

Weed Control in Christmas Trees

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Weed control is an important cultural practice in Christmas tree production throughout the year. Preemergence and postemergence herbicides are needed to minimize weed competition in Christmas tree plantings. The tree species, age, growth stage, size, time of year and soil type must be considered when formulating a herbicide program. An effective weed control program controls most weeds without stunting or injuring the trees. A successful program may include mowing and hand weeding along with applying residual preemergence herbicides and postemergence herbicides with different modes of action. Fall- or spring-applied preemergence herbicides control most annual weeds. Postemergence herbicides are needed to control perennial weeds, annuals that germinate late in the season and weed escapes due to herbicide resistance.

Weeds may interfere with tree growth at any stage of Christmas tree production. Effective weed control is most important in seedling beds and in the three years after transplanting in the field to obtain a good stand and vigorous growth. Young trees that grow with minimal weed competition develop healthy root systems, which allow them to withstand drought and other adverse conditions later. Weed competition anytime during the year of establishment may suppress tree growth and even kill trees. The rate of growth in the second and third years is related directly to the amount of weed competition. On sandy soils, weeds may use up available moisture, and young trees may succumb to drought. As trees become larger, weeds interfere with production practices such as pruning and spraying. It is difficult to spray pesticides and prune trees in fields infested



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with Canada thistle, horsenettle, horseweed, poison ivy, ragweed, pokeweed and other large or poisonous weeds. Weeds growing under and near Christmas trees should be controlled for two to three years before tree harvest. The seedheads of some grasses — such as fall panicum, giant foxtail and witchgrass — as well as broadleaves such as common and giant ragweed, hoary alyssum, field bindweed, hairy vetch and wild carrot

may grow into the tree branches and be difficult to remove.

Young trees may be sensitive to preemergence herbicides the year of planting in the field. After roots have become established and soil is packed around the seedlings, there is less potential for tree injury. Preemergence herbicides should be applied soon after transplanting to keep weeds from germinating and competing with the small seedlings. Small trees also may be sensitive to postemergence herbicides, so it is important to follow label instructions regarding tree age, size and herbicide timing. Perennial plants such as trees usually tolerate most preemergence herbicides because the herbicides stay on or near the soil surface and the roots of the trees are deep in the soil where they do not absorb the herbicides. If the tree roots come into contact with the herbicides because of heavy rain, misuse or other reasons, they may absorb the herbicides, which can result in tree injury. Using very low-solubility herbicides and rotating modes of action reduce the potential for herbicide buildup in the soil and percolation down into the tree root zone.

Postemergence herbicides target specific biological activities in plants. All plants have similar physiological and biochemical processes — e.g., photosynthesis, respiration

and cell division — so herbicides may injure crop trees under some circumstances. Tree safety is based on the degree of tree tolerance to herbicides. Some postemergence herbicides may be applied safely over the tops of conifers at any stage of growth. In other situations, the level of herbicide selectivity is narrower, and the Christmas trees are only moderately tolerant of low doses of herbicides. Various tree species may have different levels of herbicide tolerance. If a herbicide is marginally safe on Christmas trees, avoid herbicide contact with the trees during periods of active tree growth, and apply the herbicides at less sensitive growth stages. Directing the spray toward the soil to avoid tree contact helps minimize or avoid tree injury.

When making postemergence applications during the summer, select herbicides that have good foliar activity and that are safe on the trees, as indicated by information on the herbicide labels. In general, avoid broadcast applications over the tops of trees between bud break and September 1, by which time most new growth has hardened. If applications must be made during the summer, direct the herbicides toward the soil at the base of the trees. Postemergence herbicides need to contact actively growing weeds to be effective. Some winter annuals, biennials and perennials — including horseweed, wild mustards, goldenrod, quackgrass and wild carrot — are susceptible to preemergence and postemergence herbicides applied in the fall.

Some perennial and woody weeds are very difficult to control in Christmas tree plantations. Seedling trees such as poplar, maple, mulberry and sumac often become established in spite of the presence of residual herbicides. Vining plants such as poison ivy, Virginia creeper and wild grape often grow in and through the Christmas trees and cannot be treated with herbicides without risk of injury to the Christmas trees. Other weeds such as wild brambles, multiflora rose and pokeweed are very tenacious and very tolerant of most herbicides. These weeds may be controlled with spot treatments of glyphosate or triclopyr while avoiding direct spray of the Christmas trees. In many situations, hand removal is the safest and most effective method of control of these persistent weeds. Treating the stumps of woody

weeds with concentrated herbicides after hand cutting the stems and branches should reduce regrowth.

