



Thinning your forest encourages healthy tree crowns.

### General tips for keeping your trees healthy:

- ✓ Keep them free of stress
  - Water ornamental trees during drought.
  - Do not plant in flood prone areas.
  - Thin forests to encourage healthy tree crowns.
  - Do not drive or re-grade over the root system. A good network of roads will help keep soil compaction to a minimum in your forest.
- ✓ Monitor for pests – most pests are adapted to certain trees, so learn about potential pests ahead of time.
  - Every few weeks spend some time in your forest or landscape and look for signs of problems.
  - Carefully and specifically identify the pest before taking action.
  - Get current cultural and chemical recommendations from your local Cornell Cooperative Extension Office.
  - Act quickly- if you feel you might have a real problem on your hands, catch it early.
- ✓ Plant the right tree in the right spot.
  - Select the proper trees for your soils, climate, and weather.
  - Look for insect and disease resistant varieties.
  - Plant trees correctly.

✓ Consider your whole “landscape” and know what you’re dealing with.

- Is your pest actually a pest?
- Is this an isolated incident, or can it spread?
- Is it a natural pest? Or introduced?
- How many trees have been affected?



Black knot leads to cankers on tree branches, like this black cherry, and can eventually lead to death of the infected tree.<sup>c</sup>

### Additional References:

Houston, David R., Douglas C. Allen, and Denis Lachance. 1990. Sugarbush Management: a Guide to Maintaining Tree Health. Gen. Tech. Rep. NE-129. Broomall, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 55 pp.

Johnson, Warren T. and Howard H. Lyon. 1994. Insects that Feed on Trees and Shrubs. Ithaca, NY. Comstock Pub. Associates/Cornell University Press. 560 pp.

Sinclair, Wayne A., Howard H. Lyon, and Warren T. Johnson. 2005. Diseases of Trees and Shrubs. Ithaca, N.Y. : Comstock Pub. Associates/CornellUniversity Press. 660 pp.

### Web Pages of Interest:

Cornell Entomology Insect Diagnostics fact sheets <http://www.entomology.cornell.edu/Extension/DiagnosticLab/IDLFS>

USDA Forest Service Forest Health Protection <http://www.fs.fed.us/foresthealth/>

USDA Forest Service- Northeastern Area Forest Health Protection <http://www.na.fs.fed.us/fhp/index.shtm>

# Tree and Forest Health

Cornell University Cooperative Extension and  
New York State Department of Environmental Conservation  
[www.ForestConnect.info](http://www.ForestConnect.info)



Trees are tough - they can handle 40 mile per hour winds, insects feeding on their leaves, and even losing a limb or two. So, how do we know when we need to step in and give our trees a helping hand? Well, it depends on the situation and your objectives.

For instance, ornamental trees or individual trees that are important to a landscape often require much more attention than forest trees. Whether for aesthetics or shade, having trees in your yard can add value to your property, and having even one unhealthy tree can be a risk to your investment.

Trees generally require much less attention when it comes to forest health. If you lose one or two, there are many more. And, a few trees will die every year as part of the natural forest cycle. In order for all the remaining trees in a forest to grow an average of one inch larger in diameter, one in five of the existing trees must die. When looking at the health of forests, monitor for problems on a “stand” level. One defoliated tree is not a problem, but 10 trees could be.

Our primary forest health issues are the result of insects, diseases, and abiotic (non-living) factors. Most of these “pests” will not be able to kill a tree on their own, but the damage they cause adds stress to the tree. When a tree is stressed, it taps into the food (carbohydrates) stored in its roots or trunk to continue to survive. Stressed trees need to recharge just like humans do. If the stress is mild, the tree usually recovers. If the tree is hit with an additional stressor, it may not be able to recover as well and will begin to decline. Decline is when the growth rate slows down - leaves are small and discolored, annual twig growth is short, and little diameter growth is added to the trunk. Once a tree has started to go into decline, and if stress continues, it likely

will die in three to five years. We can group the serious stressors into three categories - predisposing factors, primary invaders, and secondary invaders.

