A Field Guide to Diseases & Insect Pests of Northern & Central Rocky Mountain Conifers

Skip Navigation Menu

Title Page

Table of Contents

About This Field Guide

Tree Species Included in this Book

Where To Start in the Identification Keys

Host Index

Subject Index

Glossary

Selected References

Other Recommended Field Guides for Forest Diseases

Specimen Collection and Shipping

Technical Asistance Sources

Photo and Drawing Credits

Acknowledgements

Disclaimers

Privacy Policy

Contact Us

Department of Agriculture
Forest Service

State and Private Forestry

Northern Region
P.O. Box 7669
Missoula, Montana 59807

Intermountain Region
324 25th Street
Ogden, UT 84401

Revised from original version for WWW. Last update on 10/2009.

Atropellis Canker

From page 36

Atropellis piniphila (Weir) Lohman & Cash

Hosts-- Lodgepole pine, rarely ponderosa pine. *Atropellis pinicola* causes a similar disease on western white pine.

Distribution-- Locally heavy infections are known to occur in the northernmost counties of Idaho and western Montana. Occasional stands with heavy infections occur throughout the range of the hosts.

Damage-- Branch and stem cankers are produced. Single infections in small stems or multiple infections in large stems often girdle and kill trees.

Identification-- Heavy resin flow results from stem cankers. The bark is usually tight over dead cambium (fig. 17). Dark blue or black staining in sapwood under a canker is observed by cutting into the wood (fig. 18). Minute black fruiting bodies are cup-shaped on short stems (apothecia) emerging from bark at canker margins. Cankers are usually many times longer than wide. The cankers may cause vertical seams which give stems a fluted appearance.

Similar damages-- Comandra and stalactiform blister rusts produce stem cankers which are somewhat similar to Atropellis cankers but they do not cause blue-black staining. Blue stain does not cause cankering.

Sunscald often causes cambium death with bark remaining tight on stem. Animal damage usually has some amount of shredding or chewing visible without staining.

Figure 17. *Atropellis* canker on a lodgepole pine stem. The bark is tight, and dead branches are often present within the cankered area.

References-- 2, 20, 33

Management Guide for *Atropellis* Canker

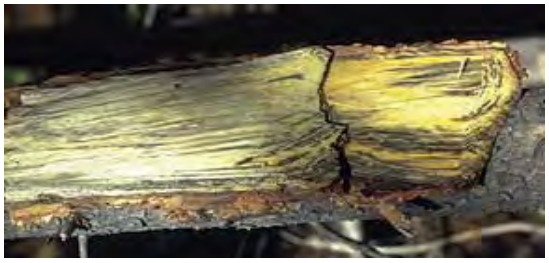

Figure 18. Black staining of the sapwood beneath an *Atropellis* canker helps distinguish it from other stem cankers.

Return to Stem Damage Menu

Blue Stain of Sapwood

From page 37

Several *Ceratocystis*- and *Leptographium*- type species.

Hosts-- All conifers are susceptible if they have been attacked by bark beetles.

Distribution-- Throughout the range of hosts.

Damage-- Blue stains are weakly pathogenic fungi that are introduced into the cambium of trees by attacking beetles. The fungi often aid significantly in the killing of trees, thereby making beetle attacks more successful. The stain spreads quickly, especially via the wood rays, to the extent of the sapwood. The lumber defect is largely cosmetic although heavy staining may indicate the presence of wood decay fungi which also are carried into trees by beetles. Blue stain can occur in sapwood of roots and branches as well as the stem.

Identification-- The apparent staining is actually the color of the fungal hyphae. The staining pattern marks the location of the fungi. After inoculation by beetles, they grow out in all directions from the beetle galleries or bore holes. Blue, black, brown, green and even red-tinted stain begins in the outermost sapwood and radiates toward the heart (fig. 19). The stain often is wedge or fan-shaped in pattern. It stops abruptly at the heartwood-sapwood interface.

Similar damages-- *Atropellis* canker causes distinct blue-black staining which tends to occur in crescents, following the annual rings more than radiating. A distinct canker is formed in *Atropellis* infections. Bark beetle gallery patterns are found under bark adjacent to blue stain. Blackstain root disease staining originates in the roots but can extend several feet upward in the stem. Like *Atropellis piniphila*, staining from blackstain root disease follows annual rings to form crescents of stain in cross- section.

References-- 5, 28

a.

b.

Figure 19. Characteristic radiating pattern of blue stain in cross sections of bark beetle-killed lodgepole pine (a) and Ponderosa pine (b) .

