Weed Control in Christmas Trees

Weeds compete with Christmas trees for moisture, nutrients, and light. Especially after the shock of transplanting into the field, growth of conifers is slow. Because of the slow growth, weed competition is particularly damaging the first year or two. Weeds cause high mortality and reduced growth during the establishment period.

Older trees can tolerate weed competition better than newly established trees. Competition from weeds, however, can cause mature trees to have lighter colored, small needles and reduced growth. Quality is reduced when weeds grow into lower branches of harvestable trees. Climbing weeds such as blackberry and wild cucumber cannot be tolerated in trees near market size.

Weeds cause other problems. Deer prefer wild plants, but do feed on Christmas trees in weedy plantings. Gophers are attracted into Christmas tree plantations when certain fleshy-rooted weeds are present. Dandelion, plantain, Canada thistle, and morningglory are examples of weeds that cause increased gopher populations. When gopher populations increase, they often feed on trees, particularly pine. Gopher tunnels also ventilate the soil, causing tree mortality from moisture loss. Weeds such as bracken and sword fern contribute to disease problems because these plants serve as the alternate host for white rust, which can attack true firs.

Not all weeds are bad. A complete absence of weeds means exposed soil, where run-off of rain can erode soil and reduce productivity, especially on bare slopes. Soil compaction caused by the beating action of rain on bare soil is undesirable. At harvest, trees stay cleaner when there is some type of ground cover. Weed control, therefore, should be designed to manage the ground cover to maintain tree growth, quality, and ease of harvest while reducing soil erosion and compaction.

Types of Weed Control

Cultivation or tillage

Square or rectangular plantings permit cross cultivation, leaving only a small square around each tree to be hoed or treated with chemical. Cultivation can be important in controlling weeds that escape or resist chemical treatments.

Chemical

Herbicides are used on most plantations, from less than 1 acre up to the largest acreage, because chemicals are effective and cost efficient. Many herbicides are registered for Christmas tree weed control. It is important to select herbicides that control the specific weed infestation in your plantation. Two major disadvantages to the use of chemical weed control are the chance of misbranding of pesti-
cides and possible damage to the trees. Herbicides must be applied at exactly the correct dose and time to control weeds without damaging or injuring the trees. Obtaining more consistent results by reading the herbicide label and other information about proper application and timing of each herbicide. Also, learn to identify weed species in order to select the most effective herbicides for your plantation.

### Weed Control Alternatives

**Minimum chemical establishment**

An alternative to the use of chemicals is summer fallowing the year before planting, followed by cross cultivating, and sowing. A winter cover crop or weed cover will reduce soil erosion. Heavy winter weed growth that occurs before soils dry in the spring, however, can result in severe competition. Hand hoeing or use of herbicides around the tree is essential for successful establishment of new plantations.

**No-till establishment**

No-till is an alternative to tillage because of the wide range of herbicides available for use in Christmas tree plantations. Herbicide effectiveness is subject to the temperature and rainfall before planting to control most weed growth or following a grass or herbicide treatment. Trees can be planted earlier and soil erosion is reduced in undisturbed soil. Winter rains can help settle the soil around the tree roots. However, only the best mechanical tree planting equipment will plant and pack the soil or sod around the roots when planting into no-till soil. Also, an improved soil condition is required when planting by hand in a no-till operation.

### Combinations of weed control practices

Combinations of control techniques usually result in the best program when all factors are considered—include cost, tree growth, soil compaction, and environmental impact. A combination of herbicides can provide excellent weed control during the establishment phase of your plantation. Either single or mixed herbicides can be applied by the soil or foliage. Herbicides are feasible in different situations for establishing a tree stand. Tillage may be helpful during the summer following planting to prevent from cracking around the trees. True fir, particularly Noble and Shasta, are slow to respond to pre-emergence herbicides and are desirable for 2 to 3 years. Herbicides are often applied in strips under the tree row and the area between rows can be cultivated or mowed. After trees are established and growing, a shift from cultivation to mowing might be desirable. This shift away from cultivation to a managed ground cover helps stabilize soil on less erosion or soil compaction, and less mud during harvest.

