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Central Forest Experiment Station

Pocket Guide to Christmas Tree Diseases

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POCKET GUIDE TO CHRISTMAS TREE DISEASES

Contents

NORTH CENTRAL FOREST EXPERIMENT STATION

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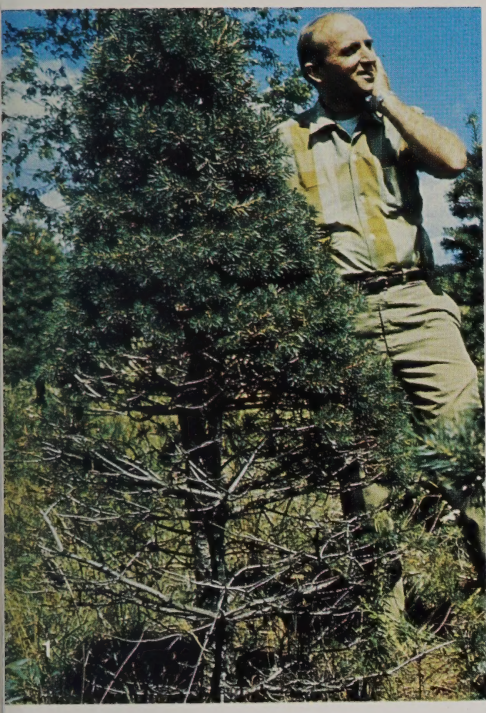
Each year more than 30 million American families bring a live Christmas tree into their homes to become the warm and glowing center of their Christmas celebration. Years ago, most Christmas trees were cut wild. But, as demand increased and the supply of suitable wild trees decreased, growing Christmas trees in plantations became more and more common.

Today growing Christmas trees is big business. More than 30 million trees are harvested each year in the United States, nearly 10 million of these in the Lake States of Michigan, Wisconsin, and Minnesota. In 1986, there were about half a billion trees growing in 43 states. About 7,500 year-round workers plus 100,000 part-timers are needed to plant and tend these trees. It takes constant and skilled care for 8-15 years to produce a salable, high-quality Christmas tree.

During this time, the trees face many hazards, such as adverse weather, fire, insects, and even animal damage. But the most critical threat is usually disease (fig. 1). Described and pictured on the following pages are the common disease problems of Christmas trees. Learning to identify these diseases is the first step in prevention and control.

Diseases affecting trees in their natural settings may be relatively harmless, but in intensively managed nurseries and plantations, they can have a devastating impact (fig. 2). Disease can reduce growth, produce unsightly foliage, increase susceptibility to insects and other diseases, and even kill trees.



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Scotch Pine

Scotch pine has been a favored Christmas tree species over the years. However, it is not native to this country, so planted outside its natural habitat, it suffers many disease problems. This is especially true of the short-needled varieties.

Lophodermium Needlecast

Lophodermium seditiosum
(Formerly *Lophodermium pinastri*)

Lophodermium needlecast became a serious problem in Scotch pine Christmas tree plantations in the early 1970's. It was disseminated around the country primarily on infected nursery stock. This needlecast can also be an important problem on red pine nursery stock and, to a lesser extent, in red pine plantations. Nursery trees were often lifted and shipped to the field for planting before *Lophodermium* symptoms appeared. Trees remaining in the nursery soon lost their foliage as did field-planted trees shortly after planting.

This infected nursery stock infected nearby susceptible trees with windborne spores. As a result, epidemics developed in Scotch pine Christmas tree plantations in many different states.

The first symptoms show up as spots on otherwise green needles (fig. 3). Infected needles turn brown (fig. 4) early in the growing season and by summer most of the infected foliage has fallen off, leaving only the green, current-year growth.

Black fruiting bodies develop on the brown needles from August through October (fig. 5). These fruiting bodies produce spores that will infect the remaining foliage during prolonged rainy periods. Spore dissemination and infection peak in late summer and fall.

During this period foliage must be protected with a fungicide. Spore dissemination and infection processes are similar for most needlecast diseases. The main difference is that the timing of infection and symptom development is different among the different needlecast diseases. This means that the timing of fungicide application will be different as well.

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Brown Spot Needlecast

Scirrhia acicola

Brown spot needle disease became important on Scotch pine in the mid 1960's. It caused severe needlecast, especially on the lower branches and on the moist, shaded, north side of trees (fig. 6). The symptoms are most readily observed between August and October.

Like *Lophodermium,* brown spot causes needle spots (similar to fig. 3) followed by needle browning and the development of black fruiting bodies (fig. 7).


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Cyclaneusma Needlecast

Cyclaneusma minus

Cyclaneusma minus needlecast, formerly known as *Naemacyclus* needlecast, has recently become important in Scotch pine and is thought to spread via infected nursery stock. This is a complex needlecast that mostly affects old needles, particularly when trees are under stress (fig. 8). Infection and needle loss can occur throughout the growing season.

