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## PREFACE

*Common Pests of Trees in Ontario* is a revised edition of *Common Pests of Ornamental Trees and Shrubs*, first printed in 1975. This edition has been prepared by B. H. McGauley and C. S. Kirby. It has been renamed to reflect a shift in emphasis from horticulture to forestry. Accordingly, some pests that attack only shrubs and ornamentals have been deleted from this publication, and several important pests of forest, plantation, and shade trees have been added. Illustrations of the pests or the injuries they cause are supplied to aid in their identification. The main features of the habits and lifecycles of pests are outlined in order that the reader will better understand the reasons for taking steps in any effort to control a specific pest. Unless otherwise indicated, all pests discussed in this publication are considered to be native to Ontario.

Pesticides and pest control recommendations are outlined in Appendix C. Because the regulatory status, use-pattern, and availability of control materials are subject to change or discontinuation at any time, Appendix C will be revised and updated as necessary. Contact the nearest office of the Ministry of Natural Resources for the latest edition.

The use of trade, firm or corporation names in this publication is for the information and convenience of the reader. Such use does not constitute an official endorsement or approval by the Ministry of Natural Resources of any product or service to the exclusion of others that may be suitable.

Pesticide products mentioned in this publication have been reviewed by the Ontario Pesticides Advisory Committee and have been classified under the Ontario Pesticides Act.

## INTRODUCTION

About 10 000 species of insects and mites, and an equal number of diseases, that attack woody plants in Ontario have been identified. More than 90 per cent of those pests and diseases occur in limited numbers and as such do not threaten the health of plants. Of those known to be potentially injurious to trees, many are transitory, occurring only infrequently in localized outbreaks of short duration. Artificial control of these is often for cosmetic purposes. Pesticides should be applied only against specific pests, and at a time when their abundance or the injury they cause makes spraying justifiable. With most pests only one stage in the lifecycle is controlled with a particular pesticide. Therefore, proper timing of treatment is very important. Calendar dates given in the text are meant to be used as a general guide; the development of a pest will vary from place to place and from year to year, depending on the weather.

All pesticides sold or used in Canada must be registered under the Pest Control Products Act, administered by the Pest Management Regulatory Agency of Health Canada. The registration states the type of use (restricted, commercial, domestic), the pests against which the material may be used, the rates and timing of application, and precautions for use. Registered pesticides are, in turn, scheduled (or approved) for sale and use in Ontario by the Ontario Pesticides Advisory Committee, under the Pesticides Act, administered by the Ministry of the Environment. Materials mentioned in this publication are among those presently approved for use by the general public; they are available at most nurseries, garden centres, and hardware stores. When properly handled they present little hazard to the applicator or the environment.

## TYPES OF PEST INJURY

Most insects and mites can be categorized into one of five main groups according to the way in which they injure trees: defoliators, borers, sucking insects and mites, gall-makers, and root-feeders. *Defoliators* cause the functional loss of leaves, in whole or in part, through destruction of the chlorophyll-bearing tissues. Defoliators may be further classified as: *leaf chewers* which consume all of the leaf tissues, *leaf skeletonizers* which eat the soft outer tissues but leave a skeletal network of veins, and *leaf miners* which feed upon the succulent interior tissues while tunnelling between the upper and lower surfaces of the leaves. *Borers* work mainly in the inner bark and wood, but all parts of a tree, from the buds to the roots, are subject to attack. The main effects of borer activity are deformity of the parts affected and weakening of the supporting fibres. *Sucking insects and mites* extract the cell sap, causing a general devitalization, wilting, distortion, or discolouration of the parts attacked. *Gall-makers* cause plants to produce abnormal growths as a reaction to irritations or stimuli such as feeding, stinging, egg-laying, or injection of toxins. Galls usually have a characteristic shape and location on the host, but in spite of their often conspicuous appearance most affect the appearance rather than the health of trees. *Root-feeders* destroy the tissues whereby the plant absorbs the nutrients necessary for its sustenance and growth. Seedlings and recently transplanted stock with limited root systems are most susceptible to this type of injury.

Tree diseases may be defined as abnormal physiological conditions, or disruptions in the normal life processes, which may, or may not, be fatal. The disruptions are caused by both parasitic, or living, and non-parasitic agents. Parasitic agents of trees are principally fungi but, to a lesser extent, also include bacteria and viruses. Non-parasitic agents include nutrient imbalance, toxic chemicals, adverse weather, and other stress-producing conditions such as mechanical injuries and changes in soil and water levels.

As with insects, parasitic diseases also may be grouped according to the part of the plant attacked, namely below ground in the root, above ground in woody tissues (stems or branches), and in the foliage (leaves or needles).

The presence of disease in trees is shown by the development of visible signs and symptoms. *Signs* are structures produced by parasitic agents. Examples include mushrooms, conks on the trunk, and felt-like layers and “shoestrings” under the bark. Non-parasitic agents do not produce disease signs. Symptoms are changes that occur in trees as a result of injury by both parasitic and non-parasitic agents. Examples include wilted leaves, leaf spots, blotches and curls, foliar discolouration, premature leaf fall, wounds and cankers, swellings and galls, bleeding and gum formation, and deformed, dying, and dead parts.

It is important to be aware that not all tree injuries are caused by insects and diseases. Damage may also be caused by birds (sapsuckers) and rodents such as mice, rabbits, and squirrels. Bird and rodent damage are not discussed in this publication.

## Alder (*Alnus*)

### Woolly Alder Aphid

(*Paraprociophilus tessellatus*)

The woolly alder aphid is a pest of alder and silver maple. The most distinctive sign of an infestation is the prolific production of white waxy filaments extruded from the bodies of aphids in closely packed colonies. A number of generations, both sexual and asexual, develop during a complete life cycle. The insect overwinters in the egg stage on the bark of maple trees. As soon as the leaves have expanded, the young aphids, all females, known as stem mothers, migrate to the undersurface and settle near the mid-veins. They produce large colonies which collectively extract great quantities of sap, causing the leaves to curl inward and to form protective feeding shelters. In midsummer, winged adults develop and fly to the branches of alder where a number of generations are produced asexually. In the autumn, winged sexual forms develop and return to maple trees to mate and deposit eggs to perpetuate the species over winter.

The woolly alder aphid is not considered to be particularly injurious to either alder or maple. However, as the aphids feed on sap drawn from the trees, they excrete copious quantities of a sweet sticky liquid known as honeydew. This excretion often attracts large numbers of ants and may serve as a medium for the growth of black sooty mold.



*Woolly Alder Aphid Colony*

#### CONTROL

- Predators of the woolly alder aphid are numerous. Infestations usually are not of sufficient duration to warrant the application of chemical sprays.

## Apple (*Malus*)

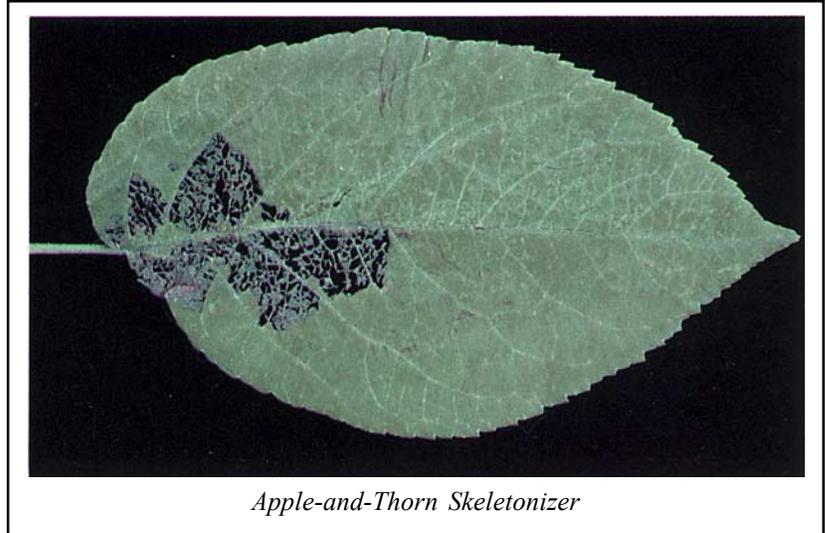
Including Flowering Crab

### Apple-and-Thorn Skeletonizer

(*Choreutis pariana*)

This insect attacks apple, flowering crab, purple plum, hawthorn, and quince. The adult is a small reddish-brown moth. The full-grown larva is a yellowish-green caterpillar with prominent black tubercles.

