

# SECTION I.

## HOP

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### Annual Grass and Broadleaf Weeds

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#### dimethenamid-P (Outlook)

**Rate** 0.56 to 1 lb ai/a (12 to 18 oz/a product on coarse soils, 14 to 21 fl oz/a product on medium and fine soils).

**Time** Apply preemergence to weeds when hops are dormant or in early vegetative stages of growth. Incorporate with rainfall, sprinkler irrigation, or by mechanical means soon after application to maximize weed control.

**Remarks** Controls numerous annual grass weeds and certain broadleaf weeds when applied prior to emergence. Only one application allowed per season. Do not apply more than 21 oz/a per growing season. Preharvest interval is 60 days. If planting a cover crop between hop rows, be aware of possible injury to small grains or direct applications to hop rows only.

**Caution** Contact of spray mixture with hop foliage may cause injury to hops. May only be applied by ground (banded) application (including postemergence-directed). Has not been tested on all soil types in the Pacific Northwest so test on a small area of field to confirm crop safety on the local soil type.

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

**Chemical family** Chloroacetamide

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#### flumioxazin (Chateau SW, Redeagle, Tacoma, Tuscany SC, Warfox)

**Rate** 0.19 lb ai/a (6 oz/a of 51% ai products).

**Time** Apply to dormant hops November thru February in a 1- to 1.5-foot band to each side of the hop row. Rain following application will improve preemergence weed control.

**Remarks** Do not apply more than 6 oz/a in a single application. Do not apply more than 6 oz/a during a growing season. Do not add an adjuvant. If weeds have emerged at the time of application, tank mix with a labeled herbicide such as paraquat or glyphosate to improve control of emerged weeds. Controls numerous broadleaf and some grass weeds when applied prior to emergence.

**Caution** Do not allow spray to contact green stems, foliage, flowers, or cones because unacceptable injury may occur. Preharvest interval is 30 days. Avoid spray or drift outside the area. Do not mow or rake over treated area as dust created by mowing may drift onto sensitive crops or vegetation and damage crop foliage.

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

**Chemical family** N-phenylphthalimide derivative

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#### glyphosate (several trade names)

**Rate** Consult labels

**Time** Apply to actively growing weeds.

**Remarks** Glyphosate will injure and kill hops, so avoid all contact with hop foliage. Remove any sucker that may be growing in areas to be sprayed. Use a low-pressure, coarse spray to minimize drift within the hop yard. Glyphosate controls many perennial weeds if applied at the weed growth stage stated on the label.

**Caution** Do not allow spray to contact green hop stems or foliage. Any crop receiving spray will be killed. Preharvest interval is 14 days.

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

**Chemical family** None generally accepted

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#### indaziflam (Alion)

**Rate** 0.045 to 0.065 lb ai/a (3.5 to 5 fl oz/a product). Use the lower rates on soils with less than 1% organic matter content. Do not use on sand soils. Lower (3.5 fl oz/a) rates are preferred for crop safety.

**Time** Apply preemergence to weeds when hops are dormant. Fall applications are less likely to cause injury to the crop.

**Remarks** Controls numerous annual grass weeds and broadleaf weeds when applied prior to emergence. Can be applied as an early spring dormant application and/or as a fall dormant application after hop harvest. Do not apply more than two applications for a total of 7 to 10 fl oz/in a 12 month period depending on soil organic matter. Only apply to hop vines where the soil has completely settled around the vines and there are no open roots. Apply in a minimum of a 2 foot band on each side of the hop row.

**Caution** Use only on hops that have been established at least one year. Do not use on soils with greater than 20% gravel content. Early spring dormant application can be made to hop shoots that are in the bud stage up to 2 inches tall. Do not allow spray to contact green stems, foliage, flowers, or cones or unacceptable injury may occur.

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

**Chemical family** Alkylazine

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#### isoxaben (Trellis SC)

##### Supplemental label

**Rate** 0.495 to 1 lb ai/a (16 to 31 fl oz/a product)

**Time** Apply preemergence to weeds when hops are dormant or in early bud stage of growth, in fall to early spring, to debris-free soil surface. Incorporate with 0.5 inch water within 21 days after application.

**Remarks** Identify weeds and adjust rates according to charts listed on label. Trellis SC performance is improved when application is banded to each side of the planting row before crop emergence. At least 20 GPA is recommended.

**Caution** Can be used on newly planted hops that the soil has have been settled by packing or rainfall. Soil cracks may cause plant injury. Do not apply through any type of irrigation system.

