

# Weed Control in Christmas Trees

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**W**eed 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 and/or postemergence herbicides with different modes of action. Fall or spring-applied preemergence herbicides control most annual weeds for 6-8 weeks. However, residual herbicides do not last throughout the season. Postemergence herbicides are often needed to control perennial weeds, annuals that germinate during the season, and weeds that escape due to herbicide tolerance or resistance.

Weeds interfere with tree growth at any stage of production or time of year. Effective weed control is essential in seedling beds and in the first three years after transplanting in the field, to obtain a good stand and vigorous growth. Weed competition during the year of establishment may suppress tree growth and

even kill trees. Young trees that grow with minimal weed competition develop healthy root systems, which allow them to withstand drought and adverse conditions later. 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 with Canada thistle, horsenettle, poison ivy, horseweed, ragweed, pokeweed, sumac 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 some 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. Apply preemergence herbicides soon after



Weeds can interfere with tree growth at any stage of Christmas tree production.

transplanting to keep weeds from germinating and competing with the small seedlings. Small trees also may be sensitive to postemergence herbicides, and it is important to follow label instructions regarding tree age, size and herbicide timing. Established perennial plants such as Christmas 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 due to light/sandy soils, heavy rain or other reasons, they may absorb the herbicides, which can result in tree injury. Using very low-solubility herbicides and rotating modes of action reduces 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 – for example, 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. Growers may apply some postemergence herbicides 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, such as before budbreak in spring and after new growth has hardened in the fall. Directing the spray to avoid tree contact helps to minimize 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 Sept. 1, by which time most new growth has hardened. If applications must be made during the summer, direct the herbicides toward the soil between the rows 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, spotted knapweed and wild carrot – are susceptible to preemergence and postemergence herbicides applied in the fall.

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

most effective method of control of these woody weeds. Treating the stumps of woody weeds with concentrated herbicides after cutting the stems and branches may 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. Growers can use a highboy sprayer 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 effective for herbicide applications and normally should not be used for weed control. 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 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. Roundup Ultra, with 4 pounds of the isopropylamine (IPA) salt of glyphosate (3 pounds of acid equivalent [ae] per gallon), is a good 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.

## Abbreviations used in tables

ACCase inhibitor = Acetyl CoA Carboxylase inhibitor

ALS inhibitor = Acetolactate Synthase inhibitor

PPO inhibitor = Protoporphyrinogen Oxidase inhibitor

PS II inhibitor = Photosystem II inhibitor

RUP = restricted use pesticide

VLCFA synthesis inhibitor = very long chain fatty acid synthesis inhibitor

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](http://greenbook.net), [cdms.com](http://cdms.com), and [agrian.com](http://agrian.com) are free online databases for looking up label and MSDS information.

*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.*

**Table 1. Annual broadleaves and grass response to Christmas tree herbicides.**

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

	Common Name	Annual broadleaves										Annual grasses							
		Buckwheat, Wild	Common Chickweed	Common Lambsquarters	Common Ragweed	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
<b>Preemergence Herbicides</b>	<b>Common Name</b>																		
AATREX 4L	atrazine	G	G	G	G	G	G	G	G	G	F	G	F	G	F	G	F	N	F
BARRICADE 4 FL	prodiamine	N	F	G	P	N	P	P	G	P	N	G	E	P	F	G	G	P	G
COBRA 2EC	lactofen	G	G	G	G	P	G	G	G	F	P	N	N	N	N	N	N	N	N
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	E	G	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
MARENGO 0.622 SC	indaziflam	G	G	F	F	F	G	G	G	F	G	G	G	G	G	G	G	P	G
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	G	F	P	G	P	G	G	G	G	G	F	G	G	G	G	G
PENNANT MAGNUM 7.62 EC	s-metolachlor	F	N	F	P	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	G	P	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
<b>Postemergence Herbicides</b>	<b>Common Name</b>																		
COBRA 2 EC	lactofen	G	G	F	G	P	G	G	G	F	P	N	N	N	N	N	N	N	N
DEFY AMINE 4; TURRET 5.5 L	2,4-D	G	P	F	G	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	G	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	N	G	G	N	G	N	F	N	N	N	N	N	N	N	N	N

