.

**Remarks** Add a surfactant to the spray mix.

**Caution** Avoid drift to sensitive crops. Will kill legumes.

**Site of action** (diflufenzopyr) Group 19: inhibits indole acetic acid transport; (dicamba) Group 4: synthetic auxin

**Chemical family** (diflufenzopyr) Semicarbazone; (dicamba) Benzoic acid

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### **glyphosate**

**Rate** 3 lb ae/A

**Time** Apply to actively growing knapweed when most plants are at bud stage.

**Remarks** Glyphosate kills many knapweed plants but also kills grass that might compete with new knapweed seedlings. Russian knapweed is not controlled. When using glyphosate, follow by seeding with a locally adapted grass.

**Site of action** Group 9: inhibits EPSP synthase

**Chemical family** None generally accepted

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### **imazapic (Plateau)**

**Rate** 0.188 lb ai/A for Russian knapweed

**Time** Apply in fall or early winter after Russian knapweed has grown old.

**Remarks** Use 1 quart/A methylated seed oil as the adjuvant. Selective to most native grasses. Higher rates may suppress seed of some cool-season grasses.

**Caution** Before using, note crop rotation restrictions.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Imidazolinone

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### **picloram (Tordon)**

**Rate** 0.25 to 0.5 lb ae/A (1 lb ae/A for Russian knapweed)

**Time** Apply in late spring before or during flower stem elongation.

**Remarks** A selective treatment that, at the suggested rate, will not damage perennial grasses. Treatment made in bud stage may not prevent seed production in the year of application. However, seed germination is markedly reduced.

**Caution** **Most formulations are restricted-use herbicides.** Do not contaminate water or use in diversified crop areas. Potatoes, beans, and most other broadleaf crops are sensitive to picloram.

**Site of action** Group 4: synthetic auxin

**Chemical family** Pyridine

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### **triclopyr + clopyralid (Redeem R&P)**

**Rate** 1.5 to 2 pints/A (2.5 to 4 pints/A for Russian knapweed)

**Time** Apply from rosette to early bolt stage when weeds are actively growing. Russian knapweed should be in early bud to early flower growth stage.

**Remarks** Add a nonionic surfactant at surfactant manufacturer's recommended rate. Apply in at least 10 gal/A water by ground.

**Caution** Do not exceed 4 pints/A per year. Do not allow drift to desirable vegetation. Note label restrictions on overseeding or reseeding.

**Site of action** (both) Group 4: synthetic auxin

**Chemical family** (both) Pyridine

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Knotweed, Bohemian (*Polygonum bohemicum*), Japanese (*Polygonum cuspidatum*), giant (*Polygonum sachalinense*), Himalayan (*Polygonum polystachyum*), or fleeceflower

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### **dicamba (Clarity)**

**Rate** 0.25 lb ae dicamba mixed with 1 gal water/400 sq ft

**Time** Apply in late August to new regrowth since plant was cut back in June.

**Remarks** Apply as a basal spray to the stems at ground level.

**Caution** Do not apply in areas where roots of desirable plant species are growing.

**Site of action** Group 4: synthetic auxin

**Chemical family** Benzoic acid

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### **glyphosate**

**Rate** Spot treatment: 0.06 lb ae (2.67 fl oz) glyphosate with 1 gal water

**Time** Apply as a coarse spray when weeds are actively growing and most are at bud to early flowering growth stage.

**Remarks** Spray for complete, uniform coverage but not to the point of runoff.

**Caution** Glyphosate is nonselective: it injures or kills any vegetation it contacts.

**Site of action** Group 9: inhibits EPSP synthase

**Chemical family** None generally accepted

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### **glyphosate (Roundup Pro Concentrate)**

**Rate** Inject 5 ml/stem

**Time** Inject with a hand-held device into hollow stem of actively growing plants between second and third internodes.

**Remarks** Mark each stem when making the injection to avoid reapplying.

**Caution** Non-crop use only. Total of all treatments must not exceed 8.5 quarts/A of Roundup Pro Concentrate or 1,600 stems/A per year.

**Site of action** Group 9: inhibits EPSP synthase

**Chemical family** None generally accepted

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### **imazapyr (Arsenal or Habitat)**

**Rate** 0.5 to 1 lb/A or 1% solution + 0.25% surfactant.

**Time** Apply in midsummer, after seedhead forms, up to killing frost.

**Remarks** Spray to cover plants but not to runoff. Habitat is labeled for aquatic sites.

**Caution** Before using, note crop rotation restrictions.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Imidazolinone

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### **triclopyr ester (Garlon 4 or Remedy) or triclopyr amine (Garlon 3A) or triclopyr + 2,4-D ester (Crossbow)**

**Rate** 0.5% to 2% concentration for application with a handgun sprayer.

**Time** Apply to actively growing plants in midsummer.

**Remarks** Adding 0.25% to 0.5% of a suitable surfactant to Garlon 3A improves results. No surfactant is needed with Garlon 4 or Remedy.

**Caution** Garlon products are registered for use on rights-of-way, industrial sites, and forestry (release and site preparation). Crossbow and Remedy can be used on permanent pastures and rangeland up to 1.5 lb ae/A. Observe all grazing and harvesting restrictions.

**Site of action** Group 4: synthetic auxin

**Chemical family** (triclopyr) Pyridine; (2,4-D) Phenoxy acetic acid

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Kochia (*Kochia scoparia* = *Bassia scoparia*)

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### **aminocyclopyrachlor + chlorsulfuron (Perspective)**

**Rate** 4.75 to 8 oz/A

**Time** Apply either preemergence or postemergence. Postemergence applications are most effective on seedlings.

**Remarks** Adjuvants can be used; these include methylated seed oils 0.5 to 1% v/v, nonionic surfactants at 0.25 to 1% v/v, and crop oil concentrates at 1%v/v.

**Caution** Do not apply to the root zone of desirable trees and shrubs. May injure or kill some grass species.

**Site of action** (aminocyclopyrachlor) Group 4 synthetic auxin; (chlorsulfuron) Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** (aminocyclopyrachlor) Pyridine; (chlorsulfuron) Sulfonylurea

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### **chlorsulfuron (Telar and others)**

**Rate** 0.75 oz ai/A (1 oz/A).

**Time** Apply preemergence, or postemergence from seedling to bolting stage of growth.

**Remarks** Add 0.25% by volume of nonionic surfactant to spray mixture. Some kochia populations have developed resistance to this mode of action; where resistance is suspected use other herbicides or combinations.

**Caution** Avoid drift to sensitive crops.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Sulfonylurea

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### **dicamba (Clarity and others)**

**Rate** 0.25 to 1 lb ae/A (0.5 to 2 pints/A)

**Time** Apply in spring when seedlings are actively growing.

**Remarks** Some kochia populations have developed resistance to this mode of action; where resistance is suspected use other herbicides or combinations.

**Caution** Avoid drift to sensitive crops.

**Site of action** Group 4: synthetic auxin

**Chemical family** Benzoic acid

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### **fluroxypyr (Vista)**

**Rate** 2.1 to 7.7 oz ae/A (6 to 22 oz/A)

**Time** Apply in spring from seedling to bolting stage of growth.

**Remarks** Use of a methylated seed oil is recommended (see label for details). Some kochia populations have developed resistance to this mode of action; where resistance is suspected use other herbicides or combinations.

**Caution** Avoid drift to sensitive crops.

**Site of action** Group 4: synthetic auxin

**Chemical family** Pyridine

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### **glyphosate**

**Rate** 1.1 to 1.7 lb ae/A

**Time** Apply in spring from seedling to flowering stage of growth.

**Remarks** Adequate foliar coverage of kochia is necessary. Add nonionic surfactant if not included in the formulation. Some kochia populations have developed resistance to this mode of action; where resistance is suspected use other herbicides or combinations.

**Caution** Glyphosate is nonselective and injures or kills other vegetation in the treated area.

**Site of action** Group 9: inhibits EPSP synthase

**Chemical family** None generally accepted

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### **hexazinone (Velpar)**

**Rate** 0.5 to 1.5 lb ai/A (2 to 6 pints/A)

**Time** Apply preemergence in the spring.

**Remarks** Early spring hexazinone application controls newly germinating seedlings.

**Caution** Hexazinone is a restricted-use herbicide. Do not contaminate water.

**Site of action** Group 5: photosystem II inhibitor

**Chemical family** Triazinone

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### **imazapic (Plateau)**

**Rate** 2 to 3 oz ae/A (8 to 12 fl oz/A)

**Time** Apply preemergence or postemergence to actively growing kochia.

**Remarks** Add 0.25% by volume of nonionic surfactant or 1.5 to 2 pints/A methylated seed oil or crop oil concentrate to spray mixture. Some kochia populations have developed resistance to this mode of action; where resistance is suspected use other herbicides or combinations.

**Caution** Avoid drift to sensitive crops.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Imidazolinone

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### **imazapyr (Arsenal, Habitat)**

**Rate** 0.5 to 1 lb ae/A (2 to 4 pints/A)

**Time** Apply preemergence or postemergence to actively growing kochia.

**Remarks** Add 0.25% by volume of nonionic surfactant, or 1 to 2 pints/A methylated seed soil or crop oil concentrate to spray mixture. Some kochia populations have developed resistance to this mode of action; where resistance is suspected use other herbicides or combinations.

**Caution** Imazapyr is nonselective; spray will injure or kill vegetation contacted.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Imidazolinone

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### **metsulfuron (Escort and others)**

**Rate** 0.6 to 1.2 oz ai/A (1 to 2 oz/A)

**Time** Apply in spring from seedling to flowering stage of growth.

**Remarks** Add 0.25% by volume of nonionic surfactant to spray mixture. Application sites differ between products; consult labels. Some kochia populations have developed resistance to this mode of action; where resistance is suspected use other herbicides or combinations.

**Caution** Avoid contacting sensitive crops. Apply only to pasture, rangeland, and non-crop sites.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Sulfonylurea

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### **rimsulfuron (Matrix)**

**Rate** 1 oz ai/A (4 oz/A)

**Time** Apply preemergence or postemergence to kochia seedlings.

**Remarks** Add 0.25% by volume of nonionic surfactant to spray mixture. Some kochia populations have developed resistance to this mode of action; where resistance is suspected use other herbicides or combinations.

**Caution** Avoid contacting sensitive crops. Primarily for noncrop sites, as many grasses are controlled by Matrix.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Sulfonylurea

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### Kudzu (*Pueraria montana* var. *lobata*)

**Remarks** Although PNW data are lacking, clopyralid, fosamine, glyphosate, imazapyr, metsulfuron, picloram, sulfometuron, and triclopyr are used for control of kudzu in the Southeastern US.

**Site of action** (imazapyr, metsulfuron, sulfometuron) Group 2: acetolactate synthase (ALS) inhibitor; (glyphosate) Group 9: inhibits EPSP synthase; (clopyralid, picloram, triclopyr) Group 4: synthetic auxin; (fosamine) Group 26, unknown

**Chemical family** (metsulfuron, sulfometuron) Sulfonylurea; (imazapyr) Imidazolinone; (glyphosate) none generally accepted; (clopyralid, picloram, triclopyr) Pyridine

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### Lawnweed (*Soliva sessilis*)

**Remarks** Although PNW data are lacking, isoxaben, metsulfuron, and 2,4-D + MCPP + dicamba are used for control in the Southeastern US.

**Site of action** (metsulfuron) Group 2: acetolactate synthase (ALS) inhibitor; (glyphosate) Group 9: inhibits EPSP synthase; (picloram) Group 4: synthetic auxin

**Chemical family** (metsulfuron) sulfonylurea; (glyphosate) none generally accepted; (picloram) phenoxy acetic acid

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### Larkspur, tall or duncecap (*Delphinium occidentale*)

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### **picloram (Tordon)**

**Rate** 1 lb ae/A

**Time** Apply to actively growing plants from flower stalk formation to early seed development.

**Remarks** Poisonous plant.

**Caution** **Most formulations are restricted-use herbicides.** Do not graze until plants have dried up after spray application. Refer to label for grazing restrictions. Do not contaminate water. Potatoes, beans, and many other crops are very sensitive to picloram. Do not use in diversified cropping areas. For rates exceeding 0.5 lb ae/A (1 quart/A), apply only as a spot treatment not to exceed 25% of an owner's acreage in a particular watershed in a single season.

**Site of action** Group 4: synthetic auxin

**Chemical family** Pyridine

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#### Loosestrife, garden (*Lysimachia vulgaris*)

**Remarks** Although PNW data are preliminary, initial results indicate that glyphosate, imazamox, imazapyr, and aminopyralid may provide effective garden loosestrife control.

**Site of action** (imazapyr, imazamox) Group 2: acetolactate synthase (ALS) inhibitor; (glyphosate) Group 9: inhibits EPSP synthase; (aminopyralid) Group 4: synthetic auxin

**Chemical family** (imazapyr, imazamox) Imidazolinone; (glyphosate) none generally accepted; (aminopyralid) Pyridine

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#### Lupine (*Lupinus* spp.)

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#### **2,4-D LV ester**

**Rate** 2 lb ae/A

**Time** Apply at the early bud stage to actively growing plants.

**Remarks** Several species of lupine are poisonous to livestock.

**Caution** Do not graze until plants dry up after application. Avoid drift to sensitive crops.

**Site of action** Group 4: synthetic auxin

**Chemical family** Phenoxy acetic acid

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#### **metsulfuron (Escort)**

**Rate** 0.9 oz ai/A (1.5 oz/A)

**Time** Apply to actively growing plants.

**Remarks** Use a surfactant to increase effectiveness. Spray to wet.

**Caution** Apply only to non-crop sites.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Sulfonylurea

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#### **picloram (Tordon)**

**Rate** 0.25 to 0.5 lb ae/A

**Time** Apply to actively growing lupine at the early bud stage.

**Remarks** Several species of lupine are poisonous to livestock.

**Caution** **Most formulations are restricted-use herbicides.** Do not graze until plants dry up after spray applications. See label for grazing restrictions. Do not contaminate water. Potatoes, beans, and many other crops are very sensitive to picloram. Do not use in diversified cropping areas. For rates above 0.5 lb ae/A (1 quart/A), apply only as a spot treatment not to exceed 25% of a landowner's acreage in a given watershed in a single season. Avoid drift to sensitive crops.

**Site of action** Group 4: synthetic auxin

**Chemical family** Pyridine

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Lythrum, purple, or purple loosestrife (*Lythrum salicaria*) and wand loosestrife (*Lythrum virgatum*)

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### **glyphosate (Rodeo)**

**Rate** 1% solution with hand-held equipment

**Time** Apply to actively growing plants at full to late flowering stage. Seedlings may be effectively treated early in the season after a fall application to mature plants.

**Remarks** Use 0.5% v/v nonionic surfactant. Thoroughly wet foliage but avoid runoff.

**Caution** Glyphosate is nonselective. It will injure or kill vegetation it contacts.

**Site of action** Group 9: inhibits EPSP synthase

**Chemical family** None generally accepted

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### **imazapyr (Habitat)**

**Rate** 0.25 to 0.5 lb ae/A

**Time** Apply to actively growing loosestrife after midbloom until killing frost.

**Remarks** Add suitable adjuvant to spray solution.

**Caution** Before using, note crop rotation restrictions. Do not apply to root zone of desirable trees.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Imidazolinone

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### **metsulfuron (Escort and others)**

**Rate** Escort: 0.6 oz ai/A (1 oz/A)

**Time** Apply to actively growing plants.

**Remarks** Using a nonionic or silicone surfactant increases effectiveness. Before using, check label to see whether product can be used on the type of site intended. Application sites differ among products; consult labels.

**Caution** Apply only to pasture, rangeland, and non-crop sites.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Sulfonylurea

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### **triclopyr (Garlon 4 or Garlon 3A)**

**Rate** 1.5 to 2% concentration for application with handgun sprayer.

**Time** When plant is in midbloom to full-bloom stage or early in season on seedlings.

**Remarks** Labeled for use on nonirrigation ditch banks and in seasonally dry wetlands.

**Site of action** Group 4: synthetic auxin

**Chemical family** Pyridine

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Mallow, Venice (*Hibiscus trionum*)

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### **2,4-D (various products)**

**alachlor (Lasso) or**

**bentazon (Basagran) or**

**bromoxynil (Buctril) or**

**chlorsulfuron (Glean) or  
dicamba (various products) or  
glyphosate (Roundup) or  
metribuzin (Sencor) or  
oxyfluorfen (Goal) or  
paraquat (Gramoxone Max) or  
picloram (Tordon)**

**Remarks** Reported to control this plant, although data are lacking in the Pacific Northwest. Follow label instructions.