Return to Stem Damage Menu

White Pine Blister Rust

From pages 38-39

Cronartium ribicola Fisch.

Hosts-- Five-needled pines including western white pine, sugar pine, limber pine, whitebark pine and bristlecone pines (both *P. aristata* and *P. longaeva* are potential hosts.) *Ribes* spp. (currants and gooseberries) are alternate hosts.

Distribution-- The pathogen was introduced from Europe and Asia in the early 1920's. It has since spread throughout most of the range of the pine hosts.

Damage-- The fungus causes branch and stem cankers that eventually lead to top kill or death of most infected trees. Generally, the larger the tree is at the time it becomes infected, the longer it survives after infection.

Identification-- The earliest symptom usually detectable is discoloration and pitch flow (figs. 20-24) from a patch on an infected twig or branch. The needles on the branch die and droop as the fungus girdles the branch (fig. 25). The bark is sunken or cracked above the dead cambium. The fungus moves up the branch and into the stem.

Stem cankers usually have abundant resin flow on the outer bark. The outer margin of the canker appears as a discolored area surrounding the dead bark. Infected trees may appear vigorous until shortly before death. Some trees may have squirrel or porcupine chewing at the canker margins. In spring, the fungus often sporulates at the canker margins producing yellow to orange, powdery blisters of spores (aecia) in the bark cracks (figs. 22, 26 and 27).

Similar damages-- Sunscald can damage the cambium resulting in roughening or even sloughing of damaged bark. Rodent feeding may be present without blister rust cankers. Deer or elk may rub their antlers on young pine stems; bears sometimes scratch or chew the bark of young trees.

These damages usually result in relatively little resin flow or tooth or claw marks are clearly visible. The presence of shredded bark is also a good clue to animal damage. *Armillaria* root rot causes resin flow at the base of trees similar to basal stem cankers of white pine blister rust but white mycelium fans are present under the bark.

References-- 2, 5, 33, 81

Figure 20. Stem cankers eventually girdle and kill trees.

Figure 21. White pine blister rust causes orange or yellow discoloration of thin bark of young trees.

Figure 22. White pine blister rust sporulating on the bole of an infected tree.

Figure 23. Basal canker of white pine blister rust.

Figure 24. Wetting branch cankers can make it easier to see the discoloration from a canker.

Figure 25. Branch flagging occurs after the canker has girdled the branch.

Figure 26. Spindle-shaped swelling is an early indication of branch infections. This infection is also sporulating.

Figure 27. Spores are produced within the blisters.

Return to Stem Damage Menu

Western Gall Rust From page 40

Endocronartium harknessii (Moore) Hirat.

Hosts-- Lodgepole and ponderosa pines.

Distribution-- Range of hosts.

Damage-- Galls form on infected branches or stems (figs. 28 and 29). Branches and small stems are killed when insects and other fungi attack galled tissue. Galls weaken stems of large trees and windbreakage is common.

Identification-- Round swellings (galls) form on branches or stems. Pustules of yellow or orange spores (aecia) form in bark cracks on galls in spring (fig. 28b). In very young trees such as 2-year-old nursery stock, slight spindle-shaped swellings are seen on the lower stern. In saplings and larger trees stem infections eventually form flared, target cankers (cankers with concentric ridges of sapwood) called "hip cankers" (fig. 29). Sporulation can sometimes be seen at the edges of hip cankers in spring.

Similar damages-- Comandra blister rust stem cankers are sometimes mistaken for gall rust hip cankers. Comandra cankers are usually somewhat longer than they are wide. From a distance, branch flagging caused by gall rust (fig. 30) often is confused with that caused by pine shoot blight cankers.

References-- 2, 5, 33, 54, 81

Management Guide for Western Gall Rust

Figure 28. Branch gall as they normally appear (a) and sporulating (b).

Figure 29. Stem ("hip") canker causedby western gall rust.

Figure 30. Branch flagging in crown caused by western gall rust.

Return to Stem Damage Menu

Other Galls and Burls

From page 41

Hosts-- All conifers, especially common in Douglas-fir, lodgepole pine, subalpine fir, and Engelmann spruce.

Distribution-- For most species, except Douglas-fir, burls are most common at high elevations. Galls on Douglas-fir are most common in dense stands where understory trees are most affected.

Damage-- Globose swellings which may be smooth or rough form on stems or branches. Although significant wood defect occurs because of deformed wood fibers, there appears to be little growth effect. Burls often are used for decorative purposes.