The larva feeds mainly on the upper surface of the leaf. The edges of the leaf are rolled upward and fastened together with silk. The larva feeds inside the fold, consuming everything but the larger veins and lower epidermis. There are two broods per year, the larvae being present in July and again in August and September. Conspicuous injury is usually caused by the second brood. Damaged leaves curl, turn brown, and fall prematurely. The insect overwinters in cocoons spun in folded leaves, on ground vegetation, or in protected places on buildings.



#### CONTROL

- Usually no control is required even though infestations may damage a large percentage of the leaves, making the tree unsightly.
- If numbers warrant spraying, almost any of the commonly available garden insecticides will provide a satisfactory means of control.



### Eastern Tent Caterpillar

(*Malacosoma americanum*)

Outbreaks of this native insect have been documented ever since the earliest records of colonial times. In addition to apple and cherry, its preferred hosts, it also attacks a wide range of deciduous trees and shrubs.

The moth lays its eggs in a band around small twigs about mid-July. These hatch the following spring about the time the leaves of wild cherry trees are beginning to unfold. The caterpillars form a silken nest or "tent" in a fork of the branches. They forage for food during the warmer parts of the day and return by means of silk threads spun from the nest to the feeding sites. The caterpillars mature in June, wander off individually to sheltered places, and pupate within a loosely woven cocoon. There is a single generation in a year.

The destructiveness of the eastern tent caterpillar is often more apparent than real.

Mainly the nests are unsightly and mar the beauty of the landscape. In periods of abundance the caterpillars may completely defoliate trees. Rarely, however, are trees killed.

## Common Pests of Trees in Ontario

Eastern tent caterpillar should not be confused with the forest tent caterpillar, which does not form a tent. The latter often rests in the tents of eastern tent caterpillar, attacks oak, aspen, maple, and birch, and undergoes mass migrations in search of food.

### CONTROL

- Prune and destroy the egg masses during the winter when they are easily observed and collected.
- Pull the tent from the branch with a gloved hand, or cut the branch below the tent and destroy it.
- If numbers warrant spraying, apply one of the commonly available garden insecticides as soon as feeding starts in May.

Other insect pests of Apple:

- Aphids - see Willow
- Cankerworms - see *Linden*
- Fall webworm - see *Ash*
- Oystershell scale - see *Lilac*

### Apple Scab

(*Venturia inaequalis*)

This fungus attacks all varieties of apples and flowering crabs. Related plants may be attacked also, including hawthorn and mountain ash. A closely related fungus, *Venturia pyrina*, causes pear scab.

Both fruit and leaves are infected, and less noticeably the blossoms and twigs. The fruit is undersized, deformed, and has hard, black spots on the skin. Infected leaves are puckered, with dark areas, and fall prematurely. By early summer the remaining foliage appears sparse and unhealthy. The disease is most prevalent and destructive in years when springtime weather continues wet, cloudy, and cool for prolonged periods. Springtime infections are started by spores released from fallen overwintered leaves. If conditions remain favourable, additional infectious spores form in fungal tissue on the new diseased leaves, and this usually perpetuates and intensifies the disease throughout the growing season.

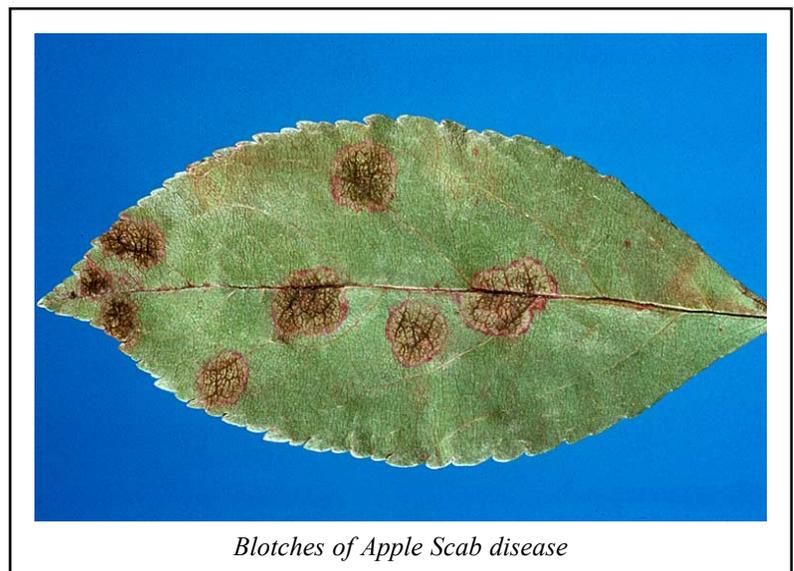
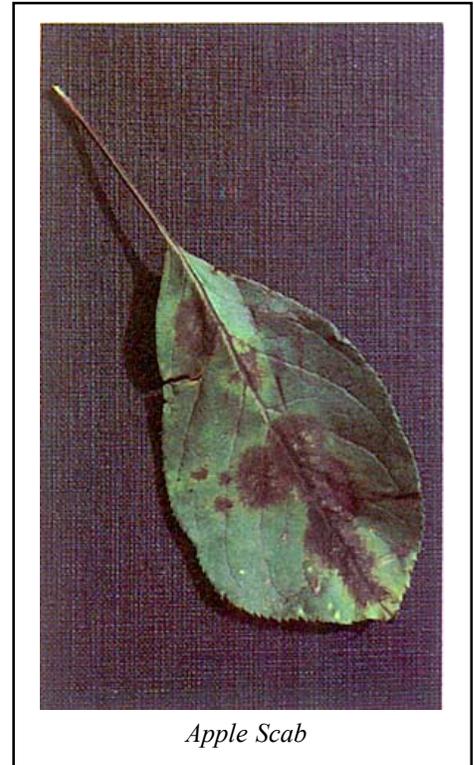
While scab does not injure trees seriously, it may reduce their vigour when infections are numerous, and certainly detracts from the trees' appearance. The main impact is reduction of fruit quality and quantity.

### CONTROL

- Rake and destroy leaves in the autumn.
- While the use of chemical protectants is not required in most years, the following method will minimize early infections when there is reason to believe that the problem is serious. Spray leaves thoroughly, first when they are about half-grown, and thereafter at ten-day intervals until end of May. Where the fruit is important, continue spraying throughout the growing season. Use dodine, benomyl, or captan.

Other diseases of Apple;

- Cedar-apple rust - see *Juniper*
- Crown gall - see *Euonymus*
- Fire blight - see *Mountain Ash*
- Powdery mildew - see *Lilac*

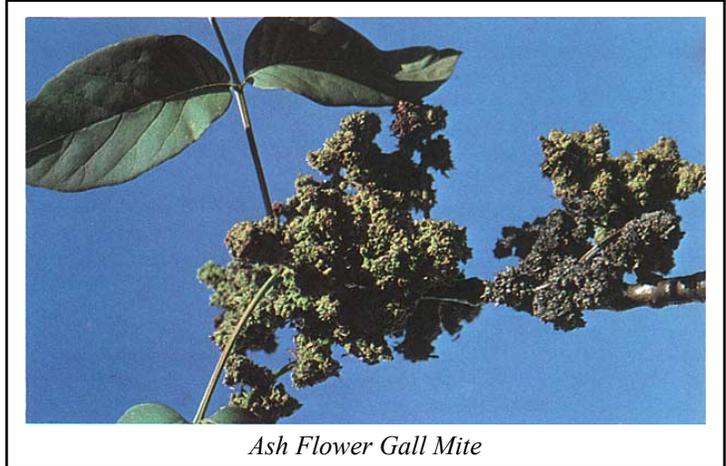


## Ash (*Fraxinus*)

### Ash Flower Gall

(*Eriophyes fraxiniflora*)

The male (staminate) flowers of white ash are sometimes deformed by a mite which causes these flower clusters to become irregularly branched and fringed. The mite becomes active when the flower buds break in the spring and feeds on the unfolding tissues. The galls vary in size, often measuring 25 mm or more in diameter. When they first appear they are green; later they dry and turn black. One of the most objectionable features is that these dark masses remain on the trees over winter. Heavily infested trees are very disfigured but are not killed.



