Thyronectria Canker

Caused by: the fungus *Thyronectria austro-americana*
Hosts: honey-locust
Symptoms: causes girdling branch and trunk cankers that result in branch dieback, reduced foliage, yellowing and wilting of foliage, premature fall coloration, and early leaf drop. Cankers are elongated and slightly sunken with callus ridges sometimes developing with age. The surface of killed bark may have a red-yellow discoloration. Reddish brown discoloration develops in sapwood beneath and near the cankers and may extend to the heartwood. Note that the reddish color associated with the center of honey-locust stems is not related to this disease.
Prognosis: cankers can cause girdling and eventual death of limbs affected. If cankers occur on main stems and trunks it can be fatal.
Management: Prevention is the best control

- Keep trees mulched and watered during dry periods, especially if they have recently been transplanted
- Prune and destroy infected branches during dry weather

Prune out dead branches to a branch junction in dry weather and at least one foot below the visible margin of the canker.
Prevention: Avoid wounding the tree since the fungus can enter through tree wounds. Disinfect pruning tools after each cut by dipping them in alcohol or similar disinfectant.
Other information: Cankers were most frequent on 'Sunburst', less frequent on 'Moraine' and 'Skyline', and least frequent on 'Imperial', 'Holka', and 'Shademaster'.

Seiridium Canker

Caused by: the fungus *Seiridium unicorne*

Hosts: Mainly Leyland cypress and *Chamaecyparis* species, but also sometimes Eastern red-cedar, Oriental arborvitae, and bald-cypress

Symptoms: Cankers on the branches will often be sunken and dark purple to black colored. They will also frequently be oozing resin. Cankers will grow until they have effectively blocked water and nutrients from the affected branch. The foliage on these branches will begin to fade to a light green-gray color, and will eventually die and turn brown. When cankers are located on the main stem of the tree, the entire portion of the tree above the canker will be killed. Multiple affected branches are often seen on the same tree.

Prognosis: Seiridium cankers have the potential to kill an entire tree. This will happen if the canker starts near the base of the trunk. If affected branches are not pruned out, spores will be continually dispersed and potentially cause infection at new sites. The disease can be hastened by water stress and from winter injury.

Management: Prune out cankers and dead limbs. The limb should be cut at least 6 inches from the base of the canker. Disinfect pruning tools with an alcohol solution, or other disinfectant between every cut. Remove and/or destroy pruned out material. There is no effective chemical treatment for this disease.

Prevention: Drought stress favors development of the disease, keep trees moist during dry periods. When planting, plant trees far enough apart to encourage good air circulation. Avoid over-fertilization and apply mulch out to the drip-line. Infectious spores can be spread by rain splash and overhead irrigation. Avoid wetting the foliage of trees, and apply irrigation water directly to the root zone.

Nectria Canker

Caused by: the fungus called *Nectria cinnabarina*

Hosts: more than 90 plant genera, including woody and herbaceous plants, including: linden, horse chestnut, elm, honey-locust, maple, hickory, spruce, pine

Symptoms:

- Also known as the 'coral spot' fungus, the most easily identifiable characteristic is the red-orange fruiting bodies that appear on the bark
- Cankers are slightly sunken and appear on the branches near wounds
- Leaves wilt and wither
- Sometimes a gelatinous mass oozing from each fruiting body can be seen

Prognosis: This disease is often seen on trees stressed by freezing, water shortage, mechanical injury, or other diseases. This disease usually takes out one branch at a time. If the plant remains stressed, and the main stem becomes infected, the disease can be fatal. This can be seen in smaller trees such as crabapple and redbud.

Management: Prevention is the best control

- Keep trees mulched and watered during dry periods, especially if they have recently been transplanted
- Prune and destroy infected branches during dry weather

Prevention: Avoid wounding the tree since the fungus can enter through tree wounds. Disinfect pruning tools after each cut by dipping them in alcohol or similar disinfectant.

Fusarium Canker

Caused by: Several species of fungi called *Fusarium,* most often *Fusarium lateritium.*
Hosts: Apple, red and green ash, quaking aspen, cotoneaster, winged euonymus, American horn beam, black locust, and willow.

Symptoms: Peach colored sporodochia (cushion-shaped fruiting bodies) all over the bark, often erupting from the lenticels in the bark. Cankers can become sunken as healthy tissue grows around them. Symptoms and signs that are visible to the naked eye are otherwise hard to find. Confirmation of a fusarium canker usually requires the use of a microscope to diagnose the canoe shaped spores it produces.

