Pesticides for Use in Christmas Tree Production in the North Central Region

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INTRODUCTION

Purpose of This Bulletin

This bulletin was developed to provide you with the latest available information on fungicide, insecticide or herbicide products available for pest management. Information included in the pesticide tables was acquired from product labels. This information should help you select an appropriate product for control of the target pest.

Stay Up-to-Date

Registration of pesticide products changes each year. Some products are removed from the market, new products are introduced, new uses are found for old products, or new restrictions are placed on their use. Check with your County Extension agent for updates that have occurred since the publication of this bulletin.

Always Read the Label

Always read the label of the pesticide to be sure that it is registered and appropriate for the target pest.

Note that some products require supplemental labels, which are available from your chemical supplier.

Many commonly used products are included in the list in this bulletin. However, other products may be registered and available for use in your state. Read the label and consult your County Extension office, Department of Natural Resources or Department of Agriculture if you have questions about the registration status of a pesticide product.

Selection of Products

Pesticides should be selected and applied to control specific pests. However, if there are two or more pests threatening the field or the trees, compare the recommendations for each pest and read the labels of the registered pesticides you are considering for use. In some cases, a single application can be used to control both pests.

Occasionally, collective names are used when referring to similar species. For example, "aphid pests" may include the giant pine aphid, powdery pine needle aphid, spotted pine aphid, white pine aphid, and others. All of these aphid species can be managed using the same insecticide.

IPM - Integrated Pest Management

Tree growers must deal with a great number of pests. The entire tree is vulnerable to attack including roots, stems, foliage, shoots and terminal leaders. Damage can range from complete mortality, to growth loss, to cosmetic damage that reduces the value of trees at market time.

Integrated Pest Management (or IPM), is the best approach to manage pests in nursery, Christmas tree or forest and seed orchard production. IPM is defined as using all available tools or tactics to prevent economically important damage from pests, without causing damage to the environment.

Pesticides are an important part of an IPM program, but should not be expected to cure all pest problems. Pesticide use is a corrective measure, designed to "control" a target pest.

However, effective long-term pest management must also include measures designed to prevent outbreaks of pests and to maintain tree health and vigor. Pesticide use should be incorporated into a year-long management program that includes the use of cultural controls, biological controls, frequent and regular pest scouting, accurate pest diagnosis, and evaluation of each pest management practice.

When using pesticides, growers should be conscious of factors such as timing, coverage and selection of the appropriate product. A good knowledge of the pest's life cycle, and selection of appropriate products and application equipment will improve coverage and the effectiveness of the control. The ability to recognize beneficial biocontrol insects, combined with cultural, sanitation or mechanical controls, may allow growers to delay or avoid treatment of a minor pest problem.

Contact your County Extension office to learn more about IPM and methods to integrate pesticide use with other pest management tools. For example, many publications and specialists can help you learn how to use good cultural practices to prevent damaging pest populations from occurring. Another example is the use of degree days to more accurately time insecticide application. Accurate timing can reduce the number of applications needed and increase the effectiveness of the spray. These practices may also help conserve beneficial insect predators or parasitoids. Sound IPM practices will pay off in the long run, both economically and environmentally.

SAFE USE OF PESTICIDES

Pesticide Name

The trade name (first letter capitalized; Lorsban, for example) is used when a pesticide is sold under only one well-known brand name. The accepted common name of a pesticide is used when it is sold under several brand names; chlorpyrifos, for example, has dozens of trade names (Lorsban is probably the most common). Some well-known brand names may be given in parentheses following the common name; carbaryl (Sevin).

Application Rates

The amount or rate of each formulation (the commercial mixture of toxicant and inert ingredients) used are given. Examine the label or contact your County Extension agent for more help in choosing appropriate rates for your situation. Use this information to help you select the safest pesticide for your application.

Abbreviations

We have tried to be consistent in the abbreviations used in the control recommendations. The abbreviations used are as follows:

Dry Measure

oz = ounces
lb = pound; 16 oz per lb

Liquid Measure

fl oz = fluid ounces
pt = pint; 16 fl oz per pt
qt = quart; 32 fl oz per qt, 2 pt per qt
gal = gallon; 128 fl oz per gal, 8 pt per gal, 4 qt per gal

Areas or Amounts Treated

sq ft = square foot, square feet
sq yd = square yard(s)
per acre (acre) = 43,560 square feet

Dry Formulations

The amount of active ingredient(s) in a dry formulation is given as a percentage in the formulation. For example, 50% WP indicates a wettable powder formulation containing 50 percent active ingredient.

B—bait; pesticide mixed with some attractant material that is applied without mixing with water.

D—dust; a finely ground pesticide intended for use without mixing with water.

G—granule; a coarse particle intended for use without mixing with water.

WP—wettable powder; a finely ground pesticide intended to be mixed with water for application.

SP—soluble powder; a finely ground pesticide to be dissolved in water for application.

Liquid Formulations

The amount of active ingredient in a liquid formulation is given as pounds active ingredient per gallon. This is usually cited with the ingredients statements on the label. For example, 3.2 lb/gal EC indicates an emulsifiable concentrate that contains 3.2 pounds active ingredient per gallon.

EC = emulsifiable (or soluble) concentrate: a solution of pesticide intended to be mixed with water for application.

F = flowable: a suspension of pesticide intended to be mixed with water for application.

ULV concentrate: ultra low-volume concentrate: a solution of pesticide intended to be applied by aircraft without mixing with water.

This section has been adopted, in part, and modified from *Chemical Control of Insects & Nematodes in Field & Forage Crops* (Extension Bulletin E-1582, October 1991) written by Douglas A. Landis, George W. Bird, Larry G. Olsen and Fred Warner, Department of Entomology and Pesticide Research Center, Michigan State University, and *Control & Management of Christmas Tree Insect Pests in Michigan* (Extension Bulletin E-2572, April 1995) written by Deborah McCullough and Tom Ellis, Department of Entomology, Michigan State University.

GUIDELINES FOR SAFE USE OF PESTICIDES

Selecting Pesticides

Always thoroughly read the label and the supplemental labeling material for any pesticide that you may consider using. Understand the label instructions and limitations. Make certain that your operation will use the pesticide only for the purposes listed and in the manner directed on the label. Select only those pesticides that are labeled for the crop you wish to use it on and the pest(s) you wish to control. To do otherwise will cost you in terms of effective and economical product performance, and may lead to an unacceptable risks to humans, the crop, and the surrounding environment.

Protecting Groundwater

Many people who live in rural areas get their drinking water from wells. Since well water is groundwater, it is easy to see why you should be concerned about keeping pesticides out of groundwater. There are several processes that determine the fate of pesticides and whether they will end up in your drinking supply.

Adsorption is the binding of chemicals to soil particles. The amount and persistence of pesticide adsorption varies with pesticide properties, soil moisture content, soil pH, and soil texture. Soils high in organic matter or clay are the most adsorptive; coarse, sandy soils are much less adsorptive. A soil-adsorbed pesticide is less likely to volatilize, leach or be degraded by microorganisms, but is also less available for intake by plants.

Volatilization occurs when a solid or liquid turns into a gas. Volatilization of pesticides increases with higher air temperature and air movement, higher temperature at the treated surface (soil, plant, etc.), low relative humidity, and when spray droplets are small. Pesticides also volatilize more readily from coarse-textured soils and from medium- to fine-textured soils with high moisture content. A pesticide in a gaseous state can be invisible and carried away from a treated area by air currents.

Runoff is the movement of pesticides in water across the soil surface. It occurs as water moves over a sloping surface, carrying pesticides either mixed in the water or bound to eroding soil. The amount of pesticide runoff depends on the grade or slope of an area, the erodibility and texture of the soil, the soil moisture content, the amount and timing of irrigation or rainfall, and properties of the pesticide.

Leaching also moves pesticides in water. In contrast to runoff, leaching occurs as water moves downward through the soil. Factors that influence leaching include whether the pesticide dissolves easily in water, soil structure and texture, and the amount and persistence of pesticide adsorption to soil particles.

Absorption is the process by which chemicals are taken up by plants. Once absorbed, most pesticides degrade within plants. However, some residues may persist inside the plant and may be released back into the environment as the plant tissues decay.

Crop removal can transfer pesticides. When treated crops are harvested, the pesticide residues are removed with them and transferred to a new location. After harvest, many agricultural commodities are washed or processed, which can remove or degrade much of the remaining residue. However, the wash water may now be contaminated and should be disposed of as a potential contaminant.

Microbial degradation occurs when microorganisms such as fungi and bacteria use a pesticide as a food source. Conditions that favor microbial growth include warm temperatures, favorable pH levels, adequate soil moisture, aeration (oxygen), and fertility. Adsorbed pesticides are more slowly degraded because they are less available to some microorganisms.

Chemical degradation is the breakdown of a pesticide by processes not involving a living organism. The adsorption of pesticides to the soil, soil pH levels, soil temperature and moisture all influence the rate and type of chemical reactions that occur. Many pesticides, especially the organophosphate insecticides, are susceptible to degradation by hydrolysis in high pH (alkaline) soils or spray mixes.

Photodegradation is the breakdown of pesticides by sunlight. To learn how to protect groundwater when applying pesticides, some basic information on groundwater is helpful. *Groundwater* is the water beneath the earth's surface occupying the saturated zone (the area where all the pores in the rock or soil are filled with water). It is stored in geological formations known as *aquifers*. Groundwater moves through aquifers and can be obtained at points of

natural discharge such as springs or streams, or by drilling a well into the aquifer.

The upper level of the saturated zone in the ground is called the *water table*. The water table depth below the soil surface fluctuates throughout the year, depending on the amount of water removed from the ground and the amount of water added by recharge and connected surface waters. Recharge is water that seeps through the soil from rain, melting snow, or irrigation. Surface waters are visible bodies of water such as lakes, rivers, and oceans.

Both surface water and groundwater are subject to contamination by *nonpoint source pollution*. This type of pollution generally results from land runoff, precipitation, acid rain, or percolation rather than from a discharge at a specific, single location (such as a single pipe or well head). Contamination from these single sites is known as *point source pollution.*

Keeping Pesticides Out of Groundwater

A pesticide that is not volatilized, absorbed by plants, bound to soil, or broken down can potentially move through the soil to groundwater. The movement of groundwater is often slow and difficult to predict. Substances that enter groundwater in one location can turn up years later in other locations. A major difficulty in dealing with groundwater contaminants is that the sources of pollution are not easily recognized. The problem is occurring underground, out of sight.

It is very difficult to clean contaminated groundwater. The best solution is to prevent contamination in the first place. The following pesticide application practices can reduce the potential for surface and groundwater contamination.

Use integrated pest management programs—Keep pesticide use to a minimum by combining chemical control with other pest management practices.

Consider the geology of your area—Be aware of the water table depth and the permeability of the geological layers between the surface soil and groundwater. Sinkholes can be especially troublesome because they allow surface water to quickly reach groundwater.

Select pesticides carefully—Pesticides that are highly soluble, relatively stable, and not readily adsorbed to soil tend to be the most likely to leach. Read labels carefully and consult a specialist from a County Extension office, or your chemical dealer, if necessary. The tables in this bulletin will also help you choose the best pesticide for your use.

Follow label directions—The label carries crucial information about the proper rate, timing, and placement of the pesticide

Calibrate accurately—Calibrate equipment carefully and often to avoid over or under application.

Measure accurately—Carefully measure concentrates before they are placed into the spray tank. Do not "add a little extra" to ensure the pesticide will do a better job.

Avoid back-siphoning—The end of the fill hose should remain above the water level in the spray tank at all times to prevent back-siphoning of chemicals into the water supply. Use an anti-backflow device when siphoning water directly from a well, pond, or stream.

Consider weather and irrigation—If you suspect heavy rain will occur, delay applying pesticides. Control the quantity of irrigation to minimize potential pesticide leaching and runoff.

Avoid spills—But when spills occur, contain and clean them up quickly with an absorbent material such as cat litter.

Mix on an impervious pad—Mix and load pesticides on an impervious pad if possible, where spills can be contained and cleaned up. If mixing is done in the field, change the location of the mixing area regularly.

Dispose of wastes properly—Obey laws regulating the disposal of pesticide wastes. Triple rinse containers. Pour the rinsewater into the spray tank for use in treating the site or the crop.

Store and mix pesticides away from water sources such as well, ponds, and springs.

Protect Nontarget Organisms

Bees and other pollinating insects are essential for successful production of tree fruits, small fruits, most seed crops and certain vegetables. Many insecticides are highly toxic to pollinating honeybees and wild bees. Be aware of how bee poisonings can occur from applying pesticides and how to prevent them. Take the following precautions to reduce the chance of bee poisoning:

- Do not apply insecticides that are toxic to bees if the site contains a crop or weeds which are in bloom. Mow cover crops and weeds to remove the blooms before spraying.

- Select insecticides that are least harmful to bees, and select the safest formulation. Dusts are more hazardous to bees than sprays. Wettable powders are more hazardous than emulsifiable concentrates or water soluble formulations. Granular insecticide formulations are generally the least hazardous to bees. Microencapsulated insecticides are extremely hazardous because the minute capsules can be carried back to the hive.

- Reduce drift during application. Use drift control materials whenever possible.

- Time pesticide applications carefully. Evening applications are less hazardous than early morning; both are safer than midday applications.

- Do not treat near hives. Bees may need to be moved or covered before using insecticides near colonies.

The best way to avoid injury of **beneficial insects and microorganisms** is to minimize insecticide use. Use selective insecticides whenever possible and apply only when necessary as part of a total pest management program.

Pesticides can be harmful to all kinds of vertebrates such as **fish and wildlife**. Most recognizable are the direct effects from acute poisoning. Fish kills can result from water pollution by a pesticide (usually insecticides). Pesticides can enter water via drift, surface runoff, soil erosion, and leaching.

Bird kills from insecticides can occur when birds ingest the toxicant in granules, baits, or treated seed; drink or use contaminated water; or feed on insecticide-contaminated prey.

Pesticide Emergency Preparedness

At the time that the pesticide is purchased, ask the chemical dealer for a complete specimen label of the product you bought. This label and labeling information packet is an exact duplicate of the label information that is affixed to and/or must accompany the pesticide container. Use the specimen label material as a reference during any pesticide emergency. Bring the specimen label material along with any person who has become poisoned and needs medical attention.

