

# 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.

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When cultivation or tillage is used alone, late winter and early spring weeds can compete before the soil dries enough to cultivate. Cultivating wet soil, particularly with a rototiller, can cause soil compaction and leave the soil prone to erosion.

### Rotary and flail mowing

Either rotary or flail mowing can control weed and growth close to the ground to reduce weed competition, established for 3 or more years. Flail mowing cuts plant growth close to the ground to reduce weed competition. It is used in other tree crops and might be adaptable for Christmas tree plantations. Commonly, rotary mowing is used to cut weeds 2 to 3 inches above the soil surface. Special equipment with fenders to protect trees is required as trees approach harvest size. Trees must be spaced for cross-mowing when other weed control methods are not employed.

### 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 mishandling of pesti-

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cides and possible damage to the trees. Herbicides must be applied at exactly the correct dose and time to control weed growth selectively without damaging the trees. Obtain 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 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 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. Herbicides can be applied the summer before planting to control most weed growth or following a grass or grain crop without additional cultivation. 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 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 considered—including cost, tree growth, soil compaction, and erosion. A combination of tillage and herbicides can provide excellent weed control during the establishment phase of your plantation. Either tillage or use of herbicides is feasible in different situations for establishing a tree stand. Tillage may be helpful during the summer following planting to prevent the ground from cracking around the trees. True firs, particularly Noble and Shasta, are slow to establish and cultivation may be desirable for 2 to 3 years.

Herbicides often are 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 resulting in less erosion and 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 surrounding the Willamette Valley. Most weed control research and experience has been obtained in this area of the state. When planning a weed control program in other parts of the state, consider differences in rainfall, soil types and organic matter contents, and weed infestations.

Soil-active herbicides must be activated with rain. In drier regions, apply these herbicides when rainfall can be ensured within a couple weeks after application. A

fall application may be preferred east of the Cascade Mountains to ensure activation with winter rains.

Light-textured soils low in organic matter and rocky soils require reduced doses of soil-active herbicides for satisfactory weed control and minimal chance for injuring Christmas trees. Know your soil and consult the 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.

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

#### **Chemical formulations**

Herbicides are generally formulated as fluids or as concentrated dry materials. Some fluid formulations are liquid, but others are fine particles suspended in the liquid known as flowables. Dry materials can be soluble, but most are wettable powders that can be suspended in a properly agitated spray tank.

Different formulations have different amounts of active ingredient. The label recommendations are generally stated in pounds of product per acre, whereas guidelines in Extension publications are listed as pounds active ingredient (a.i.) or pounds acid equivalent (a.e.) per gallon, particularly when more than one formulation of the same chemical is available. The correct dose can be calculated as follows: The maximum dose of atrazine is 4 pounds a.i. per acre, which equals 5 pounds of 80 percent wettable powder (80WP) or 1 gallon of the 4-pound-per-gallon-flowable (4L) or 4.4 pounds of the 90 percent water-dispersible granules.

Price is an important consideration in selecting a formulation, but convenience of measuring may justify a higher price. For instance, atrazine 4L is easier to measure than the 80 WP or the 90 percent granules.

#### **Foliage vs. root uptake**

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 uniform application to the soil surface is necessary with herbicides absorbed 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 held 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 arrangement, 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 solid 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 seedling 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 most Christmas tree plantations.

#### Resistant weeds

Certain weeds resist herbicides, both naturally and through selection of resistant biotypes. Rotating herbicides and spot treating 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 precise coverage and minimizes spray contact with the tree. A small flood-jet nozzle can cover the width between rows or 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 962 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. Multiple-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. Herbicide drift on to harvest roads or adjoining property also can be a problem.

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## 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 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-

tween commercial formulations, suggested doses listed in this guide are stated as pounds active ingredient per acre (pounds ai./acre) or pounds acid equivalent/acre (pounds ae./acre) unless otherwise indicated. Apply lower rates for sandy or rocky soils containing low amounts of organic matter.

