

# SECTION T.

## PROFESSIONAL LANDSCAPE MAINTENANCE

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## Introduction

Ed Peachey

*Revised March 2018*

Weed management in professionally managed landscapes requires a thorough knowledge of the weeds, weed control practices, application options, plant tolerances, and management strategies. Success with any method depends on planning, properly selecting control methods, and effective timing. When selecting chemicals for weed control, you must understand the subtle differences in application techniques, residual activities, susceptibilities and timing for control of target species, tolerance of desirable plants, potential for weed shifts, and long-term effects of integrating site objectives and year-round weed management strategies. Often, treatments must be repeated or combined with other practices for maximum control.

**Weed shifts** Weed infestations are dynamic and change depending on previous cultural and weed control practices. For example, routine use of the same or similar herbicides will result in a shift to weed species that tolerate the treatment. Repeated use of simazine in nurseries was first demonstrated to cause a shift within a natural population of common groundsel. Since then, more than 72 species represented in 40 genera have been reported to tolerate triazine herbicides. Globally, there are currently 413 unique cases of herbicide resistance (species x **site of action**), found in 222 species.

**Preventing weed shifts** Weeds that survive repeated use of the same or similar herbicides must be eliminated before the tolerant species or biotypes become established. Spot-treat or hand pull weeds and combine these methods with other weed management practices to minimize the occurrence of resistant biotypes.

**Managing weedy vegetation** Successful weed control in landscapes requires a comprehensive or year-round approach whereby a combination of weed control practices is employed and alternated over several years. Development of these strategies requires knowledge of each weed and weed control practice. Weeds must be identified and information gathered about the effectiveness of each weed control practice. Consider costs and select herbicide combinations that can be applied together or in split applications that control the weeds present in the landscape. Note the action of each herbicide or how the chemical works in the plant. Then tank mix, and alternately use these products to reduce the chance of developing resistant species or biotypes. Often a combination of mechanical, herbicidal, and sometimes hand removal or spot treatment with herbicide sprays or wipers will provide the most effective year-round control.

**Soil-active herbicides** Persistent, soil-applied herbicides can be applied to weed-free soil during winter when rain will activate the chemical. Some compounds may be applied throughout the year if irrigation is available. Apply lower rates on sandy soils having lower clay or organic matter, or cation exchange capacities. Existing vegetation can be controlled by mixing the soil-active herbicide with a post-emergence contact or translocated herbicide, provided such a mix is not prohibited by either label. Consult labels for listed species and duration of expected control. Avoid disturbing the soil when applying.

**Postemergence herbicides** In landscape plantings, postemergence weed control requires precision since few options exist. Postemergence treatments either selectively control susceptible weeds or are applied with selective equipment. Frequent scouting aimed at identifying susceptible weeds and the correct stage of weed growth must be combined with appropriate weather conditions and labeled spray additives to maximize control. Consult each label for numerous precautions or information about crop or cultivar tolerances. Always test new products on selected plants before adopting their use throughout your operation.

**Caution!** Information provided in this handbook is not intended to be a complete guide to herbicide use. Before using any chemical, read the recommendations on the label. Before a chemical can be recommended for a specific use, it must be thoroughly tested. The recommendation on the manufacturer's label, when followed, can prevent many problems from arising from the wrong use of a chemical.

**Note** Herbicides must be applied at the correct rate and time to selectively control weed growth with minimal chance for injury to nursery crops. Obtain more consistent results by reading the herbicide label and other information about the proper application and timing of each herbicide. Suggested rates listed in this guide are stated as pounds active ingredient per acre (lb ai/A) or pounds acid equivalent per acre (lb ae/A). Calibrate your equipment precisely and verify exact application rates, especially to irregular landscape sites.

# Established Tree, Shrub, Rose, and Ground Cover Landscapes

Ed Peachey

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Multiply rate by 0.023 for amount per 1,000 sq ft

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## geo-textiles

Available at agricultural and garden supply stores

**Spun-bonded fabrics** (non-woven) lightweight, extruded polypropylene fibers; requires mulch cover due to moderate UV light sensitivity; weed roots and rhizomes can penetrate fabric unless removed before establishment; cheapest option.

**Woven fabrics** moderate-weight polypropylene fibers woven into a mat; can be used without mulch cover due to UV light stability; weed roots and rhizomes can penetrate fabric although tightness of weave can prevent some weeds; moderate cost.

**Laminates** highly porous, dense poly film bonded to capillary fibers with a pressed, non-woven bottom layer. Surface is slick and causes rapid wetting and drying to prevent weed establishment except for perennial rhizomes that can penetrate the laminate; most expensive geo-fabric.

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## Soil-applied

### DCPA (Dacthal)

**Rate** 4.5 to 10.5 lb ai/A (6 to 14 lb/A) depending on soil type and target weeds.

**Time** Apply to weed-free soil in early spring or late summer for control of susceptible winter weeds for annual weed control.