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

**Chemical family** Benzamide

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### norflurazon (Solicam DF)

**Rate** 2 to 4 lb ai/a (2.5 to 5 lb/a Solicam DF), depending on soil texture

**Time** May be applied immediately after planting new hops. On established fields, apply to soil surface in fall after hop yards have been worked for the last time, or within 1 week after stringing in the spring.

**Remarks** Use lower rate on coarse soils and higher rate on fine soils. Note recropping interval on label. Preharvest interval is 60 days. If planting a cover crop between hop rows, be aware of possible injury to small grains or direct applications to hop rows only.

**Site of action** Group 12: bleaching; inhibits carotenoid biosynthesis

**Chemical family** Pyridazinone

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### paraquat (several trade names)

**Rate** 0.5 lb ai/a in at least 10 gal/a water. Add nonionic surfactant or crop oil concentrate to spray mix.

**Time** For control of winter annuals, apply before hops begin to grow in spring. Apply after hop vines are at least 6 ft tall; direct spray to basal 2 ft of plants.

**Remarks** Direct spray around base and in interspaces of hops. Re-treatment or spot treatment may be necessary.

**Caution** A restricted-use herbicide. Do not let spray contact green portions of plant, because injury may result. Do not exceed three applications per season. Preharvest interval is 14 days. Do not graze animals in treated hop yard. Hop vine refuse and silage may be fed to livestock. Follow all safety precautions on label.

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

**Chemical family** Bipyridilium

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### pelargonic acid (Scythe)

**Rate** Apply in a total water volume of 75 to 200 gal per acre. Apply as a 3-5% (v/v) solution on young, small annual weeds and 5-7% (v/v) solution on perennial herbaceous weeds or annual weeds over 6 inches tall. For difficult to control weeds and maximum vegetation control use 7-10% (v/v).

**Time** Apply before hops emerge to control winter annual or early emerged weeds. Apply after hop emergence, but don't allow spray to contact emerged hops. Small weeds are easier to control than larger weeds. Warm weather promotes rapid activity on plants.

**Remarks** Apply as a spot treatment or as a directed and shielded spray avoiding contact with all desirable vegetation. Contact of spray or spray drift with emerged vegetation will result in damage. Repeat applications are required to control new weeds emerging from seed or underground vegetative parts. Broadleaf weeds are generally controlled better than grass weeds. Repeated use may select for grasses.

**Caution** Pelargonic acid is a nonselective herbicide. Any spray contacting desirable vegetation will likely result in damage.

**Site of action** Group 26 unknown. Disrupts cell membranes causing leakage from the cells and rapid wilting.

**Chemical family** Carboxylic acid

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### pendimethalin (Drexel Aquapen, Prowl H2O, Satellite Hydrocap)

**Rate** 1 to 4 lb ai/a (1.1 to 4.2 quarts/a product), depending on soil texture

**Time** Apply prior to target weed emergence when hops are dormant or in vegetative stages of growth. Apply the spray directly to the ground beneath the vines and/or in areas between rows with ground equipment. Apply in a single application or sequential applications with an interval of 30 days or more.

**Remarks** Controls many annual grass weeds and certain broadleaf weeds when applied prior to weed emergence. Use lower rate on coarse soils and higher rate on fine soils. Do not exceed a maximum total of 4.2 quarts/a per year. Preharvest interval is 90 days. Note recropping interval on label. If planting a cover crop between hop rows, be aware of possible injury to small grains or direct applications to hop rows only.

**Caution** Do not apply over the top of vines with leaves or cones. Contact with hop foliage or cones by spray mixture may cause injury.

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

**Chemical family** Dinitroaniline

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### trifluralin (several trade names)

**Rate** 0.5 to 0.75 lb ai/a

**Time** Apply and incorporate when crop is dormant.

**Remarks** Use lower rate on coarse soils, higher rate on fine soils. Must be incorporated 1 to 2 inches with equipment that ensures soil mixing without injuring hop crowns. This treatment will not control mustards, prickly lettuce, horseweed (marestail), salsify, or nightshades.

**Caution** Do not spray over hop crowns. Take care that incorporation equipment does not injure hop crown buds that are needed to initiate hop bines. Disking operations that move additional treated soil onto the hop crown may delay emergence. Avoid exposing untreated soil when ditching for furrow irrigation.