Most of the "inside" foliage is lost, leaving only the current-year needles.

The first symptoms include the yellowing of 2- and 3-year-old needles and the formation of light-green spots (fig. 9).

Spots eventually enlarge and turn dark brown in contrast to the lighter browning of the dying needle.

Off-white fruiting bodies develop on brown needles and are most noticeable in wet weather, when they tend to swell, as do all needlecast fruiting bodies (fig. 10).


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Scleroderris Canker

Gremmeniella abietina

Scleroderris canker can be a serious problem in the northern parts of the north-central and northeastern states. In addition to Scotch pine, red pine can become infected. There are two strains of this disease (fig. 11). The European strain, located in the orange area on the map, attacks and kills trees of all ages, causing heavy losses in plantations. The North American strain, located in the green area, only kills trees less than 6 feet tall and can thus seriously damage Christmas trees only during the first 5 years after planting.

Trees turn brown, caused by oblong, sunken cankers that develop on stems and branches. A characteristic symptom during May and June is an orange discoloration at the bases of otherwise green needles (fig. 12).


HUDSON
BAY
LABRADOR
QUEBEC
ONTARIO
NOVA
SCOTIA
MAINE
MN
NORTH AMERICAN STRAIN
EUROPEAN STRAIN


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Gall Rusts

***Cronartium quercuum* (Pine-oak gall rust)**
***Endocronartium harknessii* (Pine-pine gall rust)**

Gall rusts can be a common problem in some Scotch pine plantations. Rust infections on stems slow growth and gradually kill old trees. Young seedlings are girdled and killed quickly. From April to June, cream-colored blisters filled with orange spores develop on the surface of galls (fig. 13).

Rust infections kill individual branches but seldom entire trees. One gall rust species, *Cronartium quercuum,* must have an alternate host, such as oak, where it spends part of its life cycle before pine can be reinfected. Another species of gall rust *(Endocronartium harknessii)* can spread directly from pine to pine.


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Pine wood Nematode

Bursaphelenchus xylophilus

The pine wood nematode may be a problem in Scotch pine trees that are dying from other causes. A microscopic worm (seen here through the eye of an electron microscope) (fig. 14) is carried from tree to tree by pine sawyer beetles that attack trees under stress (fig. 15).

The main symptom to look for is yellowing, then browning of all needles during the growing season (fig. 16). Unlike needlecast diseases, the brown needles usually remain on dead trees.

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Winter Injury

Winter injury in susceptible Scotch pine varieties can be expected three to four times during a rotation. Serious foliage loss is the result, making otherwise ready-to-harvest trees unmarketable (fig. 2). In general, short-needled Scotch pine varieties are much more susceptible to winter injury, as seen on the right, than are long-needled varieties, on the left (fig. 17).

Here is the same plantation a year later. The trees on the right were a total loss and had to be destroyed, resulting in thousands of dollars lost (fig. 18). Careful tree selection can usually prevent this problem. But the lesson is, "Don't put all your eggs in one basket!".

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Austrian Pine

Dothistroma Needlecast

Dothistroma septospora
(Formerly *Dothistroma pini*)

Austrian pine, another exotic species, is affected by a serious needlecast disease known as *Dothistroma pini*. This fungus attacks Austrian pine of all ages, causing significant foliage loss. As with other needlecasts, the needles have yellow to tan spots that enlarge to form distinct brown bands (fig. 19). Black fruiting bodies that produce spores develop in these bands.

Needle tips beyond these reddish-brown bands die in the fall while the needle base remains green (fig. 20). Severe infection can kill trees or make them more susceptible to other problems.

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Winter Injury

Winter injury can be distinguished from the needlecast disease by lack of needlespots and fruiting bodies, browning on the entire length of affected needles, and by green foliage on bottom of tree that was protected by snow cover (fig. 21).

Austrian pine is very susceptible to winter injury. It is not recommended for planting in many areas as a result of the needlecast and winter injury problems.

Red Pine

Pine Needlerust

Coleosporium asterum

Needle rust commonly infects this native pine growing in weedy fields. It is most common on young trees up to sapling size, causing unsightly foliage and slowing tree growth (fig. 22).

The most obvious sign of the fungus is the orange blisters erupting from needles on the lower branches in the spring (fig. 23). This fungus needs an alternate host, such as goldenrod or aster, to complete its life cycle.

22

Diplodia Shoot Blight and Canker

Sphaeropis sapinea (Formerly *Diplodia pinea*)

This disease causes a shoot and canker problem on red pine both in nurseries and plantations. The fungus kills current-year shoots and may enter through shearing wounds. Infected shoots may be stunted or curled (fig. 24).