Closely follow all the warning statements outlined in the PRECAUTIONARY STATEMENTS section on the pesticide label. Be certain that you use all protective clothing and equipment as specified by the label. Make certain all persons involved in the operation of the farm know and can carry out the STATEMENT OF PRACTICAL TREATMENT that is given on the front panel of all pesticide labels.

Transporting Pesticides

Have agricultural chemicals delivered by your dealer directly to your pesticide storage facility if possible. Transporting pesticides, especially large quantities, can involve a high degree of assumed liability by the grower. Department of Transportation shipping rules must also be followed for transporting large quantities of pesticides, including proper placarding of the vehicle, liability insurance, special handling requirements, etc.

Storing Pesticides

Pesticides must be stored in a facility that will protect them from temperature extremes, high humidity, and direct sunlight. The storage facility should be heated, dry and well ventilated. It should be designed for easy containment and cleanup of pesticide spills and made of materials that will not absorb any pesticide material that leaks out of a container. Store only pesticides in such a facility and always store them in their original containers. Do not store any feed, seed, food, or fertilizer with pesticides. Do not store any protective clothing or equipment in the pesticide storage facility. Try to store herbicides separate from insecticides and fungicides because volatile materials will cross-contaminate other materials. Keep the facility locked at all times when not in use to prevent animals, children, and irresponsible adults from entering and becoming poisoned. Post the facility as a PESTICIDE STORAGE FACILITY to warn others that the area is off limits. Always read and follow the STORAGE AND DISPOSAL section of all pesticide labels. For further information on proper storage, and plans for constructing a facility, consult Midwest Plan Service 37 and MSU Bulletin E-2335.

Handling and Mixing Pesticides

Always wear protective clothing and equipment when handling, mixing, and applying pesticides and during the clean up of application equipment. Protective clothing should include full coverage clothing, chemical resistant gloves and boots, eye protection, hard hat, and a MSHA/NOISH approved respirator

with a chemical absorbent material appropriate for the pesticide being used.

Mix pesticides downwind and below eye level. Avoid excessive splashing and sloshing. If pesticides are spilled on you, wash them off immediately with lots of water and change clothing. Resume spraying only after cleaning up any spills. Try to use closed handling/mixing systems when appropriate.

Mix only what is required for the area to be sprayed according to label directions. Avoid mixing excessive amounts. To do otherwise will create a hazardous waste which is difficult and expensive to dispose of. Keep unauthorized persons out of the areas when you handle pesticides.

Applying Pesticides

Prior to any application, the equipment used must be thoroughly checked for sound operation and accurately calibrated. Poor maintenance and calibration practices will lead to excessive residues on the crop and could harm humans, animals, crops and the environment. Inspect the application equipment during use to prevent the unintentional release of chemicals. If the equipment needs repair, stop the application operation and fix the problem before completing the spray job. Spray only the label directed rate to the target area.

Do not spray on days when the wind is greater than 10 miles per hour and/or weather conditions (e.g., inversions) are conducive to pesticide drift away from the target area. Make every effort to AVOID PESTICIDE DRIFT.

Warn all unauthorized persons to get out of the target area during the pesticide application. Warn occupants of properties abutting the target area when such precautions are specified by the label of the pesticide being used.

Handling and Disposing of Pesticide Containers

All pesticide containers are considered HAZARDOUS WASTE unless they are triple rinsed and the rinsate is used as additional dilution in the spray mixture. After triple rinsing all emptied pesticide containers, perforate both ends so that the container cannot be reused. All metal and plastic triple rinsed containers should be offered for recycling. If this option is not available, dispose of them in a state licensed sanitary landfill. Dispose of all paper containers in a sanitary landfill or municipal waste incinerator. Do not bury or burn any pesticide containers. Do not reuse any empty pesticide containers for any purpose.

Cleaning of Pesticide Application Equipment

Follow all specific label directions for cleaning application equipment. If such instructions are not given on the pesticide label, then triple rinse the entire inside of the application equipment, spraying the rinsate on a labeled site not exceeding labeled rates. Wash off the outside of the equipment in the target area. Only after rinsing the equipment out with fresh water should you clean the spray system with an appropriate cleaning solution. Do not spray any cleaning solution onto any crop; dispose of the cleaning solution as you would any municipal waste. Follow the equipment manufacturer's guidelines for routine and year-end cleaning and maintenance.

Unused and Unwanted Pesticides

Unused and unwanted pesticides are considered HAZARDOUS WASTE by both federal and state regulations. To be exempt from the stringent requirements for the disposal of hazardous pesticide waste, make every effort to purchase the exact amount of pesticides that will be needed during the growing season. Take extreme care in the calibration and application of any pesticide so that leftovers are not generated at the end of the job. Use any pesticide containing rinsates and unused pesticides exactly according to label USE directions. If these procedures cannot be met, contact the Department of Natural Resources Hazardous Waste Division for instructions on the legal disposal of pesticide waste.

Worker Protection Standard

New federal rules for farm worker protection, issued during 1992, require farmers to provide additional training and notification to farm workers to prevent accidental or occupational exposure to pesticides. Farmers should contact Extension agents to learn the details of this standard and availabilty of training materials for education of workers and handlers.

Read and follow the label instructions on **Restricted Entry Intervals (REI)** for every pesticide used. Some pesticide labels require both oral warning and posted signs to notify workers of pesticide applications. If the label doesn't require both forms of notification, notify workers either orally or by posting warning signs at entrances to treated areas. When using posted signs, post 24 hours or less before the pesticide application and remove signs within three days after the end of the restricted entry interval. Keep workers out during the entire time the signs are posted (except for early-entry

workers wearing the proper personal protective equipment).

Record Keeping

The 1990 Farm Bill requires that all applicators who apply restricted use pesticides (RUP) keep records and maintain them for two years. Records to be kept include:

1. brand or product name, formulation, and the EPA registration number of the RUP that was applied;

2. total amount and the rate of application of the RUP;

3. address or location, the size of area treated, the target pest, and the crop, commodity or stored product to which the RUP was applied;

4. month, day and year on which the RUP application occurred; and

5. name, address, and certification number (if applicable) of the certified applicator who applied or supervised the application of the RUP.

As of October 1992, a Drift Management Plan was required. The purpose of the plan is to show that reasonable care has been taken by the grower to prevent drift of pesticides during application

Be sure to properly record all pesticide applications. Your County Extension office can help provide forms and suggestions for record keeping systems. Penalties are up to $500 for the first violation and up to $1000 for subsequent violations. Provisions for protecting the identity of individual producers are included in the law. Although, at the time of this printing, no state agency have been designated to enforce this new rule in some states, accurate records should be kept for efficient farm management.

Endangered Species Act

To minimize the adverse impact of pesticides on endangered species, the EPA has initiated **The Endangered Species Act**. Every implicated pesticide will have an endangered species warning statement regarding use of the product within the geographic area when endangered species restrictions apply. Users must obtain a county-specific endangered species bulletin from their local County Extension office, which will identify the specific area where use restrictions apply. Application of listed pesticides in the identified geographic areas in that county will be restricted or prohibited.

SARA Title III Emergency Planning and Community Right to Know Act

The Community Right to Know law, under SARA Title III, requires farmers to notify their State Emergency Response Commission (SERC), Local Emergency Planning Committee (LEPC) and local fire department that they store extremely hazardous materials. Check with the state Department of Natural Resources or County Extension office to receive a list of EPA established _extremely hazardous substances_ and their planning threshold quantities.

The SERC, LEPC and local fire chief may request maps of your storage facility and detailed lists of materials you store.

This law also requires that, in the event of a spill, the SERC, LEPC and National Response Commission be notified. The reportable quantities for spills is much less than for storage and can be obtained from the above sources. Your County Extension office may be able to assist you in preparing an emergency response plan for your farm.

Farmers are protected from nuisance law suits under the Right to Farm law if you follow acceptable management practices. These practices are completed for pesticides and nearly ready for fertilizers. Contact your local County Extension office, Department of Natural Resources or regional Department of Agriculture Office to obtain copies.

MAJOR DISEASE PESTS

TREE SPECIES	DISEASE
Douglas fir	Rhabdocline needlecast, Swiss needlecast
Balsam fir	Lirula needlecast
Black, white, blue and Norway spruce	Spruce needle rust
Blue and white spruce	Rhizosphaera needlecast
All spruce	Lirula needlecast, Cytospora canker
Scotch pine	Brown spot needlecast, Lophodermium needlecast, Cyclaneusma needlecast, pine needle rust, gall rust, Sphaeropsis (Diplodia) shoot blight
Red pine	Lophodermium needlecast, Cyclaneusma needlecast, pine needle rust, Sphaeropsis (Diplodia) shoot blight
Austrian pine	Dothistroma needlecast, Sphaeropsis (Diplodia) shoot blight
White pine	White pine blister rust

DISEASE DIAGNOSIS CHART

Pest and Host(s)	Symptoms	Time Present[1]	When to Treat[2]
Rhabdocline Needlecast	2-year-old needles yellowish brown to red-brown	March-May	Benomyl(Benlate)-Apply initially in early May. Repeat at 4 wk. intervals.
Douglas Fir	Shedding of 2-year-old needles	May-mid-July	Chlorothalonil or Copper Hydroxide - Apply at budbreak and repeat at 3-4 wk. intervals until needles are fully elongated & conditions no longer favor disease development.
	Fruiting bodies (pale orange) on 2-year-old needles	May-July	Chlorothalonil-Make one application in spring when the new shoot growth is 1/2-2 in. in length. Make additional applications at 3-4 wk. intervals until conditions no longer favor disease development.
	2-year-old needles with yellow spots	September-November	
Swiss Needlecast	Fuzzy black fruiting bodies in stomata of 1 and 2-year-old needles	April-June	Benomyl(Benlate) -Apply initially in early May. Repeat at 4 wk. intervals.
Douglas fir	Brown 2 and 3-year-old needles on lower branches	July-August	Chlorothalonil-Make one application in spring when the new shoot growth is 1/2-2 in. in length. Additional applications can be made at 3-4 wk. intervals depending on the product formulation and rate/A used in first application & environmental conditions. Mancozeb(Dithane)- Begin application in spring or early summer before infection occurs. Repeat after heavy rains and at 2 week intervals as long as needed.
	Fruiting bodies on current year's needles	September-October	
Lirula Needlecast	Scattered, buff-colored 1, 2 and 3-year-old needles. More common on lower branches.	May - October	NA[3]
Balsam fir	Infected needles may persist on twigs until the end of the 3rd growing season.		
	*In rare cases, a few current year's needles may be buff-colored.	July - December	
Rhizosphaera Needlecast	Fuzzy black fruiting bodies in stomata of 1 and 2-year-old needles	April-June	Chlorothalonil-Make first application in spring when new shoot growth is 1/2-2 in. in length. Make additional applications at 3-4 week intervals until conditions no longer favor disease development.
Blue and white spruce	Purplish-brown 2 and 3-year-old needles on lower branches	July-September	
	Fruiting bodies on current and 1-year-old needles	August-September	

Disease Diagnosis Chart (continued)

Pest and Host(s)	Symptoms	Time Present[1]	When to Treat[2]
Spruce Needle Rust Black, white, blue and Norway spruce	Whitish blisters filled with yellow spores on the underside of current year's needles Shedding of current year's needles	July-September August-early November	NA[3]
Lirula Needlecast Most common on Black Hills spruce but can be present on many species of spruce	1-year-old needles purplish-brown 2-year-old needles reddish-brown or brown with black spots and black lines. 3-year-old needles grayish-tan. Infected needles may persist on twig or be cast.	July-October June - December	NA[3]
Mycosphaerella (Scirrhia) Brown Spot Needlecast Scotch pine	1-year-old needles absent or falling off. These needles will be brown or green with reddish-brown spots. Most common on lower branches. Current year's needles brown or green with reddish-brown spots. Most common on lower branches.	May-July August-November	Mancozeb(Dithane) - Begin application in the spring or early summer before infection occurs. Repeat after heavy rains and at 2 wk. intervals as long as needed. Chlorothalonil or Chlorothalonil/ Triadimefon(Reach)- See directions for Rhizosphaera Needlecast
Lophodermium Needlecast Red and Scotch pine	Brown spots on 1-year-old needles 1-year-old needles turning brown. Most common on the bottom branches. 1-year-old needles defoliated on lower branches Black, football-shaped fruiting bodies on dead needles	March-April May-mid July June-August July - October	Mancozeb(Dithane)- See directions for Brown Spot Ferbam(Carbamate WDG)- Begin application in spring or early summer before infection occurs. Repeat after heavy rains and every 10-14 days Chlorothalonil or Chlorothalonil/ Triadimefon(Reach)- **Check below for instructions for North Central and Northeastern states.** Begin application in spring prior to budbreak. Repeat applications at approximately 6-8 wk. intervals, until spore release ceases in late fall. During drought periods, applications may be suspended, then resumed upon next occurrence of needle wetness. Chlorothalonil or Chlorothalonil/ Triadimefon(Reach)- **North Central and Northeast states**: Begin applications in mid-July to early August before infection occurs. Make additional applications until conditions no longer favor disease development.