**Remarks** Performs erratically west of the Cascades. Sprinkler-irrigate after application to activate herbicide. Inhibits mitosis in roots and shoots.

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

**Chemical family** Phthalic acid

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### dichlobenil (Casoron 4G)

**Rate** 4 to 6 lb ai/A (100 to 150 lb/A granular product)

**Time** Apply midwinter immediately before a cold rain to reduce volatility and enhance weed suppression.

**Remarks** Weigh and distribute uniformly and exactly over precisely measured areas to ensure accurate applications. Oregon results 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. Inhibits cellulose and cell wall formation.

**Caution** Some groundcovers may not be tolerant; consult label. Pine species are sensitive to injury from Casoron 4G if applied within two years after transplanting. Do not use on trees that have been established for less than 6 months. Do not allow granules to stick to foliage or to accumulate at the soil line around the base of the tree.

**Site of action** Group 20: inhibits cell wall synthesis Site A

**Chemical family** Nitrile

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### dimethenamid-p (Tower)

**Rate** 100 to 200 lb product/A depending on species present.

**Time** Apply to established plantings prior to weed emergence.

**Remarks** Does not control emerged weeds. Wait 2 to 4 weeks after planting for soil to settle before application. Irrigation or rainfall is needed to activate herbicide.

**Caution** Do not apply to seedbeds. Do not apply to sensitive ornamental plants listed on the label such as purple coneflower or ornamental grasses. Do not apply to newly transplanted ornamentals until plants have been watered and soil has been thoroughly packed and settled around roots. Use the low-labeled rate and repeat applications for extended landscape weed control. Do not apply at bud break.

**Site of action** Group 15: inhibits very long chain fatty acid synthesis

**Chemical family** Chloroacetamide

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### dithiopyr (Dimension 2EW)

**Rate** 0.375 to 0.5 lb ai/A (0.75 to 1 quarts/A)

**Time** Apply before weeds emerge around bases of ornamental plants in landscape.

**Remarks** For best results, prepare a weed-free surface with minimal clods and leaf debris. In the spring when buds are rapidly growing and expanding, over the top application of Dimension 2EW may temporarily injure new growth of desirable plants.

**Caution** Do not exceed 1.5 fl oz/1,000 sq ft every 3 to 4 months, or 4.5 fl oz/1,000 sq ft per year. Do not apply to plant roots or weakened ornamental plants, or when drift potential is moderate to high. Do not use in enclosed structures. Dithiopyr is toxic to fish and highly toxic to oysters, shrimp, and other aquatic organisms.

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

**Chemical family** Pyridine

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### EPTC (Eptam 7E)

*Not for use in roses*

**Rate** 5 to 14.9 lb ai/A (5.75 to 17 pints/A) depending on target species

**Time** Apply and immediately incorporate 2 to 3 inches deep with a rototiller 2 weeks before transplanting balled or canned stock; or, spray postplant and incorporate with tillage. In spring, apply around established plants after growth and incorporate.

**Remarks** Use higher rates for perennial weed control and incorporate to a depth of 6 inches with a rototiller. Note sensitive flowers listed on label. Primarily for grass control including quackgrass suppression. Inhibits shoot growth.

**Site of action** Group 8: lipid synthesis inhibitor but not an ACCase inhibitor

**Chemical family** Thiocarbamate

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**flumioxazin (Broadstar, SureGuard)**

**Rate** 0.375 lb ai/A (150 lb/A Broadstar)

**Time** Apply to weed-free surface.

**Caution** Foliage of desirable crops must be dry at the time of application. Wet foliage will trap granules on the leaf surface and burn the foliage. Avoid sensitive crops such as buddleia (butterfly bush) and hydrangea.

**Site of action** Group 14: protoporphyrinogen oxidase inhibitor

**Chemical family** N-phenylphthalimide

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**halosulfuron-methyl (Sedgehammer)**

*Nutsedge control around established woody ornamentals in landscapes; not for use on roses or ground covers*

**Rate** 0.031 to 0.062 lb ai/A (2/3 to 1 1/3 oz product/A)

**Time** After nutsedge has reached the 3- to 8-leaf stage of growth.

**Remarks** Wait 3 months after transplanting ornamentals, before application, and allow soil to settle around plant. A second treatment may be required 6 to 10 weeks later. Do not exceed 0.25 lb ai/A total or four applications per season. Use 0.5% nonionic surfactant concentration for broadcast applications.

**Caution** Do not apply as an over-the-top spray to desirable flowers, ornamentals, vegetables, shrubs or trees. Apply to actively growing nutsedge that is not stressed.