**Table 2. Perennial weed response to Christmas trees herbicides.**

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

		Perennial weeds																	
		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, Perennial	Vetch; Crown vetch	Virginia Creeper
Preemergence Herbicides	Common Name																		
AATREX 4L	atrazine	N	N	N	N	N	N	N	P	N	N	N	N	N	N	G	G	N	N
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
MARENGO 0.622 SC	indaziflam	N	N	P	F	P	N	F	F	P	P	N	P	G	F	P	G	G	P
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; TURRET 5.5 L	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
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
SETHOXYDIM 1 EC	sethoxydim	N	N	N	N	N	N	N	N	N	N	N	N	N	N	F	N	N	N
STINGER 3L	clopyralid	F	G	N	G	P	N	N	N	P	N	N	N	F	N	N	G	G	N

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

Herbicide trade name and common name	Mechanism of action WSSA and (HRAC) Group	Amount of product and (active ingredient) per acre	Tree species on label	Timing	Comments and limitations
AATREX 4L (atrazine) (RUP)	Photosystem II (PS II) inhibitor 5(C1)	1-2 qt/acre (1-2 lb ai/acre)	Douglas-fir Pine (Austrian, Scotch) Spruce (Blue) True fir (Grand, Noble, White)	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 top 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 (proflaminate)	Mitosis inhibitor 3(K1)	12-21 fl oz/acre (0.375-0.656 lb ai/acre)	Pine (Scotch, White) True fir ( <i>Abies</i> sp.)	Apply after transplanting and before budbreak 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 inches of rain or irrigation.
COBRA 2 EC (lactofen)	PPO inhibitor 14(E)	<b>Seedbeds:</b> 0.5-1 pt/acre (0.125-0.25 lb ai/acre)	Douglas-fir Pine Spruce True fir (Fraser, Grand, Noble)	Apply after seeding or transplanting and before budbreak.	Controls broadleaves up to 4 inches tall. Do not apply when conifers are under stress. Maximum 26 fl oz/acre/year.
GOALTENDER 4SC (oxyfluorfen)	PPO inhibitor 14(E)	<b>Conifer Seedbeds:</b> 0.5-2 pt/acre (0.25-1 lb ai/acre)  <b>Trees in containers and in field:</b> 2-4 pt/acre (1-2 lb/ai acre)	Douglas-fir Pine (Austrian, Scotch, White) Spruce (Blue, Norway) True fir (Fraser, Grand, Noble)	<b>Seedbeds:</b> Apply Goaltender preemergence after seeding, or 5 weeks after seedling emergence.  <b>Containers and field:</b> apply in spring before budbreak, and after new growth has hardened in fall.	<b>Preemergence:</b> Goaltender provides good preemergence control of broadleaves and grasses. Do not apply Goaltender on stressed trees or during periods of active growth.  <b>Postemergence:</b> Goaltender has postemergence activity against most annual broadleaves. Include a nonionic surfactant (NIS) in postemergence applications.
PENDULUM AQUA CAP 3.8 CS (pendimethalin)	Mitosis inhibitor 3(K1)	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 top of trees or to soil between trees before weeds germinate. Apply after soil has settled around new transplants.