Predisposing factors are usually abiotic (caused by non-living organisms). Abiotic factors are often things we have no control over, and therefore can do little to prevent. If serious enough these predisposing factors, such as drought, flood, ice damage, hail, and soil compaction, can kill trees on their own. One predisposing factor we can control is competition among trees for light. By thinning the forest, we can provide adequate light for the trees that remain.

Primary invaders are insects and diseases that will attack healthy trees. These include insects that feed on foliage, root-feeding insects, fungal rusts and foliar leaf spots. Minor amounts of damage caused by primary invaders can be tolerated by trees or easily controlled for, but serious damage can cause tree mortality.

Secondary invaders are insects and diseases that attack trees that are already stressed (from predisposing factors or primary invaders). Most woodboring insects, bark beetles, and some trunk and butt rots are attracted to stressed trees. These pests often stay with the tree after it dies and help in the decomposition process. There is generally little that can be done to stop secondary invaders.



Predisposing factors such as ice damage can weaken trees, making them more susceptible to insects and disease.<sup>a</sup>

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Photos from: [www.forestryimages.org](http://www.forestryimages.org) - <sup>a</sup>Minnesota Department of Natural Resources Archives, <sup>b</sup>Minnesota Department of Natural Resources, <sup>c</sup>Steven Katovich, <sup>d</sup>USDA Forest Service, <sup>e</sup>Tim Tigner, <sup>f</sup>Virginia Department of Forestry.

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## Decline Scenario Example

2001 - Winter; forest hit with severe ice storm- many broken tops (open wounds).  
2003 - Spring; Forest Tent caterpillar outbreak- hundreds of trees defoliated  
2004 - Spring; Forest Tent caterpillar outbreak continues, weakened trees start to die.  
2005 - Spring; Forest Tent caterpillar outbreak continues;  
Summer; drought and Lecanium scale outbreak, many trees start to die.

In this situation the first stressor is abiotic (ice storm), followed by three years of defoliation by an insect, compounded by drought (abiotic) and the stress of an additional insect.

How do you know when to start worrying about your trees? Review the following basic list of signs<sup>1</sup> and symptoms<sup>2</sup> of problems, severity of the damage and actions you can take. Ornamental trees generally warrant more pest management due to their high visibility, but some forest pests are worth controlling. Cultural controls (altering the environment) are usually the best approach in more forested situations, but some pesticides can be used in certain circumstances. Evaluate all costs and benefits before using a pesticide. Some pesticides only can be applied by a licensed pesticide applicator. Contact your local Cooperative Extension office for guidance.

## Signs and Symptoms of Tree Stress

### Insect Damage

#### Leaf Chewing

*Agents* - Forest and Eastern Tent Caterpillar, Gypsy Moth, Viburnum Leaf Beetle, Japanese Beetle, Sawflies

*Symptoms* - Chewed foliage, removes chunks or entire leaves, sometimes leaves the veins.

*Control* - If only a few leaves are eaten or there is only a little damage, then no control is warranted. If most leaves are affected and are completely eaten, consider treating landscape trees, and promoting predators in forested situations. Healthy deciduous trees can only handle being defoliated three to four years in row; conifers even fewer. In epidemic situations consider spraying.

*Prognosis* - Minor feeding- prognosis is good; repeated defoliation - expect tree death.

<sup>1</sup>Sign- the actual stressor- egg masses, pupal cases, fungal spots on leaves, mushroom conks.

<sup>2</sup>Symptom- the outward expression of the presence of a stressor- slow growth rate, early leaf drop, cankers

#### Leaf and Twig Sap - Feeding

*Agents* - Scales, Aphids, Adelgids. Only a few species of concern- Hemlock Woolly Adelgid, Balsam Twig Aphid, Beech Scale, European Fruit Lecanium.

*Symptoms* - Leaf distortion and decline, insects suck fluid from leaves and twigs.

*Control* - Encourage predators, prune heavily infected areas, sprays available- time appropriately.

*Prognosis* - Depends on specific insect- range from good to eventual death.

#### Twig Mining

*Agents* - White Pine Weevil, Pine Tip Moths, Pine Shoot Beetle

*Symptoms* - "Wilting" of tips in many conifer species, distorts growth.