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

**Chemical family** Sulfonylurea

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**indaziflam (Marengo, Specticle 20 WSP)**

**Rate** 0.047 to 0.063 lb ai/A (3.75 to 5 oz/A Specticle)

**Time** Apply in fall to early spring, prior to weed seed germination, to firmed soil that does not have cracks.

**Remarks** Existing vegetation must be controlled with glyphosate or burndown herbicides, such as glufosinate or paraquat. Controls annual broadleaf and grass weeds, and perennial weeds from seed only. Existing perennial/biennial weeds growing from roots will not be controlled. Rainfall or irrigation of 0.25 inch or more within 3 weeks of application is required for maximum efficacy.

**Caution** Read label thoroughly to understand situations that should be avoided. This product has a long residual.

- Avoid direct contact with foliage, green bark, or roots of desired species.
- Clean spraytanks thoroughly after use.
- Do not apply around bedding plants.
- Do not apply around bearing fruit trees, unless beyond the tree drip line.
- Applications over heavily mulched areas may not control weeds adequately. It is best to apply the product before the mulch is applied.
- Avoid applications to newly seeded grasses.

**Site of action** Group 29: inhibits cellulose biosynthesis

**Chemical family** Alkylazine

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**isoxaben (Gallery 75 DF)**

**Rate** 0.495 to 0.998 lb ai/A (0.66 to 1.33 lb/A)

**Time** Apply late summer to early fall, in early spring, or immediately after cultivation. Apply to debris-free soil surface.

**Remarks** Identify weeds; adjust rates according to charts on label. Activate with 0.5 inch water or shallow cultivation before weeds emerge. Chemical stability remains adequate when left on soil surface for 21 days. Primarily controls broadleaf weeds.

**Caution** Do not apply to newly transplanted crops until media settle. See label for 14 sensitive ornamental species for which isoxaben is not recommended, including hydrangea, purple coneflower, and yucca. Use untreated soil to fill around transplants if isoxaben has been applied within 1 year.

**Site of action** Group 21: inhibits cell wall synthesis Site B

**Chemical family** Benzamide

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**napropamide (50\_DF)**

*Not for use in roses*

**Rate** 4 to 6 lb ai/A (200 to 300 lb/A 2G)

**Time** Apply any time to weed-free soil, then sprinkler irrigate to wet soil 1 to 2 inches deep, or apply during midwinter rains in western Oregon for annual weed control.

**Remarks** Use higher rates with severe weed populations, or when broadleaf weeds are present. Primarily grass control including crabgrass and annual bluegrass. Inhibits root growth.

**Site of action** Group 15: inhibits very long chain fatty acid synthesis

**Chemical family** Acetamide

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**oryzalin (Surflan AS)**

**Rate** 2 to 4 lb ai/A (2 to 4 quarts/A) depending on length of control

**Time** Apply any time to weed-free soil, then sprinkler irrigate with 0.5 inch if no rain falls within 1 week, or cultivate 1 inch deep to activate herbicide for annual weed control.

**Remarks** Consult label for tolerant ornamental species. Both grass and broadleaf control. Suppresses but will not control mustards, prickly lettuce, horseweed, and mallow. Inhibits mitosis, primarily in roots.

**Caution** Applications of Surflan AS over the top of plants with newly forming buds may cause injury. Use is not recommended on slender deutzia, Douglas-fir, Techny arborvitae, eastern hemlock, begonia, or coleus.

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

**Chemical family** Dinitroaniline

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**oxadiazon (Ronstar 2G)**

**Rate** 2 to 4 lb ai/A (100 to 200 lb/A) depending on target weed species

**Time** Apply any time to weed-free soil and irrigate with 0.25 to 0.33 inch water immediately after applying for annual weed control.

**Remarks** Do not cover with soil or mulch, or incorporate, because weed control will desist. Weeds in the pink family (chickweed, mouseear chickweed, and pearlwort) are resistant. Controls a wide range of broadleaves and some grasses (controls weed seedlings by contact action during emergence).

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**Caution** Applications of RONSTAR G must be made by a professional applicator only. See label for sensitive ornamentals, including varieties of rhododendron, spruce, hemlock, azalea, viburnum, and cotoneaster. Avoid contaminating water intended for irrigation. Do not use on plants that will produce fruit within 1 year.

**Site of action** Group 14: protoporphyrinogen oxidase inhibitor

**Chemical family** Oxadiazole

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### pendimethalin (Pendulum 2G)

**Rate** 2 to 4 lb ai/A (100 to 200 lb/A Pendulum 2G) depending on desired length of weed control

**Time** Apply at time of planting or before weed seed germinates.

**Remarks** Controls most annual grasses and some broadleaves. Soil should be loose and free of all established weeds. Water within a few days to activate herbicide before weeds emerge. Inhibits mitosis in roots and shoots.

**Caution** Granules may stain stone, wood, or other porous surfaces.

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

**Chemical family** Dinitroaniline

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### proflumicetone (Barricade 65WG or 4L and many others)

**Rate** 0.65 to 1.5 lb ai/A (1 to 2.3 lb/A 65WG) depending on desired length of weed control

**Time** Apply any time to weed-free soil, and incorporate with 0.5 inch water or rain within 14 days.

**Remarks** May be applied to newly transplanted and established ornamentals as a broadcast, over-the-top spray. Activate with 0.5 inch of rain or irrigation water, or with shallow incorporation. Inhibits germination and root development.