Disease Diagnosis Chart (continued)

Pest and Host(s)	Symptoms	Time Present[1]	When to Treat[2]
Cyclaneusma Needlecast Scotch pine	Light green spots on 2 & 3-year-old needles. Yellow 2 & 3-year-old needles with dark bands. White waxy fruiting bodies on brown 2 and 3-year-old needles. Defoliation of 2 & 3-year-old needles anywhere on the tree.	September - October October - May	Chlorothalonil or Chlorothalonil/ Triadimefon(Reach)- Apply in spring prior to budbreak. Repeat applications at approximately 6-8 wk. intervals, until spore release ceases in late fall. During drought periods, applications may be suspended, then resumed upon next occurrence of needle wetness.
Dothistroma Needlecast Austrian pine	Current year's needles with dead needle tips and green bases	October-December	Copper(Tenn-Cop 5E)- Make 1st application as needles begin to emerge from needle sheaths and repeat 3-4 wks. later. Repeat monthly through September.
Pine Needle Rust Scotch and Red pine	Frosty-orange droplets on 1 & 2-year-old needles Orange blisters erupting from 1 & 2-year-old needles on lower branches	April-early June May-mid July	NA[3]
Gall Rust Scotch pine	Globe or spindle-shaped galls present on trunk or branches Galls erupt with whitish blisters and orange spores	Entire season April-mid June	Bayleton or Chlorothalonil/ Triadimefon(Reach)- Begin application when needles break through fascicle sheath. Make additional applications at 2-3 wk. intervals until the galls of previously infected trees become pale to white in color. Mancozeb(Dithane)- See directions for Brown Spot
White Pine Blister Rust White pine	Cream colored blisters Patches of brown bark with yellow borders. Spindle shaped swellings. Resin flow on trunk.	May-mid June Entire season	NA[3] CopperTenn-Cop 5E- Make 1st application when buds open & repeat at weekly intervals until the needles break through the needle sheaths.
Sphaeropsis (Diplodia) Shoot Blight Red, Scotch & Austrian pine	Curling of terminal and lateral shoots. Shoots not hollow.	May-August	Benomyl- Apply at bud break. Repeat 10-14 days later, just before needles emerge from sheath; repeat again in 10-14 days after needles emerge.
Cytospora Canker Spruces, occasionally fir and pine	Sunken areas on the branches or stems associated with heavy pitch flow	Entire season	NA[3]

[1] The information for the time of year symptoms occur is based on observations and research conducted in Minnesota, Michigan and Wisconsin.

[2] Products listed more than once have different recommendations for different formulations. Consult the pesticide table and product labels to determine which products are labeled for use at the times listed.

[3] No disease management product information available.

MAJOR INSECT PESTS

TREE SPECIES	PEST SPECIES
All conifers	Allegheny mound ant, aphids, bark beetles, grasshoppers, gypsy moth, mites.
All firs	Allegheny mound ant, aphids, bagworm, bark beetles, grasshoppers, gypsy moth, mites, pales weevil, spruce budworm.
Balsam fir	Allegheny mound ant, aphids, bagworm, balsam gall midge, grasshoppers, gypsy moth, mites, pales weevil, spruce budworm.
Douglas fir	Allegheny mound ant, aphids, bagworm, bark beetles, Cooley spruce gall adelgid, eastern pine shoot borer, grasshoppers, gypsy moth, mites, pales weevil, spruce budworm, white pine weevil.
Eastern red cedar	Aphids, mites, pine needle scale.
Fraser fir	Allegheny mound ant, aphids, bagworm, balsam gall midge, bark beetles, grasshoppers, gypsy moth, mites, pales weevil, spruce budworm.
Scotch pine	Adana tip moth, aphids, European pine shoot moth, European pine sawfly, introduced pine sawfly, mites, jack pine budworm, jack pine tip beetle, Nantucket pine tip moth, northern pine weevil, northern pitch twig moth, pine bark adelgid, pine chafer, pine needle midge, pine root collar weevil, pine shoot beetle, pine tortoise scale, pine thrips,redheaded pine sawfly, Zimmerman pine moth.
White pine	Aphids, European pine sawfly, introduced pine sawfly, northern pine weevil, mites, pine bark adelgid, pine chafer, pine needle midge, pine shoot beetle, Zimmerman pine moth.
Other pines (Austrian, Jack, Red)	Adana tip moth, aphids, European pine sawfly, European pine shoot moth, introduced pine sawfly, jack pine budworm, jack pine tip beetle, Nantucket pine tip moth, mites, northern pine weevil, northern pitch twig moth, pine chafer, pine bark adelgid, pine needle midge, pine root collar weevil, pine shoot beetle, pine thrips, pine tortoise scale, redheaded pine sawfly, Zimmerman pine moth.
All spruce	Aphids, eastern spruce gall adelgid, mites, pales weevil, spruce budworm, spruce needle miner.
Blue spruce	Aphids, Cooley spruce gall adelgid, eastern spruce gall adelgid, mites, pales weevil, spruce budworm, spruce needle miner.
Engleman spruce	Aphids, Cooley spruce gall adelgid, eastern spruce gall adelgid, mites, pales weevil, spruce budworm, spruce needle miner.
Norway spruce	Aphids, eastern spruce gall adelgid, mites, pales weevil, spruce budworm, spruce bud scale, spruce needle miner.
Sitka spruce	Aphids, Cooley spruce gall adelgid, eastern spruce gall adelgid, mites, pales weevil, spruce budworm, spruce needle miner.
White spruce	Aphids, eastern pine shoot borer, eastern spruce gall adelgid, mites, pales weevil, spruce budworm, spruce needle miner.

INSECT PEST IDENTIFICATION

INSECT	TREE SPECIES	SYMPTOMS	TIME PRESENT[1]	WHEN TO TREAT[1]
Adana Tip Moth	Austrian, Red and Scotch Pine	Stunted, dying or dead shoots	Larvae begin feeding in late April-early May	Spray in mid- to late April to control larvae at base as they hatch from eggs; repeat in May if needed.
Allegheny Mound Ant	All Conifers	Dead or dying tree	Spring to Fall	Treat mounds between April and October when activity is observed. For best results mix insecticide into upper 2-3 inches of mound just before rain.
Anomala Beetle (Pine Chafer)	All Pines	Scorched appearance, broken or brown needles, adults present		Late June to control feeding adults.
Aphids	All Conifers	Discolored foliage, honey-dew, sooty or glittering foliage	Spring-Summer	Variable, depending on species, weather and natural enemies. Monitor for a few days to determine if predators will control aphids.
Bagworm	All Firs and Spruces, Eastern White Pine	Defoliation, brown bags with needle particles, flagging	Larvae become active in late May	
Balsam Gall Midge	Balsam and Fraser Fir	Thin canopy, premature needle drop, small galls at base of needle		Spray when needles are roughly 1.5 inches long
Balsam Twig Aphid	All Firs, Spruces Juniper	Twisted, curled needles, honeydew and sooty mold		

Insect Pest Identification Table (continued)

INSECT	TREE SPECIES	SYMPTOMS	TIME PRESENT[1]	WHEN TO TREAT[1]
Bark Beetles	All Conifers	Galleries and tunnels under bark; boring dust or pitch tubes often seen on stem	Summer	
Cooley Spruce Gall Adelgid	White, Blue, Engleman and Sitka Spruce; Douglas Fir	Spruce: pineapple-shaped galls on tips of new shoots; Douglas-Fir: Yellow spots on bent needles and cottony balls on underside of needles		Early-late April or May and again in early Fall if needed
Eastern Pine Shoot Borer	Douglas Fir, all Pines; White Spruce	Dead or discolored shoots; terminal leaders clearly broken at base, exit hole on damaged shoots		Treat before young larvae bore into shoots, usually occurs in mid-May
Eastern Spruce Gall Adelgid	All Spruces	Small pineapple-shaped ball at base of new shoot		Treat in April when buds begin to swell; repeat in September after galls open if necessary
Eriophyid Mite	All Firs and Pines	Yellow, stippled needles; tips of needles may turn brown, twist and hook	Early April; overlapping generations throughout growing season	Spray in early May and repeat in 10 days
European Pine Shoot Moth	Pines-especially Scotch, Austrian and Red	Stunted shoots, usually dead before expansion; hard yellowish pitch mass over buds in mid- to late summer; caterpillar overwinters in buds, under pitch		Spray when newly hatched larvae are moving to new shoots; usually early to late April
Grasshopper	All Conifers	Ragged needles and scarred bark on twigs, branches or seedlings	Mid-Summer	Spray in August or September

Insect Pest Identification Table (continued)

INSECT	TREE SPECIES	SYMPTOMS	TIME PRESENT[1]	WHEN TO TREAT[1]
Gypsy Moth	All Conifers	Presence of egg masses is critical; defoliation causes ragged foliage		Bt can be used when caterpillars are 1 inch or less. Spray with registered insecticide before pupation. Consult Dept. of Agriculture for current regulations.
Introduced Pine Sawfly	See Pine Sawflies			
Jack Pine Budworm	Jack and Scotch Pine	Defoliation, dry clipped needles webbed to shoots		
Jack Pine Tip Beetle	Pines, particularly Scotch and Red Pines	Yellow or red shoot tips; small glob of pitch at base of damage	Injured tips can be found throughout summer	This insect is not known to cause economic damage and should not require treatment.
Nantucket Pine Tip Moth	Pines, particularly Austrian, Red and Scotch	Deformed shoot tips; dead or dying needles at end of shoots; mined	Spring to early summer	Treat in mid-May to mid-June to control young larvae. A second generation may require treatment in mid-July to late August.
Northern Pine Weevil	All Pines; sometimes Spruces	Flagging and browning of new shoots; small circular wounds at base of damage		Spray stumps in April. Use foliar spray to kill feeding adults in late April and late August-September
Northern Pitch Twig Moth	Pines, particularly Scotch	Small, hollow pitch blister in crotch of shoots	Blisters can be seen throughout the year	
Pales Weevil	Pines, particularly Scotch and Eastern White, Douglas-Fir; some Spruces	Flagging and browning of shoots; patches of exposed bark at base of dead shoots, often exuding pitch		Spray stumps in April. Use foliar spray to kill feeding adults in late April and late August-September

Insect Pest Identification Table (continued)

INSECT	TREE SPECIES	SYMPTOMS	TIME PRESENT[1]	WHEN TO TREAT[1]
Pine Bark Adelgid	Eastern White Pine and occasionally Scotch and Austrian Pine	Discolored, stunted or dying tree; clumps of white, wooly, waxy material on stem and large branches	Blue-green nymphs appear in early May	Spray in mid-April to mid-May when nymphs are active. Trees can also be sprayed in summer; 2-3 applications at 1 week intervals may be needed.
Pine Needle Midge	Pines, particularly Scotch and Red	Bending or drooping of needles; brown bent needles in upper canopy; loss of injured needles causing thin crowns; bright orange larvae feeding at base of needles		Treat in mid-May to early June.
Pine Needle Scale	All Pines, all Spruces and Douglas-Fir	White, elongated scales on needles; discolored needles with white "flecks"		Sprays only effective when crawlers are present. First generation crawlers usually coincide with lilac bloom.
Pine Root Collar Weevil	All Pines, particularly Scotch and Red	Foliage fades to yellow, then red; black pitch on root collar and surrounding soil; larval feeding galleries in root collar and large roots		Soak root collar area in early summer to kill adults and developing larvae.
Pine Sawflies	All Pines, particularly Scotch	Defoliation; dried tufts of skeletonized needles	Spring to late Summer	Varies depending on species and weather.
Pine Shoot Beetle	All Pines	Shoots with 3/16 inch circular holes; often with round glob of pitch; shoots bent and often brown above boring hole; boring dust or feeding galleries may be observed on recently cut trees, stumps, other brood material	Adults breed in February or March. Adults begin to shoot feed in early June and continue through October	Destroy brood material and trap logs by May 15; treat foliage in early June when new adults begin to shoot feed.

Insect Pest Identification Table (continued)

INSECT	TREE SPECIES	SYMPTOMS	TIME PRESENT[1]	WHEN TO TREAT[1]
Pine Tortoise Scale	All Pines, particularly Scotch, Red and Austrian	Reddish-brown helmet shaped scales on woody tissue; discolored needles; black sooty mold on needles		Spray trees when crawlers are active.
Redheaded Pine Sawfly	See Pine Sawflies			
Spider Mites	All Conifers	Stippled or yellow mottled needles; webbing and fine frass on needles; presence of dark colored mites	Early and later summer usually peak periods	Rap a branch over a white piece of paper to determine if mites are present. Two or three sprays at 7 to 10 day intervals may be needed if populations are high.
Spruce Bud Scale	Spruce and Balsam Fir	Red or dark globular "bumps" on twigs; honeydew and sooty mold on twigs and needles		Treat in July when crawlers are active.
Spruce Budworm	Spruce and Balsam Fir	Defoliated shoot tips; browning of clipped and webbed needles		Spray insecticide in May when larvae first appear. A second spray 7 to 10 days later may be needed if populations are high.
Spruce Needle Miner	All Spruces	Clusters of reddish-brown needles webbed together; needles hollow with tiny holes at the base		Spray in mid- to late July when larvae are hatching. Consider a second spray 10 to 14 days later.
White Grub	All Conifers, but particularly Pines	Dead or dying seedlines; fibrous roots absent on dead seedlings	Late Spring	Late Spring to early Summer when insects become active.
White Pine Weevil	Spruces, Pines and occasionally Douglas-Fir	Round feeding wounds and fresh tree pitch on terminal leader in early spring; terminal leader wilts and dies in mid-summer, forming a characteristic shepards' crook; top 2-3 years of growth may be killed each year		Spray early in Spring to kill adult weevils before oviposition.

Insect Pest Identification Table (continued)

INSECT	TREE SPECIES	SYMPTOMS	TIME PRESENT[1]	WHEN TO TREAT[1]
Zimmerman Pine Moth	All Pines, especially Scotch and Austrian; rarely Spruce and Douglas-Fir	Pitch mass on stem, at branch whorl or on shoots near terminal leader; dead, broken tops. Large globular pitch mass often mixed with reddish frass on stem or large branches; patches of dead foliage in canopy; broken tops		Spray stems and large branches in early to mid-April before larval activity begins.

[1] Information on timing is based on observations and research conducted in Michigan.

HERBICIDE USE

Christmas tree production is an intensive agricultural operation designed to produce a specialty product. Consumer demands and production costs require growers to increase the production of high quality trees per acre in the shortest time possible. This requires an intensive management program focusing on factors that affect tree growth, foliage quality and general appearance. Intensive management may include the effective use of herbicides.

When properly used, herbicides provide benefits not only during initial establishment and growth of the tree, but also later, during the crop rotation. Herbicide use prepares sites for Christmas tree establishment, increases survival and early growth of newly planted trees, increases the supply of nutrients available to the tree, eliminates the need for furrow planting, reduces damage and loss due to rodents, helps develop better quality foliage on the lower part of the tree, permits easier and higher quality shearing, reduces the probability of foliage diseases, reduces the likelihood of wildfire in the plantation, and also promotes better wholesale buyer and consumer relations.

