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Managing Weeds and Vegetation in Christmas Trees

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"To produce quality Christmas trees, you must design and maintain a year-round vegetation management program."

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Controlling weeds that compete with Christmas trees is essential to producing quality trees (Figure 1). Weeds have several negative effects:

- They drastically reduce growth and increase mortality of newly planted trees by competing for light, moisture, and soil nutrients (Figure 2).
- Although established trees tolerate some weeds, excessive competition reduces vigor, needle size, tree color, foliage density, and quality, all of which influence profitability.
- At harvest, weed debris in lower branches reduces quality or renders the tree unmarketable.
- Employee efficiency and morale are reduced when Canada thistle, wild blackberries, and poison oak infest plantations.
- Bracken fern can increase disease in true firs by being an alternate host for white rust.
- Weeds provide habitat for wildlife. Deer, for example, browse more in weedy plantations, and field mice use weeds for cover. Gophers prefer weeds with fleshy roots such as dandelion, false dandelion, Canada thistle, and clovers; and their mounds provide sites for new weed infestations such as tansy ragwort. You can reduce tree damage by controlling these sources of wildlife food and cover.



Figure 1.--Adequate weed control practices provide conditions for vigorous growth of quality trees.



Figure 2.--Weeds reduce tree growth and quality by competing for water, nutrients, and (sometimes) light.

In contrast, eliminating all vegetation increases runoff, soil erosion, and soil compaction. Trees remain cleaner at harvest when some vegetation covers the soil.

Thus, successful weed management involves year-round strategies that combine weed control practices and careful management of the ground cover to achieve two objectives:

- Maintain tree growth, quality, and ease of harvest
- Reduce soil erosion and compaction

Weed management in Christmas trees integrates multiple weed control practices along with principles of stewardship and productivity. Cultural, mechanical, and chemical practices are combined to achieve the desired level of weed suppression.

Repeating the same treatment, whether mechanical or chemical, will result in a shift to weeds that tolerate the practice.

Deep-rooted perennials tolerate cultivation, prostrate weeds tolerate mowing, and resistant biotypes tolerate repeated use of the same herbicide. You can minimize weed shifts by integrating several weed control practices, including various herbicides, or by rotating practices from one season to another.

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Weed control practices

Cultivation and tillage

Cultivation controls weed seedlings by disrupting the soil around roots. However, severe weed competition and increased soil erosion are likely during the rainy season.

Complete reliance on cultivation often results in increased pruning of tree roots, increased root rots in true firs, compacted soils, and perennial weeds that tolerate cultivation. However, you can enhance any weed control program by spot hoeing or tilling small weed patches that escape or resist other control practices.

Rotary mowing or flailing

Rotary mowing cuts vegetation 2 to 3 inches above the soil surface. Mowing reduces loss of soil moisture and nutrients by reducing growth and height of vegetation for brief intervals between mowings.

In contrast, flailing cuts vegetation at or near the soil surface. Frequent flailing, especially in late spring, can reduce competition for soil moisture and nutrients by reducing weed growth during the dry summer period.

Plantations must be planted in straight rows with adequate space between rows if you plan on continuous mowing, especially as trees approach market size. Often, you can plant tree rows 6 to 12 inches wider than a standard 5-6 foot row spacing to accommodate equipment. Use tractors equipped with fenders to avoid limb breakage or injury. Control weeds growing around the base of trees by hoeing or treating with a selective herbicide.

Herbicidal weed control

Herbicides provide effective and economic management of weeds when used as part of a year-round weed control program. Learn to identify weed species and select appropriate control methods for each weed.

Herbicides require correct handling to minimize risk. Apply herbicides at the correct rate and time to control weeds selectively and minimize tree injury. You can obtain consistent results by reading the label--always verify that Christmas trees are listed on the label--and by consulting other information about proper application and timing of each herbicide.

Note: Since herbicide labels and regulations change frequently, this publication doesn't make specific herbicide recommendations. For current guidelines, refer to the Pacific Northwest Weed Control Handbook, published and revised annually by the Extension Services of Oregon State University, Washington State University, and the University of Idaho. In addition, detailed instructions for herbicide use are provided on herbicide container labels and in other literature provided by herbicide manufacturers.