#### CONTROL

Populations of the ash flower gall mite may be controlled by:

- A dormant spray of superior oil emulsion applied in the spring.
- A spray of malathion or a specific miticide applied when first blossoms begin to form.

### Fall Webworm

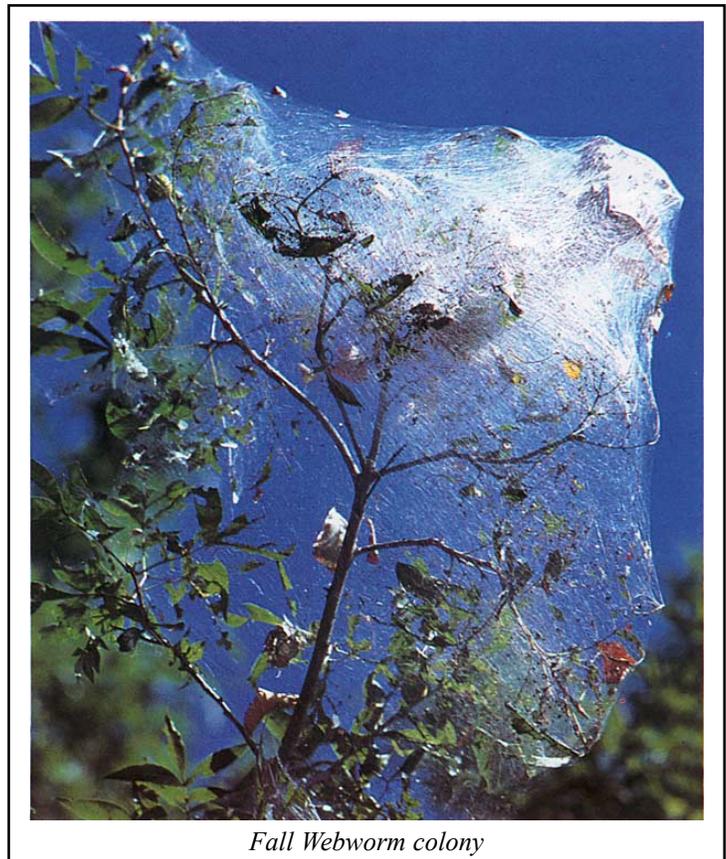
(*Hyphantria cunea*)

The fall webworm is one of the three tent-makers that commonly attack deciduous trees. Its web can readily be distinguished from that of the eastern tent caterpillar which is formed in the axils of branches early in spring, and the uglynest caterpillar which encloses entire low-growing bushes in mid-summer. The fall webworm forms a large web sometimes one metre long over the ends of branches of ash, Manitoba maple, flowering crab, and many shade and forest trees. The webs are conspicuous during August and September. The caterpillars that feed in the webs are pale yellow and very hairy. The adults are white moths with a wingspread of from 30 to 42 mm.

Injury caused by the fall webworm is seldom important on trees. Generally it is only the aesthetic value of the trees that suffers from the unsightly webs which contain excrement, dried leaf fragments, and the cast skins of the larvae.

#### CONTROL

- Chemical control is seldom required. On small trees, remove and destroy the webs, with their enclosed caterpillars, as soon as they are discovered.
- If sprays are necessary, apply one of the commonly available garden insecticides ensuring that the spray penetrates the webs.



Other insect pests of Ash:

Lilac borer - see *Lilac*

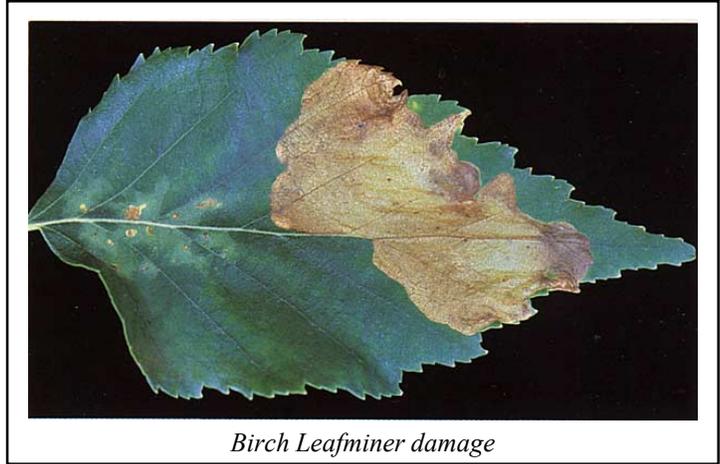
Oystershell scale - see *Lilac*

## Birch (*Betula*)

### Birch Leafminer

(*Fenusa pusilla*)

The adult of this introduced pest is a tiny black sawfly. About mid-May the sawflies emerge from the soil, and the females start egg-laying soon after the leaves unfold from the bud. The eggs are inserted singly into the tender leaf tissues. The larvae feed between the upper and lower leaf surfaces forming mines which often unite to form one large blotch involving half or more of the leaf. Heavily infested trees take on a scorched appearance. A second generation of leafminers develops in July.



All birches may be attacked, particularly white, grey, and cutleaf birches. Alder is occasionally infested. The first brood causes the most damage because it attacks the tender spring foliage which is all favourable for larval development. The second brood attacks only the newly developing leaves in the periphery of the crown and on sucker growth. Leaves that escape infestation during May will usually remain uninfested for the balance of the growing season. The vigorous growth of cultivated trees probably increases their susceptibility to attack by providing young leaves for oviposition over a long period of time.

#### CONTROL

- Apply dimethoate on trunk and/or larger limbs in the spring as soon as green shows at the tips of the buds. Follow label directions;

OR

- Apply a spray of dimethoate to the foliage about the third week in May and repeat about the end of June.

### Birch Skeletonizer

(*Bucculatrix canadensisella*)

This insect occurs right across Canada. Its attacks are restricted to the birches and possibly alder. The adults are small brown moths with diagonal white bars on the forewings. The flight period is from late June to late July. Eggs are laid on the leaves, and the larvae at first construct winding mines in them. Later they feed exposed on the undersurface leaving the veins and upper epidermis intact. Leaves so skeletonized turn brown and drop prematurely.

The birch skeletonizer is more spectacular than injurious. Because most feeding occurs in late August and September it is not as detrimental to the trees as it would be earlier in the season.

#### CONTROL

- Collecting and destroying leaves and other ground litter in the autumn will help to reduce the severity of attack the following year by killing the overwintering pupae.
- If necessary, the foliage may be protected by applying sprays of carbaryl soon after the larval mines appear. Care should be taken to thoroughly cover the underside of the leaves.



## Bronze Birch Borer

*(Agrilus anxius)*

Dieback of the uppermost branches of birch trees, with ridges on trunk and limbs, characterizes the damage caused by the bronze birch borer. Newly transplanted trees, or those in a weakened condition, are often killed.

The adult borer is a slender, olive bronze beetle about 12 mm long. It emerges from June to August through small D-shaped holes in the bark and feeds sparingly on the foliage. Eggs are laid in crevices of the bark, and the larvae burrow to the surface of the wood. Their spiral feeding galleries may cross and re-cross each other, cutting off the circulation of the sap. The tree then dies above the point of infestation. The larvae are white, legless, flattened, elongate grubs which usually require two years to complete their development.