### Chemical Weed Control Principles

**Soil and climatic effects**

Oregon’s major Christmas tree production area is located in and surrounded by the Cascades, Corvallis Valley. Most weed control research and experience has been obtained in this area of the state. When planning a weed control program, consider the following: soil slopes, soil texture differences in rainfall, soil types and organic matter content, and weed infestations.

**Soil-active herbicides** must be activated with rain. Light-textured soils low in organics require treated soil with rockier soils require reduced doses of soil-active herbicides for satisfactory weed control and minimal chance for injury to Christmas trees. Know your soil and consult the herbicide label for information about soils. During application, you may need to reduce the herbicide dose by driving slightly faster over light-textured or rocky soils. 

**Foliar-active herbicides** should be applied after Christmas trees have ceased active growth or during the winter dormant stage. Consequently, timing of application for foliar-active herbicides will vary throughout the state.

**Chemical formulations**

Herbicides are generally formulated as liquids or as concentrated dry materials. Some liquid formulations are liquid, but others are fine particles suspended in the liquid known as flowables. Dry materials can be soluble, but most are water-soluble powders that can be suspended in water. Water-soluble granules are properly agitated and tank-mixed to provide uniform application of herbicides. A boom with two nozzles provides precision spot spraying with the aid of an overhead tree. A small lawn-jet nozzle can cover the width between rows of a larger lawn-jet nozzle is used on top of the backpack sprayer for two-row applications. A ratio of 20 to 26 gallons per acre is common for herbicide applications, although many herbicides can be applied with a 5 to 10 gallons per acre. 

**Types of Applications**

**Backpack sprayers** Lightweight, portable, and relatively inexpensive back- pack sprayers are adequate for chemical weed control in small plantations and for special jobs on large plantations. Backpack sprayers with a pressure gauge or pressure control can be calibrated to provide uniform application of herbicides. A boom with two nozzles provides precision spot spraying with the aid of an overhead tree. A small lawn-jet nozzle can cover the width between rows of a larger lawn-jet nozzle is used on top of the backpack sprayer for two-row applications. A ratio of 20 to 26 gallons per acre is common for herbicide applications, although many herbicides can be applied with a 5 to 10 gallons per acre. 

### SUGGESTED FORMULATIONS FOR CHRISTMAS TREES

Note: Herbicides must be applied at exactly the correct rate and time to selectively control weed growth with minimal chance for injury to the trees. Obtain more consistent results by reading the herbicide label and other information about the proper application and timing of each herbicide. To avoid confusion be sure commercial formulations, suggested doses listed in the guide are stated as pounds active ingredient per acre (pounds a.i./A) or pounds acid equivalent per acre (pounds a.e./A). Wilcox and Johnson list otherwise indicated. Apply lower rates for sandy or rocky soils containing low amounts of organic matter. 

