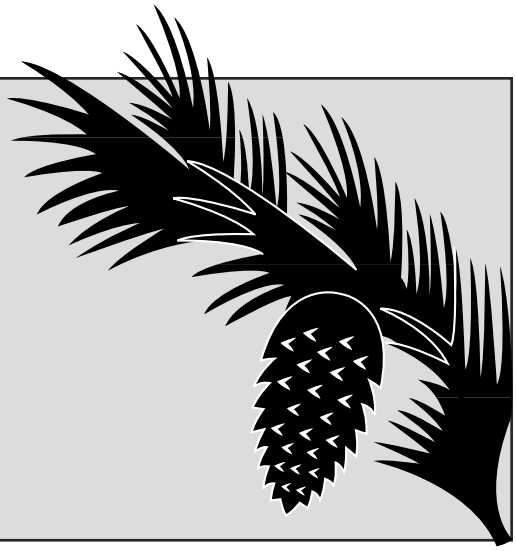
The Pitch & Needle



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Notification

Aerial application on Christmas trees will be removed from chlorpyrifos containing insecticide product labels (including Dow/Lorsban). However, OSU Professor Glenn Fisher and the Pacific NW Christmas Tree Association have expressed support for an SLN registration for this application method. ODA expects to receives a request from Dow AgroSciences in May 2005.

About this newsletter

The Pitch & Needle is a semi-annual publication of the Oregon Department of Agriculture and is intended as an aid to anyone involved in the growing and shipping of Christmas trees.

Through this bulletin, we hope to provide you with the most current shipping information as well as other topical information related to the Christmas tree industry. If you have any suggestions for topics or articles for the next issue, contact Gary McAninch at 503-986-4644 or email <gmcaninc@oda.state.or.us>.

In compliance with the Americans with Disabilities Act, this publication will be made available in alternate formats.

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CSI *Annosus* root rot

Norm Dart, Gary Chastagner and Tobin Peever

Anyone who watches television can't miss seeing one of the popular CSI programs. If you spend any time watching these programs or reading newspaper accounts of criminal investigations, you know about the increasing use of various DNA-based tests to identify victims and convict criminals of the crimes they commit. In some cases, these types of tests have been used to demonstrate that someone who was convicted of a crime was actually innocent.

Plant pathologists are following in the footsteps of criminal investigators by using DNA fingerprinting to distinguish strains of pathogens, and in some cases to help understand how pathogens spread from one plant to another. Although most people would not consider a pocket of Christmas trees that have been killed by *Annosus* root rot a crime scene, we have been using some of the same DNA fingerprinting techniques to help us identify which strain of *Heterobasidion annosum* is killing trees in Pacific Northwest (PNW) Christmas tree plantations and determine if mortality pockets are primarily the result of spore infection of a large number of cut stumps or the root-to-root spread of the pathogen after it becomes established on a few stumps in a plantation.

Annosus root rot has become a serious problem in some PNW Christmas tree plantations. This disease is caused by the fungal pathogen *H. annosum*. In PNW forests, *H. annosum* infects a diversity of native conifers, such as grand fir, noble fir, white fir, Douglas-fir, and western hemlock. Some of these host trees are more susceptible to *Annosus* root rot than others. For example, Douglas-fir is seldom damaged whereas grand fir, noble fir, white fir, and western hemlocks are moderately to severely affected by this pathogen. In the coastal regions of Oregon and Washington where western hemlock and noble fir occur, researchers have found that *H. annosum* infects up to 90 percent of western hemlock and 75 percent of noble fir in previously thinned forests.

Although this pathogen is common in PNW forests, it was seldom found in PNW Christmas tree plantations until a few years ago. With the increased production of *Annosus* root rot susceptible noble fir, and the common practice of planting seedling next to old stumps, the incidence of plantations with *Annosus* root rot has increased from less than 4 percent in 1980 to 24 percent in 2000. In some plantations, up to 40 percent of the trees have been killed before harvest.