### CONTROL

- Elimination of borers once they have become established is difficult. Sprays will not kill borers already under the bark, nor are sprays of the chemicals currently available to the homeowner efficient in killing the adult beetles to prevent egg laying. Suggested aids are:
- Maintain trees in as vigorous a condition as possible. Water during dry periods.
- Cut and destroy dead, dying, or infested branches by mid-May.

## Yellownecked Caterpillar

*(Datana ministra)*

This insect is primarily a pest of fruit trees, but it also attacks a variety of deciduous forest trees, including birch, elm, and serviceberry. The mature larva is 5 cm long, with a jetblack head. The body segment just behind the head is a bright orangish-yellow, a characteristic which gives the insect its common name. The body is striped lengthwise with alternate black and yellow stripes and is thinly covered with long, soft white hairs.

The moths are present from mid June through July. Clusters of eggs are laid on the undersides of the leaves. These hatch by early August and the larvae feed on the foliage near the ends of twigs and branches. When disturbed, the caterpillars stop feeding and elevate both ends of their bodies. They are gregarious and are often found in a solid mass on a limb. They mature in a month, descend to the ground, usually at night, burrow beneath the surface, and transform to pupae without any cocoon.

Newly hatched caterpillars skeletonize the lower surface of leaves, but older ones devour entire leaves with the exception of the stems. Small trees, particularly, may be seriously weakened or killed if severely defoliated. The yellownecked caterpillar, however, is not usually an important pest in the forest.

### CONTROL

- In light infestations on small trees, the colonies of caterpillars may be collected by hand and destroyed when they are young and are clustered on the foliage of a single branch.
- Shade trees may be sprayed when the caterpillars first appear in early August. Use malathion, carbaryl, or B.t.

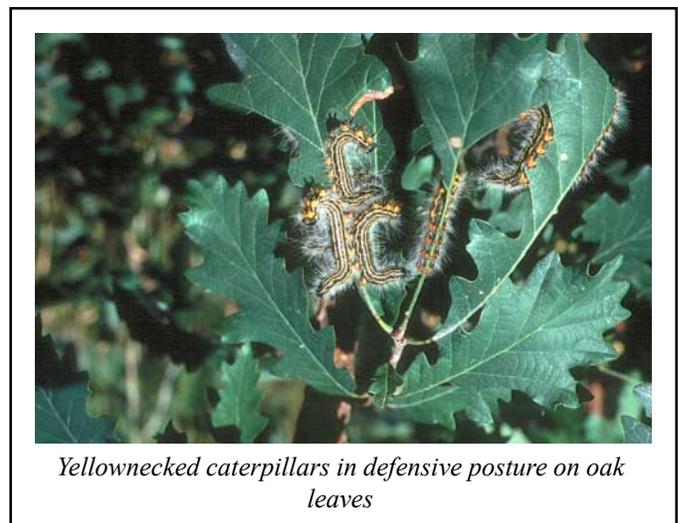
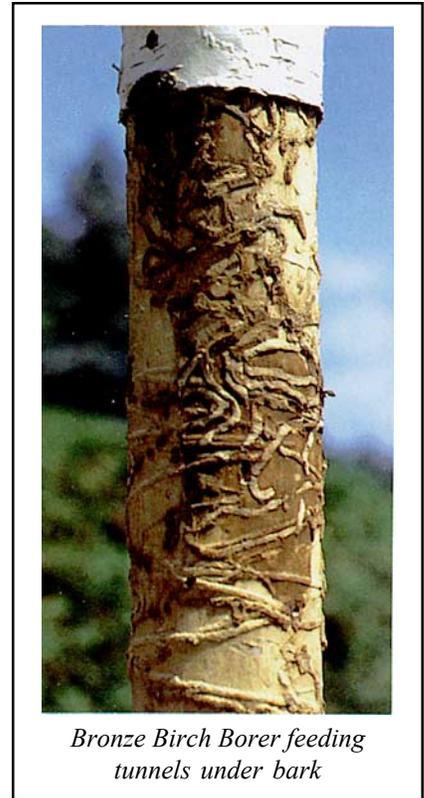
Other insect pests of Birch:

Cankerworms - see *Linden*

Fall webworm - see *Ash*

Forest tent caterpillar - see *Poplar*

Whitemarked tussock moth – see *Horse-Chestnut*



## Boxelder (Manitoba Maple) (*Acer*)

### Boxelder Bug

(*Leptocoris trivittatus*)

The boxelder bug is about 12 mm long, brownish-black, with three red stripes on the thorax and with red veins on the wings. The nymphs, or immature bugs, are bright red and feed on the flowers, seeds, and sometimes the leaves, of the female (pistillate) tree. Very few insects will develop on the male (staminate) tree. When abundant they may also feed on ash, maple, and some fruitbearing trees. Damage to trees, however, is seldom noticeable.

In the autumn, adult bugs seek dry sheltered overwintering quarters and frequently invade the attics of homes where they are a great nuisance. During warm winter days they become active and come out of hiding, only to retreat again when it turns cold. In the spring the bugs migrate to the trees and lay their reddish eggs on the bark or leaves. These hatch into nymphs which feed throughout the summer. They moult several times as they develop to the adult winged forms.

#### CONTROL

- Since the important problem is house invasion by these bugs rather than injury to the trees, do not plant boxelder near dwellings. Remove seed-bearing boxelders and replace them with a more suitable type. Bugs that do enter houses may be collected in a vacuum cleaner and destroyed.
- If necessary, apply sprays to the trees in early summer when the nymphs are feeding, or in the autumn to surfaces where the adults are congregating prior to migrating to overwintering sites. Use carbaryl, malathion, or diazinon.



### Boxelder Twig Borer

(*Proteoteras willingana*)

The adult borer is a small white-to-brownish moth, marked with clusters of tan-to-black scales. It emerges from the leaf mold in June and is active during the evenings. Eggs are laid singly on the lower surface of the leaves. Each larva constructs a small web and skeletonizes the leaf area enclosed within this shelter. Later in the season the larva bores into a dormant leaf bud, hollows out a chamber, and hibernates. In the spring the larva generally attacks another bud and then bores into the succulent current twig growth, causing formation of a spindle-shaped gall. In late May and June the mature larva drops to the ground, spins a cocoon in the leaf mold, and pupates. There is one generation per year.

When the galls of the boxelder twig borer dry out, they become woody, usually preventing further terminal growth of the infested twigs. Secondary branching then occurs, and if this growth is also destroyed, the affected tree becomes bushy and undesirable as a shade tree.

#### CONTROL

- Collect and destroy infested twigs before the larvae vacate the galls in June.
- Chemical control measures are not usually undertaken.

Other insect pests of Boxelder:

Fall webworm - see Ash

## Catalpa (*Catalpa*)

### Comstock Mealybug

(*Pseudococcus cornstocki*)

Mealy bugs are so named because of the characteristic mealy or waxy exudations that cover their bodies. The full-grown female Comstock mealybug is about 5 mm long, elongate-oval, somewhat flattened, and wingless. Short, soft spines project from the edges of the body, forming a sort of fringe. The two posterior spines are much longer than the others, forming an apparent tail. The male, which has wings, is seldom seen. A wide variety of trees and shrubs are attacked, including catalpa, horse-chestnut, maple, mulberry, poplar, boxwood, holly, privet, yew, and some fruit trees.

The insect overwinters as yellow eggs under white cottony masses in bark crevices and in the axils of twigs. Hatching begins soon after the leaves have unfolded in the spring. The nymphs move to the leaves to feed. There may be several generations in a year. Mealybugs suck out the juices and devitalize the trees. Leaves, twigs, and trunks may be distorted as a result of heavy infestations. Older mealybugs have a tendency to migrate to the branches and main trunk where they congregate at splits in the bark or at pruning scars. As a result of their feeding, knot-like galls form at these sites and interfere with the growth activities of the tree. The mealybugs also excrete honeydew which sticks to the foliage and serves as a medium for the development of black sooty mold.