Use of appropriate equipment for herbicide applications is important to obtain maximum weed control and avoid tree injury. A boom sprayer works well during the first three years after transplanting seedlings in the field for broadcast or directed (with drop nozzles) applications. A highboy sprayer can be used to straddle trees on level ground for two to three more years. As trees expand vertically and horizontally, driving through the plantings becomes more difficult, and growers may be tempted to use air-blast sprayers to apply preemergence and postemergence herbicides. Air-blast sprayers are not very effective for herbicide applications and normally should not be used. After trees are too tall for a boom sprayer, back-pack sprayers may be the most effective application method. Applicators must wear personal protective equipment (PPE) to avoid self-contamination. A few herbicides are registered and safe for airplane or helicopter application to Christmas trees. Check labels before making aerial applications.

When applying glyphosate (Roundup) post-emergence in Christmas trees, use a formulation that does not contain a surfactant or other adjuvant. Original Roundup, the isopropylamine (IPA) salt of glyphosate with 3 pounds acid equivalent (ae) (4 lb of the IPA salt) per gallon, is a good example. Touchdown Hitech (5 lb ae of the potassium salt of glyphosate per gallon) is another example. Many generic formulations of original glyphosate are available. The herbicides included in the following tables are labeled for use in Christmas trees. Many of the herbicides are available in other commercial formulations with the same active ingredients. Check labels to determine use instructions for Christmas trees. Always have labels of all pesticides in your possession before application.

Trade names and formulations of herbicides are given for the convenience of the user. Other formulations of the same herbicides or other herbicides with the same active ingredients also may be labeled for use on certain species. The mention of trade names does not imply that they are endorsed or recommended over those of similar nature not listed.

To protect yourself, others, and the environment, always read the label before applying any pesticide. Although efforts have been made to check the accuracy of information presented, it is the responsibility of the person using this information to verify that it is correct by reading the corresponding pesticide label in its entirety before using the product. Labels can and do change—greenbook.net, cdms.com, and agrian.com are free online databases for looking up label and MSDS information.

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Table 1. Annual weed response to Christmas tree herbicides.

E=Excellent, G=Good, F=Fair, P=Poor, N=No Control

		Annual broadleaves										Annual grasses							
		Buckwheat, Wild	Common Chickweed	Common Ragweed	Common Lambsquarters	Horseweed (Marestail)	Mustards, Wild radish	Nightshade, Eastern Black	Pigweeds, amaranths	Smartweeds, Ladysthumb	Velvetleaf	Annual Bluegrass	Barnyardgrass	Bromegrass, Downy	Crabgrass, Large	Fall Panicum	Foxtails, Giant, Green, Yellow	Sandbur, Field, Longspine	Witchgrass
Preemergence Herbicides	Common Name																		
AATREX 4L	atrazine	G	G	G	G	G	G	G	G	G	F	G	F	G	F	G	F	N	F
ALION 1.67 SC	indaziflam	G	G	F	F	F	G	G	G	F	G	G	G	G	G	G	G	P	G
BARRICADE 4 FL	prodiamine	N	F	P	G	N	P	P	G	P	N	G	E	P	F	G	G	P	G
GALLERY 75 DF	isoxaben	G	F	G	G	E	F	G	F	G	G	G	P	P	P	P	P	F	P
GOALTENDER 4 SC	oxyfluorfen	G	G	G	E	F	F	G	E	G	G	G	F	P	F	F	F	P	F
KERB 3.3 SC	pronamide	N	G	P	P	P	F	F	F	F	N	G	G	E	G	G	G	N	F
MISSION 25 WG	flazasulfuron	G	G	G	G	F	G	G	G	G	F	G	F	G	F	G	G	G	G
PENDULUM AQUA CAP 3.8 CS	pendimethalin	F	G	F	G	P	G	P	G	G	G	G	G	F	G	G	G	G	G
PENNANT MAGNUM 7.62 EC	s-metolachlor	F	N	P	F	N	P	G	G	F	P	G	E	F	E	E	E	F	G
PRINCEP 4L	simazine	G	E	E	E	P	E	G	E	E	P	G	E	F	F	F	E	P	F
SUREGUARD 51 WDG	flumioxazin	G	G	G	G	G	G	G	G	G	G	G	G	P	G	G	G	G	G
SURFLAN 4 AS	oryzalin	P	E	P	G	P	F	N	G	P	P	G	G	F	G	G	E	P	E
TOWER 6 EC	dimethenamid-P	N	N	P	P	N	F	G	G	F	N	G	E	G	E	E	E	G	G
VELPAR 2L	hexazinone	G	G	G	G	G	G	G	G	G	G	G	G	G	F	G	G	G	G
WESTAR 75 DG	hexazinone + sulfometuron methyl	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G
Postemergence Herbicides	Common Name																		
DEFY AMINE 4	2, 4-D	G	P	G	F	P	G	F	G	G	G	N	N	N	N	N	N	N	N
ENVOY PLUS 0.97 EC	clethodim	N	N	N	N	N	N	N	N	N	N	F	G	G	G	G	G	G	G
FUSILADE DX 2L	fluazifop-p	N	N	N	N	N	N	N	N	N	N	P	E	F	G	G	E	G	E
GARLON 3A	triclopyr	E	G	G	G	E	G	G	G	G	G	P	P	P	P	P	P	P	P
GOALTENDER 4 SC	oxyfluorfen	G	G	G	E	F	F	G	E	G	G	G	F	P	F	F	F	P	F
ROUNDUP ULTRA 4L	glyphosate	E	E	E	E	F	E	E	E	E	G	G	E	E	E	E	E	G	E
SETHOXYDIM 1 EC	sethoxydim	N	N	N	N	N	N	N	N	N	N	P	G	F	G	G	G	G	G
STINGER 3L	clopyralid	F	N	G	N	G	N	G	N	F	N	N	N	N	N	N	N	N	N

