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CHRISTMAS TREE INSECTS AND DISEASES



A FIELD GUIDE

Foreword

This field guide has been created to respond to demand from the Atlantic Christmas tree industry for a practical, portable tool. Its content, adapted from a poster released in 2006, has been taken from a larger work, *Insects and Diseases of Balsam Fir Christmas Trees*, that will be published online in 2008 (<http://cfs.nrcan.gc.ca/index/xmas>) and will replace the 1983 *Common Insects of Balsam Fir Christmas Trees*.

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CHRISTMAS TREE PESTS AND BENEFICIAL INSECTS

— INSECTS —

Balsam Fir Sawfly	3
<i>Neodiprion abietis</i>	
Balsam Gall Midge	4
<i>Paradiplosis tumifex</i>	
Balsam Shootboring Sawfly	5
<i>Pleroneura brunneicornis</i>	
Balsam Twig Aphid	6
<i>Mindarus abietinus</i>	
Balsam Woolly Adelgid (Aphid)	7
<i>Adelges piceae</i>	
Spruce Budworm	8
<i>Choristoneura fumiferana</i>	

— DISEASES —

Needle Rusts of Balsam Fir	9
<i>Pucciniastrum, Uredinopsis, Milesia</i>	
Needle Casts	10
<i>Lirula nervata, Lirula mirabilis, Isthmiella faulii</i>	
Yellow Witches Broom (Fir Broom Rust)	11
<i>Melampsorella carophyllacearum</i>	
Armillaria Root Rot	12
<i>Armillaria mellea</i>	

— BENEFICIAL INSECTS —

Red-eyed Bee.....	13
<i>Trichogrammatidae</i>	
Ladybird Beetle.....	13
<i>Coccinellidae</i>	
Non-stinging Wasp	14
<i>Ichneumonidae, Braconidae, Chalcidoidea</i>	
Tachinid Fly.....	14
<i>Tachinidae</i>	
Predatory Wasp.....	15
<i>Vespidae</i>	
Hoverfly	15
<i>Syrphidae</i>	
Lacewing	16
<i>Hemerobiidae</i>	
Rove Beetle	16
<i>Staphylinidae</i>	
Ground Beetle	17
<i>Carabidae</i>	
Stink Beetle	17
<i>Pentatomidae</i>	

Balsam Fir Sawfly

(*Neodiprion abietis*)

Seasonal History

- ◆ overwinters in the egg stage, and hatches in late June to mid-July
- ◆ larvae feed in colonies on old needles, then individually until late August
- ◆ reddish-brown cocoons form on needles or in litter
- ◆ adults emerge in early September
- ◆ females lay eggs in slits in the current-year needles using their saw-like ovipositors

Damage

- ◆ larvae feed on old needles, rarely on new needles
- ◆ feeding creates sparse foliage and reduces tree vigor
- ◆ mortality is rare, but severe outbreaks may kill small trees and spoil survivors
- ◆ localized outbreaks occur periodically

Detection and Monitoring

- ◆ an increasing problem in balsam fir stands in eastern Canada
- ◆ in winter, look for partially defoliated upper crowns; new shoots will still be green
- ◆ in summer, look for reddening of old needles, and larvae from June to August

Control

- ◆ virus registered for control
- ◆ control method must target young larvae before damage occurs

Beneficial Insects

- ◆ predatory bugs, stink bugs, ground beetles, rove beetles, fireflies, soldier beetles, click beetles, ladybird beetles, snipe flies, tachinid flies, red-eyed bees, predatory wasps and hornets, spiders



Balsam Gall Midge

(Paradiplosis tumifex)

Seasonal History

- ◆ tiny, orange adults emerge from soil and swarm from late May to late June
- ◆ adults' appearance coincides with developing buds
- ◆ eggs laid within partially opened buds
- ◆ galls (small green swellings) form around larvae
- ◆ larvae feed all summer within galls, then drop to the ground
- ◆ larvae overwinter in silk cocoons in the ground

Damage

- ◆ one to six galls per needle
- ◆ branch is distorted and discolored
- ◆ galled needles turn yellow and drop in mid-summer
- ◆ trees have bare spots and thin foliage
- ◆ trees are devalued, but usually recover within 3 years

Detection and Monitoring

- ◆ early detection of infestations is difficult
- ◆ infestations usually last 3 years
- ◆ look for adult swarms on calm sunny days, or on warm evenings
- ◆ check for galls in June

Control

- ◆ destroy affected branches before needles drop
- ◆ use pesticide only in severe outbreaks to save trees that will be harvested
- ◆ insecticide use is difficult because larvae are protected within galls