By definition, herbicides are chemical compounds that affect the germination, growth and behavior of plants. There are a wide variety of herbicidal materials - some are better adapted to certain uses than others. To choose the appropriate herbicide for a particular situation, the grower must understand basic herbicide characteristics.

Herbicides are not equally effective on all types of vegetation and some herbicides are selective when applied during certain periods of the year, such as before the trees begin growing in the spring or after they have hardened off in the late summer or early fall. Herbicides affect plants in several ways. Some are absorbed through the foliage, while others are applied to the soil and are absorbed through the root systems of actively growing plants. Soil applied herbicides usually have a residual effect, preventing regrowth of vegetation for a time after application. In addition, a herbicide mixture's effectiveness depends on the user's knowledge of the formulation characteristics.

To successfully control vegetation, the grower must understand the factors that influence herbicide effectiveness. Effective control is related to application rate, equipment calibration, application method, targeted vegetation, site characteristics, soil moisture content, weather conditions, and wetting agents.

Many compounds are available for use by Christmas tree producers to control herbaceous and woody plants. Several compounds that are registered and commonly used for Christmas tree production are listed in this bulletin. Other products may also be available in your state. Be sure to check the product label before using any product.

WEEDS AND PRODUCTS

BROADLEAF WEEDS	Basagran	Finale	Fusilade	Goal	Kerb	Grandstand	Round up	Stinger	Vantage	Derby	Gallery	Pendulum	Pennant	Princep	Snapshot DF	Surflan	XL
Blackberry						G	G										
Carrot, wild											G			P	G	P	
Chickweed, common		G		F	G		G			G	G	G	F	G	G	G	G
Clover, white		G		G	G	G	G				G	P		F	G	P	
Cocklebur, common	G	G		G			G	G						F			
Dandelion (seedling)		G		F		G		G		F	G	P	P	F	G	G	F
Evening Primrose	P	G		F			G			G	F	F	F	G	G	G	
Groundsel, common				G			G	G		F	G	P	F	G	G	F	G
Honeysuckle							G										
Horseweed (marestail)		G					G	G		F	G	P	F	F	G	G	F
Jimsonweed	G	G		G	P			G			G	P	P	G	G	P	
Knotweed, prostrate				G						G	G	G	G	F	G	G	G
Lambsquarters	F	G		G		G	G				G	G	F	G	G	G	G
Morningglory, annual	F			G			G			F	F	F	F	F	G	F	F
Mustard, wild	G	G		G	G		G				G		P		G	F	F
Pigweed spp.	P	G		G			G			G	G	G	G	G	G	G	G
Plantain	P	G				F		P			G		G	F	G	G	
Poison Ivy (oak)						G	G										
Purslane, common	G	G		G		G				F	G	G	F	G	G	G	G
Ragweed, common	F	G		F	G		G	G		G	G	P	F	G	G	F	F
Thistle, Canada	G	G					G	G						P			
Velvetleaf	G	G		G	F		G	G			G	G	G	F	G	F	P
Vetch						G	P										
Virginia Creeper						G	G										
GRASSES or GRASSLIKE																	
Barnyardgrass		G	G	G			G		G	G		G	G	G	G	G	G
Brome, downy		G			G		G							G		G	
Fescue, tall		G			G		G		F	P		P		F	P	P	
Foxtail (yellow, green)		G					G		G	G		G	G	G	G	G	G
Foxtail, giant		G	G	G			G		G	G		G	G	G	G	G	G
Horsetail (Equisetum)		G							P	P		P	P	P		P	
Johnsongrass (mature)		G			P		G		G					P		P	
Johnsongrass (seedling)		G					G		G	F		G	F	P	F	G	G
Nutsedge, yellow	G	G			P		F		P	G		P	G	P	P	P	
Panicum, fall		G		F			G		G	G		G	G	G	G	G	G
Quackgrass		G			G		G		G			P				P	
Sandbur		G					G		G	F			F	P	G	G	G

The actual level of weed control that you experience is dependent upon numerous factors, including weed size, weather conditions, soil moisture level, time of year, herbicide formulation, and application method among others. It is critical that you read the herbicide label to verify the information provided in this table and publication with the labels on each herbicide. This is only a partial list of weeds, additional weeds may be listed on the specific herbicide labels. A blank indicates that the chemical has no substantial effect on the weeds listed above, G indicates good control (80 - 100%), F indicates fair control (50-80%), and P indicates some control (0-50%).

PESTICIDES REGISTERED FOR USE IN CHRISTMAS TREE PRODUCTION BY STATE

HERBICIDES

Code: Y=Yes registered, NO=Not registered, SLN=Special Local Needs Label, SUP=Supplemental Label. A blank box indicates that registration status was unknown at time of publication. Consult state regulatory agency for more information.

Trade Name and Active Ingredient	IA	IL	IN	MI	MN	MO	WI
2,4-D L.V. 4 Ester (Riverdale Chem .Co)	Y	Y	Y	Y	Y	Y	NO
2,4-D L.V. 6 Ester (Riverdale Chem .Co)	NO	Y	NO	NO	NO	Y	Y
AAtrex 4L, Nine-O and Accu-Pak (Ciba-Geigy)	Y	Y	Y	Y	Y	Y	Y
Accord (Monsanto)	Y	Y	Y	Y	Y	Y	Y
Asulox (Rhone-Poulenc)		Y	Y	Y	Y		Y
Atrazine 4L (Drexel)		NO	Y	Y	Y		Y
Atrazine 4L & 90DF (Riverside/Terra)	Y	Y	Y	Y	Y	Y	Y
Atrazine 5L (Drexel)		NO	NO	NO	NO		NO
Atrazine 90 DF (Drexel)		NO	Y	Y	Y		NO
Clean Crop Atrazine 4L & 90 WDG (Platte Chem. Co.)	Y	Y	Y	Y	Y	Y	Y
Clean Crop Simazine 80W (Platte Chem. Co.)	NO	Y	Y	Y	Y	NO	Y
Clean Crop Simazine 90 WDG (Platte Chem. Co.)	Y	Y	Y	Y	Y	N	Y
Derby (Ciba-Geigy)	Y	Y	Y	Y	Y	Y	Y
Esteron* 99 (Rhone-Poulenc)		Y	Y	Y	Y		Y
Expedite Grass & Weed II (Nomix)		Y	Y	Y	Y		Y
Expedite Grass & Weed plus Residual Herbicide (Nomix)		Y	Y	Y	Y		Y
Finale (AgrEvo)		Y	Y	Y	Y		Y
Fusilade DX (Zeneca)	Y	Y	Y	Y	Y	Y	Y
Gallery 75 DF (DowElanco)		Y	Y	Y	Y		Y

Production by State - Herbicides - continued

Trade Name and Active Ingredient	IA	IL	IN	MI	MN	MO	WI
Goal 1.6E & Goal T/O (Rohm & Haas)	Y	Y	Y	Y	Y	Y	Y
Grandstand (DowElanco)		NO	NO	NO	NO		NO
Kerb 50-W & Kerb WSP T & O (Rohm & Haas)	Y	Y	Y	Y	Y	Y	Y
Nomix Delete (Nomix)			Y	Y	Y		Y
Pendulum 3.3 EC & WDG* Industrial (Amer.Cyanamid)	Y	Y	Y	Y	Y	Y	Y
Princep 4L, Liquid for T/O, Caliber 90DF for T/O (Ciba Geigy)	Y	Y	Y	Y	Y	Y	Y
Prism, (Valent)	Y	Y	Y	Y	Y	Y	Y
Roundup (Monsanto)	Y	Y	Y	Y	Y	Y	Y
Roundup WSD & DRYpak (Monsanto)	Y	Y	Y	Y	Y	Y	Y
Shotgun Flowable (Platte Chemical Co.)	Y	Y	Y	Y	Y	Y	Y
Sim-Trol 90DF (Sostram Corp.)	NO	Y	NO	Y	Y	NO	Y
Sim-trol 4L (Sostram Corp.)	NO	Y	NO	Y	Y	NO	Y
Simazine 4L (Drexel)		NO	Y	Y	NO		Y
Simazine 4L (Platte Chem. Co.)	Y	Y	Y	Y	Y	Y	Y
Simazine 4L, 90 DF Riverside/Terra)	Y	Y	Y	Y	Y	Y	Y
Simazine 90DF (Drexel)		NO	NO	NO	NO		NO
Snapshot 2.5 TG (DowElanco)		Y	Y	Y	Y		Y
Stinger (DowElanco)		Y	Y	Y	Y		Y
Surflan A.S. (DowElanco)		Y	Y	Y	Y		Y
Vantage (BASF)	Y	Y	Y	Y	Y	Y	Y
Velpar (DuPont)	Y	Y	Y	Y	Y	Y	Y
Velpar L (DuPont)	Y	Y	Y	Y	Y	Y	Y
XL 2G, (DowElanco)		Y	Y	Y	Y		Y

FUNGICIDES

Trade Name and Active Ingredient	IA	IL	IN	MI	MN	MO	WI
Bayleton 50% DF (Bayer Corp.)	Y	Y	Y	Y	Y	Y	Y
Benlate (Dupont)		NO	Y	Y	Y		Y
Bravo Ultrex, 720, 500, & 90DG (ISK Biosciences)	Y	Y	Y	Y	Y	Y	Y
Bravo W-75 (ISK Biosciences)	Y	Y	Y	Y	NO	Y	Y
Carbamate WDG (FMC)		Y	Y	Y	Y		Y
Daconil Ultrex, 2787 WDG & 2787 Flowable (ISK Biosciences)	Y	Y	Y	Y	Y	Y	Y
Dithane DF & Dithane M-45 (Rohm & Haas)	Y	Y	Y	Y	Y	Y	Y
Echo 90DF & 500 T & O (Sostram)	Y	Y	Y	Y	Y	Y	Y
Echo 720 (Sostram)	NO	Y	Y	Y	Y	Y	Y
Evade Flowable (Platte Chem. Co)	NO	NO	NO	NO	Y	NO	Y
Kocide LF, 101 & DF (Griffin Corp)	Y	Y	Y	NO	Y	Y	Y
Protect T/O (W.A. Cleary Chem. Corp)		Y	Y	Y	Y		Y
Reach (Isk Biosciences)	NO	Y	Y	Y	NO	Y	Y
Subdue 2E (Ciba-Geigy)	Y	Y	Y	Y	Y	Y	Y
Tenn-Cop 5E (Boliden Intertrade Inc/Griffin)	Y	Y	Y	NO	Y	Y	Y
Terranil 90DF & 6L (Riverside/Terra)	Y	Y	Y	Y	Y	Y	Y
Thalonil 90DF, 90DF WSP & 4L (Riverside/Terra)	Y	Y	Y	Y	Y	N	Y
Ziram 76DF (Elf Atochem)		Y	Y	Y	Y		NO

INSECTICIDES

Trade Name and Active Ingredient	IA	IL	IN	MI	MN	MO	WI
Ambush 25W (Zeneca, Inc.)	Y	Y	Y	Y	Y	Y	Y
Ambush 25W in WSP (Zeneca, Inc.)	Y	Y	Y	Y	Y	Y	Y
Ambush, (Zeneca, Inc.)	Y	Y	Y	Y	Y	Y	Y
Asana XL (DuPont)	Y	Y	Y	Y	Y	Y	Y
Azinphos-50 WSB (Gowan Co.)	Y	Y	Y	Y	Y	NO	Y
Azinphos-M 50W Azinphos methyl (Gowan Co.)	NO	Y	Y	Y	Y	Y	NO
Azinphosmethyl 50W (Micro Flo Co.)		Y	Y	Y	Y		NO
Baythroid 2 (Bayer Corp)	NO	NO	NO	SLN	NO	NO	NO
Carbaryl 2L (Drexel)		NO	NO	NO	NO		NO
Carbaryl 4L (Drexel)		NO	Y	Y	Y		NO
Clean Crop Carbaryl 50WP & 4L (Platte Chem Co.)	Y	Y	Y	Y	Y	Y	Y
Clean Crop Dimethoate 2.67EC (Platte Chem. Co.)	Y	Y	Y	Y	Y	Y	Y
Di-Syston 15% Granular (Bayer Corp.)	Y	Y	Y	Y	Y	Y	Y
Diazinon 50 WP (Drexel)		NO	NO	NO	NO		NO
Diazinon Insecticide (Drexel)		Y	Y	NO	Y		Y
Dimilin 25W (Uniroyal Chem. Co.)	Y	Y	Y	Y	Y	Y	Y
Dycarb 76 WP (Scotts-Sierra)	Y	Y	Y	Y	Y	Y	Y
Furadan 4F (FMC Corp)		Y	Y	Y	Y		Y
Guthion 2L (Bayer Corp.)	NO	NO	NO	NO	NO	Y	NO
Guthion 2S (Bayer Corp.)	Y	Y	Y	Y	Y	Y	Y
Guthion 3 FI (Bayer Corp.)	Y	Y	Y	Y	Y	Y	Y
Guthion Solupak 50% Wettable Powder (PVA (Bayer Corp.)	Y	Y	Y	Y	Y	Y	Y

Production by State - Insecticides - continued

Trade Name and Active Ingredient	IA	IL	IN	MI	MN	MO	WI
Imidan 50-WP,70-WSB and 70-WP (Gowan)	Y	Y	Y	Y	Y	Y	Y
Imidan 50-WSB (Gowan)	NO	NO	NO	Y	Y	NO	NO
Lindane 20% (Drexel)		NO	NO	NO	NO		Y
Lorsban 4E (DowElanco)		Y	Y	Y	Y		Y
M-Pede (Mycogen Corp)	Y	Y	Y	Y	Y	Y	Y
Mavrik (Sandoz Agro)	Y	Y	Y	Y	Y	Y	Y
Methyl Parathion 4E (Drexel)		NO	NO	NO	NO		NO
Methyl Parathion 7.5EC (Cheminova Inc.)		NO	Y	NO	Y		NO
Omite-CR (Uniroyal Chem. Co)	NO	Y	NO	Y	NO	NO	NO
Orthene Turf, Tree & Ornamental Spray, and Orthene Turf, Tree & Orn. Spray WSP (Valent)	Y	Y	Y	Y	Y	Y	Y
Parathion 8 (Drexel)		NO	NO	NO	NO		NO
Pentac Aquaflow (Sandoz Agro)	Y	Y	Y	Y	Y	Y	Y
Precision Insect Growth Regulator (Ciba-Geigy)	Y	Y	Y	Y	Y	Y	Y
Provado 1.6 Flowable (Bayer Corp)	Y	Y	Y	Y	Y	Y	Y
Sevin XLR Plus (Rhone-Poulenc)		Y	Y	SUP	Y		Y
Sniper 50 PVA (Platte Chem. Co.)	NO	NO	Y	Y	NO	NO	Y
Sunspray Ultra-Fine Spray Oil (Sun Co., Inc)	Y	Y	Y	Y	Y	Y	Y
Talstar 10 WP (FMC)	NO	SLN	NO	SLN	NO	NO	NO
Talstar 10WP (FMC)	NO			Y		NO	NO