Identification of strains

There are two strains or pathotypes of *H. annosum* found on conifers in the PNW. These are designated as S and P. The S strain has been shown to have a broader host range than the P strain. The S strain has been isolated from true firs, giant sequoia, pines, western cedar, and western juniper. In contrast, the P strain has only been isolated from pines, western cedar, and western juniper. To determine which strain is killing Christmas trees, 70 isolates from five Christmas tree species (noble fir, Fraser fir, grand fir, Nordmann fir, and Douglas fir) in plantations located near Orting, Satsop, Mossyrock, and Centralia WA, and Hillsboro OR, were typed to strain. Individual fungal isolates were typed using a DNA assay. In addition, subsets of isolates were typed using more traditional growth compatibility testing in petri dishes. These tests indicated that all the isolates from Christmas trees were the S strain. These results are not surprising given that the S strain is known to attack many different types of conifers, including various true firs.

Importance of spore vs. root-to-root spread

Freshly cut stumps are thought to be the primary infection sites for airborne spores of *H. annosum*. Once stumps are infected, the fungus spreads secondarily to lateral roots and to adjacent trees through root contacts. This secondary spread results in the formation of clusters of dead trees (mortality pockets). The extent of secondary infection and resulting size of a mortality pocket varies by host tree and site history.

Studies in spruce forests have shown that up to 15 adjacent trees can be infected from a single infected stump. Mortality pockets in a white fir forest in California were found to contain several different genetic individuals of *H. annosum* that spread between trees up to 20 feet apart. Although vegetative spread between root contacts is frequently observed in older forest settings, in first-year rotation plantings, mortality has been shown to be the result of secondary spread from numerous infected stumps in areas with high spore levels.

In PNW Christmas tree plantations, the extent of mortality ranges from a few isolated trees to large mortality pockets resulting from secondary root-to-root spread of *Annosus* root rot. It is unclear if these mortality pockets are the result of extensive root-to-root spread of the pathogen from a limited number of infected stumps or from high levels of stump infection at harvest and secondary root-to-root spread of the pathogen to seedlings that are planted adjacent to each infected stump.

A type of DNA fingerprinting called microsatellite analysis can be used to identify individual isolates of *H. annosum* that are killing trees. Microsatellite analysis is exactly the same type of DNA based test used by investigators to place humans at the scene of a crime, and by doctors to conduct maternity tests. If mortality pockets in Christmas tree plantations are the result of root-to-root spread from a limited number of infected stumps, we would expect to see the same genetic individual killing several trees within each mortality pocket. If however, tree mortality were the result of very high levels of stump infection by spores, we would expect to isolate a large number of genetically diverse individuals of *H. annosum* from infected trees within mortality pockets. The development of an effective management program in Christmas tree plantations to control this disease depends on understanding the relative importance of spore infection versus root-to-root spread of this pathogen.

To determine the genetic diversity of *H. annosum* within plantations, 53 isolates from single trees occurring in small

discrete mortality pockets of two-to-six trees were chosen for DNA fingerprinting, using a series of microsatellite markers. All of these mortality pockets were spread throughout three fields within a single plantation located near Mossyrock, WA. In all of these fields, the trees had been planted directly next to stumps from the previous rotation. Results indicated that each of the 53 isolates were genetically unique individuals. These results indicate that mortality within these three fields is most likely the result of high levels of stump infection by spores and the short distance spread of the pathogen to seedlings that are planted next to each infected stump.

Using genetic information to better manage *Annosus* root rot in Christmas tree plantations

Because our data indicates that the mortality at the Mossyrock site is caused by many genetically distinct individuals rather than a single individual that has spread extensively from tree-to-tree as seen in older forest settings, protecting freshly cut stumps from spore infection is likely to be a critically important strategy for controlling this disease. This is particularly true in plantations where very little or no disease is already present.