**Site of action** (alachlor) Group 15: unknown; (bentazon and bromoxynil) Group 6: photosystem II inhibitor; (chlorsulfuron) Group 2: acetolactate synthase (ALS) inhibitor; (dicamba and 2,4-D) Group 4: synthetic auxin; (glyphosate) Group 9: inhibits EPSP synthase; (metribuzin) Group 5: photosystem II inhibitor; (oxyfluorfen) Group 14: protoporphyrinogen oxidase inhibitor; (paraquat) Group 22: photosystem I electron diverter

**Chemical family** (alachlor) chloroacetamide; (bentazon) benzothiadiazole; (bromoxynil) nitrile; (chlorsulfuron) sulfonyleurea; (dicamba) benzoic acid; (2,4-D) phenoxy acetic acid; (glyphosate) none generally accepted; (metribuzin) triazine; (oxyfluorfen) diphenylether; (paraquat) bipyridilium

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Matgrass (*Nardus stricta*)

**Remarks** Control is unknown. In a preliminary trial, fluzifop and sethoxydim showed some activity, but did not substantially reduce stands.

**Site of action** (fluzifop, sethoxydim) Group 1: acetyl CoA carboxylase (ACCase) inhibitors

**Chemical family** (fluzifop) Aryloxyphenoxy propionate; (sethoxydim) Cyclohexanedione

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Milkweed (*Asclepias speciosa*)

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**glyphosate**

**Rate** 2.25 lb ae/A

**Time** Apply to actively growing milkweed that has reached the late bud to flower stage of growth.

**Remarks** After small grain harvest or mowing, let milkweed regrow to mature stage before treating. Allow 7 days or more after application before tillage.

**Caution** Glyphosate controls grasses as well as other vegetation in treated areas.

**Site of action** Group 9: inhibits EPSP synthase

**Chemical family** None generally accepted

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**picloram (Tordon)**

**Rate** 1 lb ae/A

**Time** Apply at bud to early bloom to actively growing milkweed.

**Caution** **Most formulations are restricted-use herbicides.** See label for grazing restrictions. Do not contaminate water. Potatoes, beans, and many other crops are very sensitive to picloram. Do not use in diversified cropping areas. Apply rates over 0.5 lb ae/A (1 quart/A) only as a spot treatment not to exceed 25% of a landowner's acreage in any given watershed in a single season.

**Site of action** Group 4: synthetic auxin

**Chemical family** Pyridine

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Nightshade, silverleaf (*Solanum elaeagnifolium*)

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## glyphosate

**Rate** 2.25 lb ae/A

**Time** Apply to actively growing milkweed that has reached the late bud to flower stage of growth.

**Remarks** Reported to control this plant, although data are lacking in the Pacific Northwest. Follow label instructions.

**Site of action** (glyphosate) Group 9: inhibits EPSP synthase; (picloram) Group 4: synthetic auxin

**Chemical family** (glyphosate) none generally accepted; (picloram) pyridine

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## imazapyr (Arsenal)

**Rate** 1 lb ae/A

**Remarks** Reported to control this plant, although data are lacking in the Pacific Northwest. Follow label instructions.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Imidazolinone

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Nutsedge, yellow (*Cyperus esculentus*) and purple (*Cyperus rotundus*)

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## alachlor (Lasso or Micro-Tech)

**Rate** 1.5 to 4 lb ai/A

**Time** Use a preplant incorporation application.

**Remarks** Selective in corn and dry beans. Controls most annual grasses and certain annual broadleaf weeds. Absorbed mainly by germinating plant shoots; seems to inhibit protein synthesis.

**Caution** A restricted-use herbicide. Avoid contact with the eyes and skin.

**Site of action** Group 15: inhibits very long chain fatty acid synthesis

**Chemical family** Chloroacetamide

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## dichlobenil (Casoron)

**Rate** 150 lb/A of 4% granules

**Time** Apply in winter just before a period of rain, or in spring just before applying bark mulch in landscape plantings.

**Remarks** Incorporate by rototilling or rain. Selective in some fruits and ornamentals (see label). Apply midwinter immediately before a cold rain to reduce volatility and enhance weed suppression. Weigh and distribute uniformly exact quantities over precisely measured areas. Oregon results from over 9 years suggest perennial weeds can be suppressed with 4-, 3- and 2-lb ai/A rates applied in 3 consecutive years. Grazing livestock is prohibited. In non-crop-land areas only, up to 250 to 500 lb of 4% granules can be used for nutsedge control. Inhibits cellulose and cell wall formation.

**Caution** Do not breathe dust or allow contact with eyes or skin.

**Site of action** Group 20: inhibits cell wall synthesis Site A

**Chemical family** Nitrile

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## EPTC (Eptam)

**Rate** 3 to 6 lb ai/A

**Time** Apply before final seedbed preparation in the spring.

**Remarks** Incorporate immediately by disking in two directions, or rototill to distribute 2 to 3 inches deep. Apply only to soil dry on the surface, then disk immediately. Use before planting beans and potatoes. Treatment suppresses nutsedge for one season only.

**Caution** Incorporate 2 to 3 inches into soil immediately after application.

**Site of action** Group 8: lipid synthesis inhibitor but not an ACCase inhibitor

**Chemical family** Thiocarbamate

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### **EPTC with safener (Eradicane or Genate) or butylate with safener (Sutan)**

**Rate** 4 to 6.14 lb ai/A, depending on soil type and infestation; see label.

**Time** Apply preplant and incorporate immediately and thoroughly.

**Remarks** These herbicides are selective in corn. Perennial weeds must be turned under and chopped up thoroughly before treatment. See label for additional application and incorporation instructions. Suppresses emergence of new shoots from yellow nutsedge tubers but does not necessarily kill them.

**Caution** Do not use EPTC without safener on "Golden Jubilee" sweet corn west of the Cascades. Do not exceed 4 lb ai/A EPTC with safener on sweet corn.

**Site of action** (both) Group 8: lipid synthesis inhibitor but not an ACCase inhibitor

**Chemical family** (both) Thiocarbamate

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### **glyphosate**

**Rate** 2.25 lb ae/A as a broadcast spray, or a 1% solution using hand-held equipment

**Time** When nutsedge is actively growing in midseason but before new tubers begin to form, usually by June 15 to July 1.

**Remarks** Nutsedge can be reduced by encouraging active growth and applying glyphosate once or more often when several nutsedge leaves are present but before new tubers begin to form.

**Caution** Re-treatment is important. Glyphosate controls grasses as well as other vegetation in the treated area.

**Site of action** Group 9: inhibits EPSP synthase

**Chemical family** None generally accepted

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### **halosulfuron (Permit, Sandea, or SedgeHammer)**

**Rate** 0.5 to 1 oz ai/A (0.67 to 1.33 oz/A)

**Time** Labels differ. For example, apply SedgeHammer to yellow nutsedge in the three- to five-leaf stage. Apply SedgeHammer in turf to yellow nutsedge in the three- to eight-leaf stage of growth.

**Remarks** Halosulfuron is labeled on several crops. Consult labels for stage of crop or turf growth. Add 1 to 2 quarts nonionic surfactant or crop oil concentrate per 100 gal spray solution for broadcast applications. A second halosulfuron application may be required 6 to 10 weeks after the first.

**Caution** Do not exceed 1.5 oz ai/A (2 oz/A) of Permit or Sandea or two applications per season. Do not exceed 0.4 oz ai/A (5.33 oz/A) of SedgeHammer or four applications per season. Note labels for information on recropping, reseeding, and site of application.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Sulfonylurea

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### **imazapic (Plateau)**

**Rate** 0.125 to 0.188 lb ai/A

**Time** Apply postemergence when plants have bolted.

**Remarks** Add 1 quart/A methylated seed oil; do not exceed 25 gal/A spray volume.

**Caution** Before using, note crop rotation restrictions.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Imidazolinone

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### **S-metolachlor (Dual II Magnum or Dual Magnum)**

**Rate** Refer to label

**Time** Use preplant incorporated.

**Remarks** Incorporate uniformly to 2 inches before planting. Use lower rates on coarse soils.

**Caution** May cause skin sensitization reactions in some people. Do not breathe spray mist.

**Site of action** Group 15: inhibits very long chain fatty acid synthesis

**Chemical family** Chloroacetamide

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Oatgrass, tuber (*Arrhenatherum elatius* var. *bulbosum*)

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### **glyphosate**

**Rate** 1 to 2 lb ae/A

**Time** When plants are at least 15 inches tall and growing rapidly.

**Remarks** Established stands are controlled best by the 2-lb rate applied after May 1 to undisturbed sites. Newly sprouted corms are controlled with the 1-lb rate, but less herbicide will move into attached unsprouted corms. A single application to dormant corms gives only limited long-term control; tillage and repeated applications will be required.

**Site of action** Group 9: inhibits EPSP synthase

**Chemical family** None generally accepted

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Olive, Russian (*Elaeagnus angustifolia*)

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### **2,4-D LV ester**

**Rate** 2 lb ae/A

**Time** When leaves are fully developed.

**Remarks** Two to three annual re-treatments may be necessary for complete control.

**Caution** Avoid drift to sensitive crops.

**Site of action** Group 4: synthetic auxin

**Chemical family** Phenoxy acetic acid

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### **2,4-D + triclopyr (Crossbow)**

**Rate** 1.5% spray solution

**Time** Apply during active growth, after full leaf expansion, and when moisture and temperature are favorable.

**Remarks** This product also can be used in dormant stem and conventional basal applications. Refer to label for additional instructions. Re-treatment may be necessary.

**Site of action** (both) Group 4: synthetic auxin

**Chemical family** (2,4-D) pyridine; (triclopyr) phenoxy acetic acid

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### **glyphosate**

**Rate** 2 cc (ml) per inch of trunk diameter or 5% solution applied to foliage

**Time** Apply undiluted to frill cuts or apply to foliage after the Russian olive fully leaves out.

**Remarks** Spray to wet foliage but not to the point of runoff.

**Site of action** Group 9: inhibits EPSP synthase

**Chemical family** None generally accepted

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### **imazapyr (Arsenal)**

**Rate** 2 cc (ml) per inch of trunk diameter or 0.75% solution of the 2 lb ai/gal applied to foliage

**Time** Apply undiluted to frill cuts or apply to foliage after the Russian olive fully leafs out.

**Remarks** Spray to wet foliage but do not allow spray to run off foliage.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Imidazolinone

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Parsley, hedge (*Torilis arvensis*)

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### **simazine (Princep)**

**Remarks** Reported to control this plant, although data are lacking in the Pacific Northwest. Follow label directions.

**Site of action** Group 5: photosystem II inhibitor

**Chemical family** Triazine

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Pepperweed, perennial (*Lepidium latifolium*)

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### **2,4-D amine**

**Rate** 4 lb ae/A

**Time** Apply at the bud stage of growth.

**Remarks** Repeat treatments if needed. Good grass cover helps control perennial pepperweed.

**Caution** Avoid drift to sensitive crops.

**Site of action** Group 4: synthetic auxin

**Chemical family** Phenoxy acetic acid

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### **aminocyclopyrachlor + chlorsulfuron (Perspective)**

**Rate** 1.8 to 3.2 oz/A aminocyclopyrachlor + 0.7 to 1.3 oz/A chlorsulfuron (4.5 to 8 oz/A of product)

**Time** Apply to actively growing plants in spring.

**Remarks** Adjuvants can be used; these include methylated seed oils 0.5 to 1% v/v, nonionic surfactants at 0.25 to 1% v/v, and crop oil concentrates at 1% v/v. Can be applied using an invert emulsion rather than water.

**Caution** Even low rates can kill nontarget tree and shrub species so avoid application within a distance equal to the tree height of the sensitive species. Do not allow spray to drift off target. Can injure several grass species including bromes, as well as basin wildrye.

**Site of action** (aminocyclopyrachlor) Group 4: Synthetic auxin; (chlorsulfuron) Group 2: ALS inhibitor

**Chemical family** (aminocyclopyrachlor) Pyrimidine carboxylic acid; (chlorsulfuron) Sulfonylurea

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### **chlorsulfuron (Telar)**

**Rate** 0.75 oz ai/A (1 oz/A)

**Time** Apply in fall or in spring up through bloom stage.

**Remarks** Adding surfactant and/or 2,4-D improves control.

**Caution** Do not let spray drift onto sensitive crops. Labeled for use on pasture, range, Conservation Reserve Program (CRP), and non-cropland only.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Sulfonylurea

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### **imazapic (Plateau)**

**Rate** 0.125 to 0.188 lb ai/A

**Time** Apply after blossoms open (full bloom) until plants desiccate. Fall rosettes also may be treated if moisture permits.

**Remarks** Lightly cover foliage with spray solution. Add 1 quart/A methylated seed oil.

**Caution** Before using, note crop rotation restrictions.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Imidazolinone

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### **metsulfuron (Escort)**

**Rate** Escort: 0.6 to 1.2 oz ai/A (1 to 2 oz/A)

**Time** Apply to actively growing perennial pepperweed.

**Remarks** Selective to grasses. Use a surfactant.

**Caution** Do not allow spray to drift onto sensitive crops. Apply only to non-crop sites.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Sulfonylurea

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### Poison-oak and poison-ivy (*Toxicodendron* spp.)

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### **aminocyclopyrachlor + metsulfuron methyl (Streamline)**

**Rate** 1.9 to 3.8 oz/A aminocyclopyrachlor + 0.6 to 1.2 oz/A metsulfuron (4.75 to 9.5 oz/A of product)

**Time** Apply to actively growing woody plants.

**Remarks** Adjuvants can be used; these include methylated seed oils 0.5 to 1% v/v, nonionic surfactants at 0.25 to 1% v/v, and crop oil concentrates at 1% v/v. Can be applied using an invert emulsion rather than water. There are several application methods that dictate the amount of product to be mixed with the carrier, so consult the label. Controls many herbaceous species, in addition to woody species.

**Caution** Even low rates can kill nontarget tree and shrub species, so avoid application within a distance equal to the tree height of the sensitive species. Conifers can be injured, these include ponderosa pine, Douglas fir, Norway spruce, and white pine. Other trees that can be injured include aspen, Chinese tallow, cottonwoods, honey locust, magnolia, poplars, redbud, silver maple, and willow. Applications to stressed plants may reduce control. Do not allow spray to drift off target.

**Site of action** (aminocyclopyrachlor) Group 4: Synthetic auxin; (chlorsulfuron) Group 2: ALS inhibitor

**Chemical family** (aminocyclopyrachlor) Pyrimidine carboxylic acid; (chlorsulfuron) Sulfonylurea

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### **glyphosate (E-Z-Ject)**

**Rate** Follow label instructions on number of capsules per stem.

**Time** Apply when plants are actively growing at or beyond early bloom stage.

**Remarks** The E-Z-Ject system of application will not harm desirable species.

**Caution** Capsules must penetrate woody bark for control.

**Site of action** Group 9: inhibits EPSP synthase

**Chemical family** None generally accepted

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### **glyphosate**

**Rate** 3 to 3.75 lb ae/A broadcast or apply as a 2% solution with hand-held equipment.

**Time** Apply when plants are actively growing at or beyond early to full bloom stage. Results are best if applied after fruit forms. Make late summer or fall treatments before leaves lose their green color. Use higher rates for plants that have reached woody stage of growth.

**Remarks** Treat foliage when plants are growing rapidly. In orchards, prevent spray mist from contacting foliage, green bark, suckers, or fruit of crop trees or other desirable vegetation. If spray contacts immature bark on main trunk, serious localized or translocated damage can result. Roundup is a nonresidual herbicide requiring subsequent seedling control.

**Caution** Controls grasses and other vegetation in treated area.

**Site of action** Group 9: inhibits EPSP synthase

**Chemical family** None generally accepted

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### **triclopyr ester (Garlon 4) or triclopyr amine (Garlon 3A) or triclopyr + 2,4-D ester (Crossbow)**

**Rate** Spot treat: use 3 lb ae Garlon 4 or 2.25 lb ae Garlon 3A with 100 gal water; or 1 pint Crossbow in 12 gal water. Broadcast: use 4 to 8 lb ae/A Garlon 4, or 6 to 9 lb ae/A Garlon 3A, or 1 to 2 quarts/A of Crossbow.

**Time** Apply when plants are actively growing.

**Remarks** Foliage must be thoroughly wet.

**Caution** Garlon products are registered for use on rights-of-way, industrial sites, and forestry (release and site preparation). Crossbow can be used on permanent pastures and rangeland up to 1.5 lb ae/A. Observe all grazing and harvesting restrictions.