CHRISTMAS TREE PESTICIDES

Herbicides

Trade Name and Active Ingredient	Signal Word	Weeds Controlled	Registered for use on	Type of Use	Rate per acre	Application Directions	Comments
2,4-D L.V. 4 Ester & 2,4-D L.V. 6 Ester (Riverdale Chem .Co) 2,4-D ai.	Caution	Postemergence control of broadleaf weeds, herbaceous perennials and woody plants.	Christmas trees.	SP or DS	1 to 2 pt product/A (L.V. 4 Ester form). 0.6 to 1.3 pt/A. (L.V. 6 Ester form) ——————— Same rates as for Douglas fir.	Douglas fir only. Apply over the top when the trees are dormant, prior to bud break. ——————— Conifers of all species. Direct spray at weeds.	Do not spray over the tops of pines or true firs (Abies spp.). Avoid contact with Christmas tree foliage.
Accord, Glyphosate (Monsanto)	Caution	Nonselective postemergence control or partial control of woody brush, trees and herbaceous weeds.	Christmas Trees.	SP or DS	Pre-planting, 2 to 10 qt/A (broadcast) or 5 to 10% by volume (low volume directed spray). Post-planting directed spray, 2% spray solution for woody brush and trees, and 1 to 2% for herbaceous weeds.	Apply to actively growing brush and trees after leaf expanion and before fall color and leaf drop.	Avoid contact with green foliage and green bark of Christmas trees.
Asulox, Sodium salt of asulam (Rhone-Poulenc)	Caution	Post-emergence grass control and Western bracken.	Christmas tree plantings where Scotch pine, and Douglas, grand and noble firs are grown.	OTD	Ground application use a minimum of 20 gal of solution/A, or 10 gal solution/A for aerial application.	Apply as a water mix spray. For ground application use a minimum of 20 gal of solution/A. For aerial application, use a minimum of 10 gal solution /A.	Do not use a wetting agent. Apply in late summer after hardening of new tree growth.
Atrazine 4L, (Riverside /Terra Corp) or AAtrex 4L (Ciba-Geigy) or Atrazine 4L (Drexel)	Caution, Restricted	Controls many annual broadleaf and grass weeds. May be applied before or after the weeds emerge.	Conifers: Prior to transplanting, after transplanting or in established conifers (including Scotch and Austrian pine, blue spruce, Douglas and Concolor (white fir) fir, as well as others.	OTD	Broadcast 4 to 8 pt in a minimum of 5 gal of water/A by air, or 10 gal by ground.	Apply to established trees between fall and spring while trees are still dormant.	Drexel products registered for use on Christmas trees. Other products registered for use on conifers. Avoid using in well drained soils, particularly in areas having high groundwater tables. Apply before weeds are 1.5 in tall. Prior to transplanting, allow sufficient precipitation to

Christmas Tree Pesticides - Herbicides (continued)

Trade Name and Active Ingredient	Signal Word	Weeds Controlled	Registered for use on	Type of Use	Rate per acre	Application Directions	Comments
Atrazine (continued) Atrazine 90DF (Riverside /Terra Corp) or AAtrex Nine-O & AAtrex Accu-Pak (Ciba-Geigy) or Atrazine 90 DF (Drexel) ai. Atrazine				OTD	Broadcast 2.2 to 4.4 lb in a minimum of 5 gal water/A by air or 10 to 40 gal by ground.	For new transplants, apply during or soon after transplanting.	activate herbicide before transplanting. See label for additional instructions for quackgrass control etc.
Atrazine 5L, Atrazine (Drexel)	Caution	Same as Atrazine 4L (Riverside /Terra Corp.).	Same as Atrazine 4L (Riverside /Terra Corp.).	OTD	Broadcast 3.2 to 6.4 pt in a minimum of 5 gal of water/A by air, or 10 gal by ground.	Same as Atrazine 4L (Riverside /Terra Corp.).	Same as Atrazine 4L (Riverside/Terra Corp.)
Clean Crop Atrazine 4L, Atrazine (Platte Chem. Co.) Clean Crop Atrazine 90 WDG, Atrazine (Platte Chem. Co.)	Caution Restricted	Same as Atrazine 4L (Riverside /Terra Corp).	Same as Atrazine 4L (Riverside /Terra Corp).	OTD OTD	Broadcast 2 to 4 qt in a minimum of 5 gal of water/A by air, or 10 gal by ground. Broadcast 2.2 to 4.4 lb in a minimum of 5 gal water/A by air or 10 gal by ground.	Same as Atrazine 4L (Riverside /Terra Corp.).	Same as Atrazine 4L (Riverside /Terra Corp.).
Clean Crop Simazine 80W, Simazine (Platte Chem. Co.)	Caution	Same as Princep 4L.	Christmas Trees: Austrian, red, Scotch, and white pine, blue, white, red, and Norway spruce, Douglas, balsam and Fraser fir, others.	OTD	Apply 2.5 to 5 lb/A in at least 25 gal of water after trans-planting. Use the same rate for annual maintenance appli-cations.	Same as Princep 4L.	Do not apply to Christmas tree transplants less than three yrs old (Clean Crop Simazine). Do not apply to Christmas tree transplants less than two yr old (Princep 80W). Do not apply more than once a year, except as

Trade Name and Active Ingredient	Signal Word	Weeds Controlled	Registered for use on	Type of Use	Rate per acre	Application Directions	Comments
Clean Crop Simazine 80W (continued)					For quackgrass control apply 5 lb/A in the fall, or apply a split application of 2.5 lb/A in the fall, plus 2.5 lb/A in the early spring after quackgrass begins growth.		directed for quackgrass control.
Clean Crop Simazine 90 WDG, Simazine (Platte Chem. Co.)	Caution	Same as Princep 4L.	Same as Clean Crop Simazine 80W, except for the addition of white fir.	OTD	Same as Princep Caliber 90, Simazine (Ciba Geigy).	Same as Princep 4L.	Same as Clean Crop Simazine 80W.
Derby, Metolachlor & Simazine (Ciba-Geigy)	Caution	Annual grasses, certain broadleaf weeds and yellow nutsedge.	Christmas trees such as balsam, concolor and Fraser fir, Norway, Colorado and Black Hills spruce, white and Scotch pine.	DS	Apply 60 to 100 lb/A. Use lower rate on soils with low organic matter.	Apply before grass, broadleaf weeds, or yellow nutsedge emerge or after existing weeds have been removed.	Do not make more than 2 applications per yr. If granules adhere to foliage irrigate (overhead) to rinse off.
Esteron* 99, 2,4-D (Rhone-Poulenc)	Caution	For the postemergence control of broadleaf weeds, herbaceous perennials and woody plants.	Directed sprays in conifer plantations (including pine). Note: Label did not use the word Christmas trees.	SP or DS	Rates not to exceed 4 qt/A in oil, oil-water, or water carrier at 10 to 100 gal per acre.	Apply during warm weather when broadleaf weeds or brush is actively growing.	Avoid contact with needles. Repeat applications may be necessary with deep rooted perennials such as Canada thistle and many woody plants.
Expedite Grass & Weed II, Glyphosate (Nomix)	Caution	Nonselective post-emergence control.	Christmas trees.	DS	1.5 to 3.0 gal product/A.	Apply as a directed uniform spray over the foliage of undesirable vegetation.	Apply to actively growing weeds. Avoid direct contact with green foliage of desirable plants. Use only Expedite application equipment when applying this product.

Trade Name and Active Ingredient	Signal Word	Weeds Controlled	Registered for use on	Type of Use	Rate per acre	Application Directions	Comments
Expedite Grass & Weed plus Residual Herbicide & Nomix Delete, Glyphosate + Oryzalin (Nomix)	Caution	Nonselective post-emergence and selective pre-emergence.	Christmas trees.	DS	The recommended rate range for this product represents 6 to 8 lb total active ingredient or 3 to 4 gal of product/A.	Apply as a directed uniform spray over the foliage of undesirable vegetation.	Preemergence portion of this product will remain stable on the soil surface up to 21 days. Avoid direct contact with green foliage of desirable plants. Use only Expedite application equipment when applying this product.
Finale, Glufosinate-ammonium (AgrEvo)	Warning	Nonselective post-emergence control of annual and perennial grass and broadleaf weeds. Also certain woody species.	Christmas trees: site preparation prior to planting and as a post directed spray.	SP or DS	1.5 to 4 fl oz/1 gal water. 2 to 6 qt/A. Use a min. of 20 gal water/A.	Spot or directed spray. Broadcast or boom applications.	Christmas trees may be planted into treated areas after REI of 12 hr has lasped. Avoid contact with green foliage and green bark of Christmas trees.
Fusilade, Fluazifop-p-butyl (Zeneca Turf and Ornamental)	Caution	Selective postemergence annual and perennial grass control. Does not control sedges.	Christmas trees. Use directed spray with Fraser fir.	OTG	Apply 16 to 24 oz/A plus 1% crop oil concurrently (2 pt/25 gal) or 0.25% of a nonionic surfactant.	Make application when grasses are 2 to 8 in tall, but before tillering and/ or heading.	Avoid contact of spray with Fraser fir foliage.
Gallery 75 Dry Flowable, Isoxaben (DowElanco)	Caution	Preemergence control of certain broadleaf weeds.	Same as Snapshot 2.5 TG.	OTD	Apply at 0.66 to 1.33 lb/A. Use 10 to 200 gal water carrier/A.	Apply in late summer to early fall, in early spring, or anytime prior to germination of target weeds.	Apply only to established plantings. A single rainfall or irrigation is necessary of 0.5 in or more.
Goal 1.6E & Goal Turf and Ornamental, Oxyfluorfen (Rohm & Haas)	Warning	Applied post-emergence will provide both postemergence and preemergence control of many broadleaf weeds and grasses.	Conifer transplants including Christmas tree plantings: Fraser, grand and noble fir, Douglas Fir, Scotch, Austrian, and Eastern white pine, Norway and blue spruce, as well as others.	OTD	Apply 5 to 10 pt product/A.	Preemergence application should be made immediately after transplanting seedings. Apply postemergence application to weeds less than 4 inches tall. Two applications my be necessary, in fall transplanted conifer fields, for season long control.	Registered for use on recently transplanted seedings. Apply only to conifer transplant prior to bud break or after the foliage has had an opportunity to harden off.

Christmas Tree Pesticides - Herbicides (continued)

Trade Name and Active Ingredient	Signal Word	Weeds Controlled	Registered for use on	Type of Use	Rate per acre	Application Directions	Comments
Grandstand, Triclopyr (DowElanco)	Danger	Woody plants and annual and broadleaf weeds. Post emergence activity.	Christmas trees.	DS	Apply 2 to 5 pt product/A as a foliar spray directed to the base of the Christmas trees. Can be applied as a broadcast spray in bands between the rows of planted trees.	Applications should be made when woody plants and weeds are actively growing. Apply in the late summer and early Autumn after the Christmas trees have hardened off and before the leaves of the target plants drop off.	Use in established plantations that were planted at least 1 full year prior to application. Spray solution can cause needle and branch injury. Injury is less on blue spruce, white spruce, balsam and Fraser fir, than on white pine and Douglas fir. Registered in MO. Not registered in IN, IA, IL, MN, MI or WI.
Kerb 50-W & Kerb WSP Turf & Ornamental, Pronamide (Rohm & Haas)	Caution Restricted	Preemergence and post-emergence control of winter annual and perennial grasses and certain broadleaf weeds.	Christmas trees.	OTD	2.0 to 4.0 lb product/A.	Fall application prior to leaf drop and soil freeze up.	Most active in coarse to medium textured soils low in organic matter. Use only on established trees. Do not apply to fall transplanted stock less than one year old, or to spring transplanted stock transplanted less than six months.
Pendulum 3.3 EC, Pendimethalin (American Cyanamid)	Caution	Preemergence control of grasses and certain broadleaf weeds.	Christmas trees: Austrian, and Scotch pine, Douglas, balsam and concolor (white) fir, Colorado Blue and white spruce.	OTD	Short term control (2 to 4 mo): 2.4 qt/A (1.8 fl oz/1000 sq ft). Long term control (6 to 8 mo): 4.8 qt/A (3.5 fl oz/1000 sq ft).	Will not control established weeds.	Apply only to established plantations. It can be sprayed directly over the top of established trees. Efficacy will be improved if the application is followed by 0.5 in rainfall or irrigation.
Pendulum WDG Industrial, Pendimethalin (American Cyanamid Co.)	Caution	Same as Pendulum 3.3 EC.	Christmas trees: Austrian, Scotch and white pine. Douglas, balsam, Fraser and concolor (white) fir, Colorado Blue, Norway and white spruce.	OTD	Short term control (2 to 4 mo): 3.3 lb/A (1.2 oz. /1000 sq ft). Long term control (6 to 8 mo): 6.6 lb/A (2.4 oz/1000 sq ft).	Same as Pendulum 3.3 EC.	Same as Pendulum 3.3 EC.