Borax has traditionally been applied to freshly cut stumps to limit primary infection in forest situations. This method works well for pines but when tested on spruce, inconsistent results have been reported. Preliminary data suggests that applications of Sporax, which is a borax material from Wilbur Ellis, can protect noble fir stumps from infection if it is applied over the entire surface of the stump right after harvest. Additional field tests are needed to determine if other types of stump treatment, such as spraying stumps with urea or potential biocontrol agents or covering them with soil can effectively protect them from infection by spores.

In plantations in which *H. annosum* is already causing considerable losses, the stumps and root systems will have to be removed from the soil or the land will have to be left fallow until residual root systems have decayed and are no longer a potential source of inocula. Data we have collected from three PNW locations indicates that stump removal prior to planting is very effective in reducing mortality in Christmas tree plantations. Removal of stumps reduced mortality from 10.6 to 2.7 percent in one grand fir field, from 18.2 to 0.7 percent in one Fraser fir field, and from 20.7 to 3.2 percent in one noble fir field. We have also just about completed a cooperative grower study to determine if there are significant differences in the effectiveness of different types of stump removal or grinding equipment in removing stumps and root pieces from fields prior to replanting. This information should help growers in deciding which stump removal approach is best for their situation.

Another option for growers is to follow rotations of true firs with Douglas fir. Since Douglas fir is resistant to *H. annosum*, primary infection of stumps via spores would presumably be limited during harvest and minimal secondary infection would occur from inoculum left from previous rotations. This method of controlling *Annosus* root rot relies on the assumption that the roots from previous plantings of true firs will decompose over the five-to-eight year period that Douglas-fir occupies the site and most inoculum will be out competed by opportunistic soil fungi before the next rotation of susceptible true fir is planted.

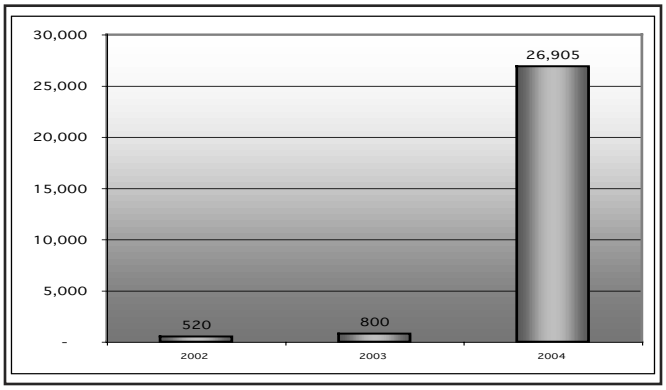
In the end, each Christmas tree grower will have to perform a customized cost benefit analysis to determine the best management option for him or her. Rotating susceptible and resistant varieties of Christmas trees keeps the site in active tree production. However, unless high value resistant true firs can be identified, planting the site to Douglas fir may not be as profitable to grow as some of the susceptible true fir species. If growers have a site that is well suited for the production of high value true firs, they may find it more profitable to remove stumps between rotations even though this management practice requires the highest initial investment.

2004 *P. ramorum* survey

Dr. Nancy Osterbauer, plant pathologist

In 2004, the Oregon Department of Agriculture (ODA) with the cooperation of the Christmas tree industry developed an emergency *Phytophthora ramorum*-free Certification Program for Christmas tree growers growing known *P. ramorum*-susceptible plants. Official inspectors visually inspected and collected samples from plant material at 669 different growing areas. Samples were tested in the laboratory according to USDA-approved protocols (Fig. 1). *P. ramorum* was not detected at any of the growing areas, although other *Phytophthora* species were found. This is the third year in a row no *P. ramorum* has been detected in Oregon Christmas tree plantations. An emergency *P. ramorum*-free certification program was also adopted for the holiday greens industry. Official inspectors and/or certified foresters visually inspected and collected 605 samples from 15 different bough collection sites for testing. No *P. ramorum* was detected. Both emergency certification programs are no longer in effect.