**Site of action** (all) Group 4: synthetic auxin

**Chemical family** (triclopyr) pyridine; (2,4-D) phenoxy acetic acid

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### Pricklypear (*Opuntia polyacantha*)

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#### **picloram (Tordon)**

**Rate** 0.25 to 0.5 lb ae/A

**Time** Apply in May to July. Timing is not critical.

**Caution** **Most formulations are restricted-use herbicides.** See label for grazing restrictions. Do not contaminate water. Potatoes, beans, and many other crops are very sensitive to picloram. Do not use in diversified cropping areas. Apply rates over 0.5 lb ae/A (1 quart/A) only as a spot treatment not to exceed 25% of a landowner's acreage in any given watershed in a single season.

**Site of action** Group 4: synthetic auxin

**Chemical family** Pyridine

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### Proso millet, wild (*Panicum miliaceum*)

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#### **fenoxaprop (Acclaim or Horizon)**

**Rate** 0.15 to 0.25 lb ai/A

**Time** Apply to actively growing plants with at least two leaves. Larger plants are harder to control.

**Remarks** Refer to product label for crops and sites on which fenoxaprop may be used.

**Caution** Do not use a crop oil or surfactant.

**Site of action** Group 1: acetyl CoA carboxylase (ACCase) inhibitor

**Chemical family** Aryloxyphenoxy propionate

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#### **fluazifop (Fusilade DX)**

**Rate** 0.09 lb ai/A (0.375 pints/A)

**Time** Apply to actively growing weeds 2 to 8 inches tall but before tillering or heading.

**Remarks** See label for crops, ad sites, and specific rates. Apply with 1% (v/v) crop oil concentrate or 0.25% (v/v) nonionic surfactant. Acts very slowly, taking at least 2 weeks and often 4 weeks to show effectiveness. Do not apply to stressed grasses.

**Caution** Do not use crop oil concentrate if treating in ornamentals. Do not apply if rain is expected within 1 hour.

**Site of action** Group 1: acetyl CoA carboxylase (ACCase) inhibitor

**Chemical family** Aryloxyphenoxy propionate

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### **nicosulfuron (Accent)**

**Rate** 0.5 to 1 oz ai/A (0.66 to 1.33 oz/A Accent)

**Time** Apply when wild proso millet is 1 to 4 inches tall.

**Remarks** Accent is registered for use in field corn and popcorn. Consult seed company representative before applying to field corn grown for seed or to any popcorn varieties.

**Caution** Take special precautions when using for wild proso millet control in sweet corn. Read label about applications where organophosphate insecticides have been used. Consult labels for rotation crop guidelines.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Sulfonyleurea

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### **sethoxydim (Poast)**

**Rate** 0.19 lb ai/A (1pint/A)

**Time** Apply to actively growing wild proso millet.

**Remarks** See label for crops, size of grass, and sites sethoxydim may be used on and for specific rates. Apply with 2 pints/A crop oil concentrate. Acts very slowly, taking at least 2 weeks and often 4 weeks to show herbicide effectiveness. Do not apply to stressed grasses.

**Caution** Do not apply if rain is expected within 1 hour.

**Site of action** Group 1: acetyl CoA carboxylase (ACCCase) inhibitor

**Chemical family** Cyclohexanedione

---

### **topramezone (Impact)**

**Rate** 0.0165 lb ai/A (0.75 oz/A)

**Time** Apply postemergence to actively growing wild proso millet that is 3 to 8 inches tall.

**Remarks** Controls wild proso millet and many annual broadleaf weeds but does not provide residual control. Add methylated seed oil or crop oil concentrate at 1 to 1.5% v/v and UAN fertilizer or ammonium phosphate at 1.2 to 1.5% v/v to the spray solution. Spray-grade ammonium sulfate at 8.5 to 17 lb/100 gal of water may be substituted for the nitrogen fertilizers.

**Caution** Apply only once per growing season. Read label carefully to determine crops that can be planted the next year.

**Site of action** Group 28: inhibits 4-hydroxyphenylpyruvatedioxygenase (4-HPPD)

**Chemical family** Triketone

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### Puncturevine (*Tribulus terrestris*)

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### **2,4-D amine or 2,4-D LV ester**

**Rate** 1 to 2 lb ae in 10 to 20 gal water for spot treatments.

**Time** Apply every 3 weeks during growing season or when new seedlings appear.

**Remarks** Seed will germinate throughout the summer when moisture is available.

**Caution** Avoid drift to sensitive crops.

**Site of action** Group 4: synthetic auxin

**Chemical family** Phenoxy acetic acid

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### **aminocyclopyrachlor + chlorsulfuron (Perspective)**

**Rate** 1.8 to 3.2 oz/A aminocyclopyrachlor + 0.7 to 1.3 oz/A chlorsulfuron (4.5 to 8 oz/A of product)

**Time** Apply to actively growing plants in spring.

**Remarks** Adjuvants can be used; these include methylated seed oils 0.5 to 1% v/v, nonionic surfactants at 0.25 to 1% v/v, and crop oil concentrates at 1% v/v. Can be applied using an invert emulsion rather than water.

**Caution** Even low rates can kill nontarget tree and shrub species, so avoid application within a distance equal to the tree height of the sensitive species. Do not allow spray to drift off target. Can injure several grass species including bromes, as well as basin wildrye.

**Site of action** (aminocyclopyrachlor) Group 4: Synthetic auxin; (chlorsulfuron) Group 2: ALS inhibitor

**Chemical family** (aminocyclopyrachlor) Pyrimidine carboxylic acid; (chlorsulfuron) Sulfonylurea

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### **bentazon (Basagran) + imazamox (Raptor)**

**Rate** 0.75 to 1 lb ai/A bentazon + 0.031 lb ai/A imazamox (4 oz/A Raptor)

**Time** Apply to small, actively growing puncturevine.

**Remarks** Controls puncturevine in snap beans where few other products are registered for use and puncturevine control is critical. Does not provide residual control of puncturevine. Tank-mixing Basagran with Raptor improves crop safety and puncturevine control. Add a nonionic surfactant or crop oil and nitrogen-based fertilizer to improve weed control.

**Caution** Do not apply to drought-stressed bean plants or plants with poor root development.

**Site of action** (bentazon) Group 6: photosystem II inhibitor; (imazamox) Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** (bentazon) Benzothiadiazole; (imazamox) Imidazolinone

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### **bromacil + diuron (Krovar I DF)**

**Rate** 8 lb ai/A (10 lb/A)

**Time** Apply before weeds emerge.

**Remarks** Rain is needed to activate this herbicide.

**Caution** Nonselective weed control. Do not apply where desirable plant roots extend.

**Site of action** Group 5: photosystem II inhibitor

**Chemical family** (bromacil) Uracil; (diuron) Urea

---

### **chlorsulfuron (Telar)**

**Rate** 1 oz ai/A (1.5 oz/A)

**Time** Apply late fall or late winter preemergence to growth. Needs moisture to activate.

**Remarks** May be used selectively or tank-mixed with other selective or bareground herbicides. Use only on pasture, range, Conservation Reserve Program (CRP), and non-cropland.

**Caution** Do not let spray drift onto sensitive crops.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Sulfonylurea

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### fomesafen (Reflex)

**Rate** 1 to 2 pints/A (0.25 to 0.5 lb ai/A)

**Time** Pre- and postemergence, depending on crop.

**Remarks** Because moisture is necessary to activate Reflex in soil for residual weed control, the herbicide may be more effective if rainfall or irrigation occurs shortly after application. If adequate rainfall is not received after a Reflex application, at least 0.25 inch overhead sprinkler irrigation before weeds emerge may improve weed control. Mechanically incorporating into soil, or cultivating after applying, reduces residual weed control and is not recommended. Reflex effectiveness will be reduced if later cultural practices expose nontreated soil.

**Caution** Only labeled in potatoes, cucurbits, snap beans, and edamame. Potato varieties may vary in their response to Reflex.

**Site of action** Group 14: protoporphyrinogen oxidase (Protox) inhibitor

**Chemical family** Nitrophenylether

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### imazapic (Plateau)

**Rate** 0.125 to 0.188 lb ai/A

**Time** Apply early postemergence when plants are cracking.

**Remarks** Add 1 quart/A methylated seed oil; do not exceed 25 gal/A spray volume.

**Caution** Before using, note crop rotation restrictions.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Imidazolinone

---

### indaziflam (Rejuvra)

*For non-crop or restoration areas*

**Rate** Grazed areas 0.046 to 0.065 lb ai/A (3.5 to 5 oz/A Rejuvra); areas not grazed or cut for hay 0.046 to 0.09 lb ai/A (3.5 to 7 oz/A Rejuvra). Use lower rates only where weed pressure is light and shorter period of residual activity is desired.

**Time** Apply at least several weeks prior to expected germination of puncturevine. Apply to dry soils when rain is not expected for at least 48 hr. Can be successfully applied several months in advance of weed germination.

**Remarks** Pre-emergent activity only. Short term control with long-term suppression that may last a year or more. Indaziflam is safe over the top of most well-established species. Do not expect to conduct successful seedings of desirable plants for several years after application.

**Caution** Adequate binding time on dry soil reduces risk of indaziflam moving into the root zone of desirable plants. Do not exceed a maximum rate of 0.065 lb ai/A (5 oz/A Rejuvra) in a single application. Do not make more than 2 applications in a 12-month period. Allow at least 60 days between applications.

**Site of action** Group 29, inhibition of cellulose biosynthesis

**Chemical family** Alkylazine

---

### MSMA (Bueno or Trans-Vert)

**Rate** 2 to 4 lb ai/A

**Time** Apply after puncturevine emerges. Best results in seedling stage of growth.

**Remarks** MSMA is more active above 70°F. Regrowth after rain or overhead irrigation may need respraying.

**Caution** Keep liquid or dust away from eyes. Wash eyes immediately with water if exposed.

**Site of action** Group 17: not well understood

**Chemical family** Organoarsenical

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### norflurazon (Solicam)

**Rate** Refer to label. Adjust rates depending on soil texture and organic matter.

**Time** Apply in fall to spring, before puncturevine emerges.

**Remarks** Remove existing weeds mechanically or by a suitable postemergent herbicide.

**Site of action** Group 12: bleaching; inhibits carotenoid biosynthesis

**Chemical family** Pyridazinone

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### **paraquat (Gramoxone Max)**

**Rate** 0.38 to 0.49 lb ai/A

**Time** Apply as a postemergence spray to puncturevine foliage.

**Remarks** Results are best when puncturevine is in the seedling stage. Add 8 to 16 fl oz/100 gal nonionic surfactant to spray mix. Paraquat is a contact herbicide requiring thorough spray coverage. Puncturevine emerging after application will not be controlled.

**Caution** **A restricted-use herbicide.** Do not use around homes or other areas contacted by children or pets. Do not breathe spray mist.

**Site of action** Group 22: photosystem I electron diversion

**Chemical family** Bipyridilium

---

### **topramezone (Impact)**

**Rate** 0.0165 lb ai/A (0.75 oz/A)

**Time** Apply postemergence to actively growing weeds 3 to 8 inches tall.

**Remarks** Controls wild proso millet and many annual broadleaf weeds but does not provide residual control. Add methylated seed oil or crop oil concentrate at 1 to 1.5% v/v and UAN fertilizer or ammonium phosphate at 1.2 to 1.5% v/v to the spray solution. Spray-grade ammonium sulfate at 8.5 to 17 lb/100 gal of water may be substituted for the nitrogen fertilizers.

**Caution** Carefully read the label to determine which crops can be planted the following year.

**Site of action** Group 28: inhibits 4-hydroxyphenylpyruvatedioxygenase (4-HPPD)

**Chemical family** Triketone

---

### Quackgrass (*Elytrigia repens*)

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### **bromacil + diuron (Krovar I DF)**

**Rate** 9.6 lb ai/A (12 lb/A)

**Time** Apply before weeds emerge.

**Remarks** Rain is needed to activate this herbicide.

**Caution** Nonselective weed control. Do not apply to areas where desirable plant roots extend.

**Site of action** (bromacil) Group 5: photosystem II inhibitor; (diuron) Group 7: photosystem II inhibitor

**Chemical family** (bromacil) uracil; (diuron) urea

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### **dichlobenil (Casoron)**

**Rate** 4 lb ai/A in berries; 4 to 6 lb ai/A in fruit trees and grapes

**Time** Apply midwinter immediately before a cold rain to reduce volatility and enhance weed suppression. Weigh and distribute uniformly exact quantities over precisely measured areas. Oregon results over 9 years suggest that perennial weeds can be suppressed with 4-, 3-, and 2-lb ai/A rates applied in 3 consecutive years. Grazing livestock is prohibited. Inhibits cellulose and cell wall formation.

**Remarks** Selective in trailing berries, fruit trees, and grapes.

**Site of action** Group 20: inhibits cell wall synthesis Site A

**Chemical family** Nitrile

---

### **EPTC (Eptam)**

**Rate** 4 lb ai/A

**Time** Apply in early spring or fall before plowing.

**Remarks** This application has been promising for selective control of quackgrass in such crops as beans, potatoes, and small-seeded legumes. It does not eradicate quackgrass but does reduce growth for the season and greatly reduces amount of live roots. Before EPTC applications, soil is disked or rotated until quackgrass rhizomes are 3 to 4 inches long.

**Caution** Apply to soil and immediately follow with a thorough disking in two directions to uniformly incorporate 6 inches deep.

**Site of action** Group 8: lipid synthesis inhibitor but not an ACCase inhibitor

**Chemical family** Thiocarbamate

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### **fluazifop (Fusilade DX)**

**Rate** 0.25 to 0.375 lb ai/A (1 to 1.5 pints/A) for first application. If reapplication is needed, use 0.19 to 0.375 lb ai/A (0.75 to 1.5 pints/A).

**Time** Apply late spring to actively growing quackgrass 6 to 10 inches tall.

**Remarks** Apply with 1% v/v crop oil concentrate or 0.25% v/v nonionic surfactant. Repeat application to control established quackgrass. Acts very slowly, taking at least 2 and often 4 weeks to show effects. Do not apply to stressed grasses. Do not mix with other pesticides unless recommended on label.

**Caution** Do not graze treated fields.

**Site of action** Group 1: acetyl CoA carboxylase (ACCCase) inhibitor

**Chemical family** Aryloxyphenoxy propionate

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### **glyphosate**

**Rate** Broadcast: use 1 to 2.25 lb ae/A. Nonsodded quackgrass: use 0.75 to 1.5 lb ae/A (1 to 2 quarts). Sodded quackgrass: use 1.5 to 2.25 lb ae/A (2 to 3 quarts).

**Time** Apply during fallow periods in cropping systems when quackgrass is in late boot to early flowering stage.

**Remarks** Foliage must be thoroughly wet, but avoid runoff.

**Caution** Glyphosate is nonselective. Re-treatment may be necessary for complete control.

**Site of action** Group 9: inhibits EPSP synthase

**Chemical family** None generally accepted

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### **pronamide (Kerb)**

**Rate** 2 to 3 lb ai/A

**Time** Apply during fall or winter when soil moisture is good and more precipitation is expected. Apply before ground freezes in the cooler areas.

**Remarks** Use higher application rates in heavier soil types.

**Caution** **A restricted-use herbicide.** Follow label for crop rotations.

**Site of action** Group 3: microtubule assembly inhibitor

**Chemical family** Benzamide

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Rabbitbrush (*Chrysothamnus* spp.)

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## 2,4-D LV ester

**Rate** 3 lb ae/A

**Time** Apply when rabbitbrush has 3 inches of new spring growth.

**Remarks** Soil moisture should be above wilting coefficient. If Sandberg bluegrass has dried up or lost its color, soil is too dry for rabbitbrush active growth, and it is too late to spray.

**Caution** Avoid drift to sensitive crops.

**Site of action** Group 4: synthetic auxin

**Chemical family** Phenoxy acetic acid

---

## picloram (Tordon)

**Rate** 0.25 to 0.5 lb ae/A

**Time** Any time during the growing season.

**Remarks** A selective treatment that will not damage perennial grasses at the suggested rate.

**Caution** **Most formulations are restricted-use herbicides.** Do not contaminate water. Do not use in diversified crop areas. Potatoes, beans, and most other broadleaf crops are sensitive to picloram.

**Site of action** Group 4: synthetic auxin

**Chemical family** Pyridine

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## Ragweed, common (*Ambrosia artemisiifolia*) and related species

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### 2,4-D ester

**Rate** 2 lb ae/A

**Time** Apply after all plants have emerged but before flowering.

**Remarks** Foliage must be thoroughly wet. Use 50 gal/A of water.

**Caution** Avoid drift to sensitive crops.

**Site of action** Group 4: synthetic auxin

**Chemical family** Phenoxy acetic acid

---

### aminocyclopyrachlor + chlorsulfuron (Perspective)

**Rate** 1.2 to 1.8 oz/A aminocyclopyrachlor + 0.5 to 0.7 oz/A chlorsulfuron (3 to 4.5 oz/A of product)

**Time** Apply to actively growing plants.

**Remarks** Adjuvants can be used; these include methylated seed oils 0.5 to 1% v/v, nonionic surfactants at 0.25 to 1% v/v, and crop oil concentrates at 1% v/v. Can be applied using an invert emulsion rather than water.