Christmas Tree Pesticides - Herbicides (continued)

Trade Name and Active Ingredient	Signal Word	Weeds Controlled	Registered for use on	Type of Use	Rate per acre	Application Directions	Comments
Princep 4L & Princep Liquid for Turf and Ornamental (Ciba Geigy) or Simazine 4L (Drexel) ai Simazine	Caution	Preemergence control of annual broadleaf and grass weeds.	Christmas trees: Austrian, red, Scotch, and white pine. Blue, white, Norway and red spruce. Douglas, balsam, Fraser and white fir, others.	OTD	2 to 4 qt in at least 25 gal of water/A after transplanting. Use the same rate for annual maintenance applications. For quackgrass control apply 4 qt/A in the fall, or apply a split application of 2 qt/A in the fall plus 2 qt/A in the early spring, after quackgrass begins growth.	Apply before weeds emerge or after removal of weed growth.	To avoid injury do not apply to Christmas trees less than 2 yr of age. Do not use until the soil is firmly settled around roots. Do not apply more than once a year, except as directed for quackgrass control. Soil moisture is needed to move herbicide into the root zone where it can be absorbed.
Princep Caliber 90 & Princep DF for Turf and Ornamental (Ciba Geigy) or Simazine 90DF (Drexel) ai. Simazine	Caution	Same as Princep 4L.	Same as Princep 4L.	OTD	Apply 2.2 to 4.4 lb /A. Apply 4.4 lb/A (quackgrass control). Same directions as Princep 4L.	Same as Princep 4L.	Same as Princep 4L
Prism, Clethodim (Valent)	Warning	Selective postemergence herbicide for control of annual and perennial grasses. Does not control sedges or broadleaf weeds.	Christmas trees, including pines, firs, spruces, and cedars.	No information available.	Annual grasses,13 to 17 fl oz/A. Perennial grasses, 17 to 34 fl oz/A.	Use a crop oil concurrently containing at least 15% emulsifer at 1% v/v (but not less than 1 pt/A) in the finished spray.	Do not apply a postemergence broadleaf herbicide within one day following an application of Prism, or reduced grass control may result. Do not apply more than 68 fl oz Prism (0.5 lb ai) /A/season.

Trade Name and Active Ingredient	Signal Word	Weeds Controlled	Registered for use on	Type of Use	Rate per acre	Application Directions	Comments
Roundup, Glyphosate (Monsanto)	Warning	Nonselective. Emerged annual and perennial weeds. Woody brush and trees.	Christmas trees. Pine, spruce, fir, as well as other tree species.	SP or DS	8 to 32 fl oz/A.	Can be applied preplant (site preparation) or post-directed. Spray on actively growing foliage of undesirable vegetation. No residual control.	Avoid contact with green foliage and green bark of Christmas trees. Nonionic surfactants may increase performance. Do not exceed more than 10.6 qt/A/yr.
Roundup WSD or Roundup DRYpak, Gyphosate (Monsanto)	Caution	Same as Roundup.	Christmas trees.	SP or DS	Roundup WSD: for annual weeds use 0.3 to 0.6 oz of product /1 gal spray solution. Use 1.1 oz/1 gal solution for harder to control perennials. Roundup DRYpak: Use 1 pak/1 gal water.	Same as Roundup.	Same warnings as Roundup. Rates are for high volume equipment (Roundup WSD).
Shotgun Flowable, Atrazine & 2,4-D (Platte Chemical Co.)	Danger Restricted	Controls or suppresses annual broadleaf and perennial broadleaf weeds as well as certain grasses.	Established conifers, including Christmas trees.	OTD	Apply 3.5 to 7 qt/A as a directed spray between and around conifers. Use ground application equipment only.	Apply in early spring when weeds are small and actively growing, and before budbreak of conifers. Quackgrass should be less than 1.5 in and treated with 7 qt/A.	Avoid using in sand and loamy sand soils where the water table is close to the surface. Apply only once per 12 mos. Do not use on coarse soils if conifer injury cannot be tolerated. Keep spray off conifer shoot growth.
Simazine 4L, Simazine (Platte Chem. Co.) & (Riverside/Terra)	Caution	Preemergence control annual broadleaf and grass weeds. At higher rates in non-crop areas it also controls many perennial broadleaf and grass weeds.	Christmas Trees: Austrian, Scotch, white and red pine, Norway, blue, red and white spruce, Douglas, Fraser and balsam fir, White fir (Riverside/Terra label only).	OTD	Apply 2 to 4 qt in at least 25 gal water/A after transplanting. Use the same rate for annual maintenance.	Apply before weeds emerge or after removal of weed growth.	Do not apply to Christmas tree transplants less than three yr old. Do not apply more than once a year, except as directed for quackgrass control (see label).

Christmas Tree Pesticides - Herbicides (continued)

Trade Name and Active Ingredient	Signal Word	Weeds Controlled	Registered for use on	Type of Use	Rate per acre	Application Directions	Comments
Simazine 90 DF, Simazine (Riverside/Terra Corp)	Caution	Same as Simazine 4L.	Same as Simazine 4L.	OTD	Apply 2.2 to 3.4 lb in at least 25 gal water/A after transplanting. Use the same rate for annual maintenance.	Same as Simazine 4L.	Same as Simazine 4L.
Sim-Trol 90DF, Simazine (Sostram Corp.)	Caution	Annual broadleaf and grass weeds.	Christmas Trees: Austrian, red, scotch and white pine. Norway, blue, and white spruce. Douglas, balsam, Fraser and concolor (white) fir, as well as others.	OTD	Apply 2.2 to 4.4 lb in at least 25 gal water/A in fall or spring after transplanting. Use same rate for annual maintenance applications. For quackgrass control apply 4.4 lb/A in the fall, or apply split application of 2.2 lb/A (fall) plus 2.2 lb/A (spring) after quackgrass begins growth.	Remove weed growth before application. Apply before weeds emerge.	Do not apply to Christmas tree transplants less than three yr old. Do not apply more than once a year, except as noted for quackgrass control. Use the lower rate on coarser textured soil and soil higher in organic matter.
Sim-trol 4L, Simazine (Sostram Corp.)	Caution	Same as Sim-Trol 90DF.	Same as Sim-Trol 90DF.	OTD	Same as above, except use 2 to 4 qt in at least 25 gal water/A. For quackgrass control, apply 4 qt /A (fall) or split application.	Same as Sim-Trol 90DF.	Same as Sim-Trol 90DF.

Trade Name and Active Ingredient	Signal Word	Weeds Controlled	Registered for use on	Type of Use	Rate per acre	Application Directions	Comments
Snapshot 2.5 TG, Trifluralin & Isoxaben (DowElanco)	Caution	Preemergence control of certain broadleaf weeds and annual grasses.	Christmas trees listed: Concolor fir, Austrian, white and scotch pine, blue spruce, others.	No information available	100 to 200 lb/A depending on weed species to be controlled.	Apply in late summer to early fall, or in early spring prior to germination of target weeds, or immediately after cultivation.	Do not apply to Christmas tree seedling transplant beds. A single rainfall or irrigation of 0.5 inch or more is necessary.
Stinger, Clopyralid (DowElanco)	Caution	Postemergence control of broadleaf weeds.	Christmas trees. Can be applied over the top of actively growing balsam, Fraser, Douglas, noble, and grand fir. Also blue and white spruce, and lodgepole and ponderosa pine.	OTG	Apply 0.25 to 0.5 pt/A for control of annual weeds. Apply 0.5 to 0.66 pt/A for difficult to control weeds such as Canada thistle and knapweed. Apply as a broadcast or band application in a minimum of 10 gal water/A by ground application.	Apply to actively growing weeds. For control of annual broadleaf weeds apply up to the 5 leaf stage.	Do not exceed 0.66 pt/A. Do not exceed 0.5 pt/A for blue spruce. The addition of a surfactant or crop oil may result in tree injury.
Surflan A.S., Oryzalin (DowElanco)	Caution	Preemergence control of most annual grasses and certain broadleaf weeds.	Christmas trees: Fir (*Abies* spp.), pine (*Pinus* spp.) and spruce (*Picea* spp.). Do not apply to Douglas fir (*Pseudotsuga menziesii*).	OTD	For 2 to 4 mo control, use 2 qt/A. For 4 to 8 mo control, use 4 qt/A.	Apply as a directed spray to the soil surface or as an over- the-top spray to established plantings.	Apply only to established plantings.

Trade Name and Active Ingredient	Signal Word	Weeds Controlled	Registered for use on	Type of Use	Rate per acre	Application Directions	Comments
Vantage, Sethoxydim (BASF)	Caution	Selective broad spectum post emergence herbicide for the control of annual and perennial grasses.	Christmas tree farms: many fir (*Abies*), pine, spruce spp. listed. Douglas fir and Canada hemlock also listed.	OTG	2.25 pt/A 3.75 pt/A 3.75 pt/A 2.25 pt/A	Annual grasses up to 6 inches. Annual grasses up to 12 in. Perennial Grass (Quack-grass, Johnsongrass, and Bermudagrass) Perennial Grass (Wirestem Muhly)	See label for rates and tree species that can be treated with Vantage/Goal 1.6E or Vantage/Stinger tank mixes. Vantage can also be used to supress tall fescue being grown as a desirable ground cover.
Velpar L, Hexazinone (DuPont)	Danger	Provides both contact and residual control of many woody plants and annual, biennial and perennial weeds.	Christmas trees: Austrian and Scotch Pine. Grand and Noble Fir. Sitka spruce.	OTD	Use 4 to 6 pt/A in first yr. plantings. Use 4 to 8 pt/A in established trees. Rate is determined by soil texture. See label for specific instructions.	Apply as a broadcast spray before bud break. Use directional spray post bud break and avoid contact with foliage.	Do not use on stressed trees. Do not use on poorly drained soils. Do not use on gravelly soils, or sandy soil with 85% or more sand. See label for additional information.
Velpar, Hexazinone (DuPont)	Danger	Same as Velpar L.	Same as above.	OTD	Use 1 to 1.5 lb/A in first yr plantings. Use 1 to 2 lb/A in established trees. Rate is determined by soil texture. See label for specific instructions.	Same as Velpar L.	Same as Velpar L.

Trade Name and Active Ingredient	Signal Word	Weeds Controlled	Registered for use on	Type of Use	Rate per acre	Application Directions	Comments
XL 2G, Benefin & Oryzalin (DowElanco)	Caution	Preemergence control of annual grasses and broadleaf weeds.	Christmas trees: Concolor, balsam, Fraser and grand fir, Norway, white, black and blue spruce, Pine species.	OTD	Apply 200 to 300 lb/A. Repeat application of 200 lb/A and higher should not be made sooner than 90 days after a previous application of XL 2G.	Apply prior to germination or after cultivation.	Apply only to established plantings. A single rainfall or irrigation of 0.5 inches or more is necessary to activate. Do not apply over 900 lb/A /12 months. Do not apply to Douglas fir (*Pseudotsuga menziesii)* or Eastern Hemlock (*Tsuga canadensis*).

Fungicides

Fungicide Trade Name/ Active Ingredient	Signal Word	Diseases Controlled	Rate per acre	Application Directions	Comments
Bayleton 50% Dry Flowable Bayleton (Bayer Corp.)	Caution	Stem and cone rusts *Cronartium* spp. (*Fusiform*) *Peridermium* spp. *Endocronartium harknessii* (*Gall*). Tip blight, *Sirococcus strobilinus*	8 oz/A.	For rusts, begin application when the needles break through the fascicle sheath. Make additional applications at 14 to 21 day intervals. Stop when galls become pale to white in color. For tip blight, begin appl. to coincide with bud break. Make 2 additional applications at 14-day intervals.	Registered for use on Christmas trees except concolor fir. Apply a maximum of 64 oz./A /season.
Benlate, Benomyl (Dupont)	Caution	Tip blight (*Diplodia*) on Austrian, red and Scotch pine. Swiss needlecast (SN) (Phaecryptopus) and Rhabdocline needlecast (RN) on Douglas fir.	16 oz/100 gal water/A. 16 oz/50 gal water/A.	Apply at bud break. Repeat 10 to 14 days later, just before needles emerge from sheath; repeat again in 10 to 14 days after needles emerge. Apply initially in early May. Repeat at 4 wk intervals.	Registered for use on Conifers (pine). For tip blight-Limit, 48 oz (3 lb)/A. For SN and RN-Limit, 80 oz (5 lb)/A.
Bravo 90 DG & Daconil 2787 WDG, (ISK Biosciences) or Terranil 90DF & Thalonil 90 DF (Riverside/ Terra Corp.) or Echo 90DF (Sostram) A.I. Chlorothalonil	Danger	Swiss needlecast Scleroderris canker (pines) and Swiss needlecast (Douglas fir). Sirococcus tip blight. Rhizosphaera needlecast (spruces), Scirrhia brown spot (pines).	2.25 to 4.50 lb. 1.13 to 2.25 lb. 1.75 to 3.0 lb. 4.5 lb.	Single application technique: Make one application in the spring when the new shoot growth is 1/2 to 2 inches in length. Make the first application in spring when new shoot growth is 1/2 to 2 inches in length. Make additional applications at 3 to 4 wk intervals until the conditions no longer favor disease development.	Registered for use on Christmas trees. Daconil 2787 WDG is not registered single application method of Swiss needlecast.

Christmas Tree Pesticides - Fungicides (continued)

Fungicide Trade Name/ Active Ingredient	Signal Word	Diseases Controlled	Rate per acre	Application Directions	Comments
Bravo 90 (continued)		Cyclaneusma and Lophodermium needlecasts (pines). Rhabdocline needlecast (Douglas fir).	2.25 to 4.5 lb. 1.13 to 2.25 lb.	Apply in early spring prior to budbreak. Repeat applications at approximately 6 to 8 wk. intervals, until spore release ceases in late fall. Apply monthly during periods of frequent rainfall. During drought periods, app. may be suspended, then resumed upon the next occurence of needle wetness. Apply at budbreak and repeat at 3 to 4 wk intervals until needles are fully elongated and the conditions no longer favor disease development. In plantations of mixed provenance, or when irregular budbreak occurs, apply weekly until all trees have broken bud, then every 3 to 4 wk as specified above.	
Bravo 500 & Daconil 2787 (ISK Biosciences) or Thalonil 4L (Riverside/Terra) or Evade Flowable, (Platte Chem. Co) or Echo 500 (Sostram Corp), A.I. Chlorothalonil	Warning	Swiss needlcast. Scleroderris canker (pines), Swiss needlecast, and Rhabdocline needlecast. Sirococcus tip blight.	4 to 8 pt. 2 to 4 pt. 3 to 5 pt.	Single application technique: Make one application in the spring when the new shoot growth is 1/2 to 2 inches in length. Make the first application in spring when new shoot growth is 1/2 to 2 inches in length. Make additional applications at 3 to 4 wk. intervals	Registered for use on Christmas trees. Thalonil 4L is registered on "Ornamentals and Conifers". It is not registered for single application method on Swiss needlecast. Echo 500 is not registered in WI. Rhabdocline needlcast (Douglas fir) is associated with these directions on the Thalonil 4L, Echo 500, and Evade Flowable labels.

