



Chapter 8 - Tree Health

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Determining a tree's health is an important part of caring for a forest. Some tree health problems may be confined to an individual tree but problems that occur on many trees within a forest may indicate an unhealthy forest. An understanding of the relationship between tree health and forest health is important in making management decisions because, to permanently improve forest health, a broad range of management actions over a long period of time is often necessary.

To assess the health of a tree, use a logical, three-step approach. Start by looking for abnormalities and damage. If anything is found, look for additional signs and symptoms, and then use all these clues to help you determine the type of damage, and finally, identify a specific causal agent.

Locate Any Damage

Look over the tree for damage such as scars, holes, discolored needles, missing bark, fine sawdust in bark crevices or around the base of the tree, unusual swellings or growths, or pitch flow. It's very important to stand back and look at the top of the tree. Is it thinning, dead, off-color or fading? Is there an unusual crop of small cones? Compare the growth of the top leader to nearby trees of the same size and species to assess current growth. Short growth or other crown problems are evidence that the tree is not getting sufficient nutrients to maintain normal health.

Look for a pattern of damage. Does the damage involve the whole tree or only one side or at a certain height or age of needles? Check adjacent trees and elsewhere in the stand for similar problems. Is the damage only on certain types, sizes, or ages of trees? Are other species damaged, too? Look at the surrounding environment. Is the damage limited to depressions, ridge tops, southern exposures, etc.?

Determine the Type of Damage

There are five general causes of damage:

1. **Insects** – Insects can be identified by their presence on or in trees but are more often identified by the damage they cause. Look for fine sawdust in bark crevices or around the tree base, small holes in the bark, grooves or tunnels under the bark or in the trunk of the tree, small masses of pitch ("**pitch tubes**") on the trunk, and chewing or webbing on the needles.

2. **Diseases** – Diseases are sometimes harder to identify than insects. Look for discoloration or browning of foliage, pitch flow or sap oozing from the bark, unusual growths, swellings, decay, or the fruiting bodies of fungi (**conks**).
3. **Animals** – Animals may damage trees by chewing, rubbing or breaking branches. Woodpeckers sometimes peck holes in tree trunks or branches.
4. **Mechanical** – Mechanical damage is the result of equipment use or other human-caused injuries to trees in a forest. Look for torn or missing bark and broken or scraped trunks and/or branches.
5. **Environmental** – Environmental damage is the result of weather, fire, or chemicals in the environment. Look for damage across a broad area on many trees of different sizes and often on many different species including shrubs.

NOTE: Trees are often damaged by one of these five factors and subsequently attacked by insects or disease, which may mask the original cause of damage. It is common to find multiple problems on the same tree, because an already weakened tree is more susceptible to insects and diseases.

Identifying the Specific Agent that Caused the Damage

Insects

Three major types of insects damage trees:

1. **Bark beetles** bore through the bark of trees where adults lay their eggs and larvae feed, grow and mature in the inner bark. This activity girdles the tree, which usually kills it, although some trees may survive if the attacks are limited (e.g., “**strip attacks**”). Each type of bark beetle has a distinctive egg gallery. Look for galleries under the bark on the trunks of dying and dead trees. Look for sawdust and/or pitch tubes in bark crevices or on the ground around affected trees. Sometimes only the tops of trees are killed.
2. **Defoliators** feed on the leaves or underside of needles. Some larvae mine buds and old needles of trees. After several years of severe defoliation, branches may die back, and top kill may occur. When defoliator populations are high, tree mortality can occur or trees can become susceptible to other insects or diseases. Look for chewed needles or leaves. Look for larvae, pupae, webbing and cocoons or egg masses.
3. **Wood Borers** infest weakened, dead, or recently felled trees. Wood borers can (occasionally) kill live trees when populations are high. The larvae mine first into the cambium of the trunk, branches or roots of the tree, then bore into the wood. Look for round or oval-shaped holes and tunnels through the wood. These may be either tightly packed with fine boring dust or loosely packed with coarse boring dust.

Diseases

There are five broad categories of diseases:

1. **Root Diseases** are caused by fungi that can be recognized by the distinctive decay or fruiting bodies they produce. Young trees of all species can be attacked and killed. Douglas-fir and grand fir trees remain highly susceptible for life but many species become less susceptible with age. Trees of all sizes may be attacked.