**Caution** Even low rates can kill nontarget tree and shrub species, so avoid application within a distance equal to the tree height of the sensitive species. Do not allow spray to drift off target. Can injure several grass species including bromes, as well as basin wildrye.

**Site of action** (aminocyclopyrachlor) Group 4: Synthetic auxin; (chlorsulfuron) Group 2: ALS inhibitor

**Chemical family** (aminocyclopyrachlor) Pyrimidine carboxylic acid; (chlorsulfuron) Sulfonylurea

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### clopyralid + 2,4-D amine (Curtail)

**Rate** 1 to 5 quarts/A Curtail

**Time** Apply to actively growing weeds after most basal leaves emerge but before bud stage.

**Remarks** Use lower rate for in-crop cereal grain application, higher rates for fallow, postharvest, and Conservation Reserve Program (CRP) applications. Consult label for specific directions. With CRP applications, for established grass only. For best results, wait at least 20 days after application before disturbing treated areas (cultivation, mowing, fertilization with shank-type applicators) to allow for thorough translocation. Apply in enough total spray volume to ensure good coverage.

**Caution** Consult label for crop rotation restrictions before using product. Several crops may be injured up to 4 years after application.

**Site of action** (both) Group 4: synthetic auxin

**Chemical family** (clopyralid) Pyridine; (2,4-D) Phenoxy acetic acid

---

## glyphosate

**Rate** 0.75 to 1.5 lb ae/A. Make wiper application solutions with a 10 to 33% glyphosate solution. Use a 1% glyphosate solution with hand-held and high-volume equipment.

**Time** Use the 0.75-lb rate when ragweed is less than 6 inches tall.

**Remarks** Apply to actively growing plants.

**Caution** Glyphosate controls grasses as well as other vegetation in treated areas.

**Site of action** Group 9: inhibits EPSP synthase

**Chemical family** None generally accepted

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Ragwort, tansy (*Senecio jacobaea*)

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## 2,4-D or picloram (Tordon) or dicamba (Clarity) or 2,4-D + dicamba (Weedmaster) or triclopyr + 2,4-D (Crossbow)

**Rate** 1 to 2 lb ae/A 2,4-D LV ester or 2,4-D amine; or 0.25 lb ae/A picloram; or 1 lb ae/A dicamba; or 2 quarts/A Weedmaster; or 1.5 to 2 quarts/A Crossbow

**Time** Apply 2,4-D in spring before any flowers appear; the earlier the application in relation to plant growth, the better the control. Picloram and dicamba can be used at the flowering stage with good results. Fall applications after rains begin seed germination have proven effective also.

**Remarks** Respraying for more than 1 year is necessary to control late-germinating seeds. Consult labels for grazing restrictions. See also pasture and rangeland section for broadcast spray.

**Caution** **Most picloram formulations are restricted-use herbicides.** Avoid drift to sensitive crops. Do not contaminate water with picloram. Potatoes, beans, and many other broadleaf crops are sensitive to picloram. Do not use picloram in diversified cropping areas. Do not graze dairy animals within 2 weeks after application.

**Site of action** (all) Group 4: synthetic auxin

**Chemical family** (2,4-D) Phenoxy acetic acid; (picloram and triclopyr) Pyridine; (dicamba) Benzoic acid

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## aminocyclopyrachlor + chlorsulfuron (Perspective)

**Rate** 1.8 to 3.2 oz/A aminocyclopyrachlor + 0.7 to 1.3 oz/A chlorsulfuron (4.5 to 8 oz/A of product)

**Time** Apply to actively growing plants in spring.

**Remarks** Adjuvants can be used; these include methylated seed oils 0.5 to 1% v/v, nonionic surfactants at 0.25 to 1% v/v, and crop oil concentrates at 1% v/v. Can be applied using an invert emulsion rather than water.

**Caution** Even low rates can kill nontarget tree and shrub species so avoid application within a distance equal to the tree height of the sensitive species. Do not allow spray to drift off target. Can injure several grass species including bromes, as well as basin wildrye.

**Site of action** (aminocyclopyrachlor) Group 4: Synthetic auxin; (chlorsulfuron) Group 2: ALS inhibitor

**Chemical family** (aminocyclopyrachlor) Pyrimidine carboxylic acid; (chlorsulfuron) Sulfonylurea

---

### aminopyralid (Milestone)

**Rate** 1 to 1.25 oz ae/A (4 to 5 fl oz/A Milestone)

**Time** Apply to actively growing plants in the rosette.

**Remarks** A nonionic surfactant at 1 to 2 quarts per 100 gal of spray enhances control under adverse environmental conditions.

**Caution** Do not allow drift to desirable vegetation. Many forbs (desirable broadleaf plants) can be seriously injured or killed. Do not exceed 7 fl oz/A Milestone per year.

**Site of action** Group 4: synthetic auxin

**Chemical family** Pyridine

---

### metsulfuron (Escort and others)

**Rate** Escort: 0.45 to 0.6 oz ai/A (0.75 to 1 oz/A)

**Time** Apply to actively growing plants.

**Remarks** Use a surfactant to increase effectiveness. Application sites differ among products; consult labels.

**Caution** Apply only to pasture, rangeland, and non-crop sites.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Sulfonylurea

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### Rue, African (*Peganum harmala*)

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### glyphosate

**Remarks** Reported to control this plant, although data are lacking in the Pacific Northwest. Follow label instructions.

**Site of action** Group 9: inhibits EPSP synthase

**Chemical family** None generally accepted

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### imazapyr (Arsenal)

**Rate** 0.75 to 1 lb ae/A or as a 1% solution with methylated seed oil adjuvant

**Time** Apply to actively growing foliage after plants bolt and through the fall.

**Remarks** Always add the appropriate surfactant.

**Caution** Before using, note crop rotation restrictions.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Imidazolinone

---

### metsulfuron (Escort)

**Rate** 1.2 oz ai/A (2 oz/A)

**Time** Apply to actively growing plants.

**Remarks** Using a nonionic or silicone surfactant increases effectiveness.

**Caution** Apply only to non-cropland sites.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Sulfonylurea

---

### Rush, bog (*Juncus effusus* var. *pacificus*)

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## 2,4-D LV ester

**Rate** Use a mixture of 1.5 lb ae 2,4-D, 50 gal water, and 2 gal diesel or a nonionic surfactant for spot treatments.

**Time** Apply in April or May after rush has made good spring growth.

**Remarks** Foliage must be thoroughly wet.

**Caution** Avoid drift to sensitive crops.

**Site of action** Group 4: synthetic auxin

**Chemical family** Phenoxy acetic acid

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## dicamba (Clarity)

**Rate** 0.75 lb ae/A (1.5 pint/A)

**Time** Apply any time the plants are actively growing.

**Remarks** Foliage must be thoroughly wet.

**Caution** Dicamba will kill clovers and other desirable broadleaf plants.

**Site of action** Group 4: synthetic auxin

**Chemical family** Benzoic acid

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Sage, Mediterranean (*Salvia aethiopsis*), meadow clary (*Salvia pratensis*), and clary sage (*Salvia sclarea*)

See *Biological Control* section in this handbook.

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Sagebrush, big (*Artemisia tridentata*)

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## 2,4-D LV ester

**Rate** 2 lb ae/A

**Time** Timing is critical for effective control. Apply during active sagebrush growth in spring when Sandberg bluegrass flowers, phloxes are forming seed, and larkspur is flowering near stem top.

**Remarks** Soil moisture should be above wilting coefficient. Use oil (no lower than No. 2 diesel) for aerial application. If water is used as a carrier, add a wetting agent.

**Caution** Avoid drift to sensitive crops.

**Site of action** Group 4: synthetic auxin

**Chemical family** Phenoxy acetic acid

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## tebuthiuron (Spike 20P)

**Rate** 0.1 to 1 lb ai/A (1 to 5 lb/A), depending on soil type and organic matter, or degree of control desired

**Time** Apply in fall east of the Cascades.

**Remarks** Lower rates used to reduce canopy cover. Grass may be temporarily injured. May take more than 1 year to show complete effects. No grazing restrictions.

**Caution** Do not apply to frozen soil. Spike will kill trees, shrubs, and some other desirable vegetation with roots extending into treated area. Consult label for precautions.

**Site of action** Group 7: Photosystem II inhibitor

**Chemical family** Substituted urea

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Sagebrush, fringed (*Artemisia frigida*)

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### picloram (Tordon)

**Rate** 0.25 to 0.5 lb ae/A

**Time** When plants are fully emerged up to flower bud formation.

**Remarks** Plants should be actively growing at the time of application. To be used on rangeland or permanent grass pastures.

**Caution** **Most formulations are restricted-use herbicides.** Avoid drift to sensitive crops. Do not contaminate water. Potatoes, beans, and many other broadleaf crops are sensitive to these herbicides. Do not use picloram in diversified crop areas. Refer to label for grazing restrictions.

**Site of action** Group 4: synthetic auxin

**Chemical family** Pyridine

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### St. Johnswort (*Hypericum perforatum*)

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### 2,4-D

**Rate** 2 lb ae/A in 50 gal of water

**Time** Apply before any blossoms open, preferably on new seedlings after germination.

**Remarks** Repeat applications as needed. Klamath beetles are preferred to control large infestations.

**Caution** Avoid drift to sensitive crops.

**Site of action** Group 4: synthetic auxin

**Chemical family** Phenoxy acetic acid

---

### metsulfuron (Escort and others)

**Rate** Escort: 0.6 oz ai/A (1 oz/A)

**Time** Apply after weeds emerge.

**Remarks** Use a surfactant to increase effectiveness.

**Caution** Apply only to pasture, rangeland, and non-crop sites. Application sites differ among products; consult labels.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Sulfonylurea

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### Sandbur, longspine (*Cenchrus longispinus*)

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### clethodim (Select or Arrow)

**Rate** 0.9 to 0.125 lb ai/A

**Time** Apply to sandbur 2 to 6 inches tall.

**Remarks** See label for crops and sites where clethodim may be used. If required, apply with suitable surfactant. Acts very slowly, taking at least 2 weeks and often 4 weeks to show effects. Do not apply to stressed grasses.

**Caution** Do not apply if rain is expected within 1 hour.

**Site of action** Group 1: acetyl CoA carboxylase (ACCase) inhibitor

**Chemical family** Cyclohexanedione

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### fluazifop (Fusilade DX)

**Rate** 0.375 lb ai/A (1.5 pints/A), depending on site

**Time** Apply to actively growing sandbur when 2 to 8 inches tall.

**Remarks** See label for crops and sites. Apply with 1% (v/v) crop oil concentrate. Acts very slowly, taking at least 2 weeks and often 4 weeks to show effects. Do not apply to stressed grasses.

**Caution** Do not use crop oil concentrate if treating sandbur in ornamentals. Do not apply if rain is expected within 1 hour.

**Site of action** Group 1: acetyl CoA carboxylase (ACCase) inhibitor

**Chemical family** Aryloxyphenoxy propionate

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### glyphosate

**Rate** 0.75 to 1.5 lb ae/A

**Time** Apply the 0.75 rate to actively growing weeds less than 6 inches tall. If weeds are above 6 inches tall, apply 1.5 lb ae/A.

**Remarks** Apply as postemergence spray to sandbur foliage.

**Caution** Glyphosate is not selective in cropland.

**Site of action** Group 9: inhibits EPSP synthase

**Chemical family** None generally accepted.

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### imazapic (Plateau)

**Rate** 0.063 to 0.188 lb ai/A

**Time** Apply early postemergence.

**Remarks** Plateau also has some preemergence activity. Add 1 quart/A methylated seed oil.

**Caution** Before using, note crop rotation restrictions.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Imidazolinone

---

### MSMA (Buena or Trans-Vert)

**Rate** 2 to 4 lb ai/A

**Time** Apply after sandbur emerges.

**Remarks** MSMA is more active above 70°F. Regrowth after rain or overhead irrigation may need respraying. Results are best when applied in the seedling stage.

**Caution** Keep liquid or dust away from eyes. Wash eyes immediately with water if exposed.

**Site of action** Group 17: not well understood

**Chemical family** Organoarsenical

---

### paraquat (Gramoxone Max)

**Rate** 0.38 to 0.49 lb ai/A

**Time** Apply as a postemergence spray to sandbur foliage.

**Remarks** Results are best if sandbur is in seedling stage. Add 8 to 16 fl oz/100 gal nonionic surfactant to spray mix. Paraquat, a contact herbicide, requires thorough spray coverage. Sandbur emerging after application will not be controlled.

**Caution** **A restricted-use herbicide.** Do not use around homes or other areas where children or pets might come in contact with the herbicide. Do not breathe spray mist.

**Site of action** Group 22: photosystem I electron diversion

**Chemical family** Bipyridilium

---

### quizalofop (Assure II)

**Rate** 0.048 to 0.55 lb ai/A (7 to 8 fl oz/A product)

**Time** Apply to sandbur 2 to 6 inches tall.

**Remarks** See label for crops and sites. Include crop oil concentrate or nonionic surfactant as label recommends. Acts very slowly, taking at least 2 weeks and often 4 weeks to show effects. Do not apply to stressed grasses.

**Caution** Do not apply if rain is expected within 1 hour.

**Site of action** Group 1: acetyl CoA carboxylase (ACCase) inhibitor

**Chemical family** Aryloxyphenoxy propionate

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Skeletonweed, rush (*Chondrilla juncea*)

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## **2,4-D or MCPA**

**Rate** 2 lb ae/A

**Time** Apply to rosettes in the spring immediately before or during bolting.

**Remarks** 2,4-D inhibits further aboveground growth but will not prevent new plant development from root buds.

**Caution** Re-treatment is important.

**Site of action** (both) Group 4: synthetic auxin

**Chemical family** (both) phenoxy acetic acid

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## **aminocyclopyrachlor + chlorsulfuron (Perspective)**

**Rate** 1.8 to 3.2 oz/A aminocyclopyrachlor + 0.7 to 1.3 oz/A chlorsulfuron (4.5 to 8 oz/A of product)

**Time** Apply to actively growing plants in spring.

**Remarks** Adjuvants can be used; these include methylated seed oils 0.5 to 1% v/v, nonionic surfactants at 0.25 to 1% v/v, and crop oil concentrates at 1% v/v. Can be applied using an invert emulsion rather than water.

**Caution** Even low rates can kill nontarget tree and shrub species, so avoid application within a distance equal to the tree height of the sensitive species. Do not allow spray to drift off target. Can injure several grass species including bromes, as well as basin wildrye.

**Site of action** (aminocyclopyrachlor) Group 4: Synthetic auxin; (chlorsulfuron) Group 2: ALS inhibitor

**Chemical family** (aminocyclopyrachlor) Pyrimidine carboxylic acid; (chlorsulfuron) Sulfonylurea

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## **aminopyralid (Milestone)**

**Rate** 1.75 oz ae/A (7 fl oz/A Milestone)

**Time** Spring or fall when rosettes are present.

**Remarks** A nonionic surfactant at 1 to 2 quarts per 100 gal of spray enhances control under adverse environmental conditions.

**Caution** Do not allow drift to desirable vegetation. Many forbs (desirable broadleaf plants) can be seriously injured or killed. Do not exceed 7 fl oz/A Milestone per year.

**Site of action** Group 4: synthetic auxin

**Chemical family** Pyridine

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## **clopyralid (Transline or Stinger)**

**Rate** 0.25 to 0.375 lb ae/A (0.66 to 1 pint/A)

**Time** Apply to rosette in fall or up to early bolting in spring.

**Remarks** Consult labels for specific site registrations.

**Caution** Product will injure or kill sensitive broadleaf forages. Consult label for crop rotation restrictions before using. Several crops may be injured several years after application.

**Site of action** Group 4: synthetic auxin

**Chemical family** Pyridine

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### **picloram (Tordon)**

**Rate** 1 lb ae/A

**Time** Apply from late fall to early spring. For best results, apply just before or during bolting.

**Remarks** Rush skeletonweed can reduce crop yields by as much as 70%, so it is important to treat small infestations. Picloram is the most effective treatment available. Re-treatment is necessary.

**Caution** **Most formulations are restricted-use herbicides.** Do not contaminate water. Potatoes, beans, and many other broadleaf crops are sensitive to picloram; do not use in diversified crop areas.

