

Species name: *Fenusa pusilla*

Common name: Birch leafminer



1. Thérèse Arcand, Natural Resources Canada, Canadian Forest Service, Laurentian Forestry Centre

This phytophagous and phyllophagous insect was introduced from Europe. Its main hosts are birch trees, where they occupy the leaves and the soil at the base of the tree. Their presence is recognizable by the presence of light green or gray spots on the leaves near the eggs in early June; these spots become brown blotches and eventually merge to cover most of the leaf. The larvae may be seen when you hold the blotched leaf to the light.

There are three species of birch leafminers that inhabit our birches. The adult forms of all three species are between 3 to 4 mm long with a wingspan between 6 to 7 mm. The whitish larvae are between 6 to 7 mm long at full length. *F. pusilla* generally attacks the trees earlier in the spring whereas the two other species, *P. thomsoni* and *H. nemoratus*, will attack later in the summer.

The trees usually survive light to moderate attacks but are left with unsightly aesthetical damage that people dislike. To help the birches withstand the attacks of leafminers, it is recommended to water the roots in the fall before the frost and in the summer during dry periods. Apply a suitable fertilizer every spring. Rake the leaves in autumn and place plastic sheets under the tree to catch the falling larva to reduce the population inhabiting the tree. (See Forest Invasive Alien Species, Natural Resources Canada)

Species name: *Forficula auricularia*

Common name: European earwig



Native to Europe, western Asia, and northern Africa; the European earwig was introduced to North America in the early 20th century and have spread throughout most of the continent. (See Crumb, Eide, & Bonn, 1941)

European earwigs prefer temperate climates. These omnivorous scavengers can cause damage to vegetable crops, flowers, and fruit orchards when at high population levels. (See Capinera, 2001).

Species name: *Gilpinia hercyniae*

Common name: European spruce sawfly



This phytophagous and phyllophagous insect is native to Europe. Its main host is the Black spruce, *Picea mariana*, the Norway spruce, *Picea abies*, and the white spruce, *Picea globa*. European spruce sawflies will mainly defoliate the old needles but may cause damage to new needles with different degrees of severity. Needle defoliation causes stunted growth rates and severe defoliation may result in tree death. European spruce sawflies produce only one generation per year when they are established in northern regions but they are bivoltinistic when they establish themselves in southern areas of Canada.

The discovery of the infestation of North American lands by this species led to the formation of a national forest insect inventory network in the United States. The population of the European spruce sawfly underwent a significant decline due to an emergent viral disease that infected the larvae. Unfortunately the population rebounded to endemic levels in Canada ranging from the Atlantic provinces through to Manitoba. (See Forest Invasive Alien Species, Natural Resources Canada)

Species name: *Lymantria dispar*

Common name: Gypsy moth



Native to Eurasia, the Gypsy moth is a defoliator of the American beech, apple, ash, balsam fir, cherry, eastern hemlock, gray birch, hickory, larch, pine, poplar, aspen, red maple, red oak, spruce, sugar maple, trembling aspen, white birch, white helm and willow trees. The caterpillars are phytophagous and phyllophagous and chew small holes in the surface of the leaves in May. Fully grown larvae can measure up to 65 mm long. They are identifiable by their dark color, hairy back and their red and blue spots. Spongy egg masses are found in late July on the trunks, the branches or in debris near defoliated trees.

Severe outbreaks will cause complete defoliation of trees and will probably affect understory trees also, significantly reducing growth rates. When a tree is completely defoliated, gypsy moths move in groups to attack another tree. They are considered the most serious defoliators of hardwood in North America. The egg masses were first detected in Canada on young cedars imported from Japan. This species is under surveillance of the Plant Health and Production Division of the Canadian Food Inspection Agency (CFIA). (See Forest Invasive Alien Species, Natural Resources Canada)

Species name: *Operophtera brumata*

Common name: Winter moth



1. Fabio Stergule, University of Udine, www.forestryimages.org
2. Daniel Adam, Office National des Forêts - France, www.forestryimages.org
3. Louis-Michel Nageleisen, Département de la Santé des Forêts - France, www.forestryimages.org

Native to Eurasia, this phyllophagous insect will feed on the leaves and buds of apple and oak trees. The winter moth will lay its eggs in the lichen or the crevasses of the trunk. The larvae are yellowish green and arch their back to move. They can manage to be carried upward by warm air by hanging on a thread. When a tree is completely defoliated, they drop to the ground by the thousands to find another food source.

