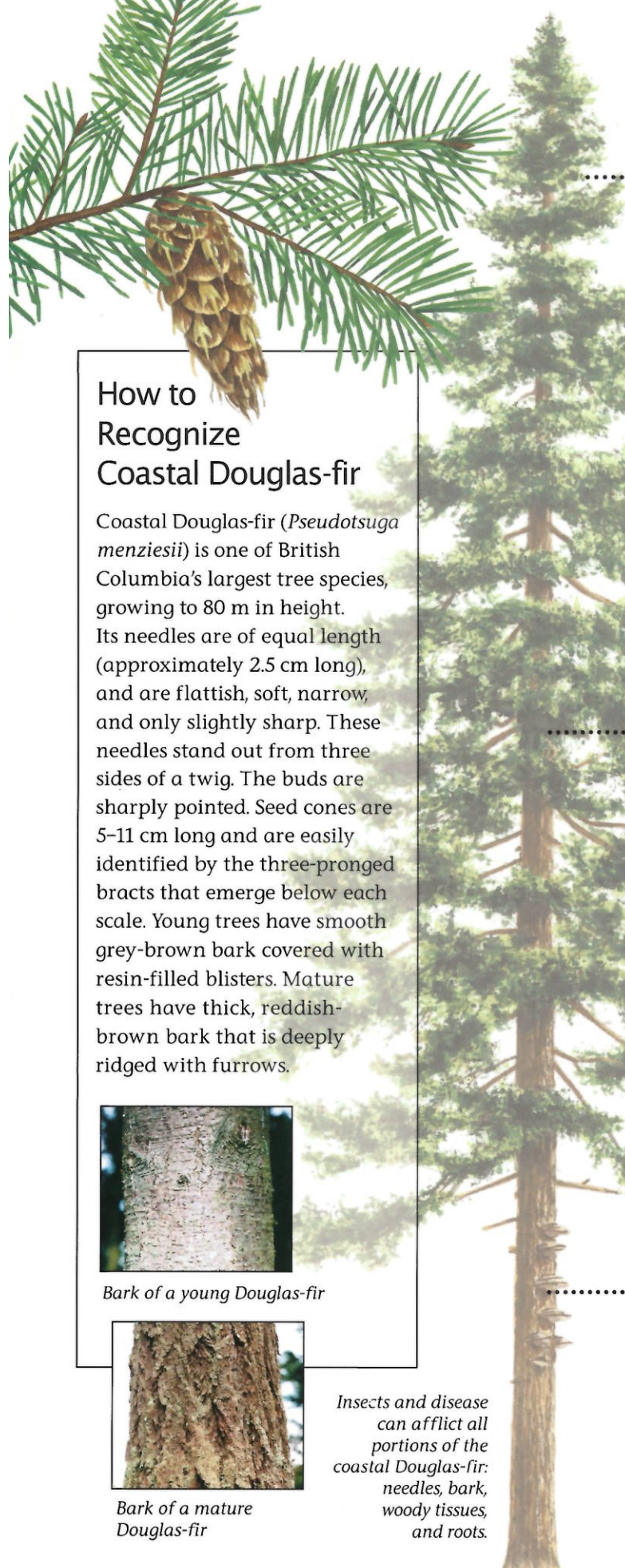


F O R E S T
H E A L T H

Common Insects and Diseases of Coastal Douglas-Fir

Trees play an important aesthetic and biological role in our environment.

Trees such as Douglas-fir can suffer from a wide variety of native and introduced pests. This guide is intended to help non-specialists recognize common ailments of Douglas-fir and diagnose the likely cause. Using this guide, you may be able to determine an appropriate treatment for your tree or better describe the problem to a tree care professional.



How to Recognize Coastal Douglas-fir

Coastal Douglas-fir (*Pseudotsuga menziesii*) is one of British Columbia's largest tree species, growing to 80 m in height. Its needles are of equal length (approximately 2.5 cm long), and are flattish, soft, narrow, and only slightly sharp. These needles stand out from three sides of a twig. The buds are sharply pointed. Seed cones are 5-11 cm long and are easily identified by the three-pronged bracts that emerge below each scale. Young trees have smooth grey-brown bark covered with resin-filled blisters. Mature trees have thick, reddish-brown bark that is deeply ridged with furrows.



Bark of a young Douglas-fir



Bark of a mature Douglas-fir

Insects and disease can afflict all portions of the coastal Douglas-fir: needles, bark, woody tissues, and roots.