#### CONTROL

- Apply a dormant spray of superior oil emulsion in early spring to kill the overwintering eggs.
- Apply a spray when the mealybugs are active, and repeat as required during the summer. Use malathion, dimethoate, carbaryl, or diazinon.

### Catalpa Leafspot

(*Phyllosticta catalpae*)

(*Macrosporium catalpae*)

(*Alternaria catalpae*)

(*Gloeosporium catalpae*)

The fungi act either singly, or jointly, to cause spotting, blotching, or perforation of leaves. Wet springtime conditions favour infection development by spores from fallen, overwintered leaves. Spots are brown to black, usually about 6 mm in diameter, and often run together to cause dark blotches, particularly towards leaf margins; in addition the edges of leaves usually curl. These symptoms first appear in midsummer and become progressively more noticeable as the season advances. Perforations may appear as a result of dead tissues dropping from infected parts of leaf blades. Apart from detracting from the appearance of leaves, and occasioning some premature leaf-fall, leafspot does not cause significant injury.

Most deciduous trees are subject to leafspot conditions to some degree and although the disease symptoms are all similar, many different kinds of fungi are involved. While most leafspot diseases are of little importance, at least one, septoria leafspot of poplar, can lead to damaging branch and stem cankers on certain hybrids.

#### CONTROL

- Rake and destroy fallen leaves.
- In wet years, spray as leaves are unfolding, and thereafter at ten-day intervals: a total of three sprays. Use zineb or captan.

## **Verticillium Wilt**

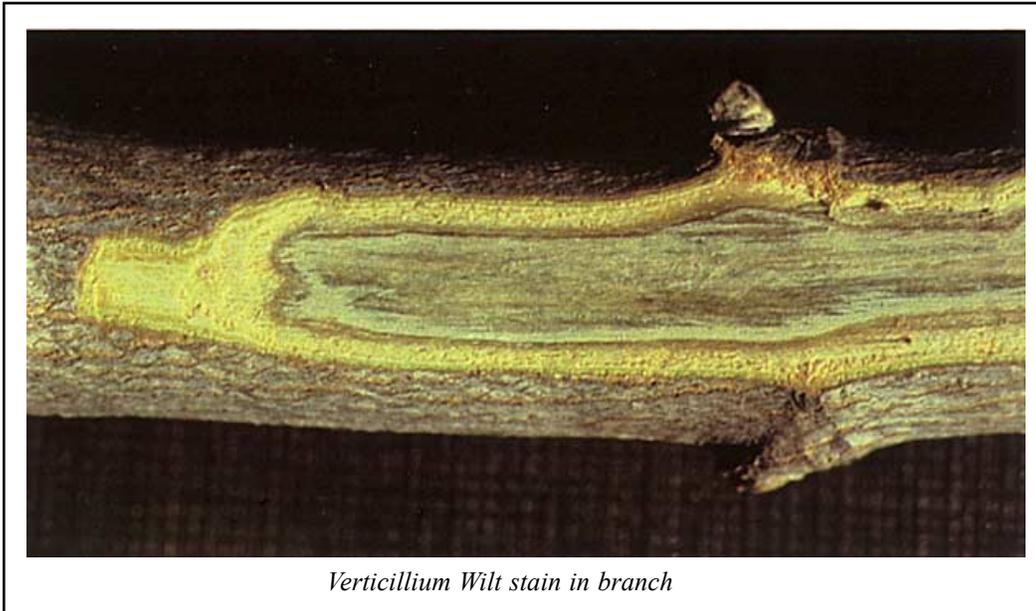
*(Verticillium dahliae)*

This soil-inhabiting fungus grows in the conducting tissues of the stems and branches, thus depriving the leaves of essential water and nutrients. Accordingly when water requirements increase during hot weather, leaves suddenly wilt, turn yellow, die, and fall prematurely. Usually only the leaves on one or two branches are affected at first, but later more branches on the same side of the tree show symptoms. Eventually wilting occurs generally throughout the plant and it may die either quickly or after several seasons. Further indications of Verticillium wilt infection are the presence of brownish streaks (for catalpa) in the outer wood, and the exuding of sap from the stem. Colour of streaks varies according to tree species.

Verticillium wilt is also a common disease of maples and occurs less frequently on a great many species of deciduous trees and shrubs.

### **CONTROL**

- Induce increased tree vigour by root-feeding with 10-8-6 or similar fertilizer.
- Remove branches that lose their leaves, but since there is the possibility of recovery, not until the growing season following the first appearance of symptoms. Sterilize pruning tools after each cut with rubbing-alcohol diluted with water to about 70 per cent strength.
- Water frequently in hot, dry weather.
- Avoid replanting at same location where a diseased tree has been removed. Evergreens are permissible as they appear immune to the disease.



*Verticillium Wilt stain in branch*

## Cedar, Eastern White (*Thuja*)

### Cedar (Arborvitae) Leafminers

(*Argyresthia thuiella*)

(*Argyresthia canadensis*)

(*Argyresthia aureoargentella*)

(*Pulicalvaria thujaella*)

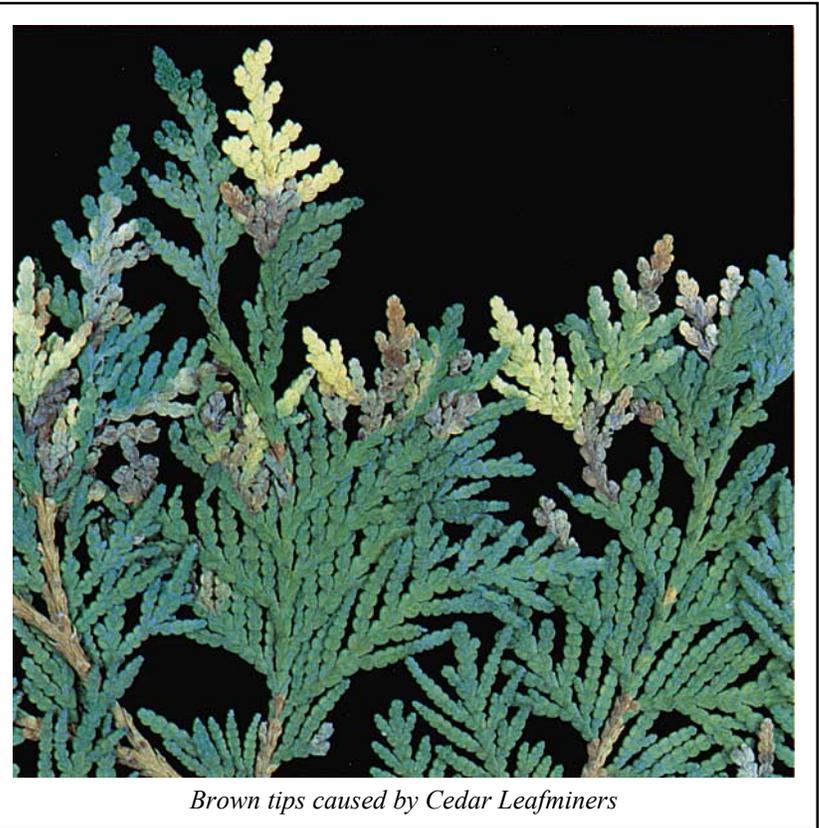
Four closely related species of leaf miners are normally found together in varying proportions attacking the foliage of eastern white cedar, also known as arborvitae. The caterpillars feed within the leaves, causing the branch tips to turn brown. Damage is often conspicuous early in the season and may be confused with other causes, particularly winter injury. However, insect-injured foliage has the interior of the leaflets hollowed out, and if held up to the light the tiny caterpillars can be seen in their feeding tunnels. The adult insects are tiny whitish moths which emerge over an extended period from early June to late July. Each species of miner has one generation per year.

#### CONTROL

- Trimming and destroying infested branch tips before June gives adequate control on small ornamentals.
- Apply a spray of dimethoate in early May or late August to control the larvae.
- Apply a spray of malathion, dimethoate, or methoxychlor in June to control the moths.