Over 40% of red oak trees in certain regions of Nova Scotia have been killed by this insect. Winter moths are now permanently established in the Maritimes and are considered serious defoliators. (See Forest Invasive Alien Species, Natural Resources Canada)

Species name: *Orgyia antiqua*

Common name: Rusty tussock moth



1. Connecticut Agricultural Experiment Station Archives, Connecticut Agricultural Experiment Station,
www.forestryimages.org

This phyllophagous insect from Europe attacks both conifer and deciduous trees. Rusty tussock moths are generalist feeders. They start defoliating the upper crown and then the outermost portion of the branches moving inward and downward towards the lower crown. The moths are easy to recognize, they measure about 30 mm long, and have a very hairy body. The caterpillars have long black pencil tufts projecting from the thoracic rear segments. The female moths are wingless.

Rusty tussock moths range from coast to coast. The damage that has been done until now is insignificant. They can be found amongst white-marked tussock moths, *Orgyia leucostigma*, since they are closely related. (See Forest Invasive Alien Species, Natural Resources Canada)

Species name: *Paraphytomyza populicola*

Common name: Lombardy leafminer



Native to Europe, this phytophagous/phyllophagous insect will attack the Eastern Cottonwood, the Lombardy Poplar and the Trembling Aspen. Lombardy leafminer larva feed on the parenchyma tissue and when they do, one can see the light green mines in the leaves. The larvae produce mines from June to October when they emerge from the mine as pupae. In the fall, the pupae fall to the ground to overwinter and emerge as adults in the spring.

Their presence does not kill the tree as the damage is done near the end of the growing season. (See Forest Invasive Alien Species, Natural Resources Canada)

Species name: *Paravespula [Vespula] vulgaris*

Common name: Common yellow-jacket hornet



Native to Eurasia, common yellow jacket hornets have been introduced to most of the world, and are distributed throughout Canada. Common yellow jacket hornets build nests underground and in trees and buildings. They can cause painful stings and compete with other insects or birds for insect prey and sources of sugar. Common yellow jacket hornets can destroy or have serious impact on 10% of beehives which can lead to financial loss. (See Akre *et al*, 1980)

Species name: *Pristiphora erichsonii*

Common name: Larch sawfly



3. Jean-François Mouton, Natural Resources Canada, Canadian Forest Service, Laurentian Forestry Centre

This insect is considered one of the larch's most damaging pests in North America. This phytophagous/phylophagous species feeds on the needles of the European larch, *Larix decidua*, the subalpine larch, *Larix lyallii*, the tamarack, *Larix laricina*, and the western larch, *Larix occidentalis*. The presence of the larch sawfly can be recognized by the presence of eggs in slits on the new shoots and groups of larvae on the branches. The eggs in the shoots cause them to dry out and will eventually lead to crown deformation. The larvae feed from mid-May to September and mature larvae drop to the ground from June to July to make their cocoons in the duff where they will overwinter and emerge in spring as a pupa. Each female will lay about 75 eggs in the slits of the shoots.

Larch sawflies were observed for the first time in British Columbia in 1882 and its origin remains uncertain. The larch is more resistant than the conifers to defoliation by this insect. The infestation can be controlled on ornamental trees by shaking them and disposing of the fallen larvae. (See Forest Invasive Alien Species, Natural Resources Canada)

Species name: *Pristiphora geniculata*

Common name: Mountain ash sawfly



1. James B. Hanson, USDA Forest Service, www.forestrimages.org

2. Steven Katovich, USDA Forest Service, www.forestrimages.org

3. E. Bradford Walker, Vermont Department of Forests, Parks and Recreation, www.forestrimages.org

This phyllophagous species is native to Europe. Mountain ash sawflies are specialists who defoliate Mountain-ash trees, *Sorbus aucuparia*. They are bivoltinistic when they occupy a southern geographical region but have only one generation per year when they occupy a northern geographical region. Young larva is pale yellow and develops black flecks over time. Mountain ash sawflies start defoliating from the crown and then disperse toward the lower branches causing more severe damage eating the entire leaf except for the central veins. The larvae overwinter in a cocoon in the soil and emerge in the adult form in May and July.