**Caution** Do not exceed 2.3 lb/A in any 12-month period.

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

**Chemical family** Dinitroaniline

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### pronamide (Kerb SC T&O)

*Not for use in roses or groundcovers*

**Rate** 1 to 2 lb ai/A (2 to 4 lb product/A)

**Time** Apply in fall before soil freezes.

**Remarks** Non residential use only. Fall applications to woody ornamentals before leaf fall. Preemergence and postemergence control of susceptible winter annual and perennial grasses and chickweed. Requires soil moisture from rain or irrigation to activate; do not incorporate mechanically. Use lower rates for annual grasses and light-texture soils; higher rates for perennial grasses and heavier soils. Control of established grasses is slow. Degraded by microorganisms in warmer weather. Inhibits root growth.

**Caution** A restricted-use pesticide.

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

**Chemical family** Benzamide

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### S-metolachlor (Pennant Magnum)

**Rate** 1.24 to 2.48 lb ai/A (1.3 to 2.6 pints/A)

**Time** Apply as direct spray toward base of desired plant, either to established ornamentals or 5 days after transplanting.

**Remarks** Existing weeds must be removed. Primarily targets grasses, but controls some broadleaf weeds and suppresses nut-sedge. Inhibits seedling roots and/or shoots.

**Caution** Do not apply more than twice per year. Consult label for tolerant ornamentals.

**Site of action** Group 15: inhibits very long chain fatty acid synthesis

**Chemical family** Chloroacetamide

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### trifluralin (Trifluralin 10G)

**Rate** 0.4 lb ai/A

**Time** Apply before weeds emerge.

**Remarks** Trifluralin must be activated by a single rain or overhead sprinkler irrigation of at least 0.5 inch. If not activated within 3 days, mechanically incorporate trifluralin with equipment that won't damage. Apply before weed seeds germinate; trifluralin will not control established weeds.

**Caution** Do not apply to ground covers until they are established and well rooted. Do not apply Trifluralin to newly transplanted ornamentals, ground covers, flowers, and non-bearing fruit and nut crops and non-bearing vineyards until soil or potting media has been settled by packing and irrigation or rainfall and no cracks are present or injury may occur.

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

**Chemical family** Dinitroaniline

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## Convenient Soil-applied Premixes for Broad-spectrum Control of Grasses and Broadleaf Weeds

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### benfen + oryzalin (XL 2G)

**Rate** 200 lb/A per application with at least 2 months between applications; do not exceed 600 lb/A per year.

**Time** Apply before target weeds germinate.

**Remarks** Precisely calibrate application equipment, preferably at half rates, to enable two perpendicular passes for increased accuracy. Inhibits cell division or mitosis, primarily in roots.

**Caution** Sensitive species include Douglas-fir, eastern hemlock, and begonia.

**Site of action** (both) Group 3: microtubule assembly inhibitor

**Chemical family** (both) dinitroaniline

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### isoxaben + trifluralin (Snapshot 2.5TG)

**Rate** 200 lb/A

**Time** Apply to soil that is free from weeds and debris. Soil must be settled with water and free of cracks after transplanting.

**Remarks** Activate within 31 days using 0.5 inch of water or shallow cultivation before weeds begin to emerge. Follow label instructions for repeat treatments.

**Caution** Do not apply to unrooted liners or cuttings, bedding plants, or new-planted ground covers.

**Site of action** (isoxaben) Group 21: inhibits cell wall synthesis  
Site B; (trifluralin) Group 3: microtubule assembly inhibitor

**Chemical family** (isoxaben) benzamide; (trifluralin) dinitroaniline



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### oxadiazon + prodiamine (RegalStar G)

**Rate** 200 lb/A

**Time** Any time during the year, but before weed seeds germinate.

**Remarks** Cultivating or disturbing the soil after application diminishes weed control. Controls spotted spurge, knotweed, yellow woodsorrel, and clover.

**Caution** Do not apply herbicide granules to wet foliage. Cultivars of *Ilex* spp. (holly) and *Rhododendron* spp. may be sensitive to this product.

**Site of action** (oxadiazon) Group 14: protoporphyrinogen oxidase inhibitor; (prodiamine) Group 3: microtubule assembly inhibitor

**Chemical family** (oxadiazon) oxadiazole; (prodiamine) dinitroaniline

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### oxyfluorfen + oryzalin (Rout)

**Rate** 50 to 100 lb/A (2% + 1% formulation, respectively)

**Time** Apply uniformly, either in spring before weed seed germination and crop growth flush, or to weed-free soil.

**Remarks** Requires 0.5 inch water immediately after application to activate and to wash product from leaves. Acts as contact-type herbicide and inhibits cell division or mitosis in roots and shoots, respectively.