Table 2. Perennial weed control response to Christmas tree herbicides.

E=Excellent, G=Good, F=Fair, P=Poor, N=No Control

Preemergence Herbicides	Common Name	Bindweed, Field, Hedge	Canada Thistle	Carrot, Wild	Dandelion	Goldenrod	Grape, Wild	Ground Ivy	Hoary Alyssum	Horsenettle	Mallow, Common	Milkweed, Common	Nutsedge, Yellow	Plantain, Buckhorn, Broadleaf	Poison Ivy	Quackgrass	Sowthistle	Vetches, Crown vetch	Virginia Creeper
AATREX 4L	atrazine	N	N	N	N	N	N	N	P	N	N	N	N	N	N	G	G	N	N
ALION 1.67 SC	indaziflam	N	N	P	F	P	N	F	F	P	P	N	P	G	F	P	G	G	P
BARRICADE 4 FL	prodiamine	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
GALLERY 75 DF	isoxaben	F	P	G	P	N	N	N	N	P	P	N	P	G	N	N	G	P	N
GOALTENDER 4 SC	oxyfluorfen	P	P	N	P	N	N	N	P	P	N	P	P	G	N	P	P	P	N
KERB 3.3 SC	pronamide	N	N	N	N	N	N	N	P	N	N	N	P	N	N	G	P	N	N
Mission 25 WG	flazasulfuron	N	F	G	F	P	N			P	G	N	G	F	P	G	G	G	N
PENDULUM AQUA CAP 3.8 CS	pendimethalin	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
PENNANT MAGNUM 7.62 EC	s-metolachlor	N	N	N	N	N	N	N	N	N	N	N	F	N	N	N	N	N	N
PRINCEP 4L	simazine	F	P	F	P	N	N	N	G	P	N	P	P	P	N	F	F	P	N
SUREGUARD 51 WDG	flumioxazin	F	G	P	G	P	N	G	G	G	G	N	P	G	N	P	G	N	N
SURFLAN 4 AS	oryzalin	N	N	N	P	N	N	N	N	N	N	N	N	N	N	P	P	N	N
TOWER 6 EC	dimethenamid-P	N	N	N	N	N	N	N	N	N	N	N	G	N	N	N	N	N	N
VELPAR 2L	hexazinone	F	F	G	F	F	N	N	G	N	G	F	P	G	F	F	G	G	N
WESTAR 75 DG	hexazinone + sulfometuron methyl	F	G	G	G	G	G	G	G	F	F	P	G	G	P	G	P	G	P
Postemergence Herbicides	Common Name																		
DEFY AMINE 4	2, 4-D	G	G	G	E	P	F	P	G	P	P	P	P	E	F	N	F	F	P
ENVOY PLUS 0.97 EC	clethodim	N	N	N	N	N	N	N	N	N	N	N	N	N	N	G	N	N	N
FUSILADE DX 2L	fluazifop-P	N	N	N	N	N	N	N	N	N	N	N	N	N	N	G	N	N	N
SETHOXYDIM 1 EC	sethoxydim	N	N	N	N	N	N	N	N	N	N	N	N	N	N	F	N	N	N
GARLON 3A	triclopyr	G	G	G	G	G	F	G	G	F	G	G	N	E	G	N	G	G	G
GOALTENDER 4 SC	oxyfluorfen	P	P	N	P	N	N	N	P	P	N	P	P	G	N	N	P	P	N
ROUNDUP ULTRA 4L	glyphosate	P	F	E	G	G	F	G	G	F	F	F	F	F	G	F	G	F	G
STINGER 3L	clopyralid	F	G	N	G	P	N	N	N	P	N	N	N	F	N	N	G	G	N

Table 3. Preemergence and postemergence weed control in seedbeds, recently transplanted seedlings and first-year Christmas trees.