Other insect pests of Cedar:

Spruce spider mite - see Spruce



## Elm (*Ulmus*)

### Smaller European Elm Bark Beetle

(*Scolytus multistriatus*)

### Native Elm Bark Beetle

(*Hylurgopinus rufipes*)

These common bark beetles have assumed great importance in recent years because they are carriers of the fungus causing Dutch elm disease. Their role in this connection is described later under Dutch elm disease.

### Elm Leaf Beetle

(*Pyrrhalta luteola*)

This insect, first discovered in Ontario in 1945 at St. Catharines, is now distributed across the southern part of the province. The adult is an olivegreen beetle, about 6 mm long, with a black stripe along each wing cover and variable markings on the back. The larva is a black grub which changes as it develops to dull yellow with two black lines down the back.

The beetles overwinter in dry sheltered places, including houses. They become active in the spring, when the buds of elm begin to swell, and feed on the developing foliage. Clusters of yellow eggs are laid on the underside of the leaves. The larvae feed for three to four weeks before descending to pupate near the base of the tree. In about ten days the adults appear. There may be two generations a year.

All species of elm are subject to attack. The foliage may be severely damaged as both the adult beetles and the larvae feed on the leaves. Adult feeding is characterized by oval holes eaten through the leaves, whereas the larvae skeletonize the leaves, leaving only the upper epidermis and coarse veins. Leaves thus damaged become functionless, appear scorched, and drop prematurely. Partially defoliated trees are weakened and become more subject to attack by bark beetles which transmit the causal fungus of Dutch elm disease.

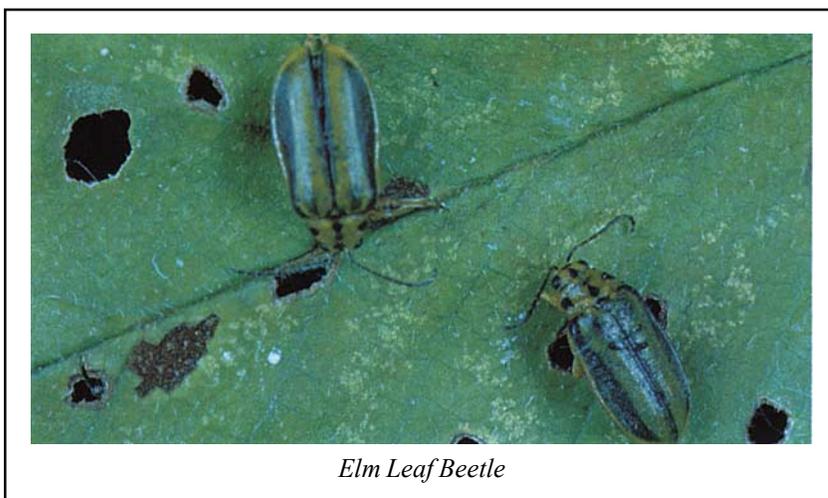
#### CONTROL

- Apply a spray to thoroughly cover the underside of the leaves when they are about three-quarters expanded. The larvae may also be killed by spraying them when they congregate at the base of trees prior to pupation. Use carbaryl, methoxychlor, or endosulfan.

### European Fruit Lecanium

(*Parthenolecanium corni*)

This widely distributed insect is a pest of all the common fruit trees, as well as a wide range of forest and shade trees and ornamental shrubs. Often referred to as the brown elm scale, it also attacks ash, beech, boxwood, hawthorn, locust, maple, oak, white cedar, and many other trees.



The size, shape, and colour of the adult female scales may vary depending on which host they have developed. Usually they are oval, convex, shiny reddish-brown, and up to 6 mm long. Frequently, however, the body is covered with a whitish pulverescence.

The insect overwinters as immature scales on the twigs of the last year's growth. At this time they are difficult to detect, being very small, flat, and covered with a thin coat of transparent wax. They develop rapidly in the spring and mature about May. After mating, each female lays eggs under her own scale covering and dies. Hatching occurs through June to July. The crawlers migrate to the leaves where they settle on the undersurface along the midrib and veins. They feed there until late summer and then migrate back to the twigs before frost. Any that fall with the leaves perish. There is only one generation per year.

Injury results from the removal of sap and the production of sticky honeydew on which a black sooty mold grows. Infestations may cause premature shedding of the foliage, killing of small branches, and stunting of growth.

#### CONTROL

This scale is not generally a serious pest of shade trees although it does frequently become abundant on young trees. Where necessary:

- Apply a dormant spray of superior oil before the buds burst in the spring.
- Spray the foliage just after the crawlers have hatched, about late July, and repeat in ten days. Thoroughly cover the branch tips and undersurface of the leaves. Use malathion, carbaryl, or diazinon.

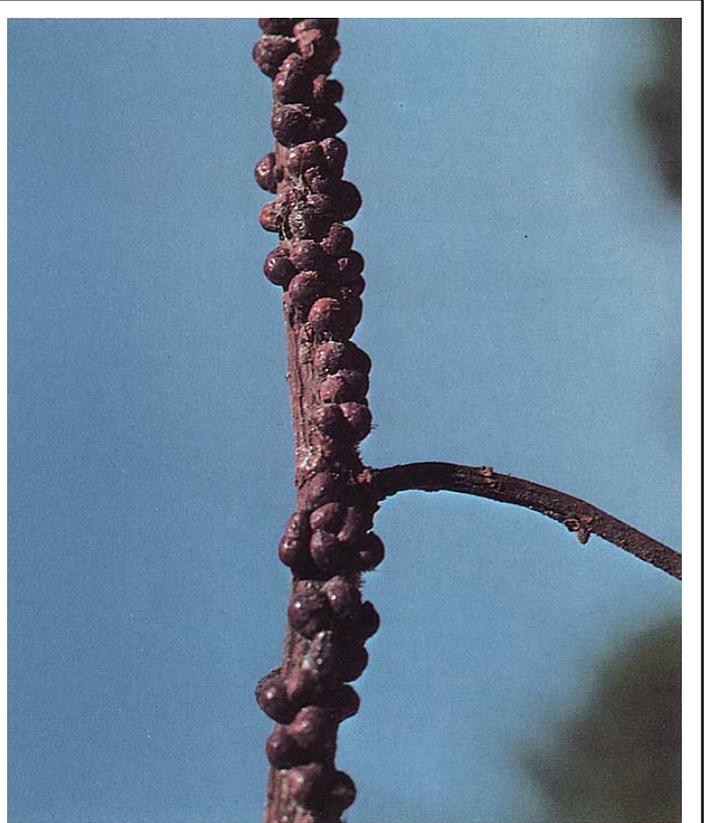
#### Spiny Elm Caterpillar

*(Nymphalis antiopa)*

The adult of this caterpillar is the well-known and beautiful *Mourningcloak Butterfly*. It is one of the few butterflies causing damage to trees. The preferred hosts of the larvae are elm and willow, but they also attack birch, maple, mountain ash, and several other deciduous trees.

The upper wing surface of the butterfly is brownish-purple, with a yellow border finely dotted with dark blue markings. The mature larva is about 50 mm long, with a black bilobed head covered with tubercles. The body is black, thinly sprinkled with white dots, and bearing several rows of large, branched spines. On the top of each body segment is a red spot.

The butterflies hibernate in sheltered places and are active on warm days in March and April. The females deposit eggs in clusters of up to 450 around small twigs, when the



*European Fruit Lecanium*



*Spiny Elm Caterpillar*

foliage is nearly full grown. The caterpillars feed gregariously, consuming all the leaf tissue except the veins. Usually only terminal branches scattered throughout the crown are defoliated, but when the caterpillars are abundant whole trees may be stripped of their foliage. In late June or early July the caterpillars become mature and wander in search of sites to pupate. The butterflies are in flight in late summer, then go into hibernation in early autumn. Occasionally there is a second generation, which seldom causes much damage and usually goes unnoticed.