Where's the Problem?

Foliage or branch tips affected:

Foliage discoloured or absent. Frass or webbing present...see defoliating insects

Insects that feed on needles are called **defoliators**. Caterpillars, the pre-adult form of butterflies and moths, are common defoliators. Severe infestations can strip a tree of most of its foliage.



Foliage discoloured or mottled. Small bumps or blisters on leaf surface ...see foliar problems

Foliage covered with small, cottony tufts...see foliar problems/adelgids

Symptoms of **foliar problems** are chlorosis or discoloration, bleaching, shrivelling, twisting or dropping of needles. These symptoms can be caused by aphids, needle midges, conifer rust fungi, fungal blight, or needle cast diseases. Most foliar problems do not endanger tree survival.



Whole tree affected (declining):

Mature tree

Crown discoloured bright yellow, red, or brown ...see bark beetles

Bark beetles are one of the most damaging forest insect pests. They attack trees by boring into the inner bark and laying eggs. The Douglas-fir beetle prefers felled trees, slash, stumps and wind-fall, as well as trees that have been damaged or stressed.



Tree any age

Gradual thinning of crown and yellowing foliage...see root diseases

Root diseases are caused by a group of fungi. Roots that become infected will gradually die. Over several years, infected trees will weaken because the usual flow of nutrients and water is cut off. They may also be blown down more easily because the root system becomes unstable.



Main stem:

Conks (bracket fungi) visible on stem...see wood decay fungi

Wood decay fungi survive on the woody tissue of trees and cause decay in the heartwood and sapwood. These decay fungi gain access to the interior of the tree stem through wounds, broken or dead branches, or the roots.