**Caution** Do not apply to wet foliage or plants with whorls. Note all other precautions on label.

**Site of action** (oxyfluorfen) Group 14: protoporphyrinogen oxidase inhibitor; (oryzalin) Group 3: microtubule assembly inhibitor

**Chemical family** (oxyfluorfen) diphenylether; (oryzalin) dinitroaniline

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## Postemergence or Foliar Applied

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### bentazon (Basagran T&O)

**Rate** 0.5 lbs ai/A (16 oz/A Basagran)

**Time** Spring to early summer, depending on growth stage of weeds.

**Remarks** Use handheld pump-up back pack or knapsack sprayers. For control of Canada thistle and suppression of sedges and nutsedge where other options such as clopyralid are not possible. For Canada thistle, apply 2 pints/A when plants are between 8 inches tall and bud stage. Apply a second application 2 weeks later if needed. For nutsedge, apply 1.5 to 2 pints/A when plants are 6-8 in tall, and make a second application 7 to 10 days later if needed. Always add a crop oil concentrate. Use no more than 2 lb ai/A per year. Irrigate to make sure plants are actively growing before applying bentazon. Not as effective if temperatures drop below 50°F at night and in daytime does not exceed 70°F. Efficacy will be poor on drought stressed weeds.

**Caution** Apply as a directed spray, away from the crop.

**Site of action** Group 6: photosystem II inhibitor

**Chemical family** Benzothiadiazole gran)

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### clethodim (Envoy or Envoy Plus)

**Rate** Consult labels.

**Time** Apply postemergence to actively growing annual or perennial grasses as listed on label.

**Remarks** Consider environmental and plant growth conditions that affect leaf uptake (see label for guidelines). Controls annual bluegrass.

**Caution** Do not exceed 68 fl oz/A per season.

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

**Chemical family** Cyclohexanedione

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### fenoxaprop ethyl (Acclaim Extra)

**Rate** 13 to 39 fl oz/A

**Remarks** For grass control in many deciduous and evergreen trees, and in shrubs and herbaceous and flowering plants. Adjust rates depending on number of grass tillers (see label). Ensure thorough coverage to actively growing, susceptible grasses. Repeat after grass begins active growth, but do not exceed 120 fl oz/A per season. Inhibits fatty acid production, cell membranes, and new growth.

**Caution** Juniper, salvia, and philodendron are not tolerant

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

**Chemical family** Aryloxyphenoxy propionate

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### fluazifop (Fusilade II)

**Rate** 16 to 24 fl oz/A (0.25 to 0.375 lb ai/A)

**Time** Apply to actively growing grasses, or within 7 days after irrigation, as a directed spray with 0.25% nonionic surfactant when susceptible grasses are in the labeled growth stage.

**Remarks** Identify grasses, and adjust rates depending on susceptibility and stage of weed growth as label instructs. Results often are erratic if grasses are stressed from lack of vigor, drought, high temperature, or low fertility. More mature grasses and quackgrass can be controlled but may require two applications. Annual bluegrass and all fine fescues resist treatment. Inhibits fatty acid production, cell membranes, and new growth.

**Caution** Do not tank mix with other pesticides. Do not apply within 5 days of other pesticide treatments. Not for use on tulips.

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

**Chemical family** Aryloxyphenoxy propionate

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### glufosinate ammonium (Finale)

*Spot or directed spray only*

**Rate** Consult label

**Time** Apply to thoroughly cover actively growing weeds. Avoid all contact with desirable foliage and green bark.

**Remarks** To trim or edge landscape plantings.

**Site of action** Group 10: glutamine synthase inhibitor

**Chemical family** Phosphinic acid

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## glyphosate (numerous product names)

*Not for ground covers*

**Rate** Spray: 1.5 to 5 lb ai/A or 1 to 2% solution for high-volume sprayers

**Time** Apply as directed spray toward base of bush, when weeds are actively growing or moving sugars to roots.

**Remarks** Use lower rates for annual weeds; consult label for higher rates and time of application for perennial weeds. Expedite Application Equipment contains a special formulation using small-droplet technology. Inhibits production of three amino acids and protein synthesis.

**Caution** Do not spray green foliage or green bark. If applications are repeated, do not exceed a total of 10.6 lb ai/A (10.6 quarts/A) per year. Repeated use in Australian orchards for several years has resulted in resistant biotypes. To avoid developing weed resistance, rotate chemicals and weed control practices.

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

**Chemical family** None generally accepted

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## glyphosate (several products)

*Not for ground covers*

**Rate** Wiper: use 33% solution.

**Time** Apply 1 gal product to 2 gal water and wipe weeds. Avoid contact with desirable vegetation.

**Remarks** In severe infestations, reduce equipment ground speed or apply in two directions to ensure contact with wiper. (See remarks above.)