Beneficial Insects

- ◆ parasitic midges, rove beetles, fireflies, click beetles, snipe flies, chalcid wasps, spiders



Balsam Shootboring Sawfly

(*Pleroneura brunneicornis*)

Seasonal History

- ◆ in May, small black flies lay eggs at the base of unflushed terminal buds
- ◆ white larvae tunnel into new shoots to feed
- ◆ larvae drop to ground and spend 1 or 2 years in cocoons
- ◆ larvae pupate, then emerge as adults in early spring
- ◆ may have a 2-year life cycle

Damage

- ◆ bud tips flatten into a rosette shape with a brown tip
- ◆ damage visible in late June
- ◆ late damage mimics frost damage
- ◆ weakened shoots die and drop in summer
- ◆ does not kill trees
- ◆ Fraser fir is more susceptible to damage

Detection and Monitoring

- ◆ check for larvae on trees next to native balsam fir stands
- ◆ look for adults on warm sunny days in late April

Control

- ◆ healthy, tightly sheared trees suffer less damage
- ◆ insecticides are not usually necessary
- ◆ apply insecticide in April only if there is a significant problem

Beneficial Insects

- ◆ soldier beetles, click beetles, snipe flies, tachinid flies, red-eyed bees, chalcid wasps, other parasitic wasps, spiders



Balsam Twig Aphid

(Mindarus abietinus)

Seasonal History

- ◆ eggs overwinter on buds, and hatch in spring
- ◆ hatching occurs over several weeks to ensure survival
- ◆ complex life cycle includes different adult stages
- ◆ winged forms fly in mid-June to other trees
- ◆ sexual reproduction occurs in new location

Damage

- ◆ feeds on new shoots and needles
- ◆ causes twisted shoots and curled needles in June
- ◆ severe infestations occur every 4 to 5 years in Atlantic Canada
- ◆ reduces grade of trees for up to 3 years
- ◆ black sooty mold grows on honeydew secreted by nymphs

Detection and Monitoring

- ◆ beat branches onto white paper in early spring to detect presence of aphids
- ◆ look for twisted current-year needles containing aphids

Control

- ◆ only treat high-quality trees 2 to 3 years away from harvesting
- ◆ prune affected foliage
- ◆ allow beneficial insects to reduce infestation

Beneficial Insects

- ◆ hoverflies, lacewings, ground beetles, fireflies, ladybird beetles, stink bugs, spiders



Balsam Woolly Adelgid (Aphid)

(Adelges piceae)

Seasonal History

- ◆ complex life history with two generations
- ◆ overwinters as a nymph
- ◆ nymphs feed in spring, then mature; adults lay eggs asexually in May
- ◆ new nymphs crawl about, then settle to feed as new adults
- ◆ these adults produce a second generation of nymphs in mid-August that then overwinter

Damage

- ◆ one of the more serious pests of balsam fir
- ◆ severe outbreaks can kill or downgrade trees
- ◆ adelgids suck nutrients from tree
- ◆ two types of damage:
 - stem or trunk attack (compression wood limits nutrients; white woolly insects are visible on trunk)
 - twig attack (shoots swell and become gouty, crown is distorted)
- ◆ most damage to Christmas trees results from twig attack



Detection and Monitoring

- ◆ look for white woolly masses on lower trunk and large branches in spring/summer
- ◆ look for crown gout and topkill at any time of year
- ◆ place twigs in warm water in March to detect presence of adults

Control

- ◆ climate and weather are limiting factors
- ◆ cull all infested trees and logs in winter, and burn
- ◆ a thorough spraying with a registered insecticide is helpful in early spring

Beneficial Insects

- ◆ lacewings, ground beetles, fireflies, ladybird beetles, hoverflies

Spruce Budworm

(*Choristoneura fumiferana*)

Seasonal History

- ◆ moths lay eggs on needles in late summer
- ◆ newly hatched larvae disperse on silken threads and seek crevices in which they spend the winter
- ◆ second-instar larvae emerge in late April and disperse again; by the first week of May, larvae start feeding by mining needles and buds
- ◆ larvae feed, grow, and molt as the shoots develop
- ◆ the last-stage larvae, the sixth instar, pupate in mid-July
- ◆ adults emerge several days later

Damage

- ◆ in spring, young budworm mine in old needles and current buds
- ◆ as the larvae and shoots develop, feeding continues until the new shoot is severely defoliated or killed; back feeding on previous years' foliage may also occur