Types and action of herbicides. Most *soil-applied herbicides* kill germinating seedlings, although some control both seedlings and newly established weeds. These herbicides require uniform application over the soil surface followed by adequate moisture for incorporation and activation. Apply them to soil during the rainy season or to actively growing vegetation. Consult the product label for information about soil types and herbicide rates. On light-textured sandy or rocky soils containing little organic matter, reduce rates to minimize chance of tree injury.

Foliar-active herbicides control actively growing vegetation. Selectivity can be achieved by directing the spray toward the weeds and avoiding contact with tree foliage. Conifers tend to be more resistant to herbicide damage after active tree growth ceases in midsummer or during midwinter.

Complete coverage of weed foliage is necessary for contact herbicides like paraquat. Translocated herbicides like glyphosate (Roundup) or sulfosate (Touchdown) require only partial coverage. Often, surfactants are formulated with these herbicides or can be added to the spray mixture to increase contact with the leaf and movement into the plant.

Know your weeds. Accurate weed identification is essential to select the most effective herbicides. Obtain identification pamphlets from your pesticide dealer or purchase local references such as "Weeds of the West".

Identify and map the location of principal weed infestations. Then, base your weed management program on the weeds present, soil type, topography, proximity to wells or surface water, and stage of tree growth.

Application and equipment.

Herbicides must be applied accurately and with proper equipment as described on the product label. Lightweight, portable, and relatively inexpensive backpack sprayers are adequate for small plantations and for spot treatments on large plantations. Backpack sprayers with a pressure gauge or internal pressure control can be calibrated to provide uniform application.

Cover the space between trees with either a single flood-jet nozzle or a two-nozzle boom. Usually, 20-40 gallons of water per acre are applied, although many herbicides can be applied in 5-10 gallons of water per acre. Always consult the label for proper water volume.

Managers of larger plantations generally depend on tractor-mounted sprayers or aerial application. Ground sprayers equipped with a low-pressure piston pump and mechanical agitation are efficient and reliable. Adjustable spray booms can be designed for multirow, directed, or topical applications with 20-40 gallons of water per acre when trees are small. Aerial applications with 5-10 gallons of water per acre provide greater flexibility as trees mature. However, the need for uniform application, obstacles such as trees or power lines, and possible herbicide drift onto harvest roads or adjoining property sometimes limit the use of aerial equipment.

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Sprayer calibration

Proper calibration of equipment is essential for accurate and uniform application of herbicides. Before calibrating the sprayer, make sure that everything works properly and that all nozzles and the entire system are clean. To determine the proper calibration, do the following:

1. Determine a comfortable ground speed and measure time required to cover a certain distance by walking, driving, or flying.

Example: Ground speed = 33 sec per 100 ft

2. Fill the sprayer and measure the amount of spray collected during this length of time from all nozzles.

Example: Spray collected (in 33 sec) = 32 fl oz (2 pt or 0.25 gal)

3. Determine the area sprayed from one or all nozzles and convert it to a fraction of an acre.

Example: Area sprayed (5 ft x 100 ft) = 500 sq ft or 0.0115 ac

4. Divide spray volume collected (in gallons) by the area sprayed (in acres)

to give gallons applied per acre.

Example: $0.25 \text{ gal} / 0.0115 \text{ ac} = 22 \text{ gal per ac}$

5. Divide the number of gallons per acre by the capacity of your sprayer to determine how many tankfuls are required to cover 1 acre.

Example: $22 \text{ gal per ac} / 5 \text{ gal per tankful} = 4.3 \text{ tankfuls}$

Alternatively, divide the capacity of your sprayer by gallons per acre to determine how much one tankful will cover.

Example: $5 \text{ gal per tankful} / 22 \text{ gal per ac} = 0.23 \text{ ac per tankful}$

To change the spray volume, adjust either the ground speed or nozzle size and recalculate all numbers. Changing pressure does not modify spray volume substantially.