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

Herbicide trade name and common name	Mechanism of action WSSA and (HRAC) Group	Amount of product and (active ingredient) per acre	Tree species on label	Timing	Comments and limitations
PENNANT MAGNUM 7.62 EC (s-metolachlor)	VLCFA Synthesis Inhibitor 15(K3)	1.3-2.6 pt/acre (1.2-2.5 lb ai/acre)	Douglas-fir Pine Spruce True fir ( <i>Abies</i> sp.)	Apply before weeds emerge.	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 potential injury.
SURFLAN 4 AS (oryzalin)	Mitosis inhibitor 3(K1)	2-4 qt/acre (2-4 lb ai/acre)	Pine Spruce True fir ( <i>Abies</i> sp.)	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)	VLCFA Synthesis Inhibitor 15(K3)	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> sp.)	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 5(C1)	2-3 qt/acre (1-1.5 lb ai/acre)	Pine (Austrian, Scotch) True fir (Fraser, Grand, Noble)	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 4. Postemergence weed control in seedbeds, recent transplants and first-year Christmas trees.**

Herbicide trade name and common name	Mechanism of action	Amount of product and (active ingredient) per acre WSSA and (HRAC) Group	Tree species on label	Timing	Comments and limitations
COBRA 2 EC (lactofen)	PPO inhibitor 14(E)	0.4-1 pt/acre (0.1-0.25 lb ai/acre)	Douglas-fir Pine Spruce True fir (Fraser, Grand, Noble)	Apply before budbreak or after hardening.	Controls broadleaves up to 4 inches tall. Do not apply when conifers are under stress. Max 20 fl oz/acre/year.
ENVOY PLUS 0.97E (clethodim)	ACCCase inhibitor 1(A)	12-32 fl oz/acre (0.09-0.24 lb ai/acre)	Douglas-fir Pine Spruce True fir ( <i>Abies</i> sp.)	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)	ACCCase inhibitor 1(A)	16-24 fl oz/acre (0.25-0.375 lb ai/acre)	Douglas-fir Pine Spruce True fir ( <i>Abies</i> sp.)	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 14(E)	<b>Seedbeds:</b> 0.5-1.0 pt/acre (0.25-0.5 lb ai/acre)  <b>Trees in containers and field:</b> 2-4 pt/acre (1-2 lb ai/acre)	Douglas-fir Pine (Scotch, White) Spruce (Blue, Norway) True fir (Fraser, Grand, Noble)	<b>Seedbeds:</b> apply 5 weeks after emergence.  <b>Containers and field:</b> apply before budbreak in spring and after hardening 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 top of Christmas trees except during active bud and shoot growth.
SETHOXYDIM 1 EC (sethoxydim)	ACCCase inhibitor 1(A)	1.5-3 pt/acre (0.19-0.375 lb ai/acre)	Douglas-fir Pine Spruce True fir ( <i>Abies</i> sp.)	Apply to actively growing grasses.	Sethoxydim controls grasses. Include 0.25% NIS or 1% COC.
STINGER 3L (clopyralid)	Synthetic auxin 4(O)	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 3-5 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. Do not use an adjuvant or surfactant to avoid tree injury. Do not apply with air blast sprayers; may be applied over the top of trees at any stage