#### CONTROL

- Spray the foliage as soon as feeding is observed. Use carbaryl, methoxychlor, malathion, diazinon, or B.t.

Other insect pests of Elm:

Cankerworms - see [Linden](#) Fall webworm - see [Ash](#)

Forest tent caterpillar - see [Poplar](#) Oystershell scale - see [Lilac](#)

### **Dutch Elm Disease**

*(Ceratocystis ulmi)*

This highly infectious and devastating foreign fungal disease first appeared in Canada in 1944, and in Ontario in 1946. It now occurs throughout much of the range of elm in this province. Our three native elms are highly susceptible, regardless of age or size. In parts of southern Ontario the elm population has been almost completely eliminated. Elsewhere, mainly to the east and north, the disease is more scattered, but the degree of local infection is intensifying. Consequently, throughout all of southern Ontario the disease has killed most of the mature elms, although there is no basis for believing that elms are threatened with extinction.

The disease is spread by two species of bark beetles. Spores of the fungus are transported from tree to tree by new beetles emerging from infected trees and then feeding in the bark of healthy trees. Infections usually prove fatal in from one to three years. Symptoms of a new infection usually do not appear before late June. Wilting and yellowing of the foliage suddenly occur near the end of a branch. Here, leaves soon turn brown and curl but remain attached; later, all leaves on the branch become affected, and a bare area appears in the crown when the leaves finally fall. The next year, leaves either fail to develop on that branch, or only a few undersized leaves appear that soon wither. Later, infection spreads to other parts of the tree. At any point in time the disease is more widespread in the tree than external symptoms indicate.

Dutch elm disease infections also cause brown discoloration in the outer sapwood of diseased branches. In a cross section of branch, the discoloration appears as a dark brown, partial-to-complete ring, located in the wood just beneath the bark. When the bark is removed, the discoloration appears as dark streaks, running with the grain.

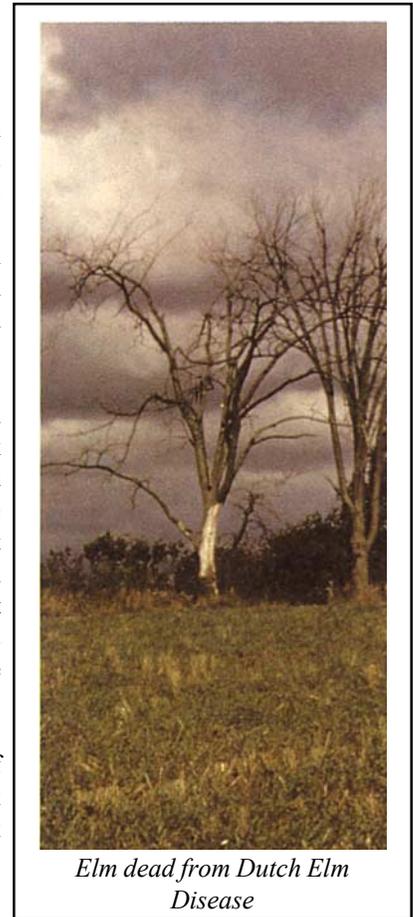
While these symptoms are usually reliable indicators of Dutch elm disease, they may be mistaken for those of other diseases, particularly Verticillium wilt. Accordingly, proof of elm disease infection rests on laboratory testing of branch samples from suspect trees.

#### CONTROL

- Apply methoxychlor to the crown in early spring, before buds swell. This material prevents infection by killing spore-carrying beetles before they can inoculate healthy trees through feeding wounds.
- Remove dying and recently killed elm trees, because they are the source of new generations of beetles.
- For individual trees of high ornamental value, injecting a fungicide into the roots appears to be effective in controlling the disease. Treatments are available only through some tree-service companies,

Other diseases of Elm:

Verticillium wilt - see [Catalpa](#)



## Euonymus (*Euonymus*)

### Euonymus Scale

(*Unaspis euonymi*)

This is one of the most serious pests of both evergreen and deciduous species of euonymus. It may also infest bittersweet, English ivy, lilac, and pachysandra.

The insect overwinters as a greyish, pear-shaped, mature female scale. Eggs are laid beneath her covering during early spring. Hatching occurs in early June and the nymphs crawl to the leaves and stems of the new growth. Here they insert their thread-like mouth parts and suck the plant juices. There are two generations per year.

#### CONTROL

- Apply a dormant spray of superior oil before growth begins.
- Spray about mid-June when the nymphs are emerging. Use diazinon, dimethoate, or malathion.

### Euonymus Webworm

(*Yponomeuta cognatella*)

This pest of European origin has become established in Ontario only in recent years and is still limited in its distribution in the province. Its life cycle and habits have not been studied, but where it does exist in localized infestations it attracts attention because of the massive webs which encompass whole trees or hedges. Complete defoliation of shrubs may occur during June.

#### CONTROL

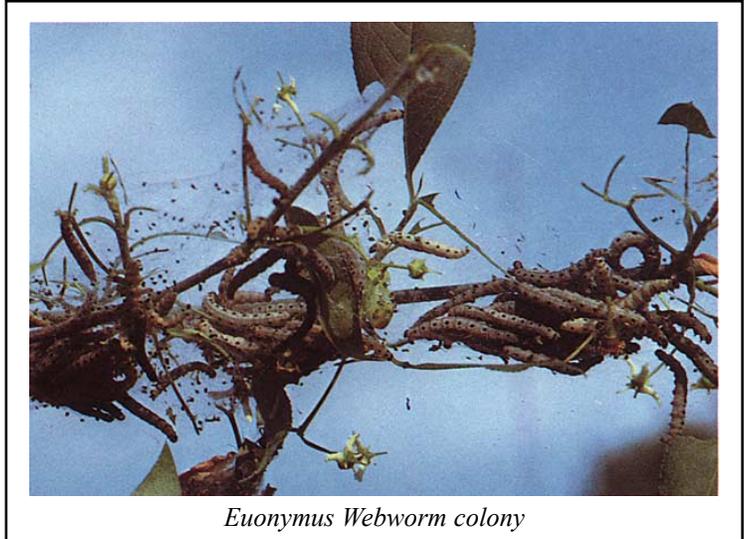
- Control measures have not been worked out but it is likely that the recommendations listed for other tent-making caterpillars would also be effective against this species (see Fall webworm under Ash).

### Crown Gall

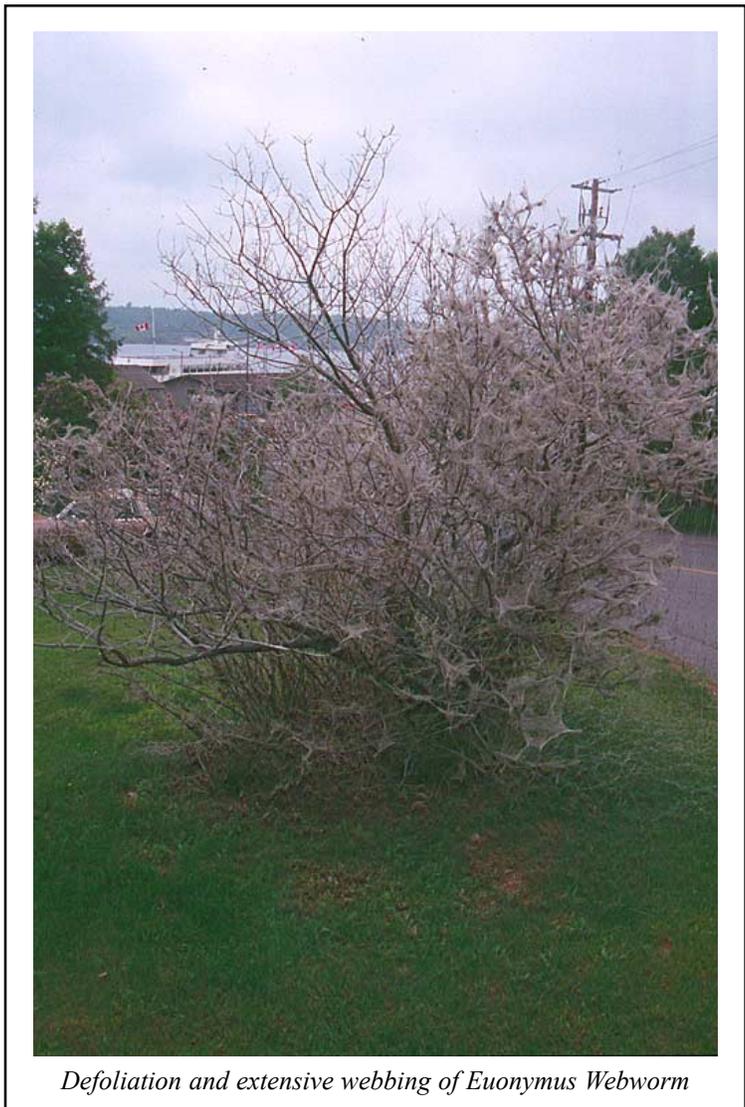
(*Agrobacterium tumefaciens*)