Because some herbicides translocate readily in plants, a variety of wick or roller applicators apply concentrated solutions on target weeds. When using a wick applicator, weeds must be taller than new trees or located between rows to avoid damaging trees. Weed control can be improved by treating weeds from both sides, although this means traveling over the field twice.

Most wick applicators are constructed from PVC pipe and contain special nylon rope that wicks the herbicide from the pipe. Several types of applicators are available from farm supply stores.

Herbicide formulations and calculations. Herbicides are formulated as soluble powders, wettable powders, flowables, dispersible granules, miscible liquids, or emulsifiable concentrates.

Both flowable and wettable powders contain finely ground clay particles that form suspensions, not solutions. Therefore, continuous agitation with mechanical agitators is required during application to prevent the herbicide from settling to the bottom of the spray tank. Strainers both within the line and at nozzles should have openings 50-mesh or larger to permit passage of the suspension. Because wettable powder formulations are abrasive, recalibrate sprayers frequently to assess delivery rates. Change nozzles frequently, depending on use and wear. Other formulations become solutions in the spray tank.

Recommended rates listed on herbicide labels are stated in pounds or gallons of product per acre. Because several products with different amounts of active ingredient may be available, guidelines in Extension publications are listed in pounds of active ingredient (ai) or acid equivalent (ae) per acre. Read the label to determine exactly how much product to apply.

When tank-mixing herbicides, always add the chemicals to a partially filled spray tank in the following order:

1. Compatibility agents (if needed)
2. Wettable powders or dispersible granules
3. Flowables
4. Emulsifiable concentrates
5. Oils
6. Surfactants

To avoid excessive foaming, fill the tank before adding surfactants or use antifoaming agents.

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Choosing alternatives and managing weed vegetation

Site preparation and new plantings

Choose fields with proper slope and drainage. Avoid fields severely infested with perennial weeds or control them before planting. To control perennial weeds or brush, you must destroy the entire plant, including underground roots and stems. Herbicides that translocate throughout the plant provide the most complete and longest acting control. Choose the correct herbicide and season for treatment based on knowledge of the weed infestation.

Begin site preparation during the summer or fall before planting by broadcasting a general purpose, translocated herbicide to control most vegetation and reduce wildlife habitats. Avoid plowing or excessive soil disturbance to minimize erosion and muddy conditions at planting. In recently cultivated fields, you can plant winter cover crops such as wheat, annual ryegrass, or improved perennial turfgrasses to reduce soil erosion and improve planting conditions in spring. Plant these cover crops by mid-September. Managing weedy vegetation in new plantings requires almost complete control around each tree to ensure survival and vigorous tree growth. At the same time, provide a protective soil cover between rows to minimize soil erosion.

Design your initial weed control program to do the following:

- Eliminate weed competition during spring and early summer, yet allow for planting or annual re-establishment of a protective ground cover to reduce erosion
- Minimize soil compaction and hardpans caused by repeated tillage
- Reduce chances of mechanical, chemical, or wildlife injury to newly planted trees
- Avoid stimulating resistant weed species or preferred food sources and cover for wildlife

Know your weeds. When you're ready to design a year-round weed management program, consult the latest edition of the *Pacific Northwest Weed Control Handbook*.

Normally, a soil-applied herbicide is applied soon after planting to reduce weed competition and injury from wildlife until the trees are established. Either broadcast the herbicide throughout the field or band it within rows.

Often, a small tractor is used with a spray tank, boom, and nozzles spaced over the row or directed toward the tree base to form an 18- to 24-inch band along the tree row. Adjust the rates, depending on soil type and organic matter content.

On sites prone to soil erosion, an increasing number of managers use vegetative ground cover that requires minimal management (Figure 3). Examples include "living mulches" that respond to drought, low fertility, or sublethal rates of postemergence herbicides.

These practices can save resources, minimize production costs, and improve long-term productivity while maintaining tree vigor and quality. Current research and Extension efforts are continually providing more management options.



Figure 3.--Where sites are prone to soil erosion, some managers have adapted technologies used in orchards to manage a vegetative cover between tree rows. They use herbicides to control vegetation within tree rows. Dwarf or intermediate sods require less maintenance than taller grasses if drought or low fertility occurs, or if growers apply sublethal rates of postemergence herbicides.