In 2005, the ODA will continue to survey for *P. ramorum* in Christmas tree plantations. The goal of the survey is to maintain the *P. ramorum*-free status for Oregon-grown Christmas trees. Towards this end, a total of 100 fields will be visually inspected and samples collected for testing in the laboratory. The number of fields surveyed in each county will vary depending upon the total acreage of Christmas trees grown in that county. If no *P. ramorum* is detected in the field(s) surveyed, that county will be officially declared free of *P. ramorum* for 2005.



Summary of the civil penalties regulation

Susan Schouten, horticulturist

The intent of this regulation is to encourage compliance with plant protection and marketing regulatory requirements, provide the ODA the authority to protect Oregon's natural resources, and to enhance the marketing of nursery and other agricultural products. Compliance is usually achieved by educating the public and industry of the regulatory regulations. Sometimes, however, a violation may be so serious and threatening that stronger measures become necessary. The ability to enforce these protections serves as an important, though hopefully secondary, educational tool.

Violations that may qualify for civil penalties fall into three categories of magnitude: major, moderate, and minor. The following table illustrates the amount of penalty that may be levied for each type of violation:

Magnitude of violation	First offense	Second offense	Third offense (or each additional offense)
Major	$5,000	$7,500	$10,000
Moderate	$300	$900	$1,800
Minor	Written notice of violation	$100	$300

Examples of violations that fall under each of these levels of magnitude are as follows:

Major

(A) Knowingly importing or transferring infested or infected plant material, or other regulated organisms into or within Oregon in violation of an agricultural quarantine order, quarantine rules and regulations, director's exemption, compliance agreement, or control area order.
(B) Using falsified or altered certificates or other official documents issued by a federal, state, or county phytosanitary official.
(C) Tampering with, altering, misrepresenting or falsifying in any manner official documents issued by a plant regulatory official.
(D) Providing false information required for issuance of documents or official certificates as required under agricultural quarantine orders, quarantine rules and regulations, director's exemptions, compliance agreements, control area orders, or imported timber products inspection program.
(E) Substituting uninspected plant material or regulated items for plant material or regulated items covered by a department inspection.
(F) Willful violation: a violation that is committed knowingly by a person, or the person's agent, who intentionally or knowingly disobeys or recklessly disregards the requirements of a statute, regulation, rule, or order.
(G) Repeat violations.

Moderate

(A) Failure to license or refusal to license as a Christmas Tree Grower; Nursery Stock Grower or Collector of Native Plants; Greenhouse Grower of Herbaceous Plants; Nursery Dealer, Florist or Landscape Contractor.
(B) Importing or transferring infested or infected plant material, or other regulated items or regulated organisms into or within Oregon in violation of an agricultural quarantine order, quarantine rules and regulations, director's exemption, compliance agreement, or control area order.
(C) Knowingly falsifying all or part of any application for registration or licensing.
(D) Failure to pay imported timber products program inspection fees.
(E) Growing plants or conducting other activities requiring a compliance agreement with the department, without entering into said compliance agreement.

Minor

(A) Failure to maintain proper certificates or paperwork as required by an agricultural quarantine order, quarantine rules and regulations, director's exemption, compliance agreement, control area order, or the timber products inspection program.
(B) Failure to notify the department as required by an agricultural quarantine order, quarantine rules and regulations, director's exemption, compliance agreement, control area order, or the timber products inspection program.
(C) Transporting or accepting for transportation plant material or regulated items that do not carry the official inspection documents required by the department.

For complete text of the civil penalties regulation, contact the ODA at 503-986-4644.

Frequently asked questions

Gary Garth, horticulturist

What do I get for my license fee?

The fees are used to fund the program of inspection and detection with the goal of preventing the introduction of new and destructive pests and diseases into Oregon Christmas tree plantations. The program was initiated in 1985 when gypsy moth populations were of much concern and had the potential of greatly impacting shipping. Inspectors provide inspections, recommendations of pest control, information relative to import/export requirements, and certification of trees grown and shipped from Oregon.