Herbicide trade name and common name*	Mode of action	Amount of product and (active ingredient) per acre	Tree species on label	Timing	Comments and limitations
PREEMERGENCE					
AATREX 4L (atrazine) (RUP)	Photosystem II (PS II) inhibitor	1-2 qt/acre/year (1-2 lb ai/acre/year)	Douglas fir Pine (Austrian, Scotch) Spruce (Blue) True fir (Grand, Noble, White)	Preemergence. New transplants: apply to soil before or after transplanting.	Aatrex controls many annual broadleaves and grasses, and suppresses quackgrass at higher rates. Apply over the tops of trees or as a directed spray between trees. Biotypes of some weed species are resistant to atrazine, so it should be used in rotation with other herbicides.
BARRICADE 4F (prodiamine)	Mitosis inhibitor	12-21 fl oz/acre (0.375-0.656 lb ai/acre)	Pine (Scotch, White) True fir (<i>Abies</i>)	Preemergence. Apply after transplanting after soil has settled around plants and before bud break in spring.	Annual broadleaf and grass control. Apply after soil has settled on new plantings. May be applied anytime on established plantings. Water into soil with 0.5 inch of rain or irrigation.
GOALTENDER 4SC (oxyfluorfen)	PPO inhibitor	Conifer seedbeds: <u>Preemergence</u> 0.5-2 pt/acre (0.25-1 lb ai/acre) <u>Postemergence</u> 0.5-1 pt/acre (0.25-0.5 lb ai/acre) Trees in containers and in field: 2-4 pt/acre (1-2 lb ai/acre)	Douglas fir Pine (Austrian, Scotch, White) Spruce (Blue, Norway) True fir (Fraser, Grand, Noble)	Preemergence. <u>Seedbeds:</u> Apply Goaltender preemergence after seeding, or 5 weeks after seedling emergence. Containers and field: apply in spring before bud break and after new growth has hardened off in fall.	<u>Preemergence:</u> Goaltender provides good preemergence control of broadleaves and grasses. Do not apply Goaltender on stressed trees or during periods of active growth. <u>Postemergence:</u> Goaltender has post-emergence activity against most annual broadleaves. Include a nonionic surfactant (NIS) in postemergence applications.
PENDULUM AQUA CAP 3.8 CS (pendimethalin)	Mitosis inhibitor	2.1-4.2 qt/acre (2-4 lb ai/acre)	Douglas fir Pine (Austrian, Scotch, White) Spruce (Blue, Norway, White) True fir (Balsam, Fraser, White)	Preemergence. Apply after transplanting or in spring to established trees.	Controls annual grasses and broadleaves. Apply Pendulum over the tops of trees or to soil between trees before weeds germinate. Apply after soil has settled around new transplants.

Table 3. Preemergence and postemergence weed control in seedbeds, recently transplanted seedlings and first-year Christmas trees (continued).