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

**Chemical family** None generally accepted

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## halosulfuron-methyl (Sedgehammer)

*For nutsedge control; directed spray only*

**Rate** 0.031 to 0.062 lb ai/A (0.66 to 0.33 oz/A) to three- to eight-leaf nutsedge

**Time** Post-directed spray on established woody ornamentals.

**Remarks** For control of nutsedge. Use lower rate on light infestations and high rate on heavy infestations. Do not exceed 5.33 oz/A per year. Add a nonionic surfactant at 0.25 to 0.5% v/v. May tank mix with glyphosate. Not recommended on roses or ground covers

**Caution** Do not apply over the top of desirable flowers, ornamentals, vegetables, trees, or shrubs.

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

**Chemical family** Sulfonylurea

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## pelargonic acid (Scythe)

*For ornamental trees and shrubs only*

**Rate** Broadcast: use 5 to 10 gal product per 100 gal water. Spot spray: use 5 to 10% solution (6.67 to 13 fl oz/gal) to cover 400 sq ft.

**Time** Apply to thoroughly wet foliage, either broadcast to non-crop area or preemergence to ornamental crop; or spot treat and trim around ornamentals, trees, flower beds, paths, and drives.

**Remarks** Controls small, actively growing weeds and weakens established weeds by removing susceptible vegetation. Disrupts cell membranes, causing leakage and symptoms of leaf burn.

**Site of action** Group 26: unknown

**Chemical family** Carboxylic acid

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## sethoxydim (Segment)

*For ornamental crops listed on label*

**Rate** 0.28 to 0.47 lb ai/A (36 to 60 fl oz/A)

**Time** Apply at optimum growth stage of grasses listed on the label.

**Remarks** Identify susceptible grasses. Control often is erratic on grasses stunted or stressed from drought, high temperatures, or low fertility. Resistant grasses include annual bluegrass and all fine fescues. Quackgrass can be suppressed. Inhibits fatty acid production, cell, membranes, and new growth.

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

**Chemical family** Cyclohexanedione

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## Root Growth Control

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### spunbonded polypropylene + trifluralin (Biobarrier)

**Rate** Consult label.

**Remarks** A geo-textile fabric containing permanently attached nodules of time-release herbicide. Prevents root encroachment when placed vertically, horizontally, or surrounding structures such as sidewalks, roads, building foundations, curbs, tennis courts, swimming pools, septic fields, or underground pipes or cables in the soil. Extend edge of fabric 18 inches beyond structure to prevent root growth around edges of protected structure. Maintain at least 4 inches of soil overlay. Physical and mitotic inhibition of roots.

**Site of action** (trifluralin) Group 3: microtubule assembly inhibitor

**Chemical family** (trifluralin) dinitroaniline

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# Bulb and Flower Beds

Ed Peachey

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Multiply rate by 0.023 for amount per 1,000 sq ft

## Preemergence, Soil-applied Treatments

### dithiopyr (Dimension 2EW)

Except Easter lily and gladiolus

**Rate** 0.375 to 0.5 lb ai/A (0.75 to 1 quarts/A)

**Time** Apply preemergence around bases of bulbs in landscape.

**Remarks** For best results, prepare a weed-free surface with minimal clods and leaf debris. Consult label for extensive list of tolerant ornamental crops.

**Caution** Do not exceed 1.5 fl oz/1,000 sq ft every 3 to 4 months or 4.5 fl oz/1,000 sq ft per year. Do not apply to plant roots or weakened ornamental plants or when drift potential is moderate to high. Do not use in enclosed structures. Dithiopyr is toxic to fish and highly toxic to oysters, shrimp, and other aquatic organisms.

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

**Chemical family** Pyridine

### EPTC (Eptam 7E)

**Rate** 5 to 14.9 lb ai/A (5.7 to 17 pints/A) depending on target weed species.

**Time** Apply 2 weeks before or after transplanting herbaceous plants, groundcovers and trees and shrubs.

**Remarks** For annual weeds, incorporate to 3 inches deep, use lower rate, and incorporate with nursery cultivator or rototillers. For perennial weeds such as nutsedge and quackgrass, use higher rate and incorporate to 6 inches for suppression. Inhibits shoots of emerging seedlings.

**Caution** All flowering bulbs, salvia, phlox, snapdragon, and ornamental pepper are susceptible to EPTC.

**Site of action** Group 8: lipid synthesis inhibitor but not an ACCase inhibitor

**Chemical family** Thiocarbamate

### isoxaben (Gallery 75DF)

*Bulbous iris, daffodil, gladiolus, hyacinth, lily, narcissus, and tulip*

**Rate** 0.495 lb ai/A (0.66 lb/A)

**Time** Apply 2 to 4 weeks after planting, before bulbs and annual weeds emerge. Also may apply after bulbs emerge but before they flower.