Name	Amount per acre		Remarks and limitations
	Actual	Formulation	
<b>Site preparation</b>			
glyphosate (Roundup)	0.75-3.75 lb. ae./A.	3 lb. ai./gal.	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. ai./A.	74% soluble powder	Apply when grasses are growing actively and wait 2 weeks before planting. Use higher rates for perennial grass control. Can be tank-mixed with other herbicides such as 2,4-D for broadleaf weed control.
2,4-D (several products)	2-4 lb. ae./A.	many formulations	Apply before planting to actively growing broadleaf weeds. Use low volatile formulations to avoid vapor drift to susceptible plants. Consult label for required doses to control moderately tolerant weeds such as spotted catsear or false dandelion.
<b>New plantings</b>			
atrazine or simazine (several brands)	2-4 lb. ai./A.	80% WP, 90% granules, or 4 lb./ gal. flowable	Simazine must be applied pre-emergence to weeds, whereas atrazine can be applied either pre- or early-postemergence. Apply either herbicide in March or April after the soil settles from transplanting, but before winter rains cease to ensure incorporation and activation in the soil. Avoid application over actively growing trees unless applied immediately before or during a rain. Band treatments beneath the trees should be 2 feet wide to reduce weed encroachment.
hexazinone (Velpar)	0.9-1.35 lb. ai./A.	2 lb. ai./gal.	Apply to 2-year-or-older stock (2-0) 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.

Name	Amount per acre		Remarks and limitations
	Formulation	Actual	
oryzalin and simazine	2-4 lb. ai./A. of each herbicide	75% and 80% WP, respectively	Apply to soil free of established weeds after transplanting or in spring when at least 0.5 inch rainfall will activate the herbicide.
Established plantings—winter applications that persist			
atrazine or simazine	2-4 lb. ai./A.	80% WP, 90% granules, or 4 lb./gal. flowable	Apply February through March while trees are dormant. Apply atrazine before annual weeds are 1.5 inches tall and use higher doses for quack-grass control, whereas simazine must be applied preemergence. Band treatments beneath the trees should be 2 feet wide to reduce weed encroachment.
hexazinone (Velpar)	0.9-to 2.7 lb. ai./A.	2 lb. ai./gal.	Apply in spring before conifer buds 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.
pronamide (Kerb)	1-2 lb. ai./A.	50% WP	Apply during fall before freezing weather and use higher doses for quack-grass control. Soil moisture is essential for herbicide activation. Especially effective in controlling grasses including grass control in a clover cover crop.
Established plantings—applications to weed foliage after conifer buds mature			
2,4-D (several brands)	1-3 lb. ae./A.	(many formulations)	Apply higher doses to Douglas fir and lower doses to true firs while trees are dormant before active growth of buds in the spring. Do not apply to pine trees. Direct the spray toward the base of trees to reduce possible injury. Use low volatile formulations to avoid vapor drift to susceptible plants. Consult label for doses required to control moderately tolerant weeds such as spotted catsear or false dandelion.
glyphosate (Roundup)	0.75-3.75 lb. ae./A.	3 lb. ae./gal.	Apply lower doses to actively growing annual weeds. Consult label for doses and time of application for perennial weeds. Apply as a directed spray toward base of established trees. Do not apply more than 8 lbs. acid equivalent (10.6 quarts) per acre per year.
dalapon (Dowpon)	3-6 lb. ai./A.	75% soluble powder	Apply as directed spray to actively growing grasses. Use higher doses for perennial grass control. Do not apply the last 2 years before harvest as tree foliage may be injured. Do not apply dalapon over the top of conifers without the addition of atrazine.
paraquat	0.5-1.0 lb ai./A.	2 lb. ai./gal.	Apply as a directed spray toward base of established trees for control of perennial foliage and annual weeds when less than 6 inches tall. Addition of a non-ionic surfactant will improve control.
asulam (Asulox)	3.34 lb. ai./A.	34% or 3.34 lb./gal.	For bracken fern control. Apply after terminal bud of conifers is mature and set to fully expanded bracken fronds.
Herbicide combinations in established plantings			
<p>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.</p>			
atrazine + 2,4-D	2-4 lb. ai./A. + 1-3 lb. ae./A.	(same as above)	Apply in spring before trees begin to grow. Do not apply on pine trees. Use lowest rates on true firs.

Name	Amount per acre		Remarks and limitations
	Actual	Formulation	
atrazine + dalapon	2-4 lb. ai./A. + 3-6 lb. ai./A.	(same as above)	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.
hexazinone + glyphosate	1 lb. ai./A. + 0.75 lb. ae./A.	(same as above)	Apply separately at correct times of year for maximum control of weed species present. Apply glyphosate as a directed spray towards base of tree.
atrazine + hexazinone	2-4 lb. ai./A. + 0.9 lb. ai./A.	(same as above)	Reduced doses of hexazinone (Velpar) are required when combined with atrazine. Note all precautions listed above for both herbicides.