**Site of action** Group 4: synthetic auxin

**Chemical family** Pyridine

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Smartweed, dotted or perennial (*Polygonum punctatum*)

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### **dicamba (Clarity)**

**Rate** 2 lb ae/A

**Time** Apply in March, April, May, or June.

**Remarks** Foliage must be thoroughly wet.

**Caution** Controls all legumes in pasture and can temporarily inhibit grass in newly established fields.

**Site of action** Group 4: synthetic auxin

**Chemical family** Benzoic acid

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### **picloram (Tordon)**

**Rate** 1 lb ae/A

**Time** March to June.

**Remarks** Foliage must be thoroughly wet.

**Caution** **Most formulations are restricted-use herbicides.** Do not graze dairy animals on treated areas within 2 weeks after application. Apply rates above 0.5 lb ae/A (1 quart/A) only as a spot treatment not to exceed 25% of a landowner's acreage in a given watershed in a single season. Avoid drift to sensitive crops. Do not contaminate water. Potatoes, beans, and many other broadleaf crops are sensitive to picloram. Do not use in diversified cropping areas.

**Site of action** Group 4: synthetic auxin

**Chemical family** Pyridine

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Snakeweed, broom (*Gutierrezia sarothrae*)

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### **aminocyclopyrachlor + metsulfuron methyl (Streamline)**

**Rate** 1.9 to 3.8 oz/A aminocyclopyrachlor + 0.6 to 1.2 oz/A metsulfuron (4.75 to 9.5 oz/A of product)

**Time** Apply to actively growing woody plants.

**Remarks** Adjuvants can be used; they include methylated seed oils 0.5 to 1% v/v, nonionic surfactants at 0.25 to 1% v/v, and crop oil concentrates at 1%v/v. Can be applied using an invert emulsion rather than water. There are several application methods that dictate the amount of product to be mixed with the carrier, so consult the label. In addition to woody species, controls many herbaceous species also.

**Caution** Even low rates can kill nontarget tree and shrub species, so avoid application within a distance equal to the tree height

of the sensitive species. Conifers can be injured, these include ponderosa pine, Douglas fir, Norway spruce, and white pine. Other trees that can be injured include aspen, Chinese tallow, cottonwoods, honey locust, magnolia, poplars, redbud, silver maple, and willow. Applications to stressed plants may reduce control. Do not allow spray to drift off target.

**Site of action** (aminocyclopyrachlor) Group 4: Synthetic auxin; (chlorsulfuron) Group 2: ALS inhibitor

**Chemical family** (aminocyclopyrachlor) Pyrimidine carboxylic acid; (chlorsulfuron) Sulfonylurea

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### **metsulfuron (Escort and others)**

**Rate** Escort: 0.45 oz ai/A (0.75 oz/A)

**Time** Apply in fall or spring.

**Remarks** Application sites differ among products; consult labels.

**Caution** Prevent drift to sensitive crops. Apply only to pasture, rangeland, and non-crop sites.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Sulfonylurea

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### **picloram (Tordon)**

**Rate** 0.25 to 0.5 lb ae/A

**Time** Full leaf development to early bloom stage.

**Remarks** Plants should be actively growing at time of treatment.

**Caution** **Most formulations are restricted-use herbicides.** Do not contaminate water. Beans, potatoes, and many other broadleaf crops are very sensitive to picloram. Do not use in diversified cropping areas. See label for grazing restrictions. Apply rates above 0.5 lb ae/A (1 quart/A) only as a spot treatment not to exceed 25% of a landowner's acreage in a given watershed in one season.

**Site of action** Group 4: synthetic auxin

**Chemical family** Pyridine

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### Snapdragon, dwarf (*Chaenorrhinum minus*)

Control is unknown, although DCPA (applied before snapdragon seed germinates) has been reported as effective.

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### Sorrel, red (*Rumex acetosella*)

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### **dicamba (Clarity)**

**Rate** 0.5 lb ae/A

**Time** Apply when red sorrel has new foliage, usually November 15 to March 15. Spring application controls spring-germinating seedlings better than sprays applied earlier.

**Remarks** This treatment kills red sorrel seedlings and most of the old plants. It prevents surviving plants from setting seed.

**Caution** Avoid drift to sensitive crops.

**Site of action** Group 4: synthetic auxin

**Chemical family** Benzoic acid

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### Sowthistle, perennial (*Sonchus arvensis*)

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### **2,4-D**

**Rate** 2 lb ae/A

**Time** Apply at bud stage and to regrowth 8 to 10 inches high.

**Remarks** Repeat applications are necessary.

**Caution** Avoid drift to sensitive crops.

**Site of action** Group 4: synthetic auxin

**Chemical family** Phenoxy acetic acid

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### **aminopyralid (Milestone)**

**Rate** 0.75 to 1.25 oz ae/A (3 to 5 fl oz/A Milestone)

**Time** Apply to actively growing plants before the bud stage of growth.

**Remarks** A nonionic surfactant at 1 to 2 quarts per 100 gal of spray enhances control under adverse environmental conditions.

**Caution** Do not allow drift to desirable vegetation. Many forbs (desirable broadleaf plants) can be seriously injured or killed. Do not exceed 7 fl oz/A Milestone per year.

**Site of action** Group 4: synthetic auxin

**Chemical family** Pyridine

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### **clopyralid + 2,4-D amine (Curtail)**

**Rate** 1 to 5 quarts/A Curtail

**Time** Apply after most rosettes have emerged but before bud stage.

**Remarks** Lower rate for in-crop cereal grain application; usually will provide only suppression. Higher rates for fallow, postharvest, and Conservation Reserve Program (CRP) applications. Consult label for specific directions. With CRP applications, for established grass only. Apply in enough total spray volume to ensure good coverage.

**Caution** Consult label for crop rotation restrictions before using product. Several crops may be injured up to 4 years after application.

**Site of action** Group 4: synthetic auxin

**Chemical family** (clopyralid) pyridine; (2,4-D) phenoxy acetic acid

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### Spurge laurel (*Daphne laureola*)

**Remarks** Although PNW data are preliminary, aminocyclopyrachlor, aminopyralid, glyphosate, imazapyr, and triclopyr + 2,4-D applied as cut stem treatments gave promising results in initial trials. Imazapyr and triclopyr + 2,4-D applied to foliage also resulted in good control.

**Site of action** (imazapyr) Group 2: acetolactate synthase (ALS) inhibitor; (glyphosate) Group 9: inhibits EPSP synthase; (2,4-D, aminocyclopyrachlor, aminopyralid, triclopyr) Group 4: synthetic auxin

**Chemical family** (imazapyr) imidazolinone; (glyphosate) none generally accepted; (2,4-D) phenoxy acetic acid; (aminocyclopyrachlor, aminopyralid, triclopyr) pyridine

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### Spurge, leafy (*Euphorbia esula*), myrtle spurge (*Euphorbia myrsinites*), and oblong or eggleaf spurge (*Euphorbia oblongata*)

Leafy spurge is a creeping perennial that emerges each year from roots that may be exceptionally deep in soil. This weed does not survive under regular cultivation. It becomes serious when it invades pastures and rangeland. Mowing is not effective and is usually impractical. Sheep will graze leafy spurge enough to reduce competition with grass and to allow some production from the rangeland. Any control program, including herbicides, must be long term. Picloram or two or three applications of glyphosate seem to be a good starting point. Establishing a competitive grass and using 2,4-D to prevent seed production and to slow the growth of survivors are essential to return the land to full productivity.

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### **2,4-D LV ester**

**Rate** 1 lb ae/A helps prevent seed formation; 6 lb ae/A helps control leafy spurge infestations.

**Time** Use lower rates to prevent seed formation in the bud to early bloom stage. Use higher rates in early spring applications.

**Remarks** When mowing is possible, spray 2,4-D on new regrowth 2 week after mowing. Re-treatments will be necessary.

**Caution** Avoid drift to sensitive crops.

**Site of action** Group 4: synthetic auxin

**Chemical family** Phenoxy acetic acid

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### **aminocyclopyrachlor + chlorsulfuron (Perspective)**

**Rate** 1.8 to 3.2 oz/A aminocyclopyrachlor + 0.7 to 1.3 oz/A chlorsulfuron (4.5 to 8 oz/A of product)

**Time** Apply to actively growing plants in spring.

**Remarks** Adjuvants can be used; these include methylated seed oils 0.5 to 1% v/v, nonionic surfactants at 0.25 to 1% v/v, and crop oil concentrates at 1% v/v. Can be applied using an invert emulsion rather than water.

**Caution** Even low rates can kill nontarget tree and shrub species, so avoid application within a distance equal to the tree height of the sensitive species. Do not allow spray to drift off target. Can injure several grass species including bromes, as well as basin wildrye.

**Site of action** (aminocyclopyrachlor) Group 4: Synthetic auxin; (chlorsulfuron) Group 2: ALS inhibitor

**Chemical family** (aminocyclopyrachlor) Pyrimidine carboxylic acid; (chlorsulfuron) Sulfonylurea

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### **dicamba (Clarity)**

**Rate** 4 to 8 lb ae/A

**Time** Apply in spring or early summer.

**Remarks** Dicamba is both soil- and foliar-active. Use on non-cropland only at these application rates. Repeat each year as needed.

**Caution** Do not graze livestock in treated fields within 30 days of slaughter.

**Site of action** Group 4: synthetic auxin

**Chemical family** Benzoic acid

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### **fosamine (Krenite S)**

**Rate** 2 gal product/100 gal water

**Time** Apply at flowering to actively growing plants. Apply spray to wet.

**Remarks** Will not kill grasses and can be used next to water. Effectiveness may be reduced if rain falls on the same day.

**Caution** Non-cropland use only.

**Site of action** Not well understood

**Chemical family** Organophosphorus

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### **glyphosate**

**Rate** 0.38 to 0.75 lb ae/A

**Time** Applications must be split, at 30-day intervals. For the 0.38 lb ae/A (1 pint) rate, apply 1 pint of glyphosate about June 1, July 1, and August 1. For the 0.75 lb ae/A (2 pints) rate, apply 2 pints of glyphosate about June 1 and July 1.

**Remarks** Three split applications (0.38 lb ae/A each) are somewhat selective, leaving some perennial grasses. These treatments are suggested when water is near the infested area or when a reseeding of grasses is planned. Applications prevent vegetative growth the year of application and will prevent seed production the second year.

**Caution** Re-treatment is necessary for continued control. Glyphosate is not selective.

**Site of action** Group 9: inhibits EPSP synthase

**Chemical family** None generally accepted

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### **glyphosate + 2,4-D (Landmaster BW)**

**Rate** 54 oz/A Landmaster

**Time** Late summer or fall.

**Remarks** Apply in 3 to 10 gal of water.

**Caution** Glyphosate is not selective; desirable grasses will be killed at this rate.

**Site of action** (glyphosate) Group 9: inhibits EPSP synthase; (2,4-D) Group 4: synthetic auxin

**Chemical family** (glyphosate) none generally accepted; (2,4-D) phenoxy acetic acid

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### **imazapic (Plateau)**

**Rate** 0.125 to 0.188 lb ai/A

**Time** Apply in late summer or fall (mid-August through October) before spurge loses its milky sap due to drought or a killing frost.

**Remarks** Add 1 quart/A methylated seed oil.

**Caution** Before using, note crop rotation restrictions.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Imidazolinone

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### **picloram (Tordon)**

**Rate** 0.5 to 1 lb ae/A. Use higher rates in areas that are difficult to re-treat. Make a series of applications of 0.5 lb ae/A if leafy spurge is near running water or lakes.

**Time** Apply any time in the growing season. Re-treatments needed for several years to control seedlings.

**Remarks** Picloram has given excellent control with follow-up treatments. It can persist for 2 years at higher application rates.

**Caution** **Most formulations are restricted-use herbicides.** Do not contaminate water. Potatoes, beans, and many other broadleaf crops are sensitive to picloram. Do not use in diversified crop areas.

**Site of action** Group 4: synthetic auxin

**Chemical family** Pyridine

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Starthistle, yellow (*Centaurea solstitialis*), purple (*Centaurea calcitrapa*), and Iberian (*Centaurea iberica*)

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### **2,4-D LV ester or 2,4-D amine**

**Rate** 1 lb ae/A in 50 gal of water

**Time** Apply before flowering.

**Remarks** Foliage must be thoroughly wet.

**Caution** Avoid drift to sensitive crops.

**Site of action** Group 4: synthetic auxin

**Chemical family** Phenoxy acetic acid

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### **aminocyclopyrachlor + chlorsulfuron (Perspective)**

**Rate** 1.2 to 1.8 oz/A aminocyclopyrachlor + 0.5 to 0.7 oz/A chlorsulfuron (3 to 4.5 oz/A of product)

**Time** Apply to actively growing plants.

**Remarks** Adjuvants can be used and include methylated seed oils 0.5 to 1% v/v, nonionic surfactants at 0.25 to 1% v/v, and

crop oil concentrates at 1%v/v. Can be applied using an invert emulsion rather than water.

**Caution** Even low rates can kill nontarget tree and shrub species, so avoid application within a distance equal to the tree height of the sensitive species. Do not allow spray to drift off target. Can injure several grass species including bromes, as well as basin wildrye.

**Site of action** (aminocyclopyrachlor) Group 4: Synthetic auxin; (chlorsulfuron) Group 2: ALS inhibitor

**Chemical family** (aminocyclopyrachlor) Pyrimidine carboxylic acid; (chlorsulfuron) Sulfonylurea

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### **aminopyralid (Milestone)**

**Rate** 0.75 to 1.25 oz ae/A (3 to 5 fl oz/A Milestone)

**Time** Apply to plants at the rosette through bolting stages.

**Remarks** A nonionic surfactant at 1 to 2 quarts per 100 gal of spray enhances control under adverse environmental conditions.

**Caution** Do not allow drift to desirable vegetation. Many forbs (desirable broadleaf plants) can be seriously injured or killed. Do not exceed 7 fl oz/A Milestone per year.

**Site of action** Group 4: synthetic auxin

**Chemical family** Pyridine

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### **chlorsulfuron (Telar)**

**Rate** 1.125 oz ai/A (1.5 oz/A). Rate selection is based on weed species and soil texture.

**Time** For best results apply to young, actively growing weeds.

**Remarks** For suppression only. Do not apply to frozen ground. Constantly agitate while mixing in spray solution. Add 0.25% v/v nonionic surfactant to the spray mixture. Apply with ground equipment in at least 10 gal/A carrier.

**Caution** See label for tank-cleaning instructions. Use on non-cropland only.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Sulfonylurea

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### **clopyralid (Stinger or Transline)**

**Rate** 0.09 to 0.375 lb ae/A (0.25 to 1 pint/A). Labeled rates vary with crops.

**Time** After most rosettes have emerged but before bud formation.

**Remarks** Best applied to actively growing weeds. See labels for registered sites.

**Caution** See label for crop rotation restrictions before using. Several crops may be injured up to 4 years after applying.

**Site of action** Group 4: synthetic auxin

**Chemical family** Pyridine

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### **clopyralid + 2,4-D amine (Curtail)**

**Rate** 1 to 5 quarts/A Curtail

**Time** Apply after most rosettes have emerged but before bud formation.

**Remarks** Lower rate for in-crop cereal grain application, higher rates for fallow, postharvest, and Conservation Reserve Program (CRP) applications. See label for specifics. With CRP applications, for established grass only. Apply in enough total spray volume to ensure good coverage.

**Caution** See label for crop rotation restrictions before Curtail. Several crops may be injured up to 4 years after applying.

**Site of action** Group 4: synthetic auxin

**Chemical family** (clopyralid) pyridine; (2,4-D) phenoxy acetic acid

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**dicamba (Clarity)**

**Rate** 1 to 2 lb ae/A

**Time** Apply when plants are still in rosettes but before flower stems elongate.

**Remarks** Plants should be actively growing at time of treatment.

**Caution** Avoid drift to sensitive crops. Follow grazing restrictions.

**Site of action** Group 4: synthetic auxin

**Chemical family** Benzoic acid

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**diflufenzopyr + dicamba (Overdrive)**

**Rate** 0.26 to 0.35 lb ae/A (6 to 8 oz/A)

**Time** Apply to seedlings or rosettes.

**Remarks** Add a suitable surfactant to the spray mix.

**Caution** Avoid drift to sensitive crops. Will kill legumes.

**Site of action** (diflufenzopyr) Group 19: inhibits indole acetic acid transport; (dicamba) Group 4: synthetic auxin

**Chemical family** (diflufenzopyr) Semicarbazone; (dicamba) Benzoic acid

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**picloram (Tordon)**

**Rate** 0.25 to 0.375 lb ae/A

**Time** In spring, to plants still in rosette through bud formation.

**Remarks** A selective treatment that will not damage perennial grasses at the suggested rate. Treating at bud stage can reduce weed seed viability by 95 to 100% in the year of application.