*Control* - Damage can spread quickly through a stand. If only one or two trees affected, identify the pest, prune out damage, and use available sprays. If a whole stand is affected, consider sanitation cut (removal of infected individuals).

*Prognosis* - Good if controlled early on.

#### Bark Beetles/Cambium Feeders

*Agents* - Bronze Birch Borer, Engraver Beetle, Elm Bark Beetle, Black Turpentine Beetle. These agents are generally attracted to stressed/declining trees but some species in this group will attack healthy trees. Some introduce diseases.

*Signs* - Small holes in the bark or raised ridges resembling tunnels under the bark. Larvae tunnel through and feed on the vascular tissue between the bark and the wood, girdling the tree.

*Control* - Remove infested trees if concerned about spread to other declining trees.

*Prognosis* - Poor, eventual death of most trees.

#### Borers

*Agents* - Locust Borer, Pine Sawyer, Wood Wasp, Asian Long-horned Beetle, Sugar Maple Borer, Emerald Ash Borer. Many species will attack healthy trees.

*Symptoms* - Holes/tunnels into wood- can girdle or make tree susceptible to breaking and decay.

*Control* - Reduce other stresses. Generally there is little that can be done. Trees can be removed when invasives such as the Asian Long-horned or the Emerald Ash Borers are involved. Some pesticides may be available.

*Prognosis* - Poor, decline or eventual tree death.

#### Diseases

##### Leaf Spots

*Agents* - Maple Tar Spot, Cedar-Apple Rust, Anthracnose, Rhizosphaera, Dothistroma, Powdery Mildew. Generally not a concern for forest trees.

*Signs* - Surface spots or dead areas on leaves.

*Control* - Sanitation- rake up fallen leaves in autumn. Late season spots on deciduous trees are little concern. Sprays are available.

*Prognosis* - Some leaf spot fungus can cause death, some have little effect; most contribute to decline.

##### Stem and Branch Cankers

*Agents* - Cytospora, Stem Rusts, Black Knot

*Symptoms* - Swellings or sunken areas on twig, branches and trunk, often discolored, cracked open with age.

*Control* - Prune out affected area 6 inches below canker during winter. Remove cankers from the vicinity.

*Prognosis* - Eventual death, often slow.

##### Vascular Wilts

*Agents* - Dutch Elm Disease, Verticillium Wilt, Ash Yellows

*Symptoms* - Individual branches turning yellow (flagging), death of major sections of the crown, wilting leaves.

*Signs* - Bluish streaking on the underside of the bark or surface of the wood; peel back bark on a 1/2" diameter branch to find coloring.

*Control* - In a landscaping situation, prune out the affected limb if possible, or remove the whole tree. Some fungicides are available for Dutch Elm Disease. In a forest you should remove the affected trees when thinning-schedule of thinning is important.

*Prognosis* - Usually tree mortality.



Forest tent caterpillar larvae feed on foliage, leaving only the major veins and leaf petioles behind.<sup>b</sup>

#### Trunk Rots

*Agents* - Large Conks (mushrooms) growing out of the side of the tree.

*Symptoms* - Fungus has colonized the tree and generally there is a large column of decay associated with the conk. Removing the conk will have no effect on the fungus. Generally only found on trees in decline, wounded trees, and standing dead trees.

*Control* - If infected tree is in a high traffic area or near something of value, consider removing. In forested areas, let stand or remove when thinning. These trees can be hazardous but they can also have high value to wildlife.

*Prognosis* - Generally tree mortality, can be slow.

Disposal of infected trees can be tricky. Many of the insects and diseases that can cause a tree to die often die with the tree, or are natural parts of the environment and no special precautions need to be taken. When dealing with trees killed by a non-native pest such as Dutch Elm Disease or the Asian Long-horned Beetle, trees should be either burned, buried, or chipped before the next cycle of the pest begins. Also, do not transport firewood out of infested areas, even if you don't expect it to be infested- this is a popular way for insect larvae and eggs to spread quickly as was seen with the gypsy moth and is a potential for the Asian long-horned beetle.