Prognosis: Cankers will grow and girdle infected stems and branches, and if cankers are located on main branches or stems the disease could be fatal.
Management: Prune out cankers at least 6 inches below the diseased portion. Disinfect pruning tools after each cut by dipping them in alcohol or similar disinfectant.
Prevention: Avoid wounding the tree since the fungus can enter through tree wounds. Reducing stresses such as drought, heat or flooding will help to strengthen the trees natural defenses.

Botryosphaeria Canker

Caused by: the fungus *Botryosphaeria ribis, Botryosphaeria dothidea*, and several other *Botryosphaeria* species

Hosts: 170 genera of plants, including apple, birch, dogwood, elm, hickory, horse chestnut, linden, oak, and sycamore

Symptoms:

- Sunken areas with swollen ridges (cankers) form on infected bark. These cankers cut off sap flow, girdling branches, and cause leaves to turn yellow, brown, and then wilt
- Branches die beyond the point of girdling
- Causes branch wilting and dieback
- Cankers are usually cracked, dry, discolored, and covered with small black fruiting bodies that can be seen with a hand lens
- Leaf blights and fruit rots

Prognosis:

- This disease is often seen on stressed trees. Trees stressed by wounding, drought, freezing, defoliation, planting outside of native ranges are especially susceptible.
- This disease usually takes out one branch at a time. If the plant remains stressed, and the main stem becomes infected, the disease can be fatal. This can be seen in smaller trees such as crabapple and redbud.

Management:

- Prune infected branches 6-8 inches below affected tissue during dry weather to keep spores from spreading.
- Remove diseased branches from the site since the fungus can persist and sporulate in dead plant material.
- Keep trees healthy by watering during drought periods and mulching properly

Prevention: Avoid wounding the tree since the fungus can enter through tree wounds. Disinfect pruning tools after each cut by dipping them in alcohol or similar disinfectant.

Other information: Research has found *Botryosphaeria* species are not host specific, so they can be easily transferred between unrelated hosts (example: apple to oak)

Cytospora Canker

Caused by: the fungus *Cytospora kunzei* (also known *as Valsa kunzei* var*. piceae*)
Hosts: Norway and Colorado blue spruce. Occasionally, Cytospora canker is found on Douglas-fir, hemlock, and larch
Symptoms: The disease normally starts on the lowest branches of the tree and, over a period of several years, progresses upward. At first, needles have a purplish hue, eventually turning brown and dropping, leaving dry, brittle twigs and branches. On severely infected trees, the fungus will enter the trunk through wounds (usually where the branch meets the trunk of the tree), killing the cambium layer and leaving dead bark. This dead tissue is called a "canker." A conspicuous white resin or "pitch" covers the cankered portion of the branch or trunk, sometimes flowing several feet down the trunk of the tree. This is an important means of diagnosing Cytospora canker; however, resin flow can also be associated with other tree injuries and is not exclusively symptomatic of Cytospora canker. Within the cankered area, black, pinhead-size fruiting structures (pycnidia) of the fungus can be seen with a microscope or hand lens and are a positive sign of the disease.

Prognosis: Infected trees are weakened substantially, but are rarely killed.

Management:

Cultural Management

Because Cytospora canker is a stress- induced disease, trees should be planted in sites that are favorable to their growth (e.g., avoiding places where they become too crowded). Minimize stress of established trees by taking care not to injure the root system or compacting the surrounding soil. Use a three-to-four-inch layer of organic mulch to retain moisture and reduce rapid soil temperature fluctuations. Water well in dry periods and provide adequate moisture in late fall before the ground freezes. Improving soil quality will reduce stress. Infected branches should be removed to improve appearance and reduce chances of further spread. Avoid pruning or working around trees when foliage, twigs, and branches are wet because water disperses the fungal spores. Clean tools thoroughly and disinfect with rubbing alcohol, a 10% bleach solution or comparable disinfectant after each cut when pruning out diseased wood.