<table>
<thead>
<tr>
<th>Herbicide</th>
<th>Active Formulation</th>
<th>Remarks and limitations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site preparation</td>
<td><strong>gallon</strong></td>
<td><strong>Remarks</strong></td>
</tr>
<tr>
<td>glyphosate (Roundup)</td>
<td>0.75-3.75 lb a.i./A</td>
<td>Apply lower doses to actively growing annual weeds. Consult label for proper application and see herbicide label for information about soils and doses. During application, you may need to reduce the herbicide dose by driving slightly faster over light-textured or rocky soils.</td>
</tr>
<tr>
<td></td>
<td>3 lb/gal</td>
<td></td>
</tr>
<tr>
<td>dalapon (Dowpon)</td>
<td>3 lb a.i./A</td>
<td>Apply when grasses are growing actively and 2 weeks before planting. Use higher rates for dormant grass control. Should be tank-mixed with other herbicides such as 2,4-D for broadleaf weed control.</td>
</tr>
<tr>
<td>74% soluble powder</td>
<td>Apply before planting to actively growing broadleaf weeds. Use low volumes to avoid drift to susceptible plants. Consult label for required doses to control moderate tolerant weeds such as spotted carrot or false dandelion.</td>
<td></td>
</tr>
<tr>
<td>2,4-D (several products)</td>
<td>2.4 lb a.i./A</td>
<td></td>
</tr>
<tr>
<td></td>
<td>many formulations</td>
<td></td>
</tr>
<tr>
<td>New plantings</td>
<td>80% WP, 90% granules, or 4 lb/gal</td>
<td></td>
</tr>
<tr>
<td>atrazine (or several brands)</td>
<td>2.4 lb a.i./A</td>
<td></td>
</tr>
<tr>
<td>simazine (or several brands)</td>
<td>0.9-1.35 lb a.i./A</td>
<td>Apply to 2-year-or older stock (2-6) 1 month after transplanting, but before winter rains cease to ensure incorporation and activation in the soil. Consult label for specific doses and precautions depending on soil organic matter content.</td>
</tr>
<tr>
<td>hexazinone (Velpar)</td>
<td>2 lb/gal</td>
<td></td>
</tr>
<tr>
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</tr>
</tbody>
</table>
cides and possible damage to the trees. Herbicides must be applied at exactly the correct dose and time to control weed growth without damaging the trees. Ob- tain more consistent results by reading the herbicide label and following the application and timing of each herbicide. Also, learn to identify weed spe- cies in order to select the most effective herbicides for your plantation.

**Weed Control Alternatives**

**Minimum chemical establishment**

An alternative to the use of herbicides is summer fallowing the year before planting, followed by cross culti- vating, and supplemental hand hoeing. A winter cover crop or weed cover will reduce soil erosion. Heavy winter weed growth that occurs before soils dry in the spring, however, can result in severe competition. Hand hoeing or use of herbicides around the tree is essential for suc- cessful establishment of new plantations.

**No-till establishment**

No-till is an alternative to4 the use of wide range of herbicides available for use in Christmas tree plantations. Herbicides can be applied summer before planting to control most weed growth or following a grazing or brome cover. Cross tillage can be applied prior to planting. Tiller can be planted earlier and soil erosion is reduced in undisturbed soil. Winter rains can help settle the soil around the trees. However, only the best mechanical tree planters will plant and pack the soil or sod around the roots when planting into no-till soil. Also, more care is required when planting by hand in a no-till operation.

**Combinations of weed control practices**

Combinations of several weed control techniques usually result in the best program when all factors are con- sidered—cost, tree growth, soil composition and erosion, and cost of labor. A combination of no-tillage and herbicides can provide excellent weed control during the establishment phase of new plantations. Either tillage or use of herbicides is feasible in different situations for establishing a tree stand. Fertilizer may be harmful during the summer follow- ing treatment where plants could be damaged by herbicides. A chemical between the years before planting to control weed growth with minimal chance for injury to the trees. Obtain more consistent results by reading the herbicide label and other information about the proper ap- plication and timing of each herbicide. To avoid confusion be- tween commercial formulations, suggested doses listed in this guide are stated as pounds active ingredient per acre (pounds ai/acre). Formulations that contain different rates of the same chemical are listed below.