Herbicide trade name and common name*	Mode of action	Amount of product and (active ingredient) per acre	Tree species on label	Timing	Comments and limitations
PENNANT MAGNUM 7.62 EC (s-metolachlor)	Mitosis inhibitor	1.3-2.6 pt/acre (1.2-2.5 lb ai/a)	Douglas fir Pine Spruce True firs (<i>Abies</i>)	Preemergence. Apply before weeds emerge.	Labelled for use in nurseries and on trees that will be dug for landscape purposes. Annual grasses, nightshades, pigweeds and yellow nutsedge control. To avoid tree injury, do not apply to seedbeds, cutting beds or unrooted cuttings before transplanting, or to plants in field until the soil has settled firmly around the roots. When broadcast over the top of plant foliage, follow with sufficient overhead irrigation to wash it from the foliage to reduce the chance of injury.
SURFLAN 4 AS (oryzalin)	Mitosis inhibitor	2-4 qt/acre (2-4 lb ai/acre)	Pine Spruce True firs (<i>Abies</i>)	Preemergence. Apply before weeds germinate.	Annual grass control. Apply to transplanted trees after soil has settled around trees and roots. Do not apply to seedbeds or seedling transplant beds.
TOWER 6 EC (dimethenamid-P)	Mitosis inhibitor	21-32 fl oz/acre (0.98-1.5 lb ai/acre)	Douglas fir Pine (all species) Spruce (Colorado Blue, Norway) True fir (<i>Abies</i>)	Preemergence. Apply after soil has settled around transplants.	Controls grasses, yellow nutsedge. May be used in seedling nurseries and new field plantings. Apply after soil has settled around new transplants. Do not apply during bud break. Maximum of 2 applications and 64 fl oz/a/year.
VELPAR 2L (hexazinone)	PS II inhibitor	2-3 qt/acre (1-1.5 lb ai/acre)	Pine (Austrian, Scotch) True fir (Fraser, Grand, Noble)	Preemergence. New transplants: apply on trees 2 years or older. Apply after soil has settled around seedlings and roots.	Do not use in nurseries or seedbeds. Maximum of 1 application per year. Rates vary, depending on soil type. Use low rate on sandy soil.

Table 3. Preemergence and postemergence weed control in seedbeds, recently transplanted seedlings and first-year Christmas trees (continued).

Herbicide trade name and common name*	Mode of action	Amount of product and (active ingredient) per acre	Tree species on label	Timing	Comments and limitations
POSTEMERGENCE					
ENVOY PLUS 0.97E (clethodim)	ACCase inhibitor	12-32 fl oz/acre (0.09-0.24 lb ai/acre)	Douglas fir Pine Spruce True fir (<i>Abies</i>)	Postemergence. Apply to actively growing grasses.	Controls grasses. Include 0.25% NIS or 1% COC. For control of mature grasses, include ammonium sulfate (AMS) at 17 lb/100 gal of spray solution. Wait 30 days before planting after an application of Envoy Plus.
FUSILADE DX 2E (fluazifop-P)	ACCase inhibitor	16-24 fl oz/acre (0.25-0.375 lb ai/acre)	Douglas fir Pine Spruce True fir (<i>Abies</i>)	Postemergence. Apply to actively growing grasses.	Controls grasses. Include 0.25% NIS or 1% COC. Include ammonium sulfate (AMS) at 17 lb/100 gal of spray solution for large grasses. Perennial grasses may require multiple applications for control.
GOALTENDER 4 SC (oxyfluorfen)	PPO inhibitor	Seedbeds: 0.5-1.0 pt/acre (0.25-0.5 lb ai/acre) Trees in containers and in field: 2-4 pt/acre (1-2 lb ai/acre)	Douglas fir Pine (Scotch, White) Spruce (Blue, Norway) True fir (Fraser, Grand, Noble)	Postemergence. <u>Seedbeds:</u> apply 5 weeks after emergence. <u>Containers and field:</u> apply before bud break in spring and after new growth has hardened in the fall.	Goaltender controls annual broadleaves both pre- and postemergence. Maximum of 4 pt/acre/year pre- and postemergence. Do not apply inside greenhouses; do not apply to conifers under stress. May be sprayed over the tops of Christmas trees except during active bud and shoot growth.
SETHOXYDIM 1 EC (sethoxydim)	ACCase inhibitor	1.5-3 pt/acre (0.19-0.375 lb ai/acre)	Douglas fir Pine Spruce True fir (<i>Abies</i>)	Postemergence. Apply to actively growing grasses.	Sethoxydim controls grasses. Include 0.25% NIS or 1% COC.
STINGER 3L (clopyralid)	Synthetic auxin	4-10 fl oz/acre (0.09-0.23 lb ai/acre)	Douglas fir Pine (White) Spruce (Blue) True fir (Balsam, Fraser, Grand, Noble)	Postemergence. Apply when susceptible weeds are at 3- to 5- leaf stage; for Canada thistle and spotted knapweed control, apply the high rate before weed bud stage.	Controls composites, legumes, nightshade, smartweeds and plantains. Do not exceed 8 fl oz/acre (0.188 lb ai) on blue spruce. To avoid tree injury, do not use an adjuvant or surfactant. Do not apply with air-blast sprayers. May be applied over the tops of trees at any stage.

Table 4. Preemergence weed control in Christmas trees established 2 or more years in field.

