White spruce with fungal needle cast

Diagnosing Spruce Problems

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DEPARTMENT OF NATURAL RESOURCES

FORESTRY DIVISION
FOREST HEALTH TEAM

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New or older needles eaten

Yellow-headed spruce sawfly

Yellow-headed spruce sawfly larvae feeding

New growth removed by yellow-headed spruce sawfly larvae

Description

- Feeds on branch tips of white, black, and blue spruce shorter than 15 feet tall.
- Usually feeds on needles in open-grown clusters of trees.
- Larvae present in late May through June.
- Top-kill or death of small trees possible.

Management

- Heavy damage on small trees may require spraying with an appropriate insecticide on larvae less than ½" long in late May (do not use Btk, *Bacillus thuringiensis* var. *kurstaki*, which is only effective on the larvae of moths and butterflies).

New or older needles eaten

Spruce budworm

Spruce budworm larva

Needles at branch tips brown and tied together with silk

Spruce budworm pupa

Scorched top of balsam fir

Description

- Prefers to feed on needles in upper crown or those exposed to sun on trees of all sizes.
- Prefers balsam fir, but readily feeds on white spruce.
- Larvae present in late May through June.
- Larvae tie needles and shoots together with silk.
- Infested trees appear scorched because clipped, dead needles get caught in silk.
- Empty pupal cases often present year-round.
- Several years of heavy defoliation can kill trees.

Management

- Protect older, valued balsam fir in yards with an insecticide containing *Bacillus thuringiensis* var. *kurstaki* (Btk can be used by organic farmers).
- In managed forests, avoid keeping too many older balsam firs that overtop the main canopy.
- More information may be found on the Minnesota DNR forest health webpage, https://www.dnr.state.mn.us/treecare/forest_health/spruce-budworm/index.html.

New or older needles discolored

Spruce needle rust

Spruce needle rust showing tongue-like structures

Spruce needle rust

Description

- Small, yellow, tongue-like structures pop out of needles, causing them to turn tan or pink in spring or summer.
- Diseased needles often fall off.

Management

- Management is rarely required since infected spruce usually survive.

New or older needles discolored

Spruce spider mite

Adult spruce spider mite

Webbing created by spruce spider mite

Damage on spruce

Description

- Associated with dry weather.
- Damaged needles range from mottled yellow to bronze.
- Very fine webbing visible on twigs.
- Egg cases and adults visible with hand lens.
- Confirm existing infestations by tapping branches over white paper to see moving mites.

Management

- Heavy infestations on young spruce may require application of a horticultural oil or a miticide from early June to early July.

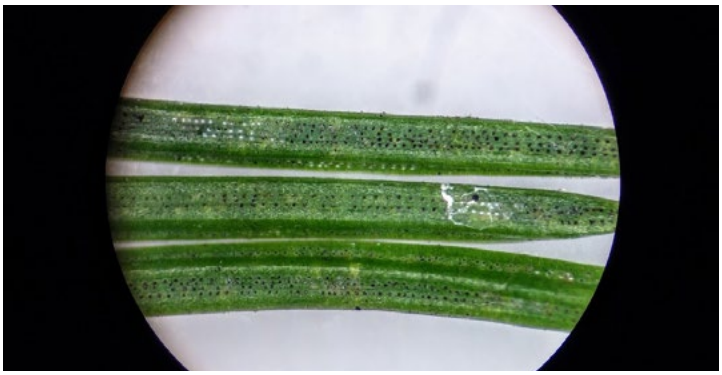
Mainly older needles discolored

Fungal needle casts

Stigmina needle cast

Needles showing symptoms of needle cast

Rhizosphaera needle cast



Close-up of needle cast fruiting bodies

Description

- Current-year needles green and buds healthy.
- Infected older needles turn brown to purple and fall off lower and interior branches.
- Fruiting bodies appear as small black dots or black lines on needles.