Established plantings

After trees are established, shift your weed management practices away from cultivation to avoid root pruning and to stabilize soils. Doing so results in less erosion, soil compaction, and mud at harvest.

Persistent soil-applied herbicides can be either broadcast or applied in bands within the tree row. Normally, late fall or early spring applications are most effective because rainfall incorporates and activates the herbicide in the soil.

Certain foliar-active herbicides may be applied to actively growing weeds before trees break bud in the spring or after terminal buds mature in summer. Herbicide combinations, applied either separately or as tank-mixes, are most effective if you identify each weed species and select appropriate combinations and application dates.

Managed soil covers such as grass sods, annual species, or small, noncompetitive weeds can be mowed or flailed between tree rows. Mowing often favors the growth of turfgrasses over that of weeds. A narrow strip representing one-third to one-half the area must be maintained free of competition within the tree row. Small, low-growing winter annuals or ground covers can be managed to stabilize soil within the tree row prior to harvest.

Certain weeds resist repeated use of the same control practice. Many perennial weeds, for example, tolerate cultivation, and low-growing prostrate weeds resist mowing. Some species resist a specific herbicide. Rotating control practices, including individual herbicides and spot treating with a hoe or herbicide, eliminates resistant survivors and reduces severe infestations of tolerant weeds.

Restoration of abandoned plantations

Severe weed competition in abandoned plantations often causes extremely slow tree growth and short, yellow needles. True firs normally suffer most from severe competition, Douglas-fir less, and pines least. If you eliminate competition, tree color will improve dramatically, and substantially larger buds and longer terminals will develop.

To release tree growth in abandoned plantings, broadcast one or a combination of herbicides at the maximum rate. When you choose the treatment, note carefully both the weeds you'll control and the restrictions about soil type or timing of each application.

After eliminating weed growth, reduce your rates and rotate the herbicides. You can mow again to supplement and maintain a year-round weed management program.

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Year-round vegetation management

To produce quality Christmas trees, you must design and maintain a year-round vegetation management program, both before planting and throughout the life of the plantation. Year-round management involves integrating a variety of control practices. Consider the following points as you develop a year-round strategy.

Prevent weed problems by planting clean stock and cleaning field equipment when moving between sites. Eradicate new weed infestations before they become established throughout the field. Avoid weed shifts by rotating control practices that have the same (or similar) action on the weed.

Identify and map all weed infestations throughout the plantation. Consult weed identification sources, including books and local consultants. You can make a map by noting the weeds present in a single 2-foot by 3-foot frame that you

randomly place throughout the plantation. Repeat according to the number of acres in the field. Keep records for comparison several years later, when weeds may have shifted.

List controls based on your experience, herbicide labels, local experts, and published information. Learn the strengths and weaknesses, proper timing, and unique properties of each control method before integrating it into a year-round strategy.

Prioritize your weeds. One priority would include highly competitive or troublesome weeds (such as perennials), poisonous plants, and weeds that attract vertebrate pests. Another would include moderately competitive weeds or ground covers, which may require suppression during active growth stages. Again, you might choose low-growing or winter annuals to provide protection from soil erosion. Your priorities should change as the trees mature or as you begin a new planting cycle.

Design and implement a year-round weed management strategy that not only employs a wide array of weed suppression or control practices but also provides long-term stability and resource conservation. Rotate and combine weed management practices that have different actions on the weed. Include hoeing or spot spraying, if needed, to avoid or delay weed shifts and spread of infestations.

Evaluate the results of your weed management program by periodically mapping weed infestations, preferably once each year (mid-to late summer). Based on your yearly evaluation, modify your weed management practices before weed populations shift and become established throughout the plantation.

Use herbicides safely!

- Wear protective clothing and safety devices as recommended on the label. Bathe or shower after each use.
- Read the herbicide label--even if you've used the herbicide before. Follow closely the instructions on the label (and any other directions you have).
- Be cautious when you apply herbicides. Know your legal responsibility as an herbicide applicator. You may be liable for injury or damage resulting from herbicide use.

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