The population varies with the climate and they have a few predators that limit their range. The presence of this insect rarely kills the host tree. (See Forest Invasive Alien Species, Natural Resources Canada)

Species name: *Profenusa thomsoni*

Common name: Ambermarked birch leafminer



3. René Pâquet, Natural Resources Canada, Canadian Forest Service, Laurentian Forestry Centre

Until 1955, the Ambermarked birch leafminer and the birch leafminer were thought to be one and the same, the former species is now thought to be introduced from Europe. The main hosts of this phytophagous/phylophagous species are the gray birch, *Betula populifolia*, the white birch, *Betula pendula*, and yellow birch, *Betula alleghaniensis*. The larvae of the ambermarked birch leafminer emerge from the eggs laid inside the leaves, and produce small, light-coloured mines on the upper surface of the leaves by eating the tissue inside. They start eating the foliage in the month of July and eventually cause overall browning of the foliage as time goes by. They produce one generation per year. They overwinter in cocoons on the ground when they reach full maturity.

The tree will generally not die from an attack of *P. thomsoni* but it will become more susceptible to other insect infestations. Most of the damage occurs around the end of the growing season, therefore growth loss is minimal and serious infestations seldom last more than one year. This species is found throughout all of Canada. (See Forest Invasive Alien Species, Natural Resources Canada)

Species name: *Rhizotrogus majalis*

Common name: European chafer beetle (June Bug)



Native to Europe, the European chafer beetle appeared in North America in the 1930s. Larval stage is a grub which prefers to feed on the roots of turf grass. The European chafer grubs have a soft, white, curved body with tan-brown heads and 6 legs. Adult is similar in appearance to the June beetle but slightly lighter in colour. One life cycle per year, adults mate in late June-early July, females will lay eggs approximately 5 cm deep in the ground. Eggs hatch late July/early August and grubs feed on grass roots until ground freezes. Grubs will migrate below frost line to overwinter. The following spring, the grubs will migrate back to surface to feed on roots and pupate in late May/early June. Adults emerge from the ground 2 weeks later. Secondary damage to turf can be caused by grub predators such as skunks, raccoons, and birds. (See Capinera, 2008)

Species name: *Rhyacionia buoliana*

Common name: European pine shoot moth



2. Fabio Stergule, University of Udine, www.forestrymages.org

Native to Europe, the European pine shoot moths are phytophagous/xylophagous insects that attack mainly the mugo pine, *Pinus mugo*, the ponderosa pine, *Pinus ponderosa*, the red pine, *Pinus resinosa*, and the Scotch pine, *P. sylvestris*. They burrow tunnels in young shoots and buds causing deformations in the stem and reducing growth rates. The eggs hatch in June and the larva weave a silken shelter in order to feed by boring a tunnel inside the needles, a browning of the foliage is visible. They attack the buds and migrate from bud to bud until they finally penetrate the new shoots. European pine shoot moths will overwinter inside the shoots and renew the attack on the buds and the new shoots in the following spring. An infestation of this species is recognizable by the dry twisted needles at the end of the twigs and an abundance of resin on the buds. The deformations of the shoots cause the growth of numerous adventitious buds.

R. buoliana prefers to attack red pine trees under 15 years old in plantations as well as ornamental trees. Infested trees seldom die from its attacks; however European pine shoot moths can destroy new plantations if left uncontrolled. (See Forest Invasive Alien Species, Natural Resources Canada)

Species name: *Scolytus multistriatus*

Common name: Smaller European elm bark beetle



This specialized phytophagous/phloeophagous insect is native to Europe. Its main North American host is the white elm, *Ulmus americana*. European elm bark beetle infestation can be easily recognized by the formation of gallery in the phloem with entrance and exit holes in the bark. The holes are dug both by the adults and by the larvae. After they are done feeding, the adults lay their eggs in the trunks of weak and injured trees. They overwinter as larva and then change into a pupa and then an adult in the spring.

S. multistriatus had a harder time establishing itself in Canada than the native elm bark beetle, *Hylurgopinus rufipes*, because of the cool climate but they are considered as big a nuisance. This species is a vector of the fungi *Ophiostoma ulmi* and *O. novo-ulmi* which cause Dutch elm disease, and damage done indirectly by propagating Dutch elm disease by distributing spores from tree to tree is greater than the damage done directly by its feeding behaviour. (See Forest Invasive Alien Species, Natural Resources Canada)

Species name: *Taeniothrips inconsequens*

Common name: Pear thrips



3. Claude Moffet, Natural Resources Canada, Canadian Forest Service, Laurentian Forestry Centre

Native to Europe, the pear thrips' main hosts are the Norway maple, the red maple and the sugar maple. The pear thrips is a phytophagous insect that feeds on the sap by sucking and piercing the host tree's buds and leaves. This small insect measures between 1 and 1.5 mm long. The color of the larvae varies from pale yellow to translucent light green and the eyes are easy to distinguish. The sugar maple species seems to suffer the most severe attacks from the pear thrips compared to the red maple and the Norway maple. The larva feed on the growing foliage throughout the spring season. When there is a moderate infestation, the leaves will have white or pale yellow spots or dark colored abnormally small stunted leaves.