Herbicide trade name and common name*	Mode of action	Amount of product and (active ingredient) per acre	Tree species on label	Timing	Comments and limitations
AATREX 4L (atrazine) (RUP)	Photosystem II Inhibitor	1-4 qt/acre/year (1-4 lb ai/acre/year)	Douglas fir Pine (Austrian, Scotch) Spruce (Blue) True fir (Grand, Noble, White)	Apply to dormant established trees in late fall or early spring.	Aatrex controls many annual broadleaf weeds and grasses. For quackgrass control, apply the high rate in fall or early spring when trees are dormant. Apply over the tops of trees or directed to soil between rows. Several weed species have biotypes that are resistant to atrazine.
ALION 1.67 SC (indaziflam)	Cellulose synthesis inhibitor	2.5-5 ounces/acre (0.033-0.065 lb ai/acre)	Christmas trees and conifer plantations	Apply before weeds germinate in the spring.	Label pending for 2015. Use on trees established in the field at least 1 year. Controls most annual weeds. Apply as a directed spray to soil at bases of trees. Good control of most annual broadleaves. Fair control of common ragweed and horseweed.
BARRICADE 4 FL (prodiamine)	Mitosis inhibitor	21-48 fl oz/acre (0.656-1.5 lb ai/acre)	Pine (Scotch, White) True fir (<i>Abies</i>)	Preemergence to weeds.	Controls grasses and some broadleaves. Apply anytime over the top or as a directed spray.
GALLERY 75 DF (isoxaben)	Cellulose synthesis inhibitor	0.67-1.33 lb/acre (0.5-1 lb ai/acre)	Pine (Scotch, White) Spruce (Blue, White) True fir (Balsam, White)	Apply in the spring before annual weeds germinate.	Controls annual broadleaves. No control of grasses or perennial weeds. Apply to trees established in the field after soil is settled around the plants. May be applied over the tops of trees or as a directed spray.
GOALTENDER 4SC (oxyfluorfen)	PPO inhibitor	1-2 qt/acre (1-2 lb ai/acre)	Douglas fir Pine (Austrian, Scotch, White) Spruce (Blue, Norway) True fir (Fraser, Grand, Noble)	Apply to established trees in the field or in containers. Apply before bud break or after new growth has hardened.	Trees in field and containers. Goaltender provides good preemergence and postemergence control of many broadleaves. Do not apply Goaltender on stressed trees or during periods of active tree growth.

Table 4. Preemergence weed control in Christmas trees established 2 or more years in field (continued).

Herbicide trade name and common name*	Mode of action	Amount of product and (active ingredient) per acre	Tree species on label	Timing	Comments and limitations
KERB 3.3 SC (pronamide) (RUP)	Mitosis inhibitor	2.5-5 pt/acre (1-2 lb ai/acre)	Douglas fir Pine Spruce True fir (<i>Abies</i>)	Apply in late fall when soil temperature is below 55°F.	Controls annual and perennial grasses (including annual bluegrass and quackgrass), common chickweed and mustard weeds. Apply to trees established in the field at least 1 year. May be applied over the tops of trees or as a directed spray between rows. Control lasts 6-8 weeks in the spring.
MISSION 25 WG (flazasulfuron)	ALS inhibitor	2.14-2.85 OZ (0.033-0.045 lb ai/acre)	Douglas fir Pine (Eastern White, Red, Scotch, White) True fir (Balsam, Fraser, Noble, Nordman, White) Spruce (Blue, Norway)	Apply in early spring before bud break or in late fall.	Mission has both pre- and postemergence activity. Controls most annual grasses and broadleaf weeds, including Carolina geranium, redstem filaree and field pansy. Do not apply within 1 year of seeding trees. May be applied over the tops in spring or after new growth has hardened in fall.
PENDULUM AQUA CAP 3.8 CS (pendimethalin)	Mitosis inhibitor	2.1-4.2 qt/acre (2-4 lb ai/acre)	Douglas fir Pine (Austrian, Scotch, White) Spruce (Blue, Norway, White) True fir (Balsam, Fraser, White)	Apply after transplanting or in spring to established trees.	Controls annual grasses and broadleaves. Apply Pendulum over the tops of trees or to soil between trees before weeds germinate.
PENNANT MAGNUM 7.62 EC (s-metolachlor)	Mitosis inhibitor	1.3-2.6 pt/acre (1.2-2.5 lb ai/acre)	Douglas fir Pine Spruce True fir (<i>Abies</i>)	Apply in spring before weeds emerge.	Labelled for use in nurseries and on trees that will be dug for landscape purposes. Controls annual grasses, nightshades, pigweeds, yellow nutsedge.
PRINCEP 4L (simazine)	Photosystem II inhibitor	2-4 qt/acre (2-4 lb ai/acre)	Douglas fir Pine (Austrian, Scotch) Spruce (Blue, Norway, White) True fir (Balsam, Fraser, White)	Apply to dormant trees more than 2 years old.	Controls many annual broadleaf weeds and grasses, and suppresses quackgrass. Apply 2 qt in fall and 2 qt in spring for quackgrass control. Some weed species have populations resistant to simazine.