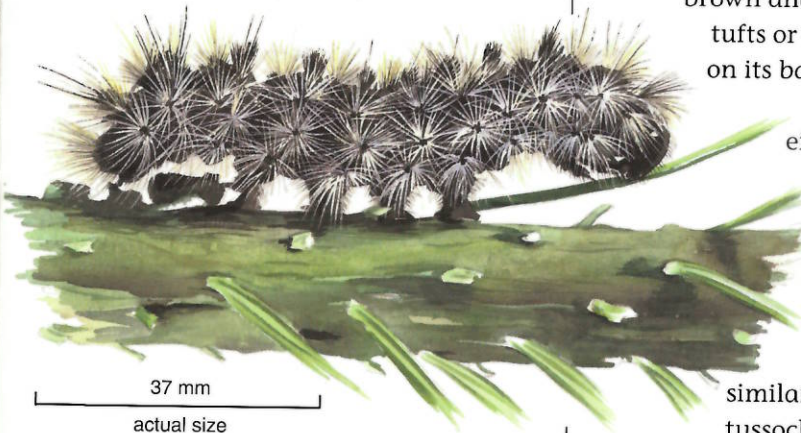




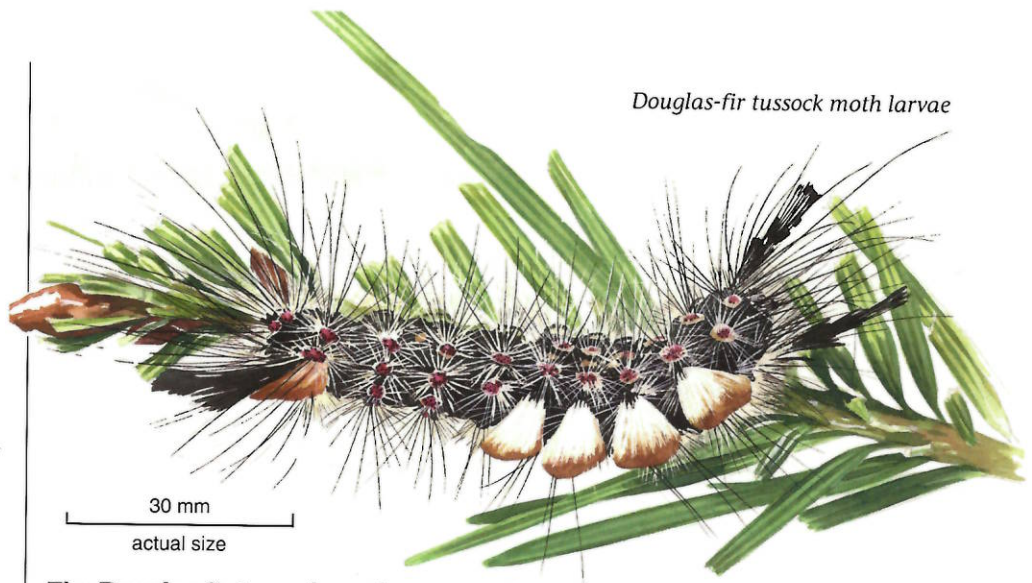
Defoliating insects

Defoliators are insects that feed on the needles or leaves of trees. Caterpillars, the pre-adult or larval form of butterflies and moths, are common foliage-eating pests of conifers, including Douglas-fir. Symptoms of damage include discolouration or loss of foliage (in general, from the top of the tree downward and from branch tips inward); chewed needles on the tree or ground; silken webbing; frass (insect droppings) accumulations under the tree; and abundant caterpillars, pupae, pupal cases, or adult moths.

Silver-spotted tiger moth larvae



The **silver-spotted tiger moth** is a common defoliator of conifers in southwestern British Columbia. Douglas-fir is its preferred host. Young caterpillars feed in colonies and form loose tent-like webs containing dead needles and frass near the ends of branches. Individual branches are defoliated. When the larva are nearly full grown they disperse and feed individually. The hairy caterpillars are tufted in shades of red-brown, yellow and black, and are usually first detected in late winter or early spring. Damage is not severe and defoliated branches usually recover.



Douglas-fir tussock moth larvae

The **Douglas-fir tussock moth** occasionally defoliates small groups of Douglas-fir trees throughout the Fraser Valley and on southeast Vancouver Island (most forest outbreaks occur in the Kamloops region). The sides and posterior portions of the caterpillar's body are covered with hairy tufts that arise from small red nodes. Four thick, brown and cream coloured tufts or brushes are found on its back. Two long, black tufts arise from either side of the head and one from the rear.

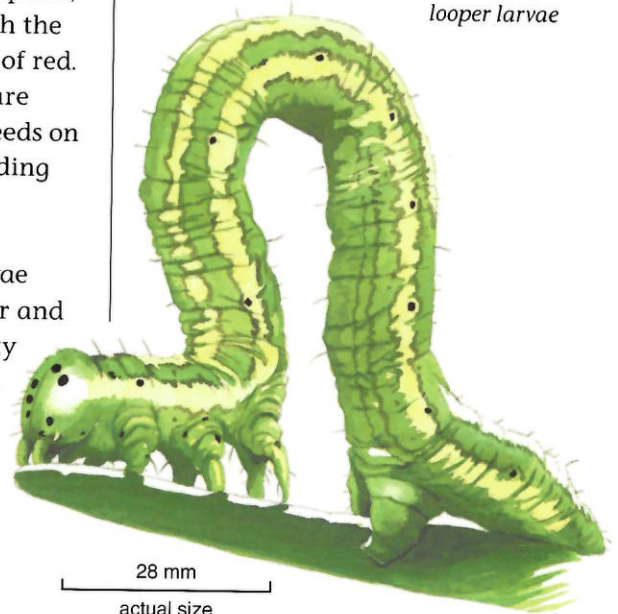
The **rusty tussock moth** caterpillar looks very similar to the Douglas-fir tussock moth caterpillar; however, the nodes from which the tufts arise are orange instead of red. The four brushes on its back are golden. This caterpillar also feeds on many other tree species including deciduous trees.

Phantom hemlock looper larvae have killed mature Douglas-fir and western hemlock in several city parks and residential areas in the Lower Mainland. This smooth, hairless caterpillar has a green head with black dots, and a lime green body with yellowish stripes.

Spruce budworm is a serious pest of Douglas-fir forests in the interior of British Columbia. This budworm also affects Douglas-fir in the Pemberton Valley and Fraser Canyon areas, but is seldom a pest problem on the coast. The full-grown larvae have hairless, reddish to olive-brown bodies and each body segment has four distinct light-coloured spots. Young larvae mine needles and buds, and feed on new foliage. Mature larvae may feed on older foliage.

Defoliator populations usually cycle between outbreak levels and undetectable numbers. The combined effects of predators, parasites, disease, weather, and food availability naturally control populations.

Phantom hemlock looper larvae





Laminating of wood caused by *Phellinus weirii*.

the annual growth rings. Red-brown, mats of hair-like fungal mycelia may be found between sheets of decayed wood. This fungus rarely produces fruiting bodies.