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

**Chemical family** Dinitroaniline

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## Certain Annual and Perennial Broadleaf Weeds

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### 2,4-D + flumioxazin (Panther D)

**Rate** 0.5 lb ae/a 2,4-D + 0.0325 lb ai/a flumioxazin (1 pint/a product)

**Time** Make directed applications to row middles. Apply 1 pint/a each application, 30 day treatment interval.

**Remarks** Do not apply more than 1 pint/a in a single application. Do not apply more than 3 pints/a during a cropping season. Do not add an adjuvant. Controls numerous broadleaf weeds. Preharvest interval is 30 days.

**Caution** Do not allow spray to contact green stems, foliage, flowers, or cones because unacceptable injury may occur. Avoid spray or drift outside the area. Do not mow or rake over treated area as dust created by mowing may drift onto sensitive crops or vegetation and damage crop foliage.

**Site of action** (2,4-D) Group 4: synthetic auxin; (flumioxazin) Group 14: protoporphyrinogen oxidase inhibitor

**Chemical family** (2,4-D) Phenoxy acetic acid; (flumioxazin) N-phenylphthalimide derivative

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## 2,4-D (several trade names)

**Rate** 0.48 lb ae/a (1 pint/a product)

**Time** Apply when annual broadleaf weeds are small.

**Remarks** Controls susceptible broadleaf weeds. Make directed applications to the row middles. Make up to three applications with at least 30 days between treatments.

**Caution** Avoid contact with new hop foliage and apical buds. Do not exceed 1.43 lb ae/a (3 pints product/a) per year crop cycle. Preharvest interval is 28 days. Avoid spray drift outside the target area.

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

**Chemical family** Phenoxy acetic acid

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## carfentrazone (Aim EC)

**Rate** 0.03 lb ai/a (2 fl oz/a product)

**Time** Apply to emerged weeds up to 4 inches tall.

**Remarks** Apply using shielded sprayers or hooded sprayers to control emerged and actively growing broadleaf weeds within or between the rows of the crop. Apply in at least 20 gal of spray solution. Allow 14 days between treatments. Use a nonionic surfactant with at least 80% ai at 2 pints/100 gal of spray solution or a quality crop oil concentrate at recommended rates. Controls only susceptible broadleaf weeds less than 4 inches tall or across. Do not apply within 7 days of harvest.

**Caution** Do not let spray contact green portions of plant, because injury may result. Do not exceed 0.119 lb ai/a (7.6 fl oz/a product) per season. Avoid spray or drift outside the area.

**Site of action** Group 14: protoporphyrinogen oxidase (PPO) inhibitor

**Chemical family** Triazolinone

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## clopyralid (Stinger, Spur)

**Rate** 0.125 to 0.25 lb ae/a (0.33 to 0.67 pint/a product)

**Time** Apply after training when the growing points of the hop plants are above the spray zone.

**Remarks** Special local needs labels ID-040011, OR-040038, and WA-040008 for Stinger. Clopyralid has a narrow spectrum of weeds controlled and controls many weeds in the sunflower (e.g., Canada thistle, marehail), legume (e.g., clover), and smartweed families. Hops may show some transient, minor leaf cupping where the spray contacts the lower leaves and suckers on treated plants. Test within a small area before treating the entire hop yard. The grower assumes all risk of crop injury, yield reduction, and crop loss. If a second application is required, the re-treatment interval is 21 days.

**Caution** Do not apply broadcast more than twice per crop per year. Do not exceed 0.25 lb ae/a per year. Preharvest interval is 30 days. Do not compost treated vegetation if compost will be used on sensitive species.

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

**Chemical family** Pyridine

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## pyraflufen (Venue)

**Rate** 0.0040 to 0.0053 lb ai/a (3 to 4 fl oz/a)

**Time** Apply a minimum of 20 GPA for listed broadleaf weeds and sucker control. Direct applications to the basal 2 ft of vines or trained bines that are at least 6 ft tall.

**Remarks** Apply in at least 20 gal/a water. Higher water volumes are recommended for difficult to control weeds. Add crop oil concentrate to spray mix at 1% to 2% v/v.

**Caution** Do not apply more than two times per season. Allow 30 days between applications. Preharvest interval is 30 days. Follow all safety precautions on the label.

**Site of action** Group 14: protoporphyrinogen oxidase (PPO) inhibitor

**Chemical family** Phenylpyrazole

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## Certain Annual and Perennial Grass Weeds

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### clethodim (several trade names)

**Rate** 0.068 to 0.12 lb ai/a (rate varies by product)

**Time** Apply to actively growing grasses at the size recommended on the label.

**Remarks** Rate depends on target grasses. Add a nonionic surfactant at 0.25% v/v to the spray mix. Wait at least 14 days between applications.