Management

- Adequately space spruce trees or prune out lower branches to improve air circulation; water correctly during drought, keeping water off needles https://www.youtube.com/watch?v=a4hNIJxPxbg. Fungicides are unlikely to be a long-term solution.

Scattered dead branches or twigs

Cytospora canker

Cytospora canker on spruce

Description

- Colorado blue spruce especially susceptible.
- Buds dead, needles dead or missing.
- Infection can occur anywhere on the tree.
- Pitchy sap found on branches at cankers (dead zones of bark on branches or trunks).
- Golden spore tendrils may be on dead twigs or cankers.

Management

- Properly water during drought; adequately space trees; prune out infected branches during dry weather and sterilize cutting tool between cuts; avoid wounding healthy branches and trunk.

Needles on branches above snow line turn brown

Late spring frost

Description

- Most common in low-lying areas.
- New shoots droop, wilt, and may die, often only on the lower part of the tree.

Management

- Management is not necessary since spruce almost always survive spring frost damage.

Spring frost damage on spruce

Winter injury

Description

- Moisture loss from needles during winter can't be replaced.
- Needles on branches above snow line turn brown from tip toward base and often on the south or southwest side of the crown.

Management

- Before the ground freezes, protect the sides of small spruce most exposed to wind and sun with a windscreen: http://msue.anr.msu.edu/news/smart_winter_protection_for_trees_and_shrubs.

Winter injury on white spruce

Winter injury

Leader wilted or dead

White pine weevil

Terminal leader dead

White pine weevil larva

Adult exit holes

Chip cocoons

Description

- Terminal leader and up to three whorls of branches drooped over and dead.
- Other branches unaffected.
- Mainly affects spruce less than 20 feet tall.
- Larvae and chip cocoons found under bark of wilting leaders from May through July.
- Prefers open-grown trees.

Management

- Prune out and destroy attacked leaders by July 15.

Shoots and twigs swollen, needles green or dead

Spruce galls

Spruce gall midge

Cooley spruce gall

Eastern spruce gall

Description

- Generally an aesthetic problem, especially on larger trees.
- Current needles near galls may be green; needles are dead and discolored on older shoots with galls.
- Cooley spruce galls are mainly on Colorado blue spruce and white spruce. Find them at the tips of new growth.
- Eastern spruce galls mainly affect Norway and white spruce. Find the pineapple-shaped galls at the base of new shoots.

Management

- Management is not necessary on spruce with healthy crowns. Avoid planting spruce in heavy shade. Prune out green galls on small spruce.

Tree canopy uniformly turning orange

Bark beetles

Pitch tube

Bark beetle gallery

Adult beetle exit holes

Description

- Attack stressed trees.
- Larvae feed in tunnels (galleries) under bark.
- Sometimes attack causes small clumps of pitch called pitch tubes to form on bark surface.
- Adults leave very small exit holes.

Management

- See pine bark beetle webpage: https://www.dnr.state.mn.us/treecare/forest_health/barkbeetles/index.html. Management is the same for bark beetles in spruce.

Tree canopy uniformly turning orange

Fungal root diseases

Dried pitch and resin at the base of the trunk indicate Armillaria infection

Armillaria **fruiting bodies**

Armillaria **mycelial fan**

Armillaria **mycelial fan beneath bark**

Description

- Attack stressed trees.
- Can eventually cause pitch production at the base of the trunk.
- Trees may die in 1-3 years.

Management

- Avoid root diseases by keeping trees healthy. Mulch correctly https://www.youtube.com/watch?v=Le05ExdzSIA around the base of trees. Avoid fertilizing or wounding. Properly water during drought https://www.youtube.com/watch?v=a4hNIJxPxbg.

Pitch masses on trunk

Pitch mass borer

Pitch masses on trunk

Pitch mass borer larva

Description

- Pitch masses are up to 4 inches across.

Management

- Dig through pitch mass to kill larva or pupa; healthy trees usually survive attack.