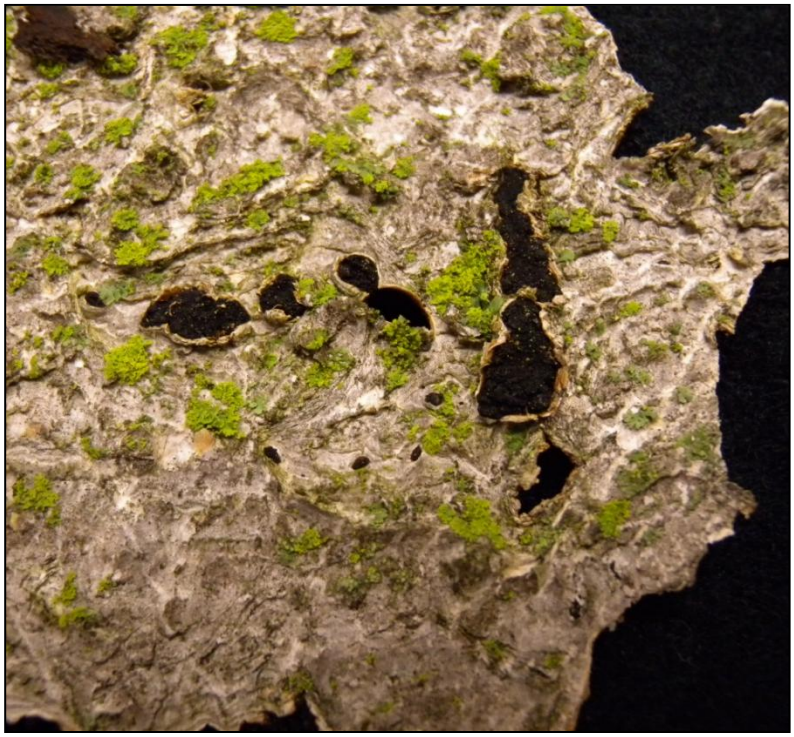
Chemical Management

Applications of copper-containing fungicides have not been effective in preventing or treating Cytospora canker and, in general, chemical control is not useful in controlling this disease.

Prevention: Susceptibility varies widely among species, but generally trees under stress or growing outside their natural range are more prone to the disease. Cytospora canker rarely affects trees less than 15 to 20 years old. Infected trees are weakened substantially, but are rarely killed.

Hypoxylon Canker

Caused by: the fungus *Biscogniauxia atropunctata*
Hosts: Mainly all oaks, but also found on maple, hornbeam, hickory, beech, sycamore, and linden.
Symptoms: Initially, the tree will show signs of stress like smaller leaves in the spring, foliar yellowing, and branch tip dieback. Inspection of the trunk may then reveal the actual fungal signs. There will be a black crust-like structure, called the stroma. Depending on the time of year, it may be covered with tan spores in the spring, or as the fungus matures it will harden and turn a more dark silvery color with black pimple-like structures imbedded in it. The size of the fungal crust can range in size from 1-20 inches long by 1-10 inches wide. Because of its color, the canker can easily blend in with the surrounding bark and is often times overlooked. It may also be covered with a layer of bark that has not yet been pushed off because of the fungal growth underneath.
Prognosis: If cankers are on main structural branches or the trunk of the tree, tree death is likely to occur. If the cankers are further up in the canopy, branch loss and structural damage may occur. However, this fungus will also cause a white rot of the sapwood which will cause the tree to become structurally unsound and may call for total removal of the tree.
Management: Prevention is key in managing this disease. Keeping trees stress free will help them to produce enough natural defense mechanisms. Extra irrigation during dry periods, mulching to the drip line, and ensuring proper protection of the tree on construction sites will keep the tree healthy
Prevention: The casual fungus of this canker is generally an opportunistic fungus and will only cause disease on stressed trees, particularly heat and drought stressed trees.



Golden Canker

Caused by: the fungus *Cryptodiaporthe corni*
Hosts: Pagoda dogwood (*Cornus* alternifolia) and giant dogwood (*C. controversa*)
Symptoms: The infected branches turn golden-yellow and are speckled with orange fungal fruiting bodies. Other symptoms include wilting and death of leaves on infected branches, followed by branch dieback.
Prognosis: This disease can be fatal if the main trunk of a tree becomes infected, but it usually takes out one branch at a time.
Management: Prune the cankered branches during dry weather four to six inches below the discolored bark. The infected branches are the source of spores for many months.
Prevention: Plant resistant species. Disinfect pruning tools after each cut by dipping them in alcohol or similar disinfectant.