Blackstain root disease, caused by *Leptographium wageneri*, is a vascular wilt. This means it causes little degradation of the roots, but instead kills by interrupting the flow of water within the tree. The fungus produces a brown to black stain which can be identified by cutting into the last few years of wood growth. This fungus is mainly transferred to host trees by root beetles, less often directly from root to root. It never produces a visible fruiting body.



Pitting of wood caused by laminated root rot.



Note the dark streaks in the sapwood caused by blackstain.



For further information, please contact:

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Nanaimo, BC
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(250) 751-7001 or toll-free 1-800-331-7001
or via Enquiry BC - 1-800-663-7867

Ministry of Forests- www.for.gov.bc.ca

Canadian Forest Service -
www.pfc.cfs.nrcan.gc.ca

Insect Diagnostics -
www.forestry.ubc.ca/fetch21/FRST308/labindex.html

How Can I Control These Pests?

These general guidelines will show you how to control pest infestations. Consult a specialist before using any insecticide.

Douglas-fir trees, though fairly tolerant to **defoliating insects**, may be killed if attacked year after year. In these cases, apply an approved insecticide, especially to preserve special or high value trees.

Damage caused by **adelgids** will rarely need to be treated because it is usually not significant except on seedlings or small saplings. Insecticides that are registered and recommended for aphids are usually effective if they are applied when the adelgid is first noticed.

Trees attacked by **Douglas-fir beetles** rarely survive. Cut down infested trees and burn the bark to kill any living beetles and to prevent the spread of these insects to nearby susceptible trees.

Carpenter ants may be a nuisance as well as cause serious structural damage to wood construction. Because dead and down trees, waste wood, and firewood are likely to harbour ant colonies, clear these materials away from buildings.

When **bracket fungi**, or **conks**, appear on the tree, it usually indicates well advanced decay. The wood will have deteriorated to the point where the tree may be structurally unsound, causing the stem to break. Remove affected trees as they can pose a safety hazard.

Few options are available to treat trees afflicted with **root disease**. Remove any infected dead or obviously weakened trees from the area as they will pose a hazard to humans and property if they fall. Ideally, also remove the infected stumps because they can harbour the fungi for many years, and will spread the disease to newly planted Douglas-fir or other susceptible neighbours. If stump removal is not possible, use the following table to restrict your choice of future plantings near infected stumps.

If tree dies from:	Do not replace with:
<i>Armillaria ostoyae</i>	Douglas-fir, true firs, spruce, cedar, hemlock, pines
<i>Phellinus weirii</i>	Douglas-fir, true firs, hemlock
<i>Leptographium</i>	No restriction



Foliar problems

Foliar diseases are most noticeable the year after infection occurs, particularly if the infection year was wet with mild temperatures. A foliar disease, such as Douglas-fir needle blight produces small, dark spots on the needles. These are clearly visible in the spring, just before the affected needles drop. Most foliar diseases do not warrant treatment as they will persist only for a year or two. Trees will suffer only if they lose foliage over several consecutive years or if new foliage is repeatedly infected. In these cases, you may consider applying a fungicide to reduce the frequency or severity of infection.



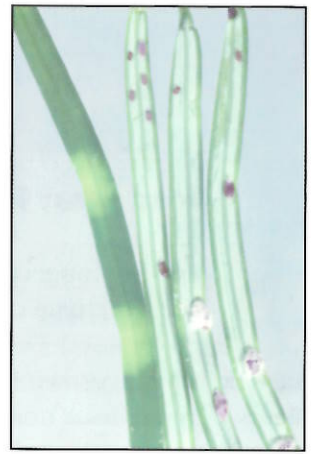
Typical symptoms of foliar disease

The **Cooley spruce gall adelgid**, an aphid-like insect, alternates between two hosts, Douglas-fir and spruce. It is named for the cone-like galls or swellings it causes on the branches of spruce trees. This insect is extremely small – the adults are approximately 0.1 cm long. Adults, which are completely covered with a white, waxy wool, appear as white tufts on the underside of needles, on new shoots, and on developing cones.

Attacked needles may be yellow or mottled and twisted, and may drop prematurely. Light infestations are



Cooley spruce gall adelgid wool on kinked needles.



*Upper side of needles (L) and the aphid-like *Adelges cooleyi* on the underside of needles (R).*

common, yet not seriously damaging. Damage is usually less conspicuous on older trees. Small trees stressed by environmental conditions are often more heavily infested.