**Table 5. Preemergence weed control in established Christmas trees.**

<b>Herbicide trade name and common name</b>	<b>Mechanism of action WSSA and (HRAC) Group</b>	<b>Amount of product and (active ingredient) per acre</b>	<b>Tree species on label</b>	<b>Timing</b>	<b>Comments and limitations</b>
AATREX 4L (atrazine) (RUP)	PS II inhibitor 5(C1)	1-4 qt/acre (1-4 lb ai/acre)	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 annual broadleaves 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.
BARRICADE 4 FL (prodiamine)	Mitosis inhibitor 3(K1)	21-48 fl oz/acre (0.6-1.5 lb ai/acre)	Pine (Scotch, White) True fir ( <i>Abies</i> sp.)	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 21(L)	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 top of trees or as a directed spray.
GOALTENDER 4SC (oxyfluorfen)	PPO inhibitor 14(E)	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 containers. Apply before budbreak 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.
KERB 3.3 SC (pronamide) (RUP)	Mitosis inhibitor 3(K1)	2.5-5 pt/acre (1-2 lb ai/acre)	Douglas-fir Pine Spruce True fir ( <i>Abies</i> sp.)	Apply in late fall when soil temperature is below 55 °F.	Controls annual and perennial grasses, common chickweed, and mustard weeds. Apply to trees established in the field at least 1 year. May be applied over the top of trees or as a directed spray between rows. Control lasts 6-8 weeks in the spring.
MARENGO 0.622 SC (indaziflam)	Cellulose synthesis inhibitor 29(L)	7.5-15.5 fl oz/acre (0.036-0.075 lb ai/acre)	Christmas trees and conifer plantations	Apply before weeds germinate in the spring.	Use on trees established in the field at least one year. Controls most annual weeds. Apply as a directed spray to soil at base of trees. Good control of most annual broadleaves. Fair control of common ragweed and horseweed.
MISSION 25 WG (flazasulfuron)	ALS inhibitor 2(B)	2.14-2.85 oz/acre (0.033-0.045 lb ai/acre)	Douglas-fir Pine (Eastern White, Red, Scotch, White) Spruce (Blue, Norway) True fir (Balsam, Fraser, Noble, Nordman, White)	Apply in spring before budbreak, 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 top in spring or after new growth has hardened in fall.
PENDULUM AQUA CAP 3.8 CS (pendimethalin)	Mitosis inhibitor 3(K1)	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 top of trees or to soil between trees before weeds germinate.

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**Table 5. Preemergence weed control in established Christmas trees.**

<b>Herbicide trade name and common name</b>	<b>Mechanism of action WSSA and (HRAC) Group</b>	<b>Amount of product and (active ingredient) per acre</b>	<b>Tree species on label</b>	<b>Timing</b>	<b>Comments and limitations</b>
PENNANT MAGNUM 7.62 EC (s-metolachlor)	VLCFA Synthesis Inhibitor 15(K3)	1.3-2.6 pt/acre (1.2-2.5 lb ai/acre)	Douglas-fir Pine Spruce True fir ( <i>Abies</i> sp.)	Apply in spring before weeds emerge.	Controls annual grasses, nightshades, pigweeds, yellow nutsedge
PRINCEP 4L (simazine)	Photosystem II inhibitor 5(C1)	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 two 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 biotypes resistant to simazine.
SUREGUARD 51 WDG (flumioxazin) BROADSTAR 0.25%G (flumioxazin)	PPO inhibitor 14(E)	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 top 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 3(K1)	2-4 qt/acre (2-4 lb ai/acre)	Pine Spruce True fir ( <i>Abies</i> sp.)	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 top of trees. Do not use on Douglas-fir.
TOWER 6 EC (dimethenamid-P)	VLCFA Synthesis Inhibitor 15(K3)	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> sp.)	Apply preemergence to weeds and after soil has settled around transplants.	Controls grasses, some broadleaves and yellow nutsedge. Apply anytime except at budbreak. Maximum of 2 applications and 64 fl oz /acre/year.
VELPAR 2L (hexazinone)	Photosystem II inhibitor 5(C1)	2-4 qt/acre (1-2 lb ai/acre)	Pine (Austrian, Scotch) Spruce (Sitka) True fir (Fraser, Grand, Noble)	Apply broadcast before budbreak in the spring or as a directed spray after budbreak.	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 + ALS inhibitor 5(C1) 2(B)	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 budbreak in spring. Use on trees which 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 rate on a small area to gain experience with Westar. Controls most annual weeds for 3-4 months.