As root disease spreads through the root system, it slowly starves the tree (this usually takes several years for large trees). Root diseases generally spread from tree to tree via direct root contacts, which often results in a “**pocket**” or “**center**” of dead and dying trees.

Trees with root disease often have shortened terminal growth, with rounded crowns. They may also have thin, off-color (yellowish) crowns and a stress cone crop. Often, pitch will ooze through the bark at the base of the tree. Roots on **windthrown** trees may appear stubbed or callused over.

2. **Dwarf Mistletoes** are small parasitic plants that attack live trees. They produce small plants on infected branches that vary in size from one to several inches and may be yellow to purple to brown or olive green in color. Infections are most common in the lower portion of trees and often stimulate unusual branch growth, resulting in dense clusters of branches called “**witches brooms**.”

Top kill or “**dieback**” is common as the nutrients are siphoned off by infections in the lower crown. Severe infections will reduce tree height and diameter growth. Trees are rarely killed but may be seriously deformed. Bark beetles sometimes attack trees weakened by dwarf mistletoe infections.

Look for witches brooms, swelling on stems and branches, and small dwarf mistletoe plants in the branches.

CONTEST TIP: Only Douglas-fir, western larch, ponderosa pine, and lodgepole pine are attacked by dwarf mistletoes in northern Idaho.

3. **Decays** are fungi that recycle wood. They are usually identified by the kind of decay they produce or by the fruiting bodies (“**conks**”) produced on the trunk of infected trees. Most decays can be found on several different tree species, although some have a very narrow host range. They are extremely important in recycling dead and down trees, but some decays become a problem in live trees because they can cause defects and weaknesses in the trunk that predispose trees to breakage or windthrow. Trees with decay are used as nesting sites by many animal species, including birds, bats and many small mammals.

4. **Cankers** are caused by fungal diseases that attack the cambium layer and cause deformity in the trunk or branches. Most canker-causing fungi occur only on a very limited number of hosts. As cankers grow, they can girdle and kill trees or branches, or weaken trunks, predisposing them to breakage at the weakened spot. Look for **flagging** (dead branches with brown or red needles on them), deformities in the trunk or branches, or areas of severe pitching.
5. **Foliage Blights** or **Needlecasts** are diseases caused by a group of fungi that attack the foliage of live trees. Most of these fungi are very **host-specific** (i.e., each fungus attacks only one kind of tree). They usually attack either the current season of foliage or older foliage, but not both, so trees are rarely killed. Since most of these diseases are strongly favored by moist climatic conditions, some trees in a stand may be severely infected while adjacent trees have little or no infection, due to minor differences in site conditions. Look for yellowing, browning, or loss of foliage, especially in the lower crown, where moisture conditions are generally more favorable for these fungi.

Animals

Animals can cause various kinds of damage to trees, depending on the type of animal that caused the damage. For example, many browsing animals, such as deer or moose, will chew the top or branches off. Bears sometimes damage or even girdle cedar and larch trees by peeling off strips of bark to feed on the underlying cambium. Elk and other antlered big game severely damage or girdle small saplings by using them to rub the velvet off their antlers in the fall.

Woodpeckers are generally considered to be beneficial to trees because they can help to control bark beetles or other destructive insect outbreaks. Woodpeckers may flake the bark off tree trunks to reach the insects underneath but this causes little, if any, damage compared to the insect infestation. Woodpeckers also excavate nesting holes in the boles of trees but, again, the “damage” is secondary to the decay that was already present.

Mechanical

Mechanical damage is physical injury to trees that is man-caused. Examples of mechanical damage include bark injuries, broken branches, broken tops and boles on small trees, scraped branches, or other injuries caused by logging equipment such as skidders, saws, and log trucks, by vehicles scraping or bumping tree trunks along narrow forest roads, or even by people gathering firewood, chopping branches or carving into tree trunks in campgrounds. Mechanical damage can provide an entry point for diseases or insects into the damaged trees or forest stands.

Environmental

Environmental damage includes snow or wind breakage, lightning, frost injury, winter desiccation, and drought. It can be difficult to distinguish environmental damage from other kinds of damage. Determining environmental damage will often amount to eliminating other possible causes of damage by the lack of symptoms (e.g., no cankers, no insects, no galleries, no decay, and no mechanical damage).