Fungicide Trade Name/ Active Ingredient	Signal Word	Diseases Controlled	Rate per acre	Application Directions	Comments
Bravo 500 (continued)		Rhizosphaera needlecast (spruces), Scirrhia brown spot (pines).	8 pt.	until the conditions no longer favor disease development.	See below for Rhabdocline needlcast instructions associated with Bravo 500 and Daconil 2787.
		Rhabdocline needlecast (Douglas fir).	2 to 4 pt.	Apply at budbreak and repeat at 3 to 4 wk intervals until needles are fully elongated and the conditions no longer favor disease development. In plantations of mixed provenance, or when irregular budbreak occurs, apply weekly until all trees have broken bud, then every 3 to 4 wk as specified above.	Different directions on the Thalonil 4L, Echo 500, and Evade Flowable labels. These directions are for Bravo 500 and Daconil 2787 only.
		Cyclaneusma and Lophodermium needlecasts (pines).	4 to 8 pt.	Apply in early spring prior to budbreak. Repeat applications at approximately 6 to 8 wk intervals, until spore release ceases in late fall. Apply monthly during periods of frequent rainfall. During drought periods, application may be suspended, then resumed upon the next occurrence of needle wetness.	Cyclaneusma is not on the Thalonil 4L label. See separate instruction rate for Lophodermium needlecast.
		Lophodermium needlecast	2 to 4 pt.	NC and NE states: Begin applications in mid-July to early August before infection occurs. Make additional applications until conditions no longer favor disease development.	Only on the the Thalonil 4L, Echo 500, and Evade Flowable labels.

Fungicide Trade Name/ Active Ingredient	Signal Word	Diseases Controlled	Rate per acre	Application Directions	Comments
Bravo 720, Bravo W-75 & Bravo Weather Stik (ISK Biosciences) or Terranil 6L (Riverside/Terra) or Echo 720 (Sostram) A.I. Chlorothalonil	Warning	Swiss needlecast.	2.75 to 5.5 pt.	Single application technique: Make one application in the spring when the new shoot growth is 1/2 to 2 inches in length.	Bravo 720 and W-75 are registered for use on Christmas trees. Bravo Weather Stik and Terranil 6L are registered on conifers, Christmas trees are referred to in the control of Swiss needle cast directions.
		Scleroderris canker (pines) and Swiss needlecast.	1.5 to 2.75 pt.	Make the first application in spring when new shoot growth is 1/2 to 2 inches in length. Make additional applications at 3 to 4 wk intervals until the conditions no longer favor disease development.	
		Sirococcus tip blight.	2 to 3.5 pt.		
		Rhizosphaera needlecast (spruces), Scirrhia brown spot (pines).	5.5 pt.		
		Cyclaneusma and Lophodermium needlecasts (pines).	2.75 to 5.5 pt.	Apply in early spring prior to budbreak. Repeat applications at approximately 6 to 8 wk intervals, until spore release ceases in late fall. Apply monthly during periods of frequent rainfall. During drought periods, applications may be suspended, then resumed upon the next occurence of needle wetness.	Cyclaneusma needlecast is not on the Bravo W-75 label. Bravo W-75 also has different directions for Lophodermium needlecast.
		Lophodermium needlecast.	1.5 to 2.75 lb.	NC and NE states: Begin applications in mid-July to early August before the infection occurs. Make additional applications at 3 to 4 wk. intervals until the conditions no longer favor disease development.	Only on the Bravo W-75 Label.

Christmas Tree Pesticides - Fungicides (continued)

Fungicide Trade Name/ Active Ingredient	Signal Word	Diseases Controlled	Rate per acre	Application Directions	Comments
Bravo 720 (continued)		Rhabdocline needlecast (Douglas fir).	1.5 to 2.75 pt.	Apply at budbreak and repeat at 3 to 4 wk intervals until needles are fully elongated and the conditions no longer favor disease development. In plantations of mixed provenance, or when irregular budbreak occurs, apply weekly until all trees have broken bud, then every 3 to 4 wk as specified above.	Not on the Bravo W-75 label.
Bravo Ultrex & Daconil Ultrex, Chlorothalonil (ISK Biosciences)	Danger	Swiss Needlecast. Scleroderris canker (pines), Swiss needlecast. Sirococcus tip blight. Rhizosphaera needlecast (spruces), Scirrhia brown spot (pines). Cyclaneusma and Lophodermium needlecasts (pines) Rhabdocline needlecast (Douglas Fir)	2.5 to 5.0 lb. 1.25 to 2.5 lb. 1.8 to 3.2 lb. 5.0 lb. 2.5 to 5.0 lb. 1.4 to 2.5 lb.	Single application technique: Make one application in the spring when the new shoot growth is 1/2 to 2 inches in length. Make the first application in spring when new shoot growth is 1/2 to 2 inches in length. Make additional applications at 3 to 4 wk intervals until the conditions no longer favor disease development. Apply in early spring prior to budbreak. Repeat applications at approximately 6 to 8 wk. intervals, until spore release ceases in late fall. During drought periods, application may be suspended, then resume upon next occurrence of needle wetness. Apply at budbreak and repeat at 3 to 4 wk intervals until needles are fully elongated and conditions no longer favor disease development.	Registered for use on Christmas trees.

Christmas Tree Pesticides - Fungicides (continued)

Fungicide Trade Name/ Active Ingredient	Signal Word	Diseases Controlled	Rate per acre	Application Directions	Comments
Bravo Ultrex (continued)				In plantations of mixed provenance, or when irregular budbreak occurs, apply weekly until all trees have broken bud, then every 3 to 4 wk as specified above.	
Carbamate WDG, Ferbam (FMC)	Caution	Melampsora needle rust. Lophodermium Needlecast.	2 lb/100 gal water. 2 lb/100 gal water.	Single application in spring when new shoot growth is 0.5 to 2 in. in length. Begin application in spring or early summer before infection occurs. Repeat after heavy rains and every 10 to 14 days as long as needed.	Douglas fir Christmas trees Conifer
Dithane DF & Dithane M-45 Mancozeb, (Rohm & Haas)	Caution	Lophodermium needle cast, Pine gall rust, Scirrhia brown spot. Douglas Fir: Swiss needle cast.	1.5 lb per 100 gal dilute spray.	Begin application in spring or early summer before infection occurs. Repeat after heavy rains and at 2 wk intervals as long as needed.	Registered for use on Christmas trees.
Dithane F-45, Mancozeb (Rohm & Haas)	Caution	Same as Dithane DF and Dithane M-45.	1.2 qt per 100 gal dilute spray.	Same as Dithan DF and Dithane M-45.	Registered for use on Christmas trees.
Kocide LF, Copper Hydroxide (Griffin Corp) Kocide 101& Kocide DF, Copper Hydroxide (Griffin Corp)	Caution	Rhabdocline Needlecast. Rhabdocline Needlecast.	4 pt/A. 2 lb/A.	Begin applications at bud break and repeat at 3-4 wk intervals. Apply in a tank mix with another registered pesticide if moderate to severe disease pressure is present.	Registered for use on Douglas fir, miscellaneous.
Protect Turf and Ornamental Mn, Zn & Ethylenebisdithio-carbamate (W.A. Cleary Chem. Corp)	Caution	Diplodia in pine. Needlecasts in conifers: Cyclaneusma, Lophermium, Rabdocline, Rhizosphaeria, Scirrhia. See label for complete list.	1.5 lb/100 gal water (2 water soluble bags).	Specific instructions for specific diseases not listed.	Registered for use on Christmas trees in some states. To improve performance, add 2 to 4 oz spreader sticker/100 gal spray.

Fungicide Trade Name/ Active Ingredient	Signal Word	Diseases Controlled	Rate per acre	Application Directions	Comments
Reach, Chlorothalonil & Triadimefon (ISK Biosciences)	Danger	Stem gall rusts and fusiform rusts on pine. Also provides control of other pine diseases such as: Scleroderris canker, Sirococcus tip blight, Scirrhia brown spot, Cyclaneusma and Lophodermium needlecasts.	8 pt/A.	Apply in sufficient water to obtain uniform coverage. Begin applications when needles break through fascicle sheath. Make additional applications at 2 to 3 wk intervals until the galls of previously infected trees become pale to white in color. Refer to Bravo and Daconil 2787 for instructions concerning additional pine disease.	Registered for use on conifers. A maximum of 32 pt/A of REACH may be used per growing season.
Subdue 2E, Metalaxyl (Ciba-Geigy)	Warning	Phytophthora root rot.	Apply 1.25 to 2.5 gal product/A in a minimum of 50 gal water.	Directed soil spray early in spring before growth starts and in the fall before the ground freezes. Do not apply as a foliar spray.	Registered for use in "Conifers in Plantations including Christmas trees". Apply 0.5 to 1 inch water after application if rain is not expected for 3 days.
Tenn-Cop 5E, Copper salts of fatty & rosin acids (Boliden Intertrade Inc/Griffin)	Warning	Dothistroma needle blight. Diplodia tip blight.	3 pt/100 gal water.	Make first application as needle begin to emerge from needle sheaths and repeat 3-4 wk later (pine). For Christmas trees or in wet seasons repeat monthly thru September. Make first application when shoot buds open and repeat at weekly intervals until needles break thru needle sheaths.	Ornamental/Pine (Austrian, Ponderosa, Mugo, and Scot). Refers to Christmas trees. Apply to point of runoff, thoroughly wetting needles.
Thalonil 90DF WSP Chlorothalonil (Riverside/Terra)		Swiss needlecast.	0.25 to 0.5 acre/ one packet.	Same as Thalonil 90 DF	Registered on Christmas trees.

Christmas Tree Pesticides - Fungicides (continued)

Fungicide Trade Name/ Active Ingredient	Signal Word	Diseases Controlled	Rate per acre	Application Directions	Comments
Thalonil 90 DF WSP (continued)		Scleroderris canker (pines) and Swiss needlecast.	0.5 to 1 A/one packet.	Same as Thalonil 90 DF.	
		Sirococcus tip blight.	2/5 to 3/4 A/one packet.		
		Rhizosphaera needlecast (spruces), Scirrhia brown spot (pines).	0.25 A/ one packet.		
		Cyclaneusma and Lophodermium needlecasts (pines).	0.25 to 0.50 A/one packet.	Same as Thalonil 90 DF.	
		Rhabdocline needlecast (Douglas fir).	0.5 to 1 A/one packet.	Same as Thalonil 90 DF.	
Ziram 76DF, Ziram Elf Atochem	Danger	Needle Rust Melampsora.	Apply 2 lb/100 gal water.	Make one application in the spring when new shoot growth is 0.5 to 2 inches in length. Use sufficient water to provide thorough coverage.	Registered for use on Douglas Fir Christmas Trees.

Insecticides

Insecticide	Signal Word	Registered for use on	Insects Controlled	Amount	Time /method of Application	Comments
Ambush & Ambush 25W & Ambush 25W in water soluble pack Permethrin (Zeneca, Inc.)	Warning, Restricted	Christmas trees.	Nantucket pine tip moth.	6.4 to 12.8 oz/A. Same rate all 3 formulations.	Apply first application when adults appear and repeat at 5 to 7 day intervals or as needed. Use sufficient water to obtain full coverage of foliage.	
Asana XL, Esfenvalerate (DuPont)	Warning, restricted	Christmas trees.	Nantucket pine tip moth, Spittlebugs, Pineleaf chermid, Redheaded pine sawfly, Balsam woolly adelgid, Balsam tip aphid, Pine chafer, Red pine sawfly, Pine conelet bug, European pine sawfly, adult Cranb. girdler, Pine needle midge, Spruce budworm. Pales Weevil, Northern Pine Weevil.	In high volume sprayer use 5.8 to 9.6 fl oz product /100 gal. Same as above.	Apply as needed to maintain control. Spray sufficient gallonage to obtain good coverage of entire trees. Spray stumps to control developing larvae. Dilute product in kerosene instead of water.	See label for rates using a low volume sprayer, and for information on additional insects.
Azinphos-M 50W, (Gowan Co.) Azinphos-50 WSB, (Gowan Co.) Azinphosmethyl 50W, (Micro Flo Co.) Sniper 50 PVA, (Platte Chem. Co. Azinphosmethyl ai.	Danger. Restricted. Danger. Restricted. Danger Danger. Restricted.	Christmas Trees.	Scale species, sawfly species, European pine shoot moth, E. pine shoot borer, Nantucket pine tip moth. Same insects as Gowan Azinphos-M 50W minus sawfly species.	Use 0.75 to 1.5 lb/A in sufficient water to give coverage, but not less than 1 gal/A.	Time application to coincide with suspectible pest development.	

Insecticide	Signal Word	Registered for use on	Insects Controlled	Amount	Time /method of Application	Comments
Baythroid 2, Cyfluthrin (Bayer Corp)	Danger Restricted	Christmas trees (Michigan only) SLN MI-950004.	Pine shoot beetle, pine tip moths, adult Japanese beetles, gypsy moth larvae as well as other insects.	3.2 fl oz/A. Do not exceed a total of 16 fl oz. product/ A/season.	Apply prior to the establishment of high pest population.	Special Local Needs Label in MI (SLN) expires 6/09/2000. Do not harvest within 24 hr of last application.
Clean Crop Carbaryl 50 WP, Carbaryl (Platte Chem Co.)	Warning	Tree and Ornamental Insect Control: Trees (including forests, plantations etc.).	Bagworms, Cooley and Eastern spruce gall, gypsy moth, aphids, cankerworms, Jackpine budworm, Jeffrey pine needleminer, grass-hoppers, pine sawfly, pine spittlebug, pitch pine tip moth, sawflies, scale insects, and webworms, as well as others.	Use 2 lb product in 100 gal water/A. For concentrate-spray ground applica-tions, use suffi-cient water for thorough coverage.	Obtain thorough coverage of upper lower leaf surfaces. For optimum worm control, treat when in early instars.	Addition of a sticker may improve residual control.
Clean Crop Carbaryl 4L, (Platte Chem Co.) or Carbaryl 4L (Drexel)	Caution	Trees and Ornamental trees (including forests, plantations etc.).	Same as Carbary 50 WP.	Use 1 qt of product in water to obtain 100 gal solution.	Same as Carbaryl 50 WP. Scale control, also treat trunks, stems and twigs.	Same as Carbaryl 50 WP.
Clean Crop Carbaryl 80 WDG, Carbaryl (Platte Chem Co.)	Warning			Use 1.25 lb of product in water to obtain 100 gal solution.		
Carbaryl 2L, Carbaryl (Drexel)	Caution			Use 2 tsp/1 gal water or .34 oz/1 gal water.		
Clean Crop Dimethoate 2.67 EC, Dimethoate (Platte Chem. Co.)	Warning	Douglas Fir (Not listed as a Christmas tree or ornamental).	Fir cone midge.	Apply 0.75 gal in 100 gal water. Make thorough coverage applica-tions when cones are closed and pendant.	Use hydraulic or back-pack sprayer.	Systemic.