**Remarks** Activate with 0.5 inch water or shallow cultivation before weeds emerge. Chemical stability remains adequate when left on soil surface for 21 days. Primarily for broadleaf control.

**Caution** Not for commercial production sites. Not recommended on tulips taller than 0.75 inch, or on gladiolus before emergence, or if corms were less than 1 inch in diameter, or on bulbs while they are flowering.

**Site of action** Group 21: inhibits cell wall synthesis Site B

**Chemical family** Benzamide

### oryzalin (Surflan AS)

*Bulbous iris, daffodil, hyacinth, narcissus, and tulip*

**Rate** 0.75 lb to 1.5 lb ai/A (0.75 to 1.5 quarts/A) depending on target species and time of year applied.

**Time** Apply 2 to 4 weeks after planting ornamental bulbs but before annual weeds emerge.

**Remarks** For fall-planted bulbs, apply in late winter to weed-free soil. Inhibits mitosis in roots and shoots.

**Caution** Do not apply to emerged tulips taller than 0.75 inch.

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

**Chemical family** Dinitroaniline

### oryzalin + benefin (XL 2G)

*Including bulbous iris, daffodil, hyacinth, and tulip*

**Rate** Bulbs: use 75 to 150 lb/A depending on soil texture and time of year. Flowers: use 200 lb/A per application with at least 2 months between applications, not to exceed 600 lb/A per year.

**Time** Apply before target weeds germinate or immediately after cultivation. For bulbs, apply 2 to 4 weeks after planting but before weeds emerge.

**Remarks** Consult label for tolerant flowers and bulbs. (Inhibits cell division or mitosis, primarily in roots.)

**Caution** Do not apply to tulips emerged to 0.75 inch high or more, or to gladiolus before it emerges, or to plants less than 1 inch in diameter. Sensitive species include Douglas-fir, eastern hemlock, and begonia.

**Site of action** (both) Group 3: microtubule assembly inhibitor

**Chemical family** (both) dinitroaniline

### oxadiazon (Ronstar 50 WSP)

*Gladiolus only*

**Rate** 2 to 4 lb ai/A (4 to 8 lb/A) depending on target weed species.

**Time** Apply any time to weed-free soil and irrigate with 0.25 to 0.33 inch water immediately after applying for annual weed control.

**Remarks** Do not cover with soil or mulch, or incorporate, because weed control will desist. Weeds in the pink family (chickweed, mouse ear chickweed, and pearlwort) are resistant. Primarily broadleaf control (controls weed seedlings by contact action during emergence.)

**Caution** See label for sensitive ornamentals, which include varieties of rhododendron, spruce, hemlock, azalea, viburnum, and cotoneaster. Avoid contaminating water intended for irrigation. Do not use on plants that will produce fruit within 1 year.

**Site of action** Group 14: protoporphyrinogen oxidase inhibitor

**Chemical family** Oxadiazole

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**pendimethalin (Pendulum 2G)**

**Rate** 2 to 4 lb ai/A (100 to 200 lb/A) depending on desired length of weed control.

**Time** Apply before, during, or after planting bulbs. Apply to seeded wildflowers after flower seedlings have emerged but before weed seeds germinate.

**Remarks** May be applied to control susceptible weeds (primarily grasses) in bulbs (including crocus, daffodil, gladiolus, and tulip) and established wildflowers (including black-eyed Susan, California poppy, coreopsis, and oxeye daisy) listed on the label. Primarily for grass control.

**Caution** Granules may stain stone, wood, or other porous surfaces.

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

**Chemical family** Dinitroaniline

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**prodiamine (Barricade 65 WG)**

*See label for listed bulbs and wildflowers*

**Rate** 0.65 to 1.5 lb ai/A (1 to 2.3 lb/A) depending on length of control desired, and number of applications per year.

**Time** Apply before or after bulbs and wildflowers emerge, but before weeds and desirable flowers emerge.

**Remarks** Irrigate soon after treatment to wash herbicide onto the soil surface and to activate it within the top layer of soil. Do not exceed 2.3 lb/A.

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

**Chemical family** Dinitroaniline

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**S-metolachlor (Pennant Magnum)**

*Many bulbs and flowers, except daffodil*

**Rate** 1.24 to 2.48 lb ai/A (1.3 to 2.6 pints/A) depending on soil type and organic matter.

**Time** After transplanting

**Remarks** Apply when soil has firmed around plant. Irrigate shortly after planting to wash the herbicide from foliage and to activate the herbicide in the soil. Will not control emerged weeds. Existing weeds must be removed. Primarily targets grasses but controls some broadleaves and suppresses nutsedge. Inhibits seedling roots and/or shoots.