Table 4. Preemergence weed control in Christmas trees established 2 or more years in field (continued).

Herbicide trade name and common name*	Mode of action	Amount of product and (active ingredient) per acre	Tree species on label	Timing	Comments and limitations
SUREGUARD 51 WDG (flumioxazin) BROADSTAR 0.25%G (flumioxazin)	PPO inhibitor	8-12 oz (0.255-0.383 lb ai/acre) 150 lb/acre (0.375 lb ai/acre)	Douglas fir Pine (Austrian, Scotch, White) Spruce (Blue, Norway) True fir (Fraser, Grand, Noble, White)	Apply in the spring before bud break or later in the season after new growth has hardened.	Controls most annual broadleaves and grasses. Apply over the tops of trees before bud break. Sureguard may cause light needle burn. Do not use Sureguard on Christmas tree seedlings less than 1 year after emergence. Do not tank mix with an EC formulation of any other pesticide to avoid needle burn. Poor long-term horseweed control.
SURFLAN 4 AS (oryzalin)	Mitosis inhibitor	2-4 qt/acre (2-4 lb ai/acre)	Pine Spruce True fir (<i>Abies</i>)	Apply in early spring before weeds germinate.	Controls annual grasses and some broadleaves. Surflan may be applied as a directed spray to the soil surface or over the tops of trees. Do not use on Douglas fir.
TOWER 6 EC (dimethenamid-P)	Mitosis inhibitor	21-32 fl oz/acre (0.98-1.5 lb ai/acre)	Douglas fir Pine (all species) Spruce (Colorado Blue, Norway) True fir (<i>Abies</i>)	Apply preemergence to weeds and after soil has settled around transplants.	Controls grasses, some broadleaves and yellow nutsedge. Apply anytime except at bud break. Maximum of 2 applications and 64 fl oz /acre/year.
VELPAR 2L (hexazinone)	Photosystem II inhibitor	2-4 qt/acre (1-2 lb ai/acre)	Pine (Austrian, Scotch) Spruce (Sitka) True fir (Fraser, Grand, Noble)	Apply broadcast before bud break in the spring or as a directed spray after bud break. Apply after transplanting after soil has settled.	Controls most herbaceous broadleaves and some woody perennials. Apply on soil with more than 1% organic matter and less than 85% sand. Apply only once per year.
WESTAR 75 DG (hexazinone + sulfometuron)	PSII inhibitor + acetolactase synthase (ALS) inhibitor	6-8 oz/acre (0.281-0.375 lb ai/acre)	Douglas fir Pine (Scotch, White) Spruce (Blue) True fir (Fraser)	Apply to dormant trees before bud break in spring. Use on trees that have been established in the field for at least 1 year and are at least 4 years old.	Apply with a ground boom sprayer. Do not apply within 14 days before or after an organophosphate insecticide. Westar may stunt young trees and may cause shoot injury if applied during drought or on stressed trees. Use low rates on a small area to gain experience with Westar. Controls most annual weeds for 3-4 months.

Table 5. Postemergence weed control in Christmas trees established 2 or more years in field.