**Caution** Preharvest interval is 21 days. Do not apply with ammonium sulfate. Do not exceed 0.12 lb ai/a in a single application or 0.5 lb ai/a per season.

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

**Chemical family** Cyclohexanedione

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## Green Sucker Suppression

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### carfentrazone (Aim EC)

**Rate** 0.031 lb ai/a (2 fl oz/a product)

**Time** Spray only the basal 18 inches of bines and the sucker mat at the base of the bine.

**Remarks** Apply in at least 20 gal of spray solution with boom-type ground application equipment. Allow 14 days between treatments. Use a nonionic surfactant with at least 80% ai at 2 pints per 100 gal of spray solution or a quality crop oil concentrate at recommended rates. Controls only susceptible broadleaf weeds less than 4 inches tall or across.

**Caution** Avoid applications until newly trained bines have developed sufficient barking to avoid damage to the stem, and are high enough up the string to avoid contact with the apical bud. Do not exceed 0.119 lb ai/a (7.6 fl oz/a product) per season. Do not apply within 7 days of harvest. Avoid spray or drift outside the intended area.

**Site of action** Group 14: protoporphyrinogen oxidase (PPO) inhibitor

**Chemical family** Triazolinone

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### flumioxazin (Chateau SW, Redeagle, Tacoma, Tuscany SC, Warfox)

**Rate** 0.19 lb ai/a (6 oz/a of 51% ai products).

**Time** Direct application to basal 2 feet of hop plants when hops have reached a minimum height of 6 feet.

**Remarks** Do not apply more than 6 oz/a in a single application. Do not apply more than 6 oz/a during a growing season. Do not add any adjuvant. Will provide residual control of numerous broadleaf and some grass weeds.

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**Caution** Do not apply to hop vines less than 6 ft tall. Preharvest interval is 30 days. Avoid spray or drift outside the area. Do not mow or rake over treated area as dust created by mowing may drift onto sensitive crops or vegetation, resulting in injury. Pears are sensitive.

**Site of action** Group 14: protoporphyrinogen oxidase (PPO) inhibitor

**Chemical family** N-phenylphthalimide derivative

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**paraquat (several trade names)**

**Rate** 0.5 lb ai/a in at least 10 gal/a water. Add nonionic surfactant or crop oil concentrate to spray mix.

**Time** Chemical pruning: To burn back existing vines and obtain even emergence of subsequent vines, spray when vines are less than 3 ft tall. Suckering and stripping: Spray only the basal 2 ft of vines. Repeat as necessary.

**Remarks** Higher water volumes were more effective in desiccating hops in research trials. Hop response differs by variety. To determine sensitivity to injury, test selected use-rate on a few plants of each hop variety to be treated. Reduce rate, or do not use, on varieties showing unacceptable injury. Hop vine refuse and silage may be fed to livestock..

**Caution** A restricted-use herbicide. Applications to hop vines less than 6 ft tall may cause unacceptable injury. Do not apply more than three times per season. Preharvest interval is 14 days. Do not allow animals to graze in treated hop yard. Follow all safety precautions on the label.

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

**Chemical family** Bipyridilium

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**pyraflufen (Venue)**

**Rate** 0.004 to 0.005 lb ai/a (3 to 4 fl oz/a) in at least 20 gal/a water. Add crop oil concentrate to spray mix at 1% to 2% v/v.

**Time** Chemical pruning: To burn back existing vines and obtain even emergence of subsequent vines, spray when vines are less than 3 ft tall. Suckering and stripping: Spray only the basal 2 ft of vines. Repeat as necessary.

**Remarks** Higher water volumes are recommended for difficult to control weeds.

**Caution** Do not apply more than two times per season. Allow 30 days between applications. Preharvest interval is 30 days. Follow all safety precautions on the label.