**Caution** Consult label for tolerant and approved species. Do not apply more than twice per year.

**Site of action** Group 15: inhibits very long chain fatty acid synthesis

**Chemical family** Chloroacetamide

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**trifluralin (Treflan 10G)**

**Rate** 0.4 lb ai/A (40 lbs/A)

**Time** Apply Trifluralin 10G to the soil surface 2 to 4 weeks after planting, but prior to the emergence of annual weeds. Trifluralin 10G may also be applied following bulb emergence. For fall planted bulbs, apply Trifluralin 10G again in late winter or early spring to weed-free soil surfaces.

**Remarks** Trifluralin must be activated by a single rain or overhead sprinkler irrigation of at least 0.5 inch. If not activated within 3 days, mechanically incorporate trifluralin with equipment that won't damage bulbs. Apply before weed seeds germinate; trifluralin will not control established weeds.

**Caution** Do not make preplant applications of Trifluralin 10G to areas where gladioli corms less than one inch in diameter will be planted or injury may occur.

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

**Chemical family** Dinitroaniline

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**Postemergence or Foliar-applied Treatments****clethodim (Envoy Plus)**

**Rate** Consult labels.

**Time** Apply postemergence to actively growing annual or perennial grasses as listed on label.

**Remarks** Consider environment and growth conditions that affect leaf uptake (see label).

**Caution** Do not exceed 64 fl oz/A per season.

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

**Chemical family** Cyclohexanedione

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**fenoxaprop ethyl (Acclaim Extra)**

**Rate** 13 to 39 fl oz/A

**Remarks** Daylily and iris listed on label. Adjust rates depending on number of grass tillers (see label). Ensure thorough coverage to actively growing, susceptible grasses. Repeat after grass begins active growth but do not exceed 120 fl oz/A per season. Inhibits fatty acid production, cell membranes, and new growth.

**Caution** Juniper, salvia, and philodendron are not tolerant

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

**Chemical family** Aryloxyphenoxy propionate

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**fluazifop (Fusilade II)**

*Alyssum, marigold, petunia, geranium, iris, zinnia, and many others; not for tulips*

**Rate** 0.25 to 0.375 lb ai/A (16 to 24 fl oz/A)

**Time** Apply to actively growing grasses or within 7 days after irrigation with 0.25% nonionic surfactant when susceptible grasses are in the labeled growth stage.

**Remarks** Check label for crops that can be injured by over-the-top applications. Identify grasses and adjust rates depending on susceptibility and stage of weed growth as label instructs. Results often are erratic on grasses stressed from lack of vigor, drought, high temperature, or low fertility. More mature grasses and quackgrass can be controlled but may require two applications. Annual bluegrass and all fine fescues resist treatment. Inhibits fatty acid production, cell membranes, and new growth.

**Caution** Do not tank mix with other pesticides. Do not apply within 5 days of other pesticide treatments.

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

**Chemical family** Aryloxyphenoxy propionate

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**sethoxydim (Segment II)**

*Chrysanthemum, coleus, gladiolus, impatiens, iris, marigold, snapdragon, petunia, tulip, zinnia, and others*

**Rate** 0.28 to 0.47 lb ai/A (1.5 to 2.5 pints/A)

**Time** Apply at optimum growth stage listed on the label.

**Remarks** Identify susceptible grasses. Control often is erratic on grasses stunted or stressed from drought, high temperatures, or low fertility. Resistant grasses include annual bluegrass and all fine fescues, but quackgrass can be suppressed. Inhibits fatty acid production, cell membranes, and new growth.

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

**Chemical family** Cyclohexanedione

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# General Maintenance around Ornamental Plantings

Ed Peachey

Revised March 2018

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## diquat (Reglone)

**Rate** 0.5 lb ai/A

**Time** Apply any time when weeds are small and actively growing.

**Remarks** Avoid spray contact with desirable ornamental plants. Acts as a contact; absorbs electrons after photosynthesis and recycles herbicide.

**Caution** A moderately toxic herbicide; protective gear required for handling and application. Do not ingest or inhale spray mist. Wear protective face shields, respirators, and clothing.

**Site of action** Group 22: photosystem I electron diversion

**Chemical family** Bipyridilium

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## glyphosate (numerous product names)

**Rate** Spray: use 1.5 to 5 lb ai/A, or 1 to 2% solution for high-volume sprayers.

**Time** Apply as directed spray toward base of ornamental plant when weeds are actively growing or moving sugars to roots.

**Remarks** Use lower rates for annual weeds; see label for higher rates and timing for perennial weeds. Expedite Application Equipment contains a special formulation using small-droplet technology.

**Caution** Do not spray green foliage or green bark. If repeating applications, do not exceed a total of 10.6 lb ai/A (10.6 quarts) per year. Inhibits production of three amino acids and protein synthesis.

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

**Chemical family** None generally accepted

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## glyphosate (several products)

**Rate** Wiper: use 33% solution.

**Time** Apply 1 gal product to 2 gal water and wipe weeds, avoiding contact with desirable vegetation. In severe infestations, reduce equipment ground speed or apply in two directions to ensure contact with wiper. (See remarks above.)

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

**Chemical family** None generally accepted