Herbicide trade name and common name*	Mode of action	Amount of product and (active ingredient) per acre	Tree species on label	Timing	Comments and limitations
ASULOX 3.34 SL (asulam)	DHP inhibitor (cell division inhibitor)	1 gallon (3.34 lb ai)	Douglas fir Pine (Scotch) True fir (Grand, Noble)	Apply after hardening of new tree growth.	Bracken fern control. Use a minimum of 20 gallons water per acre. Do not use an adjuvant. Maximum of 1 application per season. Do not apply by air.
DEFY AMINE 4 (2,4-D-dimethylamine salt)	Synthetic auxin	1-4 qt/ acre (.95 – 3.8 lb ai/acre)	All conifer species	Apply before bud break in spring or in late summer after new growth has hardened off.	Controls herbaceous and woody broadleaved species. Apply before bud break in spring as a directed spray to control annual weeds in all conifer species. Avoid spraying tree foliage. Do not apply to diseased or stressed seedlings. May be applied by ground or air equipment in late summer after new conifer growth has hardened off to control woody plants. May cause injury to <i>Pinus</i> species if applied as a broadcast spray.
ENVOY PLUS 0.97E (clethodim)	ACCCase inhibitor	12-32 fl oz/acre (0.09-0.24 lb ai/acre)	Douglas fir Pine Spruce True fir (<i>Abies</i>)	Apply to actively growing grasses.	Controls grasses. Include 0.25% NIS or 1% COC. Include ammonium sulfate (AMS) at 17 lb/100 gal of spray solution for large grasses.
FUSILADE DX 2E (fluazifop-p)	ACCCase inhibitor	16-24 fl oz/acre (0.25-0.375 lb ai/acre)	Douglas fir Pine Spruce True fir (<i>Abies</i>)	Apply to actively growing grasses.	Controls grasses. Include 0.25% NIS or 1% (COC). Include ammonium sulfate (AMS) at 17 lb/100 gal of spray solution for large grasses. Perennial grasses may require multiple applications for complete control.
GARLON 3A (triclopyr triethylamine salt)	Synthetic auxin	2-5 pt/acre (0.75-1.75 lb ai/acre)	All conifer species; Spruce (Blue) True fir (Balsam, Fraser) <u>Douglas fir and white pine may be sensitive.</u>	Apply Garlon in late summer or early fall after conifer terminal growth has hardened while weeds and woody plants are still growing.	Controls woody and herbaceous broadleaves. Apply to Christmas trees established in the field for at least 1 year. Spray toward the base of the trees. Do not apply to newly seeded grass alleys or to legume cover crops.

Table 5. Postemergence weed control in Christmas trees established 2 or more years in field (continued).

Herbicide trade name and common name*	Mode of action	Amount of product and (active ingredient) per acre	Tree species on label	Timing	Comments and limitations
GOALTENDER 4 SC (oxyfluorfen)	PPO inhibitor	Trees in containers and field: 2-4 pt/acre (1-2 lb ai/acre)	Douglas fir Pine (Scotch, White) Spruce (Blue, Norway) True fir (Fraser, Grand, Noble)	Apply before bud break in spring and after foliage has hardened off in fall.	Goaltender controls annual broadleaves. Maximum of 4 pt (2 lb ai)/acre/year; do not apply inside greenhouses; do not apply to conifers under stress. May be sprayed over the tops of Christmas trees except during periods of active growth.
MISSION 25 WG (flazasulfuron)	ALS inhibitor	2.14-2.85 oz (0.033-0.045 lb ai/acre)	Douglas fir Pine (Eastern White, Red, Scotch, White) Spruce (Blue, Norway) True fir (Balsam, Fraser, Grand, Noble, Nordman, White)	Apply to broadleaf weeds and grasses less than 4 inches tall.	Controls many broadleaves and grasses. Apply after new tree growth has hardened off. May be applied over top of trees. Apply as directed spray during periods of active growth. Maximum of 9.6 oz (0.15 lb ai) per acre per year. Do not apply within 1 year of seeding trees. Minimum of 3 months between treatments.
ROUNDUP ULTRA 4L (isopropylamine salt of glyphosate)	Shikimic acid pathway inhibitor	1-8 pt/acre (0.5-4 lb ai/acre)	Douglas fir Pine Spruce True fir (<i>Abies</i>) Other conifers	Apply after new growth has hardened off in the fall. Avoid contact with new tree growth.	Use glyphosate formulations without surfactants. Glyphosate applied at 1-2 qt/acre kills most annual weeds; 2-4 qt/acre kills most perennial weeds. Woody species may be killed with multiple applications. No field horsetail (<i>Equisetum arvense</i>) control. Do not apply over the tops of Christmas trees. Apply as a directed spray to the weeds using a hand boom or wiper applicator.
SETHOXYDIM 1EC (sethoxydim)	ACCase inhibitor	1.5-3 pt/acre (0.19-0.375 lb ai/acre)	Douglas fir Pine Spruce True fir (<i>Abies</i>)	Apply to actively growing grasses.	Controls grasses. Include 0.25% NIS or 1% COC.
STINGER 3L (clopyralid)	Synthetic auxin	4-10 fl oz/acre (0.09-0.23 lb ai/acre)	Douglas fir Pine (White) Spruce (Blue) True fir (Balsam, Fraser, Grand, Noble)	Apply when susceptible weeds are at 3- to 5- leaf stage. For Canada thistle and spotted knapweed control, apply the high rate before weed bud stage.	Controls composites, legumes, nightshade, plantains, smartweeds and thistles. Do not exceed 8 fl oz/acre on blue spruce. Do not add an adjuvant or surfactant. Do not apply with air blast sprayers. May be applied over the tops of trees at any stage.