I haven't seen my inspector in two years—why hasn't he/she been out

Oregon Christmas tree law requires that trees be inspected on a routine basis and as often as necessary to determine freedom from plant pests and diseases. In 2004, samples were taken from fields of every licensed grower for analysis of sudden oak death disease. The horticultural inspectors also service the nursery industry and are available on call to assist growers with questions regarding plant diseases, weeds or insect pests. Feel free to call and schedule an appointment; we can usually get out within a few days notice depending upon time of year.

Will the sampling for SOD disease increase my license fee this year?

Not for this season, as we were fortunate to obtain some federal funding to cover additional costs at this time. (see related article on SOD program)

I only sell U-cut, why do I still need a Christmas tree grower's license?

The Christmas tree law mandates anyone with more than one acre of trees to be licensed. The entire industry benefits from the program regardless of size or method of marketing. The grower advisory committee works with the ODA to best manage the significance and criteria of the program.

I don't think my neighbor is licensed—what happens to him/her?

If you suspect this is the case, call the ODA and the area inspector will find out if the person is licensed. Unless there is a sign present at the field identifying a specific business, it is difficult for our inspectors to determine exactly who may manage a particular field. We will provide the unlicensed grower with licensing information. If they refuse to license, we have civil penalty authority to levy fines.

I sprayed for Douglas fir needle midge last year—why do I still have a problem?

Perhaps your timing was off. Adult midges could be monitored with traps and their appearance usually coincides with bud break. If you waited to apply "Thiodan" with "Bravo" at 2" of growth, it may have been too late for optimal control of DFNM.

I'm losing quite a few of my noble fir due to root rot—what can I do to prevent this problem from spreading and getting worse?

The Pacific Northwest Plant Disease Handbook (see listing under Web sites) does list several fungicides, which are registered for control of *Phytophthora* spp., however results have generally not been effective. Check with your chemical supplier for current registrations.

Cultural control measures include site selection, improvement of drainage and planting of less susceptible species, such as Douglas-fir or Nordman fir. Dr. Gary Chastagner of WSU—Puyallup has done much research on this topic and his references should be noted (1995).

New personnel

John Ekberg, horticulturist

Since June of 2004, our Inspection and Certification Program has been fortunate to acquire four new horticulturists. This followed the retirements of Kai Sjoblom and Gordon Wogan in March of 2004. They are as follows:

Lisa Rehms started her first day as an inspector in the Nursery & Christmas Tree Program on June 1, 2004. She has been with the Oregon Department of Agriculture Plant Division for a total of six years. Her previous position was as a plant disease program specialist in the Plant Health Section, working on projects important to Oregon's agricultural industry, such as sudden oak death, small broom rape, pine pitch canker, and imported timber.

Prior to the ODA, Lisa was a silviculture crew leader with the Black Hills National Forest. She has also held positions as a college instructor, teaching microbiology, anatomy, and geology. Lisa has a bachelor's of science degree in biology from Montana State University and a master's of science degree in botany from Angelo State University.

Lisa now provides inspection and certification in parts of Washington and Clackamas counties.

Karl Puls also started his first day as an inspector in the Nursery & Christmas Tree Program on June 1, 2004. He has been with the Oregon Department of Agriculture a total of seven years. Karl previously served ODA as an insect program specialist, supervising a crew of insect survey technicians in the Portland field office. That program places and monitors detection traps and surveys annually throughout the state, checking for new invasive pests such as gypsy moth, Japanese beetle, cherry bark tortrix, Asian long-horned beetle, red imported fire ant, and cherry ermine moth. Before coming to work for ODA, Karl spent two years with the Peace Corp in Guatemala and also was in the pest control business. Karl has a master's degree in entomology from Oregon State University.