Detection and Monitoring

- ◆ in spring, look for hollowed-out needles, needles webbed together, or needles webbed against buds
- ◆ later in the season, examine branches for shoots with needles drawn together by webbing
- ◆ feeding tunnels are often dirty, containing budworm droppings and needle fragments
- ◆ adult moths may be observed milling about the upper crowns of trees, especially in the evening
- ◆ bright green egg masses may be found on the undersides of needles

Control

- ◆ spray trees with a registered insecticide just as balsam fir shoots are elongating and expanding

Beneficial Insects

- ◆ predatory bugs, stink bugs, ground beetles, ladybird beetles, snipe flies, tachinid flies, red-eyed bees, chalcid wasps, parasitic wasps, predatory wasps and hornets, spiders



Needle Rusts of Balsam Fir

(*Pucciniastrum*, *Uredinopsis*, *Milesia*)

Several species with alternate hosts: fireweed needle rust (FR), witches' broom of blueberry (WBB), and fir-fern rusts (FF)

Seasonal History

- ◆ complex cycle requires alternate hosts
- ◆ fruiting bodies develop on fir needles from mid-June to early August
- ◆ spores infect the alternate host
- ◆ fungus overwinters on fireweed, blueberry bark, or ferns
- ◆ FR spores infect other fireweeds and fir needles in spring
- ◆ blueberry bark sloughs off in spring, and WBB spores infect fir needles
- ◆ ferns also act as source of disease in spring (FF)
- ◆ infection of fir by FR occurs earlier in summer than that of WBB

Damage

- ◆ fruiting bodies cause needles to turn yellow and drop
- ◆ only new needles are affected
- ◆ more than one species can occur on same tree
- ◆ trees are rarely killed, but tree grade may be reduced

Detection and Monitoring

- ◆ look for small, orange-yellow pustules on undersides of new needles
- ◆ *Uredinopsis* spp. (FF) are unique, having white fruiting bodies and spores
- ◆ look for witches' brooms on blueberry plants

Control

- ◆ If possible, eliminate fireweed, blueberry, and ferns from plantation areas
- ◆ do not plant Christmas trees near (within 500 m) blueberry farms
- ◆ do not include fir trees in windbreaks
- ◆ generally controlled by natural factors, such as weather
- ◆ if rusts are a recurrent problem, apply a registered fungicide just after bud break



Needle Casts

(*Lirula nervata*, *Lirula mirabilis*, *Isthmiella faulii*)

Seasonal History

- ◆ three species involved, no alternate hosts
- ◆ new needles infected in early summer
- ◆ infected needles are brown or red by next summer, but new needles are green
- ◆ fruiting bodies form on the old needles
- ◆ spores from the old needles infect new needles in the third year
- ◆ old needles usually drop in third year

Damage

- ◆ needle cast is primarily a disease of young Christmas trees and seedlings
- ◆ needles are affected individually
- ◆ severe defoliation of seedlings can occur
- ◆ reduced growth is common
- ◆ only rarely do trees die

Detection and Monitoring

- ◆ check for symptoms in early April
- ◆ look for black spots or lines on diseased needles in summer
- ◆ healthy needles mixed with infected ones on same branch
- ◆ distinctive tricolor foliage (dark green, red, and light green)

Control

- ◆ no cost-effective control measures
- ◆ generally controlled by natural factors, such as weather
- ◆ prune affected branches
- ◆ do not leave tree trimmings on ground near trees
- ◆ remove and destroy severely infected trees
- ◆ apply registered fungicide when spores are being released
- ◆ do not establish plantations near forest land where infection occurs naturally, or in areas of high humidity or fog



Yellow Witches Broom

(Fir Broom Rust)

(*Melampsorella carophyllacearum*)

Seasonal History

- ◆ a rust fungus with alternate host chickweed, a perennial weed
- ◆ yellow dwarf needles on broom produce spores in summer
- ◆ infected needles drop each year, but fungus lives within broom
- ◆ released spores infect chickweed
- ◆ rust matures on chickweed, with new spores infecting fir trees

Damage

- ◆ a swollen area on the branch indicates presence of fungus
- ◆ causes abnormal shoot growth, forming a perennial broom
- ◆ usually not severe, but is frequent where chickweed is common
- ◆ can result in reduced tree growth

Detection and Monitoring

- ◆ look for trees with visible brooms in winter, spring, and summer
- ◆ check for presence of chickweed
- ◆ look for swollen areas on branches