Identification-- Often several swellings are formed in succession along an stem (fig. 31) or branch. Some burls have flared ridges and roughened bark (fig. 32) while others are smooth and rounded (fig. 31). Afflicted trees may occur singly or there may be dozens of burled trees in a group. Frost or freeze damage of cambium cells may be a common cause of burls and galls in most species. This may account for the tendency to occur at high elevations. Once damaged, the cambium cells continually to produce abnormal xylem, resulting in burls which enlarge throughout the life of the tree. Bacterial infections often are the cause of galls in Douglas-fir.

Similar damages-- Western gall rust in lodgepole pine is most common at lower elevations. On stems, gall rust produces a definite canker. Balsam woolly adelgid causes globose or spindle-shaped swelling of branches which looks much like frost burls.

References-- 5, 33, 35, 79

Figure 31. Burls on lodgepole pine stem.

Figure 32. Burl on western redcedar.

Return to Stem Damage Menu

Comandra Blister Rust

From pages 42-43

Cronartium comandrae Pk.

Stalactiform Blister Rust

From pages 42-43

Cronartium coleosporioides Arth.

Hosts-- Ponderosa pine is host to both rusts, although stalactiform is rare on this species. Lodgepole pine is host to comandra and stalactiform blister rusts.

Distribution-- Comandra and stalactiform blister rusts occur throughout the range of the hosts. Comandra blister rust is especially severe in south-central Montana and northwest Wyoming. Stalactiform blister rust is generally restricted to high elevations (above about 5,000 feet).

Damage-- The fungi cause cankers which eventually girdle branches or stems resulting in top kill or tree death. Infection is occasionally heavy in stands causing high volume losses.

Identification-- Flagged branches have cankers with rough bark and, in late spring and early summer, pustules (aecia) of yellow or orange spores (fig. 33). Stem cankers on young trees or small cankers on larger trees initially have roughened bark, heavy resin flow (fig. 34), and often insect boring in the killed cambium. With time, stem cankers slough the dead bark at the center (figs. 35 and 36). Dead, resinous sapwood is ridged in target form concentric ridges of sapwood resulting from annual growth of the canker.

Large stem cankers sometimes sporulate at their edges as well. Porcupines and squirrels often chew the bark at canker margins (see fig. 54). Large stalactiform blister rust cankers are many times longer than their width (fig. 36). Comandra blister rust cankers are usually 2-5 times longer than wide (fig. 34). The fungi are best differentiated by microscopic examination of spores.

Similar damages-- *Atropellis* cankers are also common on lodgepole and ponderosa pines. The sapwood under *Atropelli*s cankers is stained dark blue or black. Rodent chewing at canker margins sometimes results in cankers being overlooked. Concentric ridges of sapwood and dead cambium under nonchewed bark are indicators of cankers.

References-- 2, 33, 39, 81

Management Guide for Comandra and Stalactiform.

Figure 33. Comandra blister rust sporulating on a young lodgepole stem.

Figure 34. Comandra blister rust sporulation causing rough bark.

Figure 35. Stalactiform blister rust canker on young lodgepole pine.

Figure 36. Older stalactiform blister rust stem canker.

Return to Stem Damage Menu

Peridermium Limb Rust From page 43

Peridermium filamentosum A. & K.

Hosts-- Jeffrey and ponderosa pines.

Distribution-- Locally severe in parts of Utah, Nevada and California.

Damage-- Limbs in whole sections of the crown are killed as the fungus moves systemically through stem sapwood infecting branches. Limb rust does not cause cankers on stems of mature trees. Growth loss and top-kill, resulting from branch death, can be severe.

Identification-- Mid-crown branch killing produces typical crown symptoms (fig. 37). Branch infections and cankers on sapling stems are similar to comandra blister rust (fig. 38). Stem cankers are not produced on stems with secondary phloem (larger trees).

Figure 37. Typical limb rust crown symptoms.

Similar damages-- Comandra blister rust

References-- 3, 65

Figure 38. Limb rust aecia sporulating on a Jeffrey pine limb.

Return to Stem Damage Menu

Sequoia Pitch Moth From page 44

Synanthedon sequoiae (Hy. Edwards)

Hosts-- Lodgepole, ponderosa, Jeffrey and piñon pines.

Distribution-- Range of lodgepole and ponderosa pines in Idaho and Montana. Along the California-Nevada border in Jeffrey and piñon pines.