Karl now provides inspection and certification in all of Clatsop and Columbia counties and parts of Washington and Multnomah counties.

Beverly Clark came to Oregon Department of Agriculture in 1999, as a plant disease specialist in the Fruit Tree Virus Certification Program of the Plant Health Section. She began her job as a horticulturist in January of 2005. Bev came to the ODA from the Washington Department of Agriculture where she worked as a plant pathologist for two years in the Fruit Tree Virus Certification Program. Before that, she worked for two years with the WDA as an agricultural inspector in grass seed, cereal grain, legume and vegetable seed crops. Part of her duties included the Seed Certification Laboratory as a seed analyst checking for purity, germination, and freedom from pests and disease. Prior to WDA, Bev worked for the Foundation Seed and Plant Materials Project at Oregon State University for ten years as program manager, producing early generation, true-to-type, seed of potatoes, mint, grape, cereal, legume, and grass seed.

Beverly now provides inspection and certification in all of Tillamook and Yamhill counties and parts of Polk and Washington counties.

Christy Brown became our newest horticulturist on March 7, 2005. She started with ODA in May of 2003, initially working as an insect survey technician and then as an insect program specialist 1. Christy has a bachelor's of science in horticultural science and a bachelor's of art in art studio from University of Maryland, College Park. In 1995, she worked for Behnke's Nurseries, the largest garden center nursery in Maryland, as their annuals manager. She was with the National Arboretum in Washington DC for four years, variously working as a germplasm database technician, IPM fellow, herbarium assistant, and native plant garden intern. In the summer of 2001, Christy worked for Urban Forestry with the City of Portland as the elm monitor, detecting all diseased elm trees for removal. In 2003, she earned an MS degree from Portland State University in environmental science.

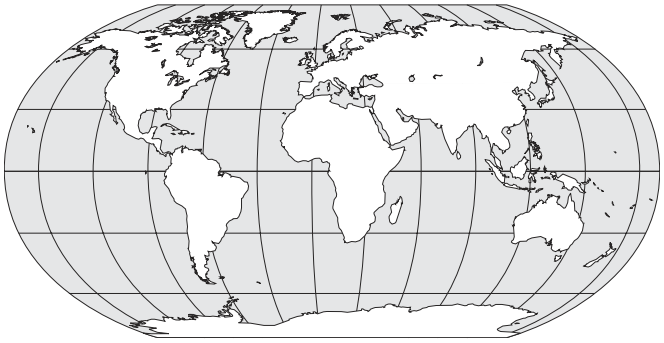
Christy now has responsibility as a sudden oak death coordinator, with all the other area horticulturists, and will also be performing regular inspections in an area to be assigned.

Registration application for Aphistar withdrawn

David Priebe, pesticide registration specialist

Aphistar (active ingredient = triazamate) has been available to Oregon (and Washington) Christmas tree growers during the past seven years (1998-2004) for control of the conifer root aphid in true fir Christmas trees (noble, Fraser, grand, etc.). This use was obtained by ODA (and WSDA for Washington) through emergency exemptions granted by the US EPA under Section 18 of FIFRA.

Aphistar is an unregistered product (which is why we had to go through the exemption process). There are, and have been, no other legal uses of this product in the US. The product was developed for the US market by Rohm and Haas Company, which sold it to Dow AgroSciences several years ago. Because the product had such an extremely small market and limited potential for additional uses beyond Christmas trees, and because significant additional fees were due to EPA to continue support of the registration application, Dow AgroSciences has withdrawn its application for US registration. Any product that may have remained in the channels of trade from last year's use has been recalled for disposal; such product would have been about 10 years old and of questionable integrity. With the withdrawal of the registration application and recall of remaining product, it will no longer be possible for us to obtain Section 18 emergency use on Christmas trees for 2005, and for the foreseeable future.