Small black fruiting bodies develop on bark above cankers and on infected needles (fig. 25).

Oblong resin-soaked, sunken cankers will often originate on wounded tissue, as seen here after the bark was removed (fig. 26). Such cankers can kill that portion of the tree above the canker.


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Blister Rust

Cronartium ribicola

White pine, another native species, is becoming an increasingly popular Christmas tree. However, it can be infected, primarily in the northern areas, by white pine blister rust.

This fungus infects through the needles, grows down the branch and enters the main trunk of the tree. The best clue is the cream-colored blisters that push through the diseased bark during spring (fig. 27).

Once in the trunk, it can girdle the tree and kill that portion of the tree above the canker (fig. 28).

Like most rust diseases, it has alternate hosts: in this case, gooseberry and currant plants.


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Air Pollution

Of all the Christmas tree species, white pine is probably the most susceptible to air pollution. Typical symptoms are yellow, red, or brown tips on current-year needles, often preceded by yellow flecks, stipples, or bands (fig. 29).

Ozone and sulfur dioxide are the apparent causes of this damage. Trees, such as the one in the middle, are unsalable (fig. 30).

At times, white pine may be affected by winter injury, but this can usually be distinguished from air pollution injury by the unaffected foliage protected by snow near the ground line (fig. 31).

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31

Swiss Needlecast

Phaeocyptopus gaumanni

Douglas fir, native to the western United States but not to the north-central and northeastern states, is affected by two important needlecast diseases.

Swiss needlecast is caused by the fungus, *Phaeocryptopus gaumanni.* The browning and early needle loss caused by this fungus result in thin-foliaged trees that are unfit for sale (fig. 32).

The 2- and 3-year-old needles, especially on the lower branches, brown up during July and August and fall off in late August (fig. 33).

Rows of fuzzy, black, fruiting bodies in tiny, pore-like openings (stomata) can be seen on the undersides of both green and discolored needles during most months (fig. 34).


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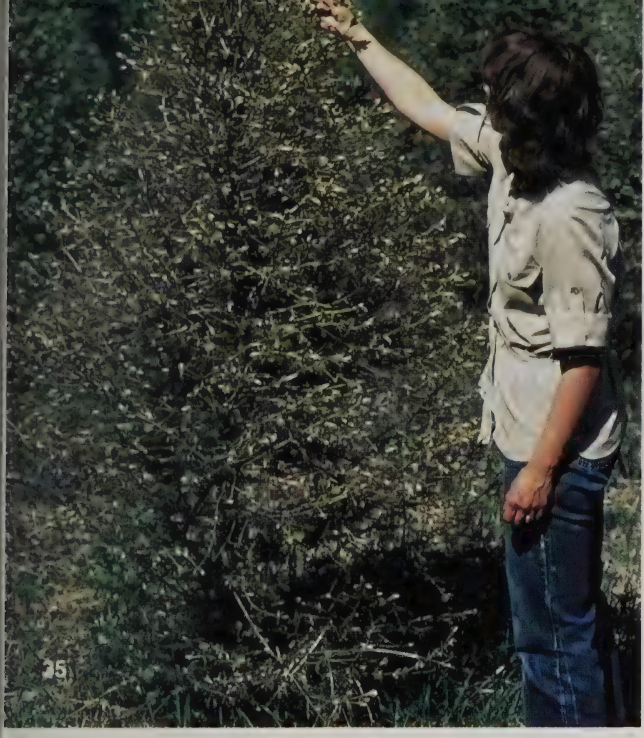
Rhabdocline Needlecast

Rhabdocline psuedotsugae

Rhabdocline needlecast, caused by the fungus *Rhabdocline psuedotsugae,* is another serious problem on Douglas fir. The browning and early needle loss caused by this fungus will make trees unsalable. (fig. 35). Heavily infected trees will keep only their current-year needles.

Symptoms to look for in fall include yellow spots that eventually enlarge, causing a reddish brown mottling that is evident by early spring (fig. 36).

Oblong fruiting bodies develop on the underside of needles and release spores during wet weather from May to July (fig. 37).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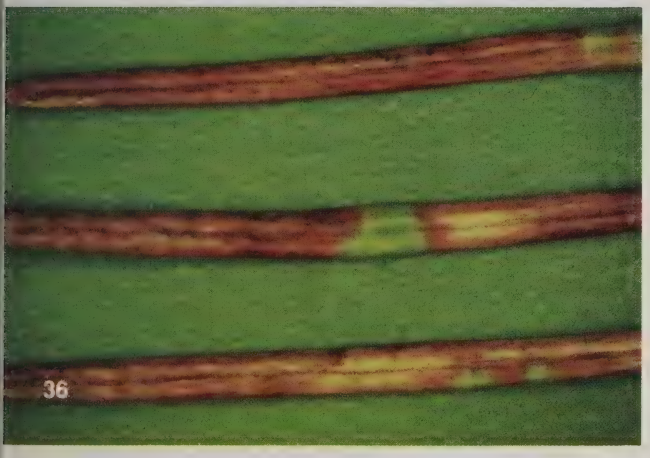
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Colorado Blue Spruce

Rhizosphaera Needlecast

Rhizosphaera kalkhoffii

The primary disease that affects this native spruce in Christmas tree plantations is *Rhizosphaera* needlecast.