Damage-- Larvae bore beneath bark in phloem and outer layers of wood causing masses of pitch to form around their entrance holes (figs. 39 and 40). Repeated attacks can girdle and kill young, small-diameter pines or cause them to break. Attack sites are usually near root collar or just above. Large numbers of attacks can weaken large trees. Resin can become a nuisance in some settings (fig. 41).

Identification-- Pitch masses containing larvae are soft, whitish, and have some reddish boring dust mixed in (fig. 40). Especially abundant at the base, these masses also are found in wounds and at junctions of limbs and bole. Old masses turn hard and yellowish. Mature larvae are yellow-white and about 1 inch long. Two years may be required to complete development. Brown pupal skins might be sticking out of masses in late June through July. Adults are clearwing moths with black and yellow markings much like a wasp.

Similar damages-- Pitch masses may be mistaken for bark beetle-caused pitch tubes. Those of the pitch moth are much larger and contain more pitch, less boring dust. Removing bark should reveal large pitch moth larva.

References-- 2, 22

Management Guide for Sequoia Pitch Moth

Figure 39. Pitch masses indicating entrance and feeding sites.

Figure 40. Larva of sequoia pitch moth within the pitch mass.

Figure 41. Pine with unusually heavy damage from sequoia pitch moth.

Return to Stem Damage Menu

Pine Pitch Mass Borer

From page 45

Dioryctria spp.

Host-- *Dioryctria cambiicola* (Dyar) in ponderosa pine and lodgepole pine; *D. ponderosae* in piñon and ponderosa pines; and *D. tumicolella* Matuura, Monroe and Ross in rust galls on ponderosa pine

Distribution-- Idaho, Montana, Utah and Nevada

Damage-- Larval stages are the damaging agents to trees. Pitch masses in the crooks of limbs, branches, and trunks are evidence of borer presence. Trees respond to larval mining by trying to pitch them out. Although, mature trees are not killed outright, they are disfigured and vigor may be reduced. Small trees can be killed if feeding scars are large enough to girdle the stem. Some species of pitch mass borers also mine branch and stem galls caused by western gall rust (*Endocronartium harknessii*)

Identification-- Pitch masses of various sizes are signs of infestation and localized feeding (figs. 42 and 43a). Heavy scarring can occur on trunks and large branches, usually in the upper half of the tree. Adults are difficult to locate, but larvae can be found mining the wood in the surrounding the pitch mass (fig. 43b). Larvae of *D. ponderosae* are pink with a dark head and adults of this species are gray-brown moths with a snout-nose and white zigzag wing markings.

Similar damages-- The pitch masses caused by Sequoia pitch moth are very similar although generally somewhat larger and are more commonly produced at the base of the tree and on the main trunk rather than on branches. Pitch tubes from bark beetle attacks are usually smaller and have more red or brown frass.

References-- 2, 3, 22

Figure 42. Pitch mass under a branch node.

Figure 43. Pitch mass on small lodgepole pine stem showing appearance of resin mass (a), and mass opened (b) to expose larva (at the top of the mass).

Return to Stem Damage Menu

Fir and Spruce Canker

From pages 46-47

Leucostoma kunzei (Fr.) Munk [Anamorph: Leucocytospora *kunzei* (Sacc.) Z. Urba]
Valsa abietis Fr. [Anamorph: *Cytospora abietis* Sacc.]

Hosts-- *Valsa abietis*--True firs and Douglas-fir are most often attacked although western hemlock and western redcedar are occasional hosts. *Leucostoma kunzei* --Spruce and Douglas-fir.

Distribution-- Range of hosts.

Damage--Branch and stem cankers are produced. Branches are quickly girdled and killed as are tops of seedlings. Stem cankers occasionally girdle and kill saplings, seldom larger trees

Identification-- Flagged branches and dead tops of seedlings and saplings are usually the most obvious symptoms (figs. 44, 46 and 47). Sunken bark with dead cambium underlying is the result of the canker. If the edge of the canker is cut with a knife, an abrupt margin is observed between the green, live bark and the brown, dead bark (figs. 44 and 46). Slight resin flow is often present at the canker margin and the bark within the cankered area often appears discolored (fig. 45). Sporulation is seldom observed. Orange tendrils of asexual spores exude from microscopic fruiting bodies (pycnidia) embedded in the the bark at canker margins. Even less common are the sexual fruiting bodies (perithecia) which form at canker margins.

Similar damages-- Hail can result in wounds similar to small cankers but usually do not girdle and kill branches. Hail wounds can become infected by *Leucostom*a or *Valsa*. Animals chew bark from branches and stems. Deer and elk rubbing, and bear clawing are also confused with cankers but leave tooth marks, scratches or strips of loose bark.