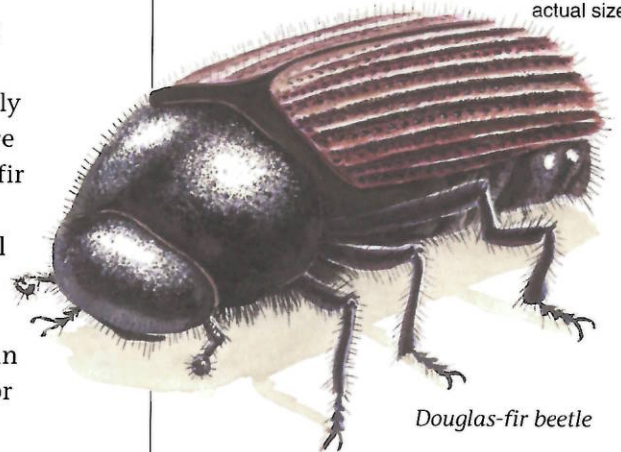


Bark beetles

Bark beetles generally attack large, mature trees. The Douglas-fir beetle prefers felled trees, slash, stumps, and windfall as well as trees that have been damaged or stressed by factors such as the urban environment, defoliators, or root disease.

Adult Douglas-fir beetles are small, 4-7 mm, cylindrical, and usually brown or black. They bore into the bark of trees and lay eggs in galleries tunnelled under the bark. Larvae hatching from the eggs feed on the inner bark. Adults may also introduce a fungus which, along with larval feeding, usually kills the tree.

The foliage of an attacked tree usually changes from green to pale yellow-green to red by the spring of the year following the initial attack, before dropping.



Douglas-fir beetle

4-7 mm
actual size



Bark beetle larval galleries



Wood decay fungi

A group of fungi called **bracket (or conk) fungi** cause decay of tree wood. These fungi survive by breaking down the components of wood tissue and absorbing the resulting nutrients. Decay fungi may enter trees through wounds, broken or dead branches, or roots.



Fomitopsis pinicola fruiting body and decay

Decays are generally split into two groups: brown rots and white rots. **Brown rots** darkly stain the wood which eventually degrades into a brittle, cube-like structure. **White rots** cause lighter staining and the wood becomes pitted or mottled, eventually degrading into a stringy structure or separating along annual rings into sheets.



Brown rot – This cube-like type of wood decay is typical of most brown rot.



White rot – This pitted type of decay is common to many white rots.

Decay fungi normally progress slowly. The presence of conks usually indicates that wood decay is well advanced – the tree is probably structurally unsound and subject to breakage.

If a conk is not present, a suspect tree may be drilled to see if the stem wood is still sound. These drill holes can be capped with putty or silicon to prevent insects or fungal spores from entering.

An example of a common wood decay fungus is *Fomitopsis pinicola*. It produces a brown crumbly rot that is not usually evident until the tree fails. The only external indicator is the fruiting body.

Insects such as wood borers, carpenter ants, and dampwood termites are often associated with decaying wood.



Root diseases

Root diseases are a group of fungi that attack healthy tree roots, interrupting the flow of water or nutrients to the crown, causing a decline in tree vigour. Usually young trees die more quickly than older ones. Living infected trees may blow over because their root system is structurally weakened. Root diseases primarily spread by contact between infected roots and neighbouring uninfected roots. Depending on the root disease, the roots of dead trees and stumps may remain infectious for many years.

Infected trees may show one or more of these symptoms: yellowing or thinning foliage; gradual shortening of leader growth (“rounding” of the crown); or a heavy crop of smallish cones. Infected trees that are wind-thrown usually have small root balls with few remaining fine roots. Additional signs and symptoms are specific to the root disease.

Armillaria root disease, caused by *Armillaria ostoyae*, may produce minor to copious resin flow (pitching) at the base of an infected tree. Whitish, fan-like fungal mycelia will be found between the bark and wood. Honey-coloured mushrooms may appear at the base of infected trees in the fall. Extended decay produces a stringy type of white rot.

Prolonged decay by **laminated root rot**, caused by *Phellinus weirii*, creates small pits in the wood. Eventually this wood separates into sheets along



Armillaria mycelia under the bark of a root or at the base of a tree.



Armillaria fruiting bodies can appear in the fall at the base of an infected tree.