Christmas Tree Pesticides - Insecticides (continued)

Insecticide	Signal Word	Registered for use on	Insects Controlled	Amount	Time /method of Application	Comments
Di-Syston 15% Granular, Disulfoton (Bayer Corp.)	Danger-Poison	Trees, including Christmas trees.	Aphids, Mimosa webworm, Mites, Pine tip moth, Soft scale (*Coccus hesperidium*) as well as other insects.	2.5 oz per inch of trunk diameter measured 4 ft above ground. 5 lb per 1000 linear ft of row or a soil injection 4 to 6 inches beneath the soil surface in 1 or 2 linear application trenches.	Broadcast or soil implant. Can also be used when transplanting. Soil Injection. See label for instructions.	Systemic insecticide.
Dimilin 25W, Insect growth regulator (Uniroyal Chem. Co.)	Caution Restricted	Christmas trees.	Nantucket pine tip moth.	Apply 4 oz/A. Aerial application: Use in 2.0 to 5.0 gal water/A. Ground application: Use sufficient water for coverage, 5 to 400 gal.	Apply in the early larval stage of development, preferably at the beginning of egg hatch of the second tip moth generation.	
Dycarb 76 WP, Bendiocarb (Scotts-Sierra)	Warning	Non-edible horticultural plants (woody): *Abies* species, Pine, *Picea* species, others.	Eastern tent caterpillar, and fall webworm. Nantucket pine tip moth, Pales pine weevil, N. pine weevil, others.	12 to 20 oz/100 gal water. 20 to 40 oz/100 gal water.	Spray to glisten.	Check registration status with your state regulatory agency.
Furadan 4F, Carbofuran (FMC Corp)	Danger Restricted	Pine seedlings in pine plantation.	Pales weevil and pitch-eating weevil.	Add 1.6 oz of product to 0.5 gal water. Mix. Add 2 lbs clay.	Apply slurry to roots of pine seedling prior to transplanting.	Treats the roots of 150 to 200 seedlings.

Christmas Tree Pesticides - Insecticides (continued)

Insecticide	Signal Word	Registered for use on	Insects Controlled	Amount	Time /method of Application	Comments
Guthion 2L & Guthion 2S Azinphosmethyl (Bayer Corp.)	Danger, Restricted	Ornamentals Christmas Trees.	Scale species, Sawfly species, European pine shoot moth also eastern pine shoot borer and Nantucket pine tip moth (Guthion 2S label only).	1.5 to 3 pt/A. Use sufficient water for complete coverage, but not less than 1 gal/A.	Apply by air or ground equipment.Time application to coincide with susceptible pest development.	
Guthion 3 FI & Guthion Solupak 50% Wettable Powder (PVA), Azinphosmethyl (Bayer Corp.)	Danger, Restricted The Solupak formulation is not restricted.	Ornamentals, Christmas Trees.	Scale species, Sawfly species, European pine shoot moth, Eastern pine shoot borer and Nantucket pine tip moth.	1 to 2 pt/A (Guthion 3 FI) or 0.75 to 1.5 lb/A (Guthion Solupak 50% Wettable Powder (PVA).	Same as Guthion 2L.	
Imidan 50-WP & Imidan 50-WSB & Imidan 70-WP & Imidan 70-WSB Phosmet (Gowan)	Warning.	Christmas trees.	Sawfly species, European pine shoot moth, eastern pine shoot borer, Nantucket pine tip moth, pitch eating weevil, pales weevil, adult root collar weevil.	Use 2 lb/A (Imidan 50-WP/ Imidan 50-WSB) or 1.3 lb/A (Imidan 70-WP/ Imidan 70-WSB) in sufficient water to achieve complete coverage.	Apply when pest populations reach economic threshold levels.	
Lindane 20% Lindane (Drexel)	Caution Restricted	Ornamentals.	Pine bark beetles, Turpentine beetles. Balsam Woolly Adelgid (Fraser fir).	Use 1 pt in 5 gal water. Use 3 qt/100 gal water.	Wet trunks thoroughly to runoff to height of 6 ft. Apply at first sign of attack, and repeat in 3 to 6 mo, if necessary. Use high pressure hyraulic application where appropriate to thoroughly wet trunks and limbs.	

Christmas Tree Pesticides - Insecticides (continued)

Insecticide	Signal Word	Registered for use on	Insects Controlled	Amount	Time /method of Application	Comments
Lorsban 4E, Chlorpyrifos (DowElanco)	Warning	Christmas trees: Nobel, Fraser, balsam, grand concolor, Douglas fir. Scotch and white pine. White spruce.	Ants, aphids, Adelgids (Cooley)(Eastern spruce gall), European pine sawfly, European pine shoot moth, grasshoppers, gypsy moth, Pales weevil (adults), pine needle midge, pine spittlebug, plant bugs, spittle bugs, spruce budworm, and spruce needleminer. Mites: European red and two spotted spider. Scales: black pine, pine needle, pine tortoise, striped pine. Pales weevil.	1 qt/acre of Lorsban 4E. 3 qt/100 gal.	Apply to foliage in sufficient water to ensure adequate coverage. For effective control of spider mites if large numbers of eggs are present, apply a second spray 7 to 10 days after initial treatment to control newly hatched immatures. For scale control, apply when scale crawlers are active.	Do not treat plants under extreme heat and drought stress. Registered for use in WI and MI as well as other states. States not included on the label: IL, IN, IA, MN, and MO, as well as other states.
M-Pede, Potassium salts of fatty acids (Mycogen Corp)	Caution	Christmas trees.	Adelgids, psyllids, spider mites, Balsam wooly adelgid, spruce spider mites, conifer and pine needle scale crawlers, as well as other insects. Tent caterpillars, gypsy moth larvae. Cooley spruce gall adelgid.	Apply a 1 to 2% v/v solution. A 2% v/v sol. is prepared by adding 2 parts M-Pede to 98 parts of spray solution (i.e. water). Apply a 3% v/v solution. Apply a 4% v/v solution.	See label for proper timing and life stage.	Product is often referred to as insecticidal soap and kills by dissolving the waxy cuticle layer of insects and mites, causing desiccation. Product must come into direct contact with pest. Do not apply to stressed conifers or when tender new foliage is present. May remove glaucous bloom from spruce. See label for tank mix rates.

Christmas Tree Pesticides - Insecticides (continued)

Insecticide	Signal Word	Registered for use on	Insects Controlled	Amount	Time /method of Application	Comments
Mavrik, Fluvalinate (Sandoz Agro)	Caution	Conifers, including Christmas trees.	Insecticide and miticide. Aphids, thrips, mites, leaf-feeding caterpillars, others.	Apply 4.0 to 10.0 fl oz/100 gal water.	Use higher rates when pest pressures are heavy.	Contact spray. Good coverage is important. Avoid breathing spray mist. Certain persons are sensitive to Mavrik, see label for additional cautions.
Methyl Parathion 7.5 EC, (Cheminova Inc.) or Clean Crop Methyl Parathion 7.5, (Platte Chem. Co.) ai. Parathion	Danger Restricted	Ornamentals, Christmas tree plantations (pines).	European pine shoot moth and Nantucket pine tip moth.	1 pt/A.	Apply in 5 to 50 gal water.	
Methyl Parathion 4E Parathion (Drexel)	Danger Restricted	Ornamentals, Christmas tree plantation.	European pine shoot moth and Nantucket pine tip moth. Pines.	1 pt/A. 2 pt/A.		
Omite-CR, Propargite (Uniroyal Chem. Co)	Danger	Christmas trees and Conifers (plantation use).	Spider mites. Southern red mite.	3 to 7.5 lb/A. 1 lb/A/100 gal water.	100 gal spray sol/A (ground application) or 10 gal spray solution/A (aerial application). Spray to wet.	Higher or lower gallonage can be used. Total number sprays/yr is 3.
Ornamite, Propargite (Uniroyal Chem. Co)	Danger	Ornamentals, Christmas trees and Conifers (plantation use).	Spider mites.	Same as Omite-CR.	Same as Omite-CR.	Same as Omite-CR.
Orthene Turf, Tree & Ornamental Spray, or	Caution	Douglas fir-Christmas tree.	Douglas fir needle midge.	2/3 lb product/100 gal water.	Applications should be made no more than 2 wk prior to bud burst.	Apply in not less than 2 gal of spray /A by air, or in 100 gal of spray/A by ground.

Christmas Tree Pesticides - Insecticides (continued)

Insecticide	Signal Word	Registered for use on	Insects Controlled	Amount	Time /method of Application	Comments
Orthene Turf, Tree & Ornamental Spray WSP, (Valent) Acephate ai.		Trees and shrubs.	Nantucket pine tip moth larvae, sawflies, root weevil adults, and sawflies. _____ Aphids, bagworms, and tent caterpillars.	1 lb/100 gal water. _____ 1/3 lb/100 gal.	See label for specific timing.	Check registration status with your state regulatory agency.
Parathion 8, Ethyl Parathion (Drexel)	Danger Restricted	Miscellaneous. Christmas trees.	Aphids and mites.	0.25 pt/100 gal water.		
Pentac Aquaflow, Decachlor bis (Sandoz Agro)	Warning	Conifers, including Christmas trees.	Miticide against most phytophagous species including two-spotted, European red and broad mites.	Apply 0.1 fl oz (2/3 tsp) per gal (0.75 ml per liter).	Mix well before spraying. Throughly wet both upper and lower leaf surfaces.	
Precision Insect Growth Regulator, Fenoxycarb (Ciba-Geigy)	Caution	Christmas trees.	Soft scale insects (wax, brown soft etc) and Lepidopterous needleminers, as well as other insects.	For soft scales, apply 2 to 4 oz product/100 gal of water. For leafminers, apply 6-8 oz product/A.	Knowledge of pest life cycle is important. Read label for precise timing.	Will not contol the adult stages of insect pests.
Provado 1.6 Flowable, Imidacloprid (Bayer Corp)	Caution **New Label EPA 3125-457**	Christmas trees.	Aphids and sawflies. _____ Adelgids.	Foliar application, 4 to 8 fl.oz/A in sufficient carrier to ensure good coverage.	Make applications as pests begin to build. Two applications at 7 to 10 day intervals may be required. _____ For gall-forming adelgids, time applications to coincide with full budswell or first budbreak or earliest bud-breaking trees.	Allow at least 7 days between applications. Do not apply more than 40 fl oz (0.5 lb/AI) of Provado per acre per year.

Christmas Tree Pesticides - Insecticides (continued)

Insecticide	Signal Word	Registered for use on	Insects Controlled	Amount	Time /method of Application	Comments
Ramik Green, Diphacinone Haco, Inc. (Rodenticide)	Caution	Christmas tree plantations.	Meadow Vole and Pine Vole.	Apply 20 lb of pellets/A in 2 applications of 10 lb each.	Aerial or ground broadcast treatment (Meadow vole) and Hand bait treatment (Pine vole).	SLN-MICHIGAN ONLY (24C). Dormant application only.
Sevin XLR Plus, Carbaryl (Rhone-Poulenc)	Caution	Non-residential trees (Forest, plantations etc.).	Ixodes spp. Deer tick, bear tick, and black legged tick.	1 to 2 qt/A.	Nymphal control- apply in late spring or early summer. Adult control- application in late summer and fall.	Do not use spot treatments. Check registration status in your state.
Sunspray Ultra-Fine Spray Oil, Paraffinic Oil (Sun Co., Inc)	Caution	Christmas trees.	Aphids, Adelgids, Scales (soft and hard). Spider mites.	2 to 4 gal oil/100 gal water/A. 1 to 3 gal oil/100 gal. water/A.	Winter. Summer.	Spray no more than 4X/growing season. Oil removes the glaucous bloom from Colorado blue spruce and Koster spruce. Use lower dose on spruce as well as certain other trees. Douglas fir tends to be sensitive.
Talstar 10WP, Bifenthrin (FMC)	Warning	Christmas trees.	Aphids, armyworm, bagworms, black vine weevil adults, brown soft scale, broad mite, fall webworm, flea beetle, lacebugs, leafhoppers, leaf-feeding caterpillars, loopers, pine needle scale crawlers Pine tip moths, Plant bugs (including Lygus spp.), San Jose Scale crawlers,white-flies as well as other insects. Beet Armyworm, European red mite, spider mites, twig borers, thrips, and leafrollers. Japanese Beetle Leafminers, Pear Psylla, Pecan leaf scorch mite.	6.4 to 32 oz Talstar 10 WP/100 gal water or acre. 9.6 to 32 oz Talstar 10 WP/100 gal water or acre. 16 to 32 oz Talstar 10 WP/100 gal water or acre.	Bagworm control: Applications should be made in mid-late June when larvae hatch and are young. Spray the larvae directly. Scale crawlers and twig borers: treat trunks, stems and twigs in addition to plant foliage.	Special Local Needs use in a number of states. Do not exceed 0.5 lb ai/A/season (MI). Can also be applied as a concentrate in sufficient spray vol/A to provide good coverage or by air. Do not apply by ground within 25 ft or by air with 75 ft of lakes, reservoirs and rivers, etc. See label for details.