Seed and sap production can be affected by *T. inconsequens*. In 1988, they ravaged 1.3 million acres of forest in Pennsylvania. It is believed that there is a correlation between the infestation of these exotic pests and warm dry spring conditions where early budding occurs which is an example of phenological synchronization between the plants and their predacious insects. (See Forest Invasive Alien Species, Natural Resources Canada)

Species name: *Tetropium fuscum*

Common name: Brown spruce longhorn beetle



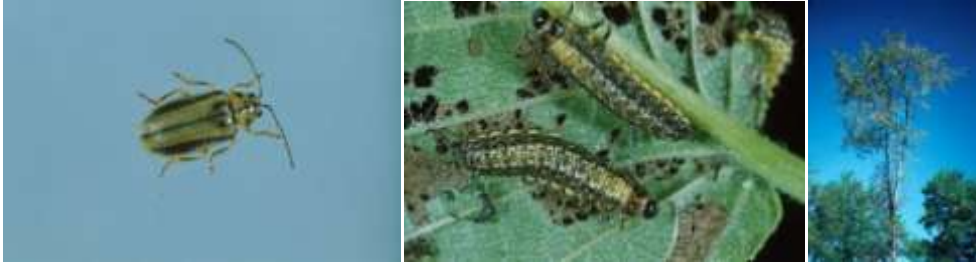
Stanislaw Kinelski, www.forestryimages.org

Native to Europe. Brown spruce longhorn beetle's main hosts are firs, pines and spruce trees where they burrow into the bark and feed on the phloem. The females lay 1 mm oblong, white eggs with a hint of green in the bark in clusters of one to ten. The larva hatch and will then feed on the phloem creating irregular tunnels filled with excrement. They overwinter under the bark, in the phloem or the cambium tissues. Brown spruce longhorn beetle larva will bore perpendicularly to the trunk in the phloem for about 1.5 to 2.5 cm and then start to burrow parallel to the trunk for about 3 to 4 cm creating an L-shaped tunnel, afterward the larva will change into a pupa. The adult form will emerge from a 4 to 6 mm diameter hole and can be found from June to August. The adult form measures between 1 to 1.5 mm long, and has a dark brown to black head and neck. The elytra are tan, brown or reddish brown with 2 to 3 longitudinal stripes. The antennae are half the body length. The larvae are yellow-white in color and measure between 14 to 28 mm long and have a flattened body. The larvae also have a 3 mm wide, reddish brown head. The pupae are white and measure between 10 to 17mm long and 3.8mm wide.

In its native forests, the brown spruce longhorn beetle will attack under-stress trees only. In Canada, *T. fuscum* also attacks healthy trees. Their feeding behaviour reduces the value of timber. Population outbreaks have been known to persist for over a decade. They also used to be mistaken for the related native species *Tetropium cinnamopterus*. (See Forest Invasive Alien Species, Natural Resources Canada)

Species name: *Xanthogaleruca luteola*

Common name: Elm leaf beetle



Marc Bolduc, Natural Resources Canada, Canadian Forest Service, Laurentian Forestry Centre

Native to Europe, this insect was accidentally introduced to North America. Its main host is the white elm tree. The elm leaf beetle is a phytophagous/phylophagous insect that can be found in British Columbia as well as eastern Canada including Ontario, Quebec, New Brunswick, Nova Scotia, and Prince Edward Island. (See Forest Invasive Alien Species, Natural Resources Canada)

Both adult beetles and larvae feed on buds and leaves causing defoliation, severe infestations can cause vulnerability in host elm, leaving it susceptible to other diseases and insects. Adults lay eggs on the underside of leaves in the spring, one week later larvae hatch and immediately begin feeding. Feeding lasts 2-3 weeks then larvae will migrate to lower parts of the tree or the ground to pupate. By midsummer adults will hatch and cycle begins again. Females can lay 5-25 eggs on a leaf and 600-800 eggs in her lifetime. When summer daylight hours drop to less than 14 hours per day, egg production stops and adult beetles will feed for a short period before leaving the tree in search of overwinter habitat. Long winters and late spring freezes help control the population. (See Capinera, 2008)