Control

- ◆ remove and burn brooms in spring or summer
- ◆ control chickweed plants growing near Christmas trees
- ◆ remove large brooms from nearby mature balsam fir



Armillaria Root Rot

(Armillaria mellea)

Seasonal History

- ◆ “shoestrings” grow underground from infected roots or stumps and infect healthy roots
- ◆ fungus moves up the roots and into the root collar and the stem at the tree’s base
- ◆ mushrooms grow near the base of infected, dead, or dying trees and hardwood stumps in early fall
- ◆ mushrooms release spores that infect live trees, dead trees, and stumps

Damage

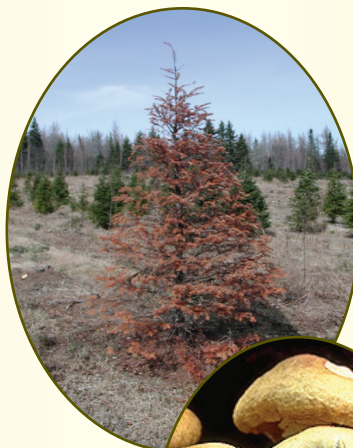
- ◆ infected trees usually turn completely red, and may die suddenly

Detection and Monitoring

- ◆ look for discolored foliage, reduced vigor, and heavy resin flow on tree stem
- ◆ diseased trees may produce stress-induced premature cone crop
- ◆ foliage turns red, and trees die within 2 months of infection
- ◆ mycelial fans grow beneath bark, and “shoestring” threads are visible along the bark of the roots
- ◆ honey-colored mushrooms grow at base of infected trees and stumps

Control

- ◆ sanitation, by removing stumps, is the best method of control
- ◆ avoid planting on former hardwood sites, especially where oak was prevalent



Red-eyed Bee

(Trichogrammatidae)

- ◆ tiny adults feed on nectar and lay eggs within the eggs of many insect pests
- ◆ larvae kill the eggs of several species



Ladybird Beetle

(Coccinellidae)

- ◆ adults and larvae eat balsam twig aphids, balsam woolly adelgids, and caterpillars



Non-stinging Wasp

(*Ichneumonoidae*, *Braconidae*,
Chalcidoidae)

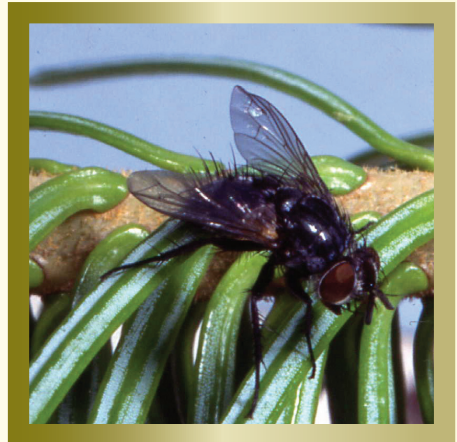
- ◆ adults depend on pollen, nectar, and honeydew to survive
- ◆ adults lay eggs on the larvae of many pests
- ◆ parasites hatch and feed inside the host, eventually killing it



Tachinid Fly

(*Tachinidae*)

- ◆ adults feed on nectar and aphid honeydew
- ◆ adults lay eggs on the larvae of several pests
- ◆ larvae hatch, burrow into pest, and kill it by feeding inside



Predatory Wasp

(*Vespidae*)

- ◆ nests in colonies in the ground or in trees
- ◆ adults feed on nectar and pollen
- ◆ adults kill and consume larvae of many pest species, and feed the semi-digested prey to wasp larvae



Hoverfly

(*Syrphidae*)

- ◆ adults resemble small wasps that hover in place, especially near flowers where they feed
- ◆ larvae search shoots for aphids, adelgids, and other small prey
- ◆ important predators of balsam twig aphids



Lacewing

(Hemerobiidae)

- ◆ adults and larvae are predators
- ◆ adults favor aphids, adelgids, mites, and small insects
- ◆ larvae favor aphids, but will eat a wide range of prey



Rove Beetle

(Staphylinidae)

- ◆ adults feed on small to medium-sized prey in foliage and on ground
- ◆ larvae feed in the soil on mites and small insects



Ground Beetle

(*Carabidae*)

- ◆ adults prefer caterpillars, but will eat almost anything on the ground
- ◆ prey species include spruce budworm, gypsy moth, balsam twig aphid, balsam woolly adelgid, and sawflies
- ◆ can also climb trees



Stink Bug

(*Pentatomidae*)

- ◆ adults kill small to medium-sized insects by piercing with their mouthparts and consuming body contents



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