**Site of action** Group 14: protoporphyrinogen oxidase (PPO) inhibitor

**Chemical family** Phenylpyrazole

## Herbicides labeled in hops in Idaho, Oregon, and Washington

| Active Ingredient (WSSA group) <sup>1</sup><br>[trade name] | Rate<br>(product/a)                        | Max use in 12<br>month period<br>(product/a) | Application<br>per season/<br>(Reapplication<br>interval) | Minimal<br>Age<br>(Month) | Replant<br>(Month) | Soil<br>incorporation<br>IN/ (Day) | PHI (Day) |
|---|--|--|---|---------------------------|--------------------|------------------------------------|-----------|
| Preemergence  |  |  |   |                           |                    |                                    |           |
| dimethenamid (15)<br>[Outlook]                              | 0.56 to 1 lb ai<br>(12 to 21 oz)           | 1 lb ai<br>(21 oz)                           | 1 / (NA)  | 0                         | 6 to 9             |                                    | 60        |
| flumioxazin (14)<br>[Chateau SW]                            | 0.19 lb ai<br>(6 oz/a)                     | 0.19 lb ai<br>(6 oz/a)                       | -   | -                         | 12                 | 0.5"/ (-)                          | 30        |
| indaziflam (29)<br>[Alion]                                  | 0.045 to 0.13 lb ai<br>(3.5 to 10 fl oz)   | 0.09 to 0.13 lb ai<br>(7 to 10 fl oz)        | 2 / (6 months)  | 12                        | -                  | - / (21)                           | NA        |
| isoxaben [21]<br>(Trellis SC)                               | 0.5 to 1 lb ai<br>(16 to 31 fl oz)         | 1.0 lb ai<br>(31 fl oz)                      | 2 / (-)   | 0                         | 0                  | 0.5"/ (21)                         | 60        |
| norflurazon (12)<br>[Solicam DF]                            | 2 to 4 lb ai<br>(2.5 to 5 lb)              | 2 to 4 lb ai<br>(2.5 to 5 lb)                | 1 / (NA)  | 0                         | 12                 | 0.5-1"/ (28)                       | 60        |
| pendimethalin (3)<br>[Prowl H2O]                            | 1 to 4 lb ai<br>(1.1 to 4.2 quarts)        | 4 lb ai<br>(4.2 quarts)                      | 2 / (30 days)   | 0                         | 12                 | 1"/ (-)                            | 90        |
| trifluralin (3)<br>[Treflan 4D]                             | 0.5 to 0.75 lb ai<br>[1 to 1.5 pints]      | 0.5 to 0.75 lb ai<br>[1 to 1.5 pints]        | 1 / (NA)  | 12                        | 5                  | - / (1)                            | NA        |
| Postemergence   |  |  |   |                           |                    |                                    |           |
| 2,4-D (4)<br>[various]                                      | 0.48 lb ae<br>(1 pint)                     | 1.43 lb ae<br>(3 pints)                      | 3 / (30 day)  | n/a                       | -                  | n/a                                | 28        |
| glyphosate (10)<br>[various]                                | 0.38 to 3.68 lb ae<br>(see label)          | 7.87 lb ae<br>(see label)                    | - / (14 days)   | -                         | -                  | n/a                                | 14        |
| capric + caprylic acid<br>(17) [Suppress EC]                | 3 to 9% v/v<br>(varies by spray<br>vol.)   | n/a  | n/a   | n/a                       | n/a                | n/a                                | 1         |
| carfentrazone (14)<br>[Aim EC]                              | 0.03 lb ai<br>(2 fl oz)                    | 0.12 lb ai<br>(7.6 fl oz)                    | - / (14 days)   | -                         | -                  | n/a                                | 7         |
| clethodim (1)<br>[various]                                  | 0.068 to 0.12 lb ai<br>(see label)         | 0.5 lb ai<br>(see label)                     | - / (14 days)   | -                         | -                  | n/a                                | 21        |
| clopyralid (4)<br>[Stinger]                                 | 0.125 to 0.25 lb ae<br>(0.33 to 0.67 pint) | 0.25 lb ae<br>(0.67 pint)                    | 2 / (21 days)   | -                         | 12                 | n/a                                | 30        |
| paraquat (22)<br>[Gramoxone SL]                             | 0.5 lb ai (2 pints)                        | 1.5 lb ai<br>(6 pints)                       | 3 / (-)   | -                         | -                  | n/a                                | 14        |
| pelargonic Acid (17)<br>[Scythe]                            | 3 to 10% v/v<br>(varies by spray<br>vol.)  | n/a  | n/a   | n/a                       | n/a                | n/a                                | 1         |
| pyraflufen (14)<br>[Venue]                                  | 0.004 to 0.005 lb<br>ai (4 fl oz)          | lb ai<br>(8 fl oz)                           | 2 / (30 days)   | -                         | -                  | n/a                                | 30        |

<sup>1</sup> WSSA group - Weed Science Society of America herbicide site of action group number.  
(n/a) – not applicable, (-) no information available.