<table>
<thead>
<tr>
<th>Herbicide Name</th>
<th>Formulation</th>
<th>Amount per acre</th>
<th>Remarks and limitations</th>
</tr>
</thead>
<tbody>
<tr>
<td>glyphosate</td>
<td>0.75-3.75 lb</td>
<td>3 lb a.i./gal</td>
<td>Apply lower doses to actively growing annual weeds. Consult label for doses and times of application from weed guides. Do not apply more than 5 pounds acid equivalent (10.6 quarts) per acre per year.</td>
</tr>
<tr>
<td>Roundup</td>
<td>3-6 lb</td>
<td>74% soluble powder</td>
<td>Apply when grasses are growing actively and wait 2 weeks before planting. Ultra Concentrate can be tank-mixed with other herbicides such as 2,4-D for broadleaf weed control.</td>
</tr>
<tr>
<td>2,4-D</td>
<td>2-4 lb</td>
<td>many formulations</td>
<td>Apply before planting to actively growing broadleaf weeds. Use low vola- tility formulations to avoid drift to desirable plants. Consult label for required躲 hours for moderately tolerant weeds such as clover or tassel dandelion.</td>
</tr>
</tbody>
</table>
| simazine       | 2-4 lb          | 80% wettable, or 4 lb wettable | Suggested herbicides for Christmas Trees

Certain weeds need herbicides, both naturally and through selection of resistant species. Rotating her- bicides and spot treating with a hoe or herbicide to elimin- ate survivors will reduce establishment of resistance in weeds.

**Types of Applications**

**Backpack sprayers**

Lightweight, portable, and relatively inexpensive backpack sprayers are adequate for chemical weed control in small plantations and for specialized jobs on large plantations. Backpack sprayers with a pressure gauge or pres- sure control can be calibrated to provide uniform applica- tion of herbicides. A boom with nozzles provides precision application to the foliage of the trees. A small flood-jet nozzle can cover the width between rows (6 to 10 feet) and be mounted on one of the backpack sprayer for two-row applications. A rate of 20 gallons water per acre is common for herbicide ap- plications, although many herbicides can be applied with a flood-jet nozzle and the two-row system with as little as 5 or 6 gallons of spray per acre. Oregon Extension Service gives directions on calculating a backpack sprayer for use in Christmas tree weed control.

**Tractor mounted sprayers**

Many tractor mounted sprayers are available when Christmas trees are small and can be controlled. Multi- ple-row tractor sprayers are not generally available for large Christmas tree plantations. Spot spraying can carry a larger quantity of spray than a backpack sprayer.

**Aerial application**

Aerial application is a frequent alternative because tree height and row spacing do not limit application equipment and costs are relatively low. Uniformity of application is a serious problem, however, when com- pared with conventional ground equipment. Another prob- lem is the inability to get close to spray where obstacles such as trees and power lines exist in or near Christmas tree plantations. Herbicides drift on to roads or adjoin properties also can be a problem.

The authors acknowledge the contributions and sug- gestions made by M. Newton, D. Green, W. M. Proeb- sting, and other faculty members of Oregon State Uni- versity. Herbicides are either applied to the foliage or to the soil. Coverage of weed leaves is important for chemicals taken up through the foliage, whereas applica- tion to the soil surface is necessary with herbicides ab- sorbed by roots. Roundup, Asulox, 2,4-D, and Dowpon are examples of herbicides absorbed primarily through foliage. Atrazine, simazine, and hexazinone (Velpar) are normally applied to the soil, although atrazine also has some foliage activity.

Uniform coverage

Herbicides must be applied uniformly. Spraying with a hand field nozzle to wet the weeds requires about 100 gallons of spray per acre for average sized weeds. A properly calibrated sprayer with a fan-type nozzle ar- rangedment, operated at a uniform speed and pressure, can do the same weed control job with 20 to 40 gallons per acre. Aerial applications are commonly applied at 5 to 10 gallons per acre.

**Agitation**

Proper agitation in the spray tank to maintain soil herbicides in suspension is essential. Agitation can be as simple as shaking a backpack sprayer or mechanical or hydraulic agitation in large sprayers.

**Spot treatment**

Certain weeds, such as blackberry or Canada thistle, are difficult to control after they become established. These weeds should be controlled during the seeding stage rather than after establishment. Spot treatment can be mechanical (hoeing or cultivating) or, more commonly, accomplished with directed herbicidal sprays. Backpack sprayers have the excellent tools for spot spraying in most Christmas tree plantations.