References-- 2, 5, 20, 33, 61, 68

Figure 44. Fir and spruce cankers are easily diagnosed by cutting away the bark. An abrupt margin is seen between dead and live cambium.

Figure 45. *Valsa* and *Leucostoma* occasionally cause cankers on large stems.

Figure 46. Canker progressing from a branch into the stem.

Figure 47. Fir and spruce cankers are usually on branches, causing flagging.

Return to Stem Damage Menu

Lachnellula Canker

From page 47

Lachnellula flavovirens (Bres.) Dennis

Hosts-- Western larch seedlings and saplings.

Distribution-- Frequent in parts of western Montana; may occur elsewhere within the range of the host.

Damage-- Stem and branch cankers girdle and kill tree top, branches, or small trees.

Identification-- Sunken, discolored, sometimes resinous areas of bark on stem or branch (fig. 48). Cambium is killed. A distinct margin between dead and live cambium is observed by cutting away bark. Small, cup-shaped fruiting bodies (apothecia) are occasionally found on dead bark within canker. These fruiting bodies are one-eighth inch in diameter; yellow inside and brown on the outside.

Similar damages-- Other fungi can cause stem cankers on larch; fruiting is required to differentiate them. Animal damage may result in girdling young trees but bark is removed by animals, whereas it remains in place with *Lachnellula* canker.

References-- 20

Figure 48. *Lachnellula* canker causing topkill of a larch sapling.

Return to Stem Damage Menu

Balsam Wooly Adelgid

From pages 48-49

Adelges piceae (Ratzeburg)

Hosts-- In Northern Region, subalpine fir and grand fir.

Distribution-- Thus far has been found only in northern Idaho, but may occur elsewhere in the region.

Damage-- All sizes of trees are attacked, but infestations may be concentrated on the stems or in the crowns. Stems-attacked trees may be killed after 2-3 years of heavy feeding (fig. 49). Nymphs feed on bark of all parts of the tree, injecting a chemical which causes abnormal cell division. This produces annual rings composed of thick cells (compression wood) in the stem, and stunting of terminal growth with distinct swellings (fig. 50) around the buds and branch nodes (gouting).

Identification-- The most obvious indicator of the aphids' presence is the white "wool"-covered females on the bark of stems or branches during summer months (figs. 51 and 52). Without the wool, adults are about one-sixteenth of an inch long and dark purple to black in color. Overwintering nymphs are about one thirty-seconds of an inch long, amber colored, flattened, and fringed with whitish wax. Gouts can be on outer branch nodes and terminal buds, and can stop production of new shoots. Dying or dead branches and crowns are other symptoms.

Similar damages-- May be mistaken for damage caused by scale insects. "Wool"-covered females and gouts are distinctive.

References-- 2, 22, 51

Management Guide for Balsam Wooly Adelgid

Figure 49. Balsam woolly adelgid damage in a riparian subalpine fir stand. The mortality associated with this insect can be substantial such stands.

[Inset above; crown symptoms of subalpine fir being killed by balsam woolly adelgid.]

Figure 50. Swelling (gouting) around buds and branch nodes caused by balsam woolly adelgid.

Figure 51. "Wool"-covered female balsam woolly adelgids as they appear during summer.

Figure 52. Balsam woolly adelgids on the bark of a subalpine fir.

Return to Stem Damage Menu

Animal Damage

From pages 50-51

Hosts-- All conifers

Distribution-- Throughout the region.

Damage-- Chewing, scratching, rubbing, shredding the bark and cambium, and browsing buds are common animal damages. Tree scarring, deforming, and girdling may result. The type and extent of damage varies with the animal and the availability of suitable trees. Under some conditions, large groups of trees can be girdled by rodent (figs. 53-54) or rabbit chewing, or debarking by bear (fig. 55). Sapsuckers (large birds in the genus *Sphyapicus*) lap up the sap that leaks from holes they bore in stems (fig. 56). Rubbing by deer or elk is common on saplings (fig. 57), particularly along well-used game trails. Deer, elk and moose browse the tender tops of seedlings, particularly in winter (fig. 58). Scratches from bear marking on thin-barked conifers (fig. 59) usually callous over with little residual effect but bear will strip the bark of saplings and small trees, sometimes girdling large groups of trees in an area.