**Caution** **Most formulations are restricted-use herbicides.** Do not contaminate water. Do not use in diversified crop areas. Potatoes, beans, and many other broadleaf crops are sensitive to picloram.

**Site of action** Group 4: synthetic auxin

**Chemical family** Pyridine

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**triclopyr + clopyralid (Redeem R&P)**

**Rate** 1.5 to 2.5 pints/A

**Time** Apply from rosette to early bolt stage when starthistle is actively growing.

**Remarks** Add a nonionic surfactant at surfactant manufacturer's recommended rate. Apply in at least 10 gal/A water by ground.

**Caution** Do not exceed 4 pints/A per year. Avoid drift to desirable vegetation. Note label restrictions on overseeding or reseeding.

**Site of action** (both) Group 4: synthetic auxin

**Chemical family** (both) Pyridine

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Sumpweed, poverty, or povertyweed (*Iva axillaris*)

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**dicamba (Clarity)**

**Rate** 1 lb ae/A

**Time** Apply when plants are actively growing.

**Remarks** Adding 0.5% (v/v) surfactant enhances control.

**Caution** Avoid spray drift. Avoid disturbing areas for 7 days after application.

**Site of action** Group 4: synthetic auxin

**Chemical family** Benzoic acid

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### **picloram (Tordon)**

**Rate** 1 to 2 lb ae/A

**Time** Apply during growing season when moisture will be sufficient to carry herbicide into soil. When little moisture will be available, apply in the fall.

**Caution** **Most formulations are restricted-use herbicides.** See label for grazing restrictions. Do not contaminate water. Potatoes, beans, and many other broadleaf crops are very sensitive to picloram. Do not use in diversified cropping areas. Apply rates above 0.5 lb ae/A (1 quart/A) only as a spot treatment not to exceed 25% of a landowner's acreage in a watershed in a single season.

**Site of action** Group 4: synthetic auxin

**Chemical family** Pyridine

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Swainsonpea or Austrian peaweed (*Swainsona salsula*)

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### **2,4-D LV ester**

**Rate** 2 lb ae/A

**Time** Apply in the early bloom stage of growth.

**Remarks** Re-treatment may be required.

**Caution** Avoid drift to sensitive crops.

**Site of action** Group 4: synthetic auxin

**Chemical family** Phenoxy acetic acid

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Tansy, common (*Tanacetum vulgare*)

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### **aminocyclopyrachlor + chlorsulfuron (Perspective)**

**Rate** 1.8 to 3.2 oz/A aminocyclopyrachlor + 0.7 to 1.3 oz/A chlorsulfuron (4.5 to 8 oz/A of product)

**Time** Apply to actively growing plants in spring.

**Remarks** Adjuvants can be used; these include methylated seed oils 0.5 to 1% v/v, nonionic surfactants at 0.25 to 1% v/v, and crop oil concentrates at 1%v/v. Can be applied using an invert emulsion rather than water.

**Caution** Even low rates can kill nontarget tree and shrub species, so avoid application within a distance equal to the tree height of the sensitive species. Do not allow spray to drift off target. Can injure several grass species including bromes, as well as basin wildrye.

**Site of action** (aminocyclopyrachlor) Group 4: Synthetic auxin; (chlorsulfuron) Group 2: ALS inhibitor

**Chemical family** (aminocyclopyrachlor) Pyrimidine carboxylic acid; (chlorsulfuron) Sulfonylurea

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### **chlorsulfuron (Telar)**

**Rate** 0.75 to 2.25 oz ai/A (1 to 3 oz/A)

**Time** Apply to actively growing vegetation in the spring.

**Remarks** Use on non-cropland only.

**Caution** Do not allow spray drift to sensitive crops.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

Chemical family Sulfonylurea

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### dicamba (Clarity) + picloram (Tordon)

**Rate** 1 to 2 lb ae/A dicamba + 0.5 lb ae/A picloram

**Time** Apply from early flower bud development to bloom stage.

**Remarks** This combination is more effective than applications of the individual products.

**Caution** Tordon is a restricted-use herbicide. See label for grazing restrictions. For rates above 0.5 lb ae/A (1 quart/A), apply only as a spot treatment not to exceed 25% of a landowner's acreage in a particular watershed in a single season. Avoid drift to sensitive crops. Do not contaminate water. Potatoes, beans, and many other broadleaf crops are sensitive to these herbicides. Do not use picloram in diversified crop areas.

**Site of action** (both) Group 4: synthetic auxin

**Chemical family** (dicamba) Benzoic acid; (picloram) Pyridine

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### metsulfuron (Escort and others)

**Rate** Escort: 0.6 oz ai/A (1 oz/A)

**Time** Apply to actively growing vegetation in the spring.

**Remarks** Use a surfactant at 0.25% v/v.

**Caution** Do not allow spray drift to sensitive crops. Apply only to pasture, rangeland, and non-crop sites. Application sites differ between products; consult labels.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Sulfonylurea

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Teasel, common (*Dipsacus fullonum*) and cutleaf (*Dipsacus laciniatus*)

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### 2,4-D amine

**Rate** 1 lb ae/A

**Time** Apply to rosette stage in fall or spring.

**Remarks** Treating after teasel begins to bolt may not be effective.

**Caution** Avoid drift to sensitive crops.

**Site of action** Group 4: synthetic auxin

**Chemical family** Phenoxy acetic acid

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### 2,4-D amine + dicamba (Rifle-D and several others)

**Rate** 0.75 lb ae/A 2,4-D + 0.125 lb ae/A dicamba

**Time** Apply to rosette stage in fall or spring.

**Remarks** Treatments made after teasel begins to bolt may not be effective.

**Caution** Avoid drift to sensitive crops.

**Site of action** (both) Group 4: synthetic auxin

**Chemical family** (2,4-D) Phenoxy acetic acid; (dicamba) Benzoic acid

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### aminocyclopyrachlor + chlorsulfuron (Perspective)

**Rate** 1.8 to 3.2 oz/A aminocyclopyrachlor + 0.7 to 1.3 oz/A chlorsulfuron (4.5 to 8 oz/A of product)

**Time** Apply to actively growing plants in spring.

**Remarks** Adjuvants can be used; these include methylated seed oils 0.5 to 1% v/v, nonionic surfactants at 0.25 to 1% v/v, and crop oil concentrates at 1%v/v. Can be applied using an invert emulsion rather than water.

**Caution** Even low rates can kill nontarget tree and shrub species, so avoid application within a distance equal to the tree height of the sensitive species. Do not allow spray to drift off target. Can injure several grass species including bromes, as well as basin wildrye.

**Site of action** (aminocyclopyrachlor) Group 4: Synthetic auxin; (chlorsulfuron) Group 2: ALS inhibitor

**Chemical family** (aminocyclopyrachlor) Pyrimidine carboxylic acid; (chlorsulfuron) Sulfonylurea

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### **chlorsulfuron (Telar)**

**Rate** 0.75 oz ai/A (1 oz/A Telar)

**Time** For best results, apply to actively growing teasel in the rosette stage.

**Remarks** Constantly agitate while mixing and spraying. Add 0.25% v/v nonionic surfactant to spray mixture. Apply with ground equipment in at least 10 gal/A carrier.

**Caution** Registered for use on pasture, range, Conservation Reserve Program (CRP), and non-cropland only. Avoid contact with sensitive crops. Can persist in soil. Do not treat powdery, dry soils or light, sandy soils unless rain is likely soon after treatment. Do not apply to frozen ground.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Sulfonylurea

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### **diflufenzopyr + dicamba (Overdrive)**

**Rate** 0.26 to 0.35 lb ae/A (6 to 8 oz/A)

**Time** Apply to rosettes.

**Remarks** Add a surfactant to the spray mix.

**Caution** Avoid drift to sensitive crops. Will kill legumes.

**Site of action** (diflufenzopyr) Group 19: inhibits indole acetic acid transport; (dicamba) Group 4: synthetic auxin

**Chemical family** (diflufenzopyr) Semicarbazone; (dicamba) Benzoic acid

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### **imazapic (Plateau)**

**Rate** 0.125 to 0.188 lb ai/A

**Time** Apply to rosettes.

**Remarks** Add 1 quart/A methylated seed oil.

**Caution** Before using, note crop rotation restrictions.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Imidazolinone

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### **metsulfuron (Escort and others)**

**Rate** Escort: 0.45 oz ai/A (0.75 oz/A)

**Time** Apply to actively growing plants.

**Remarks** Using a nonionic or silicone surfactant increases effectiveness. Application sites differ among products; consult labels.

**Caution** Apply only to pasture, rangeland, and non-crop sites.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Sulfonylurea

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### triclopyr + clopyralid (Redeem R&P)

**Rate** 1.5 pints/A

**Time** Apply when actively growing.

**Remarks** Add a nonionic surfactant at surfactant manufacturer's recommended rate. Apply in at least 10 gal/A water by ground.

**Caution** Do not exceed 4 pints/A per year. Avoid drift to desirable vegetation. Note label restrictions on overseeding or reseeding.

**Site of action** (both) Group 4: synthetic auxin

**Chemical family** (both) Pyridine

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Thistle, Canada (*Cirsium arvense*)—nonselective and/or non-cropland control

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### aminocyclopyrachlor + chlorsulfuron (Perspective)

**Rate** 1.8 to 3.2 oz/A aminocyclopyrachlor + 0.7 to 1.3 oz/A chlorsulfuron (4.5 to 8 oz/A of product)

**Time** Apply to actively growing plants in spring.

**Remarks** Adjuvants can be used; these include methylated seed oils 0.5 to 1% v/v, nonionic surfactants at 0.25 to 1% v/v, and crop oil concentrates at 1%v/v. Can be applied using an invert emulsion rather than water.

**Caution** Even low rates can kill nontarget tree and shrub species, so avoid application within a distance equal to the tree height of the sensitive species. Do not allow spray to drift off target. Can injure several grass species including bromes, as well as basin wildrye.

**Site of action** (aminocyclopyrachlor) Group 4: Synthetic auxin; (chlorsulfuron) Group 2: ALS inhibitor

**Chemical family** (aminocyclopyrachlor) Pyrimidine carboxylic acid; (chlorsulfuron) Sulfonylurea

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### aminopyralid (Milestone)

**Rate** 1.25 to 1.75 oz ae/A (5 to 7 fl oz/A Milestone)

**Time** Apply in the spring to plants in the prebud stage of growth or in the fall to plant regrowth.

**Remarks** A nonionic surfactant at 1 to 2 quarts per 100 gal of spray enhances control under adverse environmental conditions.

**Caution** Do not allow drift to desirable vegetation. Many forbs (desirable broadleaf plants) can be seriously injured or killed. Do not exceed 7 fl oz/A Milestone per year.

**Site of action** Group 4: synthetic auxin

**Chemical family** Pyridine

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### chlorsulfuron (Telar)

**Rate** 1.125 oz ai/A (1.5 oz/A)

**Time** Apply postemergence. For best results, apply to thistles in the bud-bloom stage or to fall rosettes.

**Remarks** Do not apply to frozen ground. Constantly agitate while mixing in spray solution. Add 0.25% v/v nonionic surfactant to the spray mixture.

**Caution** Avoid contact with sensitive crops. For non-cropland use only. Chlorsulfuron can persist in soil; if land is to return to cropland, allow sufficient time for product to dissipate. Powdery, dry soils and light, sandy soils should not be treated if rain is not likely after treatment.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Sulfonylurea

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### **clopyralid + 2,4-D amine (Curtil) or clopyralid (Stinger or Transline)**

**Rate** Consult labels. Rate depends on use site.

**Time** Apply to actively growing thistle after most basal leaves emerge but before bud stage.

**Remarks** Lower rate for in-crop cereal grain application, higher rate for fallow, postharvest, non-crop, and Conservation Reserve Program (CRP) applications. See label for specifics. CRP applications are for established grass only. For best results, wait at least 20 days after application before disturbing treated areas (cultivation, mowing, fertilization with shank-type applicators) to allow thorough translocation. Apply in enough total spray volume to ensure good coverage.

**Caution** Consult label for crop rotation restrictions before using these products. Several crops may be injured up to 4 years after application. Do not transfer livestock from treated areas to sensitive broadleaf crop areas without first grazing 7 days on untreated pasture.

**Site of action** (both) Group 4: synthetic auxin

**Chemical family** (clopyralid) pyridine; (2,4-D) phenoxy acetic acid

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### **dicamba (Clarity)**

**Rate** 2 lb ae/A. Spot treatment: use mixtures of 2 to 4 lb ae dicamba per 100 gal water.

**Time** May be applied any time during the growing season.

**Remarks** Higher rates may be required in high-rain areas. Soil residues are normally for one winter in western Oregon. Apply dicamba to growing thistles; uptake is through both foliage and root system. May mix with glyphosate to apply in fall.

**Caution** Avoid drift to sensitive crops. Dicamba will damage or kill clovers in pastures.

**Site of action** Group 4: synthetic auxin

**Chemical family** Benzoic acid

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### **diflufenzopyr + dicamba (Overdrive)**

**Rate** 0.26 to 0.35 lb ae/A (6 to 8 oz/A)

**Time** Apply in spring to the rosettes.

**Remarks** Add a surfactant, either nonionic or methylated seed oil, to the spray mix.

**Caution** Avoid drift to sensitive crops. Will kill legumes.

**Site of action** (diflufenzopyr) Group 19: inhibits indole acetic acid transport; (dicamba) Group 4: synthetic auxin

**Chemical family** (diflufenzopyr) semicarbazone; (dicamba) benzoic acid

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### **glyphosate**

**Rate** Broadcast: 1.5 to 2.25 lb ae/A; wiper: 10 to 33% solution. Hand-held and high-volume equipment: 2% solution

**Time** Apply when thistles are actively growing but past the bud growth stage. Fall applications must be before the first killing frost. Thistles that were mowed or tilled and have rosettes at least 6 inches wide in late summer or fall can be suppressed with 0.75 lb ae/A glyphosate plus 0.5 to 1% nonionic surfactant applied in 3 to 10 gal/A water.

**Remarks** Wait 3 days for maximum root translocation of glyphosate before tillage.

**Caution** Glyphosate controls grasses as well as other vegetation in treated areas.

**Site of action** Group 9: inhibits EPSP synthase

**Chemical family** None generally accepted

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### **picloram (Tordon)**

**Rate** In broadcast or boom sprayers, apply 1 lb ae/A. Mixtures normally used for spot treatments include 1 lb ae per 100 gal water.

**Time** Control is best if applied to actively growing thistle after most leaves emerge but before bud stage.

**Remarks** Picloram is both a foliar and soil active herbicide. It will not kill perennial grasses when used according to the label.

**Caution** **Most formulations are restricted-use herbicides.** Do not contaminate water. Potatoes, beans, and many other broadleaf crops are very sensitive to picloram. Do not use in diversified cropping areas. Do not graze dairy animals on treated areas within 2 weeks after application. For rates exceeding 0.5 lb ae/A (1 quart/A), apply only as a spot treatment not to exceed 25% of a landowner's acreage in any particular watershed in a single season.

**Site of action** Group 4: synthetic auxin

**Chemical family** Pyridine

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### **triclopyr + clopyralid (Redeem R&P)**

**Rate** 2.5 to 4 pints/A

**Time** Apply from rosette to bud stage to actively growing thistle.

**Remarks** Add a nonionic surfactant at surfactant manufacturer's recommended rate. Apply in at least 10 gal/A water by ground.

**Caution** Do not exceed 4 pints/A per year. Do not allow drift to desirable vegetation. Note label restrictions on overseeding or reseeding.

**Site of action** (both) Group 4: synthetic auxin

**Chemical family** (both) pyridine

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Thistle, Canada (*Cirsium arvense*)—selective control in crops

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### **2,4-D**

*Selective treatment in grain and grass crops*

**Rate** 1 to 1.5 lb ae/A

**Time** Apply at the early bud stage of thistle. May require repeated applications.

**Remarks** Do not apply to grass or grain crops before tiller stage or from early boot to dough stage. The 1.5 lb/A rate can injure wheat.

**Caution** Avoid drift to sensitive crops.

**Site of action** Group 4: synthetic auxin

**Chemical family** Phenoxy acetic acid

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### **2,4-D or MCPA + dicamba**

**Rate** 1 lb ae/A 2,4-D or MCPA and 0.125 lb ae/A dicamba

**Time** In wheat or barley, apply after crop begins tillering and before boot stage. May also be applied in stubble or fallow.