2004 Christmas tree exports certified by ODA

Country or state	Number of certificates issued
American Samoa	1
Aruba	2
Canada	1
Costa Rica	11
Guam	9
Guatemala	2
Hawaii	201
Hong Kong	19
Iraq	1
Japan	16
Korea	3
Mexico	1340
Northern Mariana Islands	2
Palau	2
Panama	9
People's Republic of China	2
Philippines	2
Puerto Rico	18
Republic of Korea	7
Singapore	8
South Korea	1

What to look for now

Spring (March-May)

Insects	Life stage	Host	Symptoms
Balsam woolly adelgid	Adults	True fir (esp. Fraser)	White woolly masses on bark, swelling of branch nodes
Balsam twig aphid	Adults	True fir (esp. grand)	Small greenish aphids in tops or along branches, twisting of new growth
Douglas fir needle midge	Adults	Douglas fir	Trap adults and spray at bud break
Douglas fir twig weevil	Larvae	Douglas fir and Noble fir	White grubs under bark of branches or into pith
Cooley spruce gall adelgid	Crawlers	Douglas fir	Cottony masses develop as new growth elongates

Diseases	Host	Symptoms
Swiss needle cast	Douglas fir	Rows of small, black fruiting bodies on undersides of needles
Needle rusts	True fir, (esp. Grand)	White, tube-like fruiting bodies on undersides of needles

Summer (June-September)

Insects	Life stage	Host	Symptoms
Root aphids	Adults and immatures	Noble fir	Tree decline, presence of ants in new plantings, clustering white aphids on roots
Root weevils	Adults	Douglas fir and true fir	Poor growth and discoloration (esp. in new plantings), notches in needles, and trunk girdling
Spider mites	Adults and immatures	Douglas fir and true fir	Yellowing and stippling of the foliage
Eriophyid mites	Adults	Douglas fir and true fir	Olive-green or bronze foliage beginning on interior needles
Yellow jackets	Adults	Douglas fir and true fir	Presence of ground or aerial nests. Control of aphids important

Diseases	Host	Symptoms
Grovesiella canker	True fir (esp. grand and concolor)	Large cankers with overgrowth at base of limbs, resulting in death of branches
Phytophthora root rot	True fir (esp. noble)	Brown stem cankers with branch flagging, resulting in death of trees

* The above pest problems are ones most often encountered. There may be other pests or diseases causing damage to your trees. Call your area Christmas tree inspector for specific help in diagnosis and control recommendations.

2005 Christmas Tree Advisory Committee

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Oregon Section 24(c)s: Special local needs (SLN) registrations for Christmas trees

ISSUED TO	PRODUCT	EPA #	SLN #	PEST
Bayer Crop Science	Axiom DF (Flufenacet and Metribuzin)	264-766	OR-040017	rat tail fescue and other grasses
Bayer Corp.	Axiom DF (Flufenacet and Metribuzin)	3125-488	OR-020001	rat tail fescue and other grasses
Dow AgroSciences	Kerb 50W (proamide)	62719-397	OR-040029 (allows for aerial application)	grassy and other weeds
Syngenta Crop Protection	Subdue MAXX (mefenoxam)	100-796	OR-050004	Phytophthora ramorum
FMC	Capture 2E (bifenthrin)	279-3069	OR-940041	spruce mites & root weevils
AMVAC	Discipline @EC (bifenthrin)	5481-517	OR-050005	spruce mites & root weevils
Crompton Manufacturing	Omite 6E (propargite)	400-89	OR-030022	spider mites
Dow AgroSciences	Kelthane MF (dicofol)	62719-405	OR-020031	spider mites
Makhteshim-Agan	Thionex 50W (endosulfan)	66222-62	OR-030012 (includes aerial & some ground appli. methods)	eriophyid needle mite, Douglas fir need midge, and certain adelgids & aphids.
Makhteshim-Agan	Thionex 3EC (endosulfan)	66222-63	OR-030013 (includes aerial & some ground appli. methods)	same as OR-030012

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