**Resistant weeds**

Certain weeds resist herbicides, both naturally and through selection of resistant species. Rotating her- bicides and spot treating with a hoe or herbicide to elimin- ate survivors will reduce establishment of resistance in weeds.

**SUGGESTED HERBICIDES FOR CHRISTMAS TREES**

Note: Herbicides must be applied at exactly the correct rate and time to provide effective weed control with minimal chance for injury to the trees. Obtain more consistent results by reading the herbicide label and other information about the proper application and timing of each herbicide. To avoid confusion be-
These weeds should be controlled during the seeding stage rather than after establishment. Spot treatment can be mechanical (hoeing or cultivating) or, more commonly, accomplished with directed herbicidal sprays. Backpack sprayers are excellent tools for spot spraying in small Christmas tree plantations.

### Resistant Weeds

Certain weeds resist herbicides, both naturally and through selection of resistant biotypes. Rotating herbicides and spot treatment with a hoe or herbicide to eliminate survivors will reduce development of resistance in weeds.

### Types of Applications

**Backpack sprayers**

Lightweight, portable, and relatively inexpensive backpack sprayers are adequate for chemical weed control in small plantations and for special jobs on large plantations. Backpack sprayers with a pressure gauge or pressure control can be calibrated to provide uniform application of herbicides. A boom with two nozzles provides uniform coverage and minimizes spray contact with the tree. A small flood-jet nozzle can cover the width between rows, and a larger flood-jet nozzle can be mounted on top of the backpack sprayer for two-row applications. A rate of 20 gallons water per acre is common for herbicide applications, although many herbicides can be applied with a flood-jet nozzle and the two-row system with as little as 5 or 6 gallons of spray per acre. Oregon Extension Circular 963 gives directions on calibrating a backpack sprayer for use in Christmas tree weed control.

**Tractor mounted sprayers**

Many tractor mounted sprayers are efficient when Christmas trees are small and can be straddled. Multi-ple-row tractor sprayers are not generally available for large Christmas trees. Single-row sprayers are slow, but can carry a larger quantity of spray than a backpack sprayer.

### Aerial application

Aerial application is a frequent alternative because tree height and row spacing do not limit application equipment and costs are relatively low. Uniformity of application is a serious problem, however, when compared with conventional ground equipment. Another problem is the inability to get close to spray where obstacles such as trees and power lines exist in or near Christmas tree plantations. Herbsicle drift off to harvest roads or adjoining property also can be a problem.

The authors acknowledge the contributions and suggestions made by M. Newton, D. Green, W. M. Proebsting, and other faculty members of Oregon State University.

### Suggested Herbicides for Christmas Trees

**Note:** Herbicides must be applied at exactly the correct rate and time to selectively control weed growth with minimal chance to injury to the trees. Obtain more consistent results by reading the herbicide label and other information about the proper application and timing of each herbicide. To avoid confusion between commercial formulations, suggested doses listed in this guide are stated as pounds active ingredient per acre (pounds ai./acre) or pounds and quarts active ingredient per acre (pounds ae./acres) unless otherwise indicated. Apply lower rates for sandy or rocky soils containing low amounts of organic matter.

<table>
<thead>
<tr>
<th>Herbicide</th>
<th>Formulation</th>
<th>Amount per acre</th>
<th>Remarks and limitations</th>
</tr>
</thead>
</table>

- **glyphosate** (Roundup): 0.75-3.75 lb. ai./A. | Apply lower doses to actively growing annual weeds. Consult label for doses and time of application for perennial weeds. Do not apply more than 8 pounds acid equivalent (10.6 quarts) per acre per year. |

- **dalapon** (Dowpon): 3-6 lb. ae./A. | Apply before planting to actively growing broadleaf weeds. Use low volatile formulations to avoid drift to susceptible plants. Consult label for required doses to control moderate to tolerant weeds such as spotted cresset or false dandelion. |