**Remarks** MCPA is usually more effective on Canada thistle. Results are best if applied to actively growing thistles.

**Site of action** (all) Group 4: synthetic auxin

**Chemical family** (2,4-D and MCPA) Phenoxy acetic acid; (dicamba) Benzoic acid

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### **bentazon (Basagran)**

*Selective in corn, dry beans, peas, and mint*

**Rate** 0.75 to 1 lb ai/A

**Time** When thistle is 6 to 8 inches tall. If needed, apply again in 10 to 14 days.

**Remarks** Light leaf speckling may occur, but crop plants generally outgrow this within 10 days. Canada thistle must be thoroughly covered. Use at least 20 gal/A of water and at least 40 psi by ground. For aerial application, use at least 5 gal/A of

water and a maximum of 40 psi.

**Caution** Do not use near water. Avoid applying during drought or unseasonably cold weather. Expect unsatisfactory results if daytime temperatures do not reach at least 70°F during the week after applying.

**Site of action** Group 6: photosystem II inhibitor

**Chemical family** Benzothiadiazole

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### **chlorsulfuron (Glean)**

*Barley, oats, wheat*

**Remarks** To suppress Canada thistle only. See sections in this handbook on barley, oats, and wheat for use instructions.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Sulfonylurea

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### **chlorsulfuron + metsulfuron (Finesse)**

*Barley and wheat*

**Remarks** To suppress Canada thistle only. See sections in this handbook on barley and wheat for use instructions.

**Site of action** (both) Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** (both) sulfonylurea

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### **clopyralid (Stinger)**

**Rate** 0.09 to 0.5 lb ae/A (0.25 to 1.33 pints/A). Labeled rates vary by crop.

**Time** Apply to actively growing weeds. For Canada thistle, apply after most basal leaves emerge but before bud stage.

**Remarks** For most effective control, apply as a broadcast treatment to the entire infested area.

**Caution** Consult label for crop rotation restrictions before using these products. Several crops may be injured up to 4 years after application. Consult labels for registered use sites. Stinger is registered for use on field corn, sugar beets, Conservation Reserve Program (CRP), grass seed, rangeland, pasture, Christmas tree, small grains, and non-crop areas.

**Site of action** Group 4: synthetic auxin

**Chemical family** Pyridine

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### **clopyralid + 2,4-D amine (Curtail)**

**Rate** 1 to 2 quarts/A Curtail. Maximum rate depends on crop.

**Time** Apply 2.66 pints/A formulated product to wheat or barley after crop begins tillering and before boot stage. The 2-quart rate can be used in fallow and in grass seed crops. Canada thistle should be in the rosette to prebud growth stage.

**Remarks** Apply in warm weather when weeds are actively growing and soil moisture is adequate for active plant growth.

**Caution** Consult label for crop rotation restrictions before using product. Several crops may be injured up to 4 years after application. Do not permit dairy animals or meat animals being finished for slaughter to forage or graze treated grain fields within 1 weeks after treatment. Do not harvest hay from treated grain fields.

**Site of action** (both) Group 4: synthetic auxin

**Chemical family** (clopyralid) pyridine; (2,4-D) phenoxy acetic acid

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### **dichlobenil (Casoron)**

*Selective in trailing berries, fruit trees, grapes, and ornamentals*

**Rate** 4 lb ai/A in berries; 4 to 6 lb ai/A in fruit trees and grapes

**Time** Apply in winter or spring before active growth of crops or thistle before a rainy period to allow for activation and to avoid volatilization.

**Remarks** Apply midwinter immediately before a cold rain to reduce volatility and enhance weed suppression. Weigh and distribute uniformly exact quantities over precisely measured areas. Oregon results over 9 years suggest that perennial weeds can be suppressed with 4-, 3-, and 2-lb ai/A rates applied during 3 consecutive years. Grazing livestock is prohibited. (Inhibits cellulose and cell wall formation.)

**Site of action** Group 20: inhibits cell wall synthesis Site A

**Chemical family** Nitrile

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Thistle, Italian (*Carduus pycnocephalus*), slenderflower (*Carduus tenuiflorus*), and plumeless (*Carduus acanthoides*)

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### **clopyralid (Transline or Stinger)**

**Rate** 0.125 to 0.25 lb ae/A (0.33 to 0.66 pint/A)

**Time** Apply to rosettes

**Remarks** Consult labels for specific site registrations.

**Caution** Product will injure or kill sensitive broadleaf forages. Consult label for crop rotation restrictions before using. Several crops may be injured several years after application.

**Site of action** Group 4: synthetic auxin

**Chemical family** Pyridine

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### **MCPA amine**

**Rate** 1.5 lb ae/A

**Time** When thistle is actively growing but before bolting. Thistle rosettes wider than 6 inches may be difficult to control.

**Remarks** Subclover smaller than two trifoliolate leaves may be severely injured by this treatment. Other formulations may injure clover more severely. Aerial applications often produce erratic results. Results are good from applications in October through early April, but thistles may be too dormant in midwinter in some years.

**Caution** Avoid drift to sensitive crops.

**Site of action** Group 4: synthetic auxin

**Chemical family** Phenoxy acetic acid

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Thistle, bull (*Cirsium arvense*), milk (*Silybum marianum*), musk (*Carduus nutans*), Scotch (*Onopordum acanthium*), woolly distaff (*Carthamus lanatus*), and smooth distaff (*Carthamus baeticus*)

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### **2,4-D**

**Rate** 1.5 to 2 lb ae/A

**Time** Spring or fall.

**Remarks** Use fall treatments to control rosettes of these biennial weeds. Use spring treatments before flower stalk elongates. Annual treatments are needed to control seedlings. Pasture legumes are injured or eliminated at these rates.

**Caution** Avoid drift to sensitive crops.

**Site of action** Group 4: synthetic auxin

**Chemical family** Phenoxy acetic acid

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### **aminocyclopyrachlor + chlorsulfuron (Perspective)**

**Rate** 1.8 to 3.2 oz/A aminocyclopyrachlor + 0.7 to 1.3 oz/A chlorsulfuron (4.5 to 8 oz/A of product)

**Time** Apply to actively growing plants in spring.

**Remarks** Adjuvants can be used; these include methylated seed oils 0.5 to 1% v/v, nonionic surfactants at 0.25 to 1% v/v, and

crop oil concentrates at 1% v/v. Can be applied using an invert emulsion rather than water.

**Caution** Even low rates can kill nontarget tree and shrub species, so avoid application within a distance equal to the tree height of the sensitive species. Do not allow spray to drift off target. Can injure several grass species including bromes, as well as basin wildrye.

**Site of action** (aminocyclopyrachlor) Group 4: Synthetic auxin; (chlorsulfuron) Group 2: ALS inhibitor

**Chemical family** (aminocyclopyrachlor) Pyrimidine carboxylic acid; (chlorsulfuron) Sulfonylurea

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### **aminopyralid (Milestone)**

**Rate** 0.75 to 1.25 oz ae/A (3 to 5 fl oz/A Milestone)

**Time** Apply in spring or early summer to rosettes or bolting plants or in fall to seedlings and rosettes.

**Remarks** A nonionic surfactant at 1 to 2 quarts per 100 gal of spray enhances control under adverse environmental conditions.

**Caution** Do not allow drift to desirable vegetation. Many forbs (desirable broadleaf plants) can be seriously injured or killed. Do not exceed 7 fl oz/A Milestone per year.

**Site of action** Group 4: synthetic auxin

**Chemical family** Pyridine

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### **chlorsulfuron (Telar)**

**Rate** 0.75 oz ai/A (1 oz/A)

**Time** Apply to young, actively growing weeds.

**Remarks** Do not apply to frozen ground. Maintain constant agitation while mixing product with water. Add 0.25% by volume of nonionic surfactant to spray mixture.

**Caution** Avoid contact with sensitive crops. Do not treat powdery, dry soils and light, sandy soils if rain is not likely after treatment. Labeled for use on pasture, range, Conservation Reserve Program (CRP), and non-cropland only.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Sulfonylurea

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### **clopyralid + 2,4-D amine (Curtail)**

**Rate** 1 to 5 quarts/A Curtail

**Time** Apply to actively growing thistle after most basal leaves emerge but before bud stage.

**Remarks** Lower rate for in-crop cereal grain application, higher rates for fallow, postharvest, and Conservation Reserve Program (CRP) applications. Consult label for specific directions. With CRP applications, for established grass only. For best results, wait at least 20 days after application before disturbing treated areas (cultivation, mowing, fertilization with shank-type applicators) to allow thorough translocation. Apply in enough total spray volume to ensure good coverage.

**Caution** See label for crop rotation restrictions before use. Several crops may be injured up to 4 years after application.

**Site of action** (both) Group 4: synthetic auxin

**Chemical family** (clopyralid) Pyridine; (2,4-D) Phenoxy acetic acid

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### **clopyralid (Stinger or Transline)**

**Rate** 0.09 to 0.375 lb ae/A (0.25 to 1 pint/A). Labeled rates vary with crops.

**Time** Up to the bud stage of thistles.

**Remarks** Best if applied to actively growing weeds. See labels for registered sites.

**Caution** Consult label for crop rotation restrictions before using these products. Several crops may be injured up to 4 years after application.

**Site of action** Group 4: synthetic auxin

**Chemical family** Pyridine

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### **dicamba (Clarity)**

**Rate** 0.5 to 1 lb ae/A

**Time** Apply before flower stalk lengthens on established plants and for seedling control. Spray fall applications to control rosettes.

**Remarks** Repeat applications for several years to control new seedlings.

**Caution** Dicamba residues may be in soil for 12 to 18 months after applying. Grass tolerates dicamba at these rates.

**Site of action** Group 4: synthetic auxin

**Chemical family** Benzoic acid

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### **diflufenzopyr + dicamba (Overdrive)**

**Rate** 0.175 to 0.35 lb ae/A (4 to 8 oz/A)

**Time** Apply to the rosettes.

**Remarks** Use higher rates on thistles that have bolted. Add a surfactant, either nonionic or methylated seed oil, to the spray mix.

**Caution** Avoid drift to sensitive crops. Will kill legumes.

**Site of action** (diflufenzopyr) Group 19: inhibits indole acetic acid transport; (dicamba) Group 4: synthetic auxin

**Chemical family** (diflufenzopyr) Semicarbazone; (dicamba) Benzoic acid

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### **glyphosate + 2,4-D (Campaign)**

**Rate** Broadcast: 16 to 32 fl oz/A. Spot treatment: 1 to 2% solution.

**Time** Apply to thistles in rosette stage of growth in spring or before freeze-up in fall.

**Remarks** This product is recommended for musk thistle control in rangeland, pasture, and non-croplands and for the control of those weeds listed on the product label.

**Caution** Do not graze lactating dairy animals on treated grass within 7 days after application. Animals being finished for slaughter and grazing in the treated area within 30 days of treatment must be removed from the treated area 3 days before slaughter. Do not cut forage for hay within 30 days of application. No grazing restriction if product is used for spot treatments in less than 10% of the total grazed area.

**Site of action** (glyphosate) Group 9: inhibits EPSP synthase; (2,4-D) Group 4: synthetic auxin

**Chemical family** (glyphosate) none generally accepted; (2,4-D) phenoxy acetic acid

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### **metsulfuron (Escort and others)**

**Rate** Escort: 0.6 oz ai/A (1 oz/A)

**Time** Apply postemergence to actively growing plants.

**Remarks** Using a nonionic or silicone surfactant increases effectiveness. Certain biotypes of musk and Scotch thistle are more sensitive than others to metsulfuron. Application sites differ between products; consult labels.

**Caution** Apply only to pasture, rangeland, and non-crop sites.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Sulfonylurea

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### **picloram (Tordon)**

**Rate** 0.25 lb ae/A

**Time** Apply in the fall before thistle bolts.

**Remarks** Do not use on diversified cropland. Follow-up applications will be necessary to control new seedlings and escaped plants.

**Caution** **Most formulations are restricted-use herbicides.** Soil residuals may last over 1 years after a 0.25 lb ai/A application. Do not contaminate water. Potatoes, beans, and many other broadleaf crops are sensitive to picloram. Do not use in diversified cropping areas.

**Site of action** Group 4: synthetic auxin

**Chemical family** Pyridine

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### **triclopyr + clopyralid (Quali-Pro 2,D Herbicide)**

**Rate** 1.5 to 2 pints/A

**Time** Apply to actively growing thistle from rosette to early bolt stage.

**Remarks** Add a nonionic surfactant at surfactant manufacturer's recommended rate. Apply in at least 10 gal/A water by ground.

**Caution** Do not exceed 4 pints/A per year. Do not allow drift to desirable vegetation. Note label restrictions on overseeding or reseeding.

**Site of action** (both) Group 4: synthetic auxin

**Chemical family** (both) Pyridine

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Toadflax, Dalmatian (*Linaria dalmatica*) and yellow (*Linaria vulgaris*)

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### **chlorsulfuron (Telar)**

*Idaho and Washington only*

**Rate** 1.5 to 2.25 oz ai/A (2 to 3 oz/A Telar)

**Time** Apply to actively growing yellow toadflax in the bud to bloom stage.

**Remarks** Suppresses yellow toadflax. Selective to grasses. Use a penetrating surfactant. Spray to wet.

**Caution** Do not let spray drift onto sensitive crops. Apply only to non-cropland.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Sulfonylurea

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### **dicamba (Clarity)**

**Rate** 4 to 6 lb ae/A

**Time** Apply in early spring before toadflax reaches bloom stage.

**Remarks** Repeated applications may be necessary for complete control.

**Caution** Avoid drift to sensitive crops. Dicamba severely injures or kills most broadleaf plants.

**Site of action** Group 4: synthetic auxin

**Chemical family** Benzoic acid

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### **imazapic (Plateau)**

**Rate** 0.188 lb ai/A

**Time** Apply in the fall when top 25% of plant is necrotic, usually after a hard frost.

**Remarks** Add 1 quart/A methylated seed oil to the spray mix.

**Caution** Before using, note crop rotation restrictions.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Imidazolinone

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### **picloram (Tordon)**

**Rate** 1 lb ae/A

**Time** Apply to actively growing toadflax in spring before full bloom or in late summer or fall.

**Remarks** A selective treatment that will not damage perennial grasses at the suggested rate.

**Caution** **Most formulations are restricted-use herbicides.** Do not contaminate water. Do not use in diversified crop areas. Potatoes, beans, and most other broadleaf crops are sensitive to picloram. This rate for spot treatment only.

**Site of action** Group 4: synthetic auxin

**Chemical family** Pyridine

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### **picloram (Tordon 22K) + 2,4-D**

**Rate** 0.5 lb ae/A picloram + 1.5 lb ae/A 2,4-D

**Time** In spring before full bloom.

**Remarks** May require annual treatment for 2 to 3 years. This rate of Tordon 22K may be broadcast.

**Caution** **Tordon is a restricted-use herbicide.** See label for grazing restrictions. If rate exceeds 0.5 lb ae/A (1 quart/A), apply only as a spot treatment not to exceed 25% of a landowner's acreage in any particular watershed in a single season. Avoid drift to sensitive crops. Do not contaminate water. Potatoes, beans, and many other broadleaf crops are sensitive to these herbicides. Do not use picloram in diversified crop areas.

**Site of action** (both) Group 4: synthetic auxin

**Chemical family** (picloram) pyridine; (2,4-D) phenoxy acetic acid

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### Tree-of-Heaven (*Ailanthus altissima*)

The following is adapted from a Weed Report from University of California Weed Research and Information Center (2013) for control of tree of heaven (used by permission) [https://wric.ucdavis.edu/information/natural%20areas/wr\\_A/Ailanthus.pdf](https://wric.ucdavis.edu/information/natural%20areas/wr_A/Ailanthus.pdf).

The Weed Report is an excerpt from the book *Weed Control in Natural Areas in the western United States* (Ditamaso et al, 2013, University of California Weed).

Penn State University also has good information on identification, biology, and control options at <https://extension.psu.edu/tree-of-heaven>

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### **aminocyclopyrachlor+ chlorsulfuron (Perspective)**

**Rate** 0.12 to 0.18 lb ai/A aminopyralid, 0.05 to 0.08 lb ai/A chlorsulfuron (4.75 to 8 oz product/A Perspective)

**Timing** Postemergent to foliage of young trees in summer to early fall.

**Remarks** Perspective provides broad-spectrum control of many broadleaf species. Although generally safe to grasses, it may suppress or injure certain annual and perennial grass species. Do not treat near the root zone of desirable trees and shrubs. Do not apply more than 11 oz product/A per year. At this high rate, cool-season grasses will be damaged, including bluebunch wheatgrass. Not yet labeled for grazing lands. Add an adjuvant to the spray solution.

**Site of action** (aminocyclopyrachlor) Group 4: Synthetic auxin; (chlorsulfuron) Group 2: ALS inhibitor

**Chemical family** (aminocyclopyrachlor) Pyrimidine carboxylic acid; (chlorsulfuron) Sulfonylurea

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### **glyphosate (Roundup, Accord XRT II, and others)**

**Rate** Foliar spot treatment: 2 to 4% solution glyphosate and water plus 0.5% v/v non-ionic surfactant to thoroughly wet all leaves. Stem injection treatment: one cut per every 3 inches of stem diameter, and 1 ml of undiluted herbicide added to each cut. For clumps, one hack per every 6 inches of total stem diameter. Treat largest stems.