This fungus turns needles purplish-brown (fig. 38).

The needles fall prematurely, mostly from the lower portions of the tree, thereby reducing its vigor and market value (fig. 39).

Fuzzy, black, fruiting bodies sticking out of tiny, pore-like openings (stomata) can be seen on both green and discolored infected needles (fig. 40). This fungus also infects white and Norway spruces, but to a lesser extent.


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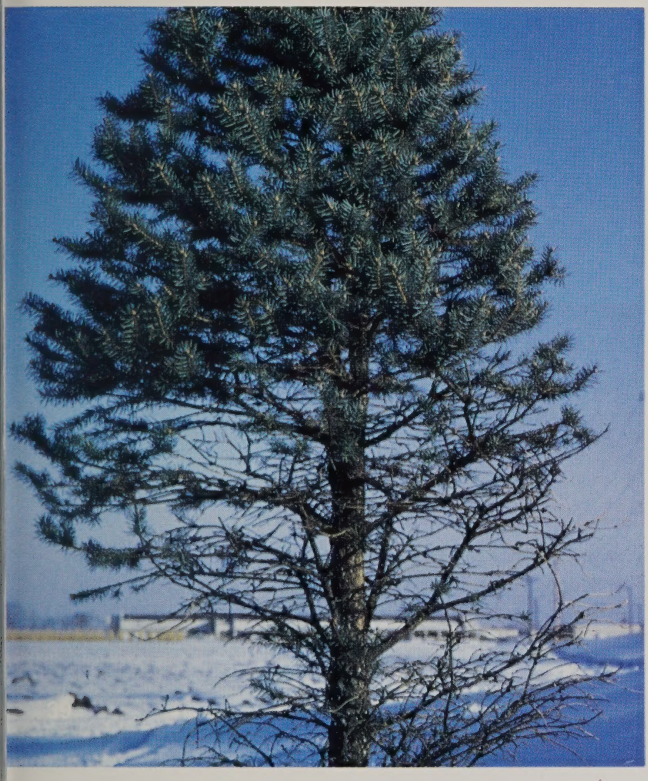

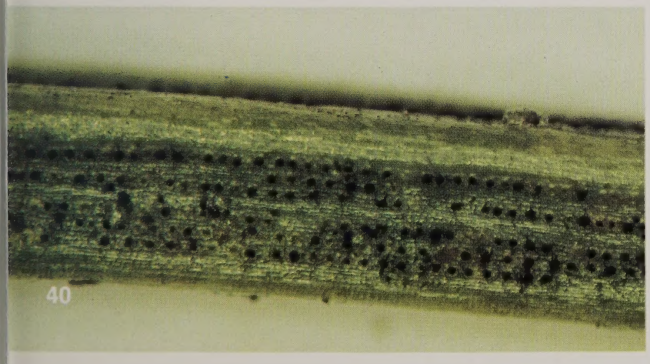
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Balsam Fir

Our native balsam fir is fairly free of serious disease problems, but sometimes the foliage can be affected by a needle rust similar to the one that affects red pine (see figs. 22 & 23).

White and Norway Spruce

These species are also nearly devoid of diseases, but Norway spruce, being an exotic, is subject to winter injury with symptoms similar to figures 2 and 21.

For More Help

Consult - an expert to identify the cause of puzzling pest problems in Christmas trees (fig. 41). Proper identification is extremely important if controls are to be effective.

Read - books and brochures about Christmas trees. (Highly recommended: CHRISTMAS TREE PEST MANUAL, for sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402)

Join - the National Christmas Tree Growers Association. It provides members with a number of valuable services including the helpful "American Christmas Tree Journal".

- your local Christmas Tree Growers Association, and attend its meetings. They often include valuable field trips that will allow you to profit from the experience of established growers.

Record - your successes and failures so that you don't make the same mistakes twice.

If you do all of your homework and plan carefully, you can avoid many costly mistakes. Nevertheless, disease problems may still occur periodically. That is why it is important to monitor your plantings for disease and other pest problems. Inspect your plantings weekly throughout the growing season and occasionally in winter. If you are observant, you can usually spot disease symptoms and other signs of distress before widespread damage occurs. Early disease detection can help prevent or reduce economic losses.

Copies available from—

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