Figure 53. Larch saplings with tops girdled by squirrels. Red and brown tops have been girdled. Trees were photographed in fall coloration

Squirrels and porcupines, in particular, often chew eat infected cambium from the margins of rust cankers (fig. 54). A sugar-based exudate containing the spores may attract them to the cankers. They also feed in the tops or mid-stem on healthy trees, girdling branches or tree tops. Squirrels also clip small branches from trees dropping them to the ground below.

Figure 54. Tooth marks from a porcupine are clearly visible in the margins of this sporulating rust canker.

Rabbits, beaver and ground-dwelling rodents feed on cambium of young trees near the ground and commonly scar or girdle trees. Underground dwellers such as pocket gophers feed on roots.

Identification-- In most cases of chewing or marking, tooth or claw marks are clearly visible in the cambium or sapwood of damaged trees. Rubbing by deer and elk produces usually leaves shredded bark attached to the damaged area.

Similar damages-- Cankers appear similar but do not show tooth marks or strips of shredded bark. Mechanical damage from vehicles, sunscald, or freeze damages all can be difficult to differentiate from rubbing and even bear debarking (unless incisor marks are evident). Circumstances often provide the best clues to the actual cause of damage.

References-- 27, 43

Management Guide for Animal Damage

Figure 55. A bear has stripped the bark and cambium from this young tree. Vertical grooves are evident.

Figure 56. Sapsuckers feed on sap which oozes from the distinctive holes they make on the stem. The holes are regularly spaced in rows.

Figure 57. Antler rubbing damage with shredded bark and callous ridges.

Figure 58. Repeated browsing has caused multiple stems to be produced by this young Douglas-fir.

Figure 59. Claw marks from bear marking trees are distinct when fresh. Callous ridges may develop if the cambium has been damaged.

Return to Stem Damage Menu

Abiotic Stem Damages

From pages 52-53

Hosts-- All conifers

Distribution-- Throughout the region.

Damage-- Sunscald, freeze and fire heat injury cause rough, scaling bark (fig. 60) and, sometimes, limited cambium death. Mechanical scarring of the stem can result from trees falling or leaning against an adjacent tree. Logging activities frequently result in bark scarring and even deeper gouging (fig. 61). In the case of sunscald or mechanical injury, the damage may involve only the outer bark, causing no defect, or the injury may lead to extensive heartrot if the cambium has been killed. Fire scars can be superficial (fig. 62) or deep and are often very resinous. Frost cracks and lightning strikes can cause vertical seams that extend deep into the stem and may lead to heartrot. Wind shake causes separation of annual rings and resin deposition at the site of damage which can cause significant defect in logs.

Identification-- Sunscald occurs when thin bark is suddenly exposed to intense sun (heat), which can result from pruning or thinning a stand. Freeze injury is similar to sunscald but is caused by a sudden drop in temperature damaging the sun-warmed and, therefore, non-hardened cambium. Sunscald and freeze injury are seen on the south to southwest side of stems. At first, the bark is discolored, if the injury is severe enough the bark will become rough and dead bark will flake (fig. 60). If the cambium has been killed, the scar may extend to the sapwood and the bark may eventually slough off. Little or no resinosus results. A ridge of callus will form between live and dead cambium.

Mechanical injury may lead to significant resin production, especially if it occurs in the spring. A ridge of callus will eventually form at the edges of a scar. Fire injury, whether from radiant heat or burning of the wood or bark, will have some evidence of char, usually on the bark at the base of the tree.

Frost cracks are caused by an extreme drop in temperature during the winter, when trees are dormant. The shrinking of outer wood, as it cools quickly compared to warmer inner wood, causes the outer wood to separate. Both frost and lightning scars may spiral somewhat on the stem. Lightning scars often have much greater loss of bark, because bark explodes from the stem. Tops of trees hit by lightning often are knocked off by the blast. Lighting strikes often kill trees but frost cracks generally do not. Either type of damage is likely to lead to internal decay. Callus ridges form along the edges of the wound leaving an apparent seam along much of the length of the stem.

Similar damages-- Cankers appear similar sunscald, freeze injury and mechanical scarring. Look for multiple, concentric rows of callus ridges at the edge of cankers.

Figure 61. Fresh mechanical wound with resin. The bark was torn away and the wood gouged during logging. Frayed wood and bark are evidence of mechanical injury.

Figure 60. Sunscald is seen on the south side of thin-barked trees

Figure 62. This old fire scar has intact bark covering most of the injury. The cambium was killed by a column of heat without burning the bark. Decay extends into the heartwood behind the injury. Pulling away loose bark revealed a single callous ridge typical of a non-canker stem injury (inset).