**Timing** Foliar treatments best when leaves are fully expanded. For stem injection treatments, root injury is increased when applied mid-June to mid-September (fall color).

**Remarks** A nonselective systemic herbicide. Can also be mixed with dicamba to achieve good control with foliar applications. Stem injection and cut stump applications are made as described for triclopyr. Like triclopyr, there is extensive coppicing with a cut stump treatment. Others have found that stem injection with glyphosate, then cut stump treatment can completely kill tree.

**Site of action** Group 9: inhibits EPSP synthase

**Chemical family** None generally accepted

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### **imazapyr (Arsenal, Habitat, Stalker, Chopper, Polaris)**

**Rate** Cut stump treatment: 20% Stalker or Chopper formulation v/v in 80% oil carrier or 20% Arsenal or Habitat v/v in 80% water carrier. Stem injection treatment: one cut per every 3 inches of stem diameter, and 1 ml of undiluted herbicide (Arsenal or Habitat) added to each cut. For clumps, one hack per every 6 inches of total stem diameter. Treat largest stems. Basal bark treatment: 20% Stalker or Chopper formulation v/v in 80% oil carrier.

**Timing** Best when used in late summer to early fall, but before leaf drop.

**Remarks** Soil residual herbicide. May result in bare ground around trees for some time after treatment. Applications are made as described for triclopyr. Imazapyr is the most consistent and best stem treatment for tree-of-heaven.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Imidazolinone

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### **metsulfuron (Escort)**

**Rate** 0.075 lb ai/A (2 oz /A Escort)

**Timing** Treatments best when leaves are fully expanded.

**Remarks** Can be tank mixed with glyphosate or triclopyr.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Sulfonylurea

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### **triclopyr (Garlon 3A, Garlon 4 Ultra, Pathfinder II)**

**Rate** Foliar spot treatment: 1 to 2% v/v solution of Garlon 4 Ultra plus 0.5% v/v non-ionic surfactant to thoroughly wet all leaves.

Basal cut stump treatment: 20 to 25% Garlon 4 Ultra in 80% oil carrier.

Cut stump treatment: 20 to 25% Garlon 3A in water.

Basal bark treatment: 20 to 30% Garlon 4 Ultra in 70 to 80% oil carrier, or Pathfinder II as a ready- to-use formulation.

Stem injection treatment: one cut per every 3 inches of stem diameter, and 1 ml of undiluted Garlon 3A added to each cut. For clumps, one hack per every 6 inches of total stem diameter. Treat largest stems.

**Timing** Foliar treatments best when leaves are fully expanded. Cut stump, basal cut stump, basal bark and stem injection treatments can be used anytime, but are best when used in late summer or early fall.

**Remarks** Triclopyr will not damage desirable grasses growing nearby. Foliar treatment should only be made on small trees, saplings, or seedlings. For cut stump treatments, cut stems horizontally at or near ground level, then immediately apply herbicide solution to cover the outer 20% of the stump face. Basal bark treatment: spray the lower trunk, including the root collar, to a height of 12 to 15 inches from the ground; the spray should thoroughly wet the lower stem but not to the point of runoff. For stem injection treatments, be sure that each cut goes well into or below the cambium layer. Trees should not be cut for at least 4 months after basal bark and stem injection treatments. A dye can be added to either product so trees already treated can be identified.

Triclopyr can be applied as a premix with aminopyralid (Capstone) at 8 to 9 pt /Acre. Triclopyr can also be mixed with picloram or imazapyr for basal bark treatments (20% Garlon 4 Ultra + 5% Tordon 22K or 3% Stalker). Basal bark applications are made as described for triclopyr. Trees should not be cut for at least one month after treatment.

**Site of action** Group 4: synthetic auxin

**Chemical family** Pyridine

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Velvetgrass, German or creeping (*Holcus mollis*)

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### **EPTC (Eptam)**

**Rate** 4 to 6 lb ai/A. Use 6-lb rate on finer soils or on heavy mats of roots and rhizomes.

**Time** Apply in spring or early fall on a thoroughly prepared seedbed.

**Remarks** A preplant soil-incorporated herbicide that also gives excellent results when metered into irrigation water. Effective if used in conjunction with a cropping program. Total kill requires at least 2 years. Prevent seedlings from reestablishing the stand. Suggested crop programs are:

- Spray 4 to 6 lb/A in spring, and seed red clover or alfalfa on soil that has been limed and fertilized for best legume growth.
- Spray 2 to 3 lb/A in spring; seed to corn for 2 years or follow with one of the other crops listed.
- Spray 4 to 6 lb/A in fall and seed to crimson clover or fall flax. The subsequent crop should tolerate EPTC. Re-treat the second year.
- Spray 4 lb/A in spring and summer fallow; follow by seeding to winter wheat or barley and treating with diuron to kill velvetgrass seedlings.

**Caution** Incorporate EPTC into soil 2 to 3 inches deep immediately after application. Use sprinkler irrigation to incorporate EPTC in very dry weather.

**Site of action** Group 8: lipid synthesis inhibitor but not an ACCase inhibitor

**Chemical family** Thiocarbamate

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### **fluazifop (Fusilade DX)**

**Rate** 0.25 to 0.375 lb ai/A + 1% crop oil concentrate or 0.25% nonionic surfactant

**Time** Apply in early spring when grass is growing well.

**Remarks** Repeat applications may be needed to control well-established grass. Do not mix with other pesticides unless label recommends.

**Caution** Do not graze treated fields.

**Site of action** Group 1: acetyl CoA carboxylase (ACCase) inhibitor

**Chemical family** Aryloxyphenoxy propionate

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### **sethoxydim (Poast)**

**Rate** Up to 0.5 lb ai/A + 2 pints/A of an oil concentrate

**Time** Apply in early spring when grass is growing well. Applying after April 1 may be less effective.

**Remarks** Repeat applications may be needed to control well-established grass.

**Caution** Do not graze treated fields.

**Site of action** Group 1: acetyl CoA carboxylase (ACCase) inhibitor

**Chemical family** Cyclohexanedione

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Velvetleaf (*Abutilon theophrasti*)

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### **2,4-D (various products)**

**Rate** 0.25 lb ae/A

**Remarks** Reported to control this plant, although data are lacking in the Pacific Northwest. Follow label instructions.

**Site of action** Group 4: synthetic auxin

**Chemical family** Phenoxy acetic acid

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### linuron (Lorox)

**Remarks** Applied postemergence, reported to control this plant, although data are lacking in the Pacific Northwest. Follow label instructions.

**Site of action** Group 7: photosystem II inhibitor

**Chemical family** Urea

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### 2,4-DB (Butyrac) or alachlor (Lasso) or bentazon (Basagran) or bromoxynil (Buctril) or clomazone (Command) or glyphosate (Roundup) or imazethapyr (Pursuit) or metribuzin (Sencor or Lexone) or norflurazon Solicam) or oxyfluorfen (Goal) or paraquat (Gramoxone Max) or terbacil (Sinbar)

**Remarks** Reported to control this plant, although data are lacking in the Pacific Northwest. Follow label instructions.

**Site of action** (clomazone) Group 13: inhibits DOXP synthase; (imazethapyr) Group 2: acetolactate synthase (ALS) inhibitor; (2,4-DB) Group 4: synthetic auxin; (glyphosate) Group 9: inhibits EPSP synthase; (terbacil and metribuzin) Group 5: photosystem II inhibitor; (oxyfluorfen) Group 14: protoporphyrinogen oxidase inhibitor; (alachlor) Group 15: unknown; (paraquat) Group 22: photosystem I electron diverter; (bromoxynil and bentazon) Group 6: photosystem II inhibitor but different binding behavior than Groups 5 and 7; (norflurazon Group 12: bleaching; inhibits carotenoid biosynthesis

**Chemical family** (clomazone) Isoxazolidinone; (imazethapyr) Imidazolinone; (2,4-DB) Phenoxy acetic acid; (glyphosate) none generally accepted; (terbacil) Uracil; (oxyfluorfen) Diphenylether; (alachlor) Chloroacetamide; (metribuzin) triazine; (paraquat) Bipyridilium; (bromoxynil) Nitrile; (norflurazon) Pyridazinone; (bentazon) Benzothiadiazole

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### Water hemlock, western (*Cicuta douglasii*)

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### 2,4-D or MCPA

**Rate** 2 lb ae/A

**Time** Apply at bud stage of growth.

**Remarks** Plants are highly poisonous to both animals and humans.

**Caution** Do not graze treated areas until plants dry up after spraying. Avoid drift to sensitive crops.

**Site of action** (both) Group 4: synthetic auxin

**Chemical family** (both) phenoxy acetic acid

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### Willow (*Salix* spp.)

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### 2,4-D LV ester

**Rate** 2 to 3 lb ae/A

**Time** Apply when leaves are fully developed and growing.

**Remarks** Use oil (no lower than No. 2 diesel) for aerial application. Willows will resprout, and re-treatment may be required.

**Caution** Avoid drift to sensitive crops.

**Site of action** Group 4: synthetic auxin

**Chemical family** Phenoxy acetic acid

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**metsulfuron (Escort)**

**Rate** Escort: 0.6 oz ai/A (1 oz/A)

**Time** Apply to fully leafed-out brush.

**Remarks** Full spray coverage is required. Use a surfactant.

**Caution** Apply only to rangeland and non-crop sites.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Sulfonylurea

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**triclopyr amine (Garlon 3A) or triclopyr ester (Garlon 4) or triclopyr + 2,4-D LV ester (Crossbow)**

**Rate** Depends on which triclopyr formulation is used

**Time** Apply when willows are actively growing.

**Remarks** Foliage must be thoroughly wet.

**Caution** Garlon products are registered for use on rights-of-way, industrial sites, and forestry (release and site preparation). Crossbow can be used on permanent pastures and rangeland up to 1.5 gal/A. Observe all grazing and harvesting restrictions. Avoid spray drift.

**Site of action** (all) Group 4: synthetic auxin

**Chemical family** (triclopyr) pyridine; (2,4-D) phenoxy acetic acid

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Willowherb, hairy (*Epilobium hirsutum*)

**Remarks** Although PNW data are preliminary, aminopyralid, glyphosate, imazamox, imazapyr, and triclopyr gave promising results in initial trials.

**Site of action** (imazamox, imazapyr) Group 2: acetolactate synthase (ALS) inhibitor; (glyphosate) Group 9: inhibits EPSP synthase; (aminopyralid, triclopyr) Group 4: synthetic auxin

**Chemical family** (imazamox, imazapyr) imidazolinone; (glyphosate) none generally accepted; (aminopyralid, triclopyr) pyridine

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Wiregrass, African or ventenata (*Ventenata dubia*)**imazapic (Plateau, Panoramic)**

**Rate** 5 oz /A Plateau or Panoramic

**Time** Apply in the fall after African wiregrass has emerged.

**Remarks** High litter levels may reduce effectiveness, some bare ground should be visible for better control. Labeled for use on pasture, range, Conservation Reserve Program (CRP), and non-cropland.

**Caution** Many perennial grasses can be injured if applications are made during the spring.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Imidazolinone

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**sulfosulfuron (Outrider)**

**Rate** 0.75 oz/A Outrider

**Time** Apply in the fall after African wiregrass has emerged (1 inch rain and soil temperature above 45°F).

**Remarks** Many grasses are sensitive to sulfosulfuron so selection of grasses for any revegetation efforts should consider use of wheatgrasses. Mature Idaho fescue is tolerant and while perennial bromes are injured during the first season, they will persist. Meadow foxtail (*Alopecurus pratensis*) is removed from perennial grass stands so if this species is used for forage, avoid

applying sulfosulfuron.

**Caution** Labeled for use on pasture, range, Conservation Reserve Program (CRP), and non-cropland. Wheat is the only rotational crop for one year after application, see label for details.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Sulfonyleurea

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### **flufenacet + metribuzin (Axiom DF)**

**Rate** 0.27 to 0.31 lb ai/A flufenacet + 0.068 to 0.084 lb ai/A metribuzin (8 to 10 oz/A Axiom) in established timothy hay.

**Time** Apply before weeds emerge, or no later than the two-leaf stage.

**Remarks** Do not graze timothy in the fall and cut height cannot be shorter than 3.5 inches. Rain or irrigation after application is needed for sufficient weed control activity.

**Caution** Harvest at lower than 3.5 inches may cause injury to timothy. Grazing in fall after hay harvest may cause injury to timothy. It is best to harvest at 4 inches to allow energy stored in stems to be used to produce new stems next year.

**Site of action** (flufenacet) Group 15: inhibits very long chain fatty acid synthesis; (metribuzin) Group 5: photosystem II inhibitor

**Chemical family** (flufenacet) oxyacetamide; (metribuzin) triazinone

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### **indaziflam (Esplanade 200 SC)**

**Rate** 3.5 to 7 oz/A

**Time** Apply preemergence.

**Remarks** Controls many other annual grasses and some broadleaf weeds.

**Caution** Keep away from surface water, at least 25 feet, and areas below the mean watermark.

**Site of action** Group 29: cellulose biosynthesis inhibitor

**Chemical family** Alkylazine

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### **rimsulfuron (Matrix)**

**Rate** 0.031 to 0.062 lb ai/A (2 to 4 oz /A Matrix)

**Time** Apply before or soon after seedlings emerge.

**Remarks** Controls some other annual grasses, and some annual broadleaf species. Add a nonionic surfactant at 1 quart/100 gal spray to improve activity.

**Caution** Consult label if there are plans to seed grasses after application.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Sulfonyleurea

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### Woad, dyer's (*Isatis tinctoria*)

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### **2,4-D LV ester**

**Rate** 1.9 to 2.85 lb ae/A

**Time** Apply in spring or fall to rosettes, or in early summer when plant is in bud.

**Remarks** For satisfactory control, it may be necessary to treat infested areas during both the rosette and bud stages of growth.

**Caution** Avoid drift to sensitive crops.

**Site of action** Group 4: synthetic auxin

**Chemical family** Phenoxy acetic acid

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### **aminocyclopyrachlor + chlorsulfuron (Perspective)**

**Rate** 1.8 to 3.2 oz/A aminocyclopyrachlor + 0.7 to 1.3 oz/A chlorsulfuron (4.5 to 8 oz/A of product)

**Time** Apply to actively growing plants in spring.

**Remarks** Adjuvants can be used; these include methylated seed oils 0.5 to 1% v/v, nonionic surfactants at 0.25 to 1% v/v, and crop oil concentrates at 1% v/v. Can be applied using an invert emulsion rather than water.

**Caution** Even low rates can kill nontarget tree and shrub species, so avoid application within a distance equal to the tree height of the sensitive species. Do not allow spray to drift off target. Can injure several grass species including bromes, as well as basin wildrye.

**Site of action** (aminocyclopyrachlor) Group 4: Synthetic auxin; (chlorsulfuron) Group 2: ALS inhibitor

**Chemical family** (aminocyclopyrachlor) Pyrimidine carboxylic acid; (chlorsulfuron) Sulfonylurea

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### **chlorsulfuron (Telar)**

**Rate** 0.75 oz ai/A (1 oz/A Telar)

**Time** Apply before or after weeds emerge. Results are best on young, actively growing weeds.

**Remarks** Constantly agitate while mixing and spraying. Add 0.25% v/v nonionic surfactant to spray mixture. Labeled for use on pasture, range, Conservation Reserve Program (CRP), and non-cropland.

**Caution** Use on non-cropland only. Avoid contact with sensitive crops. Can persist in soil. Do not treat powdery, dry soils or light, sandy soils if rain is not likely soon after treatment. Do not apply to frozen ground.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Sulfonylurea

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### **imazapic (Plateau)**

**Rate** 0.125 to 0.188 lb ai/A (8 to 16 oz/A Plateau)

**Time** Apply to rosettes or after blossoms open (full bloom) until plants desiccate.

**Remarks** Add 1 quart/A methylated seed oil to the spray mix.

**Caution** Before using, note crop rotation restrictions.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Imidazolinone

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### **metsulfuron (Escort and others)**

**Rate** Escort: use 0.3 to 0.6 oz ai/A (0.5 to 1 oz/A)

**Time** Apply to actively growing plants.

**Remarks** Use a nonionic or silicone surfactant.

**Caution** Do not let spray drift to sensitive crops. Apply only to pasture, rangeland, and non-crop sites. Application sites differ between products; consult labels.

**Site of action** Group 2: acetolactate synthase (ALS) inhibitor

**Chemical family** Sulfonylurea