**Table 6. Postemergence weed control in established Christmas trees.**

Herbicide trade name and common name	Mechanism of Action WSSA and (HRAC) GROUP	Amount of product and (active ingredient) per acre	Species on label	Timing	Comments and limitations
ASULOX 3.34 SL (asulam)	DHP (cell division) inhibitor 18(I)	4 qt/acre (3.34 lb ai/acre)	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.
COBRA 2 EC (lactofen)	PPO inhibitor 14(E)	0.4-1 pt/acre (0.1-0.25 lb ai/acre)	Douglas-fir Pine Spruce True fir (Fraser, Grand, Noble)	Apply before budbreak or after hardening.	Cobra controls many annual broadleaves up to 4 inches tall. Avoid application to conifers under stress. Maximum 26 fl oz/acre/year.
DEFY AMINE 4 (2,4-D-dimethylamine salt)	Synthetic auxin 4(O)	1-4 qts/acre (0.95 – 3.8 lb ai/acre)	All conifer species	Apply before budbreak in spring or in late summer after new growth has hardened.	Controls herbaceous and woody broadleaved species. Apply before budbreak 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 in late summer after new conifer growth has hardened to control woody plants. Avoid spraying tree foliage. May cause injury to Pinus species if applied as a broadcast spray.
ENVOY PLUS 0.97E (clethodim)	ACCCase inhibitor 1(A)	12-32 fl oz/acre (0.09-0.24 lb ai/acre)	Douglas-fir Pine Spruce True fir ( <i>Abies</i> sp.)	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 grass control.
FUSILADE DX 2E (fluazifop-P)	ACCCase inhibitor 1(A)	16-24 fl oz/acre (0.25-0.375 lb ai/acre)	Douglas-fir Pine Spruce True fir ( <i>Abies</i> sp.)	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 mix for large grasses. Perennial grasses may require multiple applications for complete control.
GARLON 3A (triclopyr triethylamine salt)	Synthetic auxin 4(O)	2-5 pt/acre (0.75-1.75 lb ai/acre)	All conifer species; Spruce (Blue) True fir (Balsam, Fraser) <b>Douglas-fir and White pine may be sensitive to triclopyr.</b>	Apply Garlon in late summer or early fall after conifer terminal growth has hardened and 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 towards the base of the trees. Do not apply to newly seeded grass alleys or to legume cover crops.
GOALTENDER 4 SC (oxyfluorfen)	PPO inhibitor 14(E)	<b>Trees in containers and field:</b> 2-4 pt/acre (1-2 lb ai/acre)	Douglas-fir Pine (Scotch, White) Spruce (Blue, Norway) True fir (Fraser, Grand, Noble)	Apply before budbreak in spring and after foliage has hardened 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 top of Christmas trees except during periods of active growth.

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**Table 6. Postemergence weed control in established Christmas trees.**

Herbicide trade name and common name	Mechanism of Action WSSA and (HRAC) GROUP	Amount of product and (active ingredient) per acre	Species on label	Timing	Comments and limitations
MISSION 25 WG (flazasulfuron)	ALS inhibitor 2(B)	2.14-2.85 oz/acre (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. 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 9(G1)	1-8 pt/acre (0.5-4 lb ai/acre)	Douglas-fir Pine Spruce True fir ( <i>Abies</i> sp.) Other conifers	Apply after new growth has hardened 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 top of Christmas trees. Apply as a directed spray to the weeds using a hand boom or wiper applicator.
SETHOXYDIM 1EC (sethoxydim)	ACCase inhibitor 1(A)	1.5-3 pt/acre (0.19-0.375 lb ai/acre)	Douglas-fir Pine Spruce True fir ( <i>Abies</i> sp.)	Apply to actively growing grasses.	Controls grasses. Include 0.25% NIS, or 1% COC.
STINGER 3L (clopyralid)	Synthetic auxin 4(O)	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 3-5 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 top of trees at any stage.
TURRET 5.5L (2,4-D-isooctyl ester)	Synthetic auxin 4(O)	10-21 fl oz/acre (0.42-0.90 lb ai/acre)	Douglas-fir Pine Spruce True fir ( <i>Abies</i> sp.)	Apply before budbreak in spring.	Controls herbaceous and woody broadleaves. Apply over the top of Douglas-fir. Apply as a directed spray for all other conifer species. Avoid spraying tree foliage. Do not apply to diseased or stressed seedlings.



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