- **asulam** (Asulox): 3.34 lb. ai./A. | Apply after terminal bud of conifers is mature and set to fully expanded bracken fronds. For bracken fern control. Apply after terminal bud of conifers is mature and set to fully expanded bracken fronds. |

- **hexazinone** (Volpara): 0.9-1.35 lb. ai./A. | Apply to 2-year-old or older slash (2-6) month after transplanting, but before winter rains cause to ensure incorporation and activation in the soil. Consult label for specific doses and precautions depending on soil organic matter content. |

### Remarks and limitations

- Apply in spring before conifer bud break. Requires some moisture for activation in the soil. But less than required for atrazine. Consult label for specific doses and precautions depending on type of soil and soil organic matter content. If trees are growing actively, apply as a directed spray to reduce chance of injury. |

### Established plantings—winter applications that persist

- **hexazinone** (Volpara): 0.9-1.35 lb. ai./A. | Apply to 2-year-old or older slash (2-6) month after transplanting, but before winter rains cause to ensure incorporation and activation in the soil. Consult label for specific doses and precautions depending on soil organic matter content. |

### Established plantings—applications to weed foliage after conifer bud break

- **dalapon** (Dowpon): 3-6 lb. ai./A. | Apply as directed spray to actively growing grasses. Use higher doses for perennial grass control. Do not apply the last year before harvest as tree foliage may be injured. Do not apply dalapon over the top of conifers without the addition of an adjuvant. |

- **asulam** (Asulox): 3.34 lb. ai./A. | Apply for bracken fern control. Apply after terminal bud of conifers is mature and set to fully expanded bracken fronds. |

### Herbicide combinations in established plantings

**Note:** Herbicide combinations can be applied either separately or as tank-mixes if: 1) Neither product label prohibits the combination, 2) Instructions on both labels are followed, 3) A physical or chemical incompatibility does not reduce efficacy of one or both herbicides, 4) You wish to accept responsibility for the combination since manufacturers accept liability for labeled tank-mixes only. Combinations are most effective when you identify each weed infesting your plantation. Then select herbicide combinations that can be tank-mixed or apply separately at the correct time during the year. The following combinations have been used successfully by many growers.

- **asulam** (Asulox): 3.34 lb. ai./A. | Apply in spring before trees begin to grow. Do not apply on pine trees. Use lower rates on true firs. |

### Established plantings—spring applications that persist

- **glyphosate** (Roundup): 0.75-3.75 lb. ai./A. | Apply lower doses to actively growing annual weeds. Consult label for doses and time of application for perennial weeds. Do not apply more than 8 pounds acid equivalent (10.6 quarts) per acre per year. |
<table>
<thead>
<tr>
<th>Name</th>
<th>Actual</th>
<th>Formulation</th>
<th>Remarks and limitations</th>
</tr>
</thead>
<tbody>
<tr>
<td>atrazine + dalapon</td>
<td>2-4 lb. ai./A.</td>
<td>(same as above)</td>
<td>Atrazine seems to decrease possible phytotoxicity caused by dalapon applied over conifer trees. Apply in spring before trees begin to grow. Do not apply dalapon the last 2 years before harvest as tree foliage may be injured.</td>
</tr>
<tr>
<td>hexazinone + glyphosate</td>
<td>1 lb. ai./A. + 0.75 lb. ae./A.</td>
<td>(same as above)</td>
<td>Apply separately at correct times of year for maximum control of weed species present. Apply glyphosate as a directed spray towards base of tree.</td>
</tr>
<tr>
<td>atrazine + hexazinone</td>
<td>2-4 lb. ai./A. + 0.9 lb. ai./A.</td>
<td>(same as above)</td>
<td>Reduced doses of hexazinone (Velpar) are required when combined with atrazine. Note all precautions listed above for both herbicides.</td>
</tr>
</tbody>
</table>