This bacterial disease causes swellings on the lower stem and branches of certain Euonymus species, as well as on many other trees and shrubs including hickory, rose, willow, apple, cotoneaster, and raspberry. The galls are usually woody, tumour-like, rough-surfaced, and up to 5 cm in diameter.

Infection occurs when the causal bacterium in the soil gains entrance to plant tissues through wounds, caused by garden tools, in the bark of the stem and roots. For



*Euonymus Webworm colony*



*Defoliation and extensive webbing of Euonymus Webworm*

*Common Pests of Trees in Ontario*

this reason, galls often develop at the point of grafting in the vicinity of the root collar. Heavy infections can slow growth and damage branches in large trees, while small trees and shrubs may be killed.

**CONTROL**

- Avoid planting nursery stock that shows suspicious-appearing swellings.
- Avoid planting susceptible species.
- Destroy young trees and shrubs that develop galls.
- Avoid wounding roots and stems of shrubs and trees during cultivation.
- Prune out affected branches on larger trees.

Other diseases of Euonymus:

Powdery mildew - see Lilac



## Hawthorn (*Crataegus*)

### Pear sawfly

(*Caliroa cerasi*)

The adult is a small, four-winged, black and yellow sawfly. The full-grown larva is tadpole-shaped, with the body covered with a slimy, olivegreen secretion. Hawthorn, mountain ash, serviceberry, cherry, pear, plum, and quince are attacked.

The insect overwinters as a larva in an earthen case a few centimetres below the surface of the ground. It pupates in the spring, and the adult emerges in early June. Eggs are laid singly in small, semi-circular slits cut in the leaves. The soft-bodied larvae feed mainly on the upper surface of the leaves, leaving the veins and lower epidermis. When mature, the larvae drop to the ground and pupate. There may be a partial second generation in July and August. Heavily infested trees appear as if scorched, and the skeletonized leaves drop prematurely. The surface of fruit may also be eaten, leaving a russeted appearance.

Trees severely attacked lose vigour, especially if injured in two successive years.



Pear Sawfly larvae

#### CONTROL

- This insect is sporadic in its attack, therefore artificial control measures should be applied only when infestations warrant them. Almost any insecticide will give effective control.

Other insect pests of Hawthorn:

Eastern tent caterpillar - see [Apple](#)

### Hawthorn Leaf Blight

(*Fabraea thumenii*)

This fungus causes leaf spotting and premature defoliation of various hawthorn species, especially English hawthorn. A similar condition, caused by a closely related fungus, affects pear trees. The hawthorn leaf blight is most destructive in wet years when heavily infected trees may become almost bare by late summer.

Symptoms of infection on leaves consist of a few-to-many slightly depressed, angular, brown-to-reddish-brown spots less than 6 mm across. Spots enlarge and merge into relatively large brown areas. In midsummer, the dead areas bear small dark, raised pustules or spore-producing structures on their upper surface.

#### CONTROL

- Rake and destroy leaves in the autumn.
- In the spring, spray half-grown leaves with zineb; repeat after two weeks.

Other diseases of Hawthorn:

Juniper rusts - see [Juniper](#)

## Honeylocust (*Gleditsia*)

### Honeylocust Pod Gall

(*Dasyneura gleditschiae*)

This species has been a minor pest of honeylocust for many years, but it is only since the introduction of the new thornless varieties that it has assumed importance. Moraine, Shademaster, and Sunburst locusts are particularly susceptible to infestation.

The adult gall-maker is a small, two-winged fly or midge, about 3 mm long. The male is black and the female is characterized by a red abdomen. The larva is a tiny white maggot.

The life history of this pest in Ontario has not been extensively studied. The midge becomes active in late April or May at about the time locusts start growth. Tiny yellow eggs are inserted among the young leaflets and these hatch in just a day or two. Larval feeding on the inner surface of a leaflet stops its development, but the outer surface grows normally. This produces a seed-like pod from which the insect gets its common name. Feeding continues inside the gall for about three weeks. There may be three or more generations per year. Adults emerging in September overwinter in the soil.

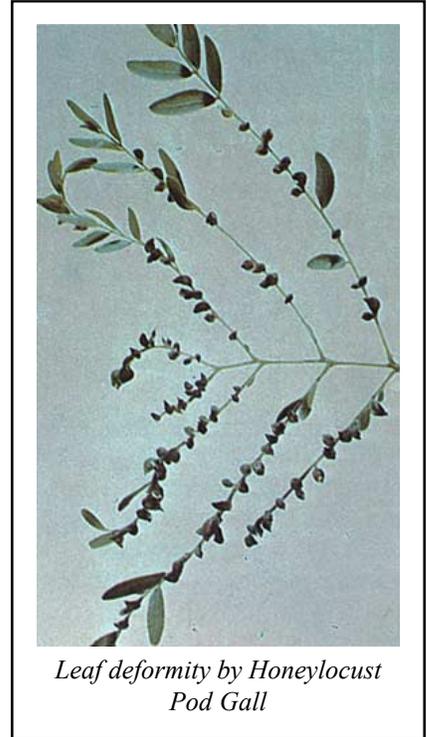
Galled leaflets may dry up and drop prematurely. Continued galling and repeated defoliation may cause the death of small branches. However, new growth often develops at the base of dead twigs; hence, trees are seldom ruined by infestation but may become unsightly.

#### CONTROL

- There is no satisfactory control for this insect. Dimethoate has helped in some instances but individual trees may be injured by the chemical (test single branch to determine safety).

Other insect pests of Honeylocust:

Cottony maple scale- see [Maple](#)



## Horse-Chestnut (*Aesculus*)

### Whitemarked Tussock Moth

(*Orgyia leucostigma*)

This insect is a general feeder on more than 60 host trees and shrubs, both deciduous and coniferous. It is a much greater pest of shade trees in cities and towns than in the forest. Among the preferred hosts are horsechestnut, elm, linden, maple, and birch. In addition to defoliating the trees, the caterpillars may girdle the twigs by eating the bark near the beginning of the season's growth. The affected tips die, break off, and drop to the ground.

The colourful larva has a coral-red head, two diverging pencils of black hairs just behind the head and one at the rear of the body. Clusters of white bristles radiate from rows of small yellow tubercles on the sides. The female moth is grey, hairy, and wingless.

The insect overwinters as eggs which hatch between April and June. Larvae first skeletonize the undersurface of the leaves, later they consume all but the larger veins. When disturbed, the larvae drop on threads of silk and are sometimes transported considerable distances by the wind. They mature in five or six weeks, then spin cocoons, usually on the trunk. The adult emerges from July to September. The female lays up to 500 eggs in a white, frothy mass on the old cocoon and then dies. The frothy material hardens and becomes brittle, forming an effective protection. There is one generation per year.

#### CONTROL

- The conspicuous egg masses may be collected during winter and destroyed.
- Apply a spray as soon as larval feeding begins in late May. Use carbaryl or B.t..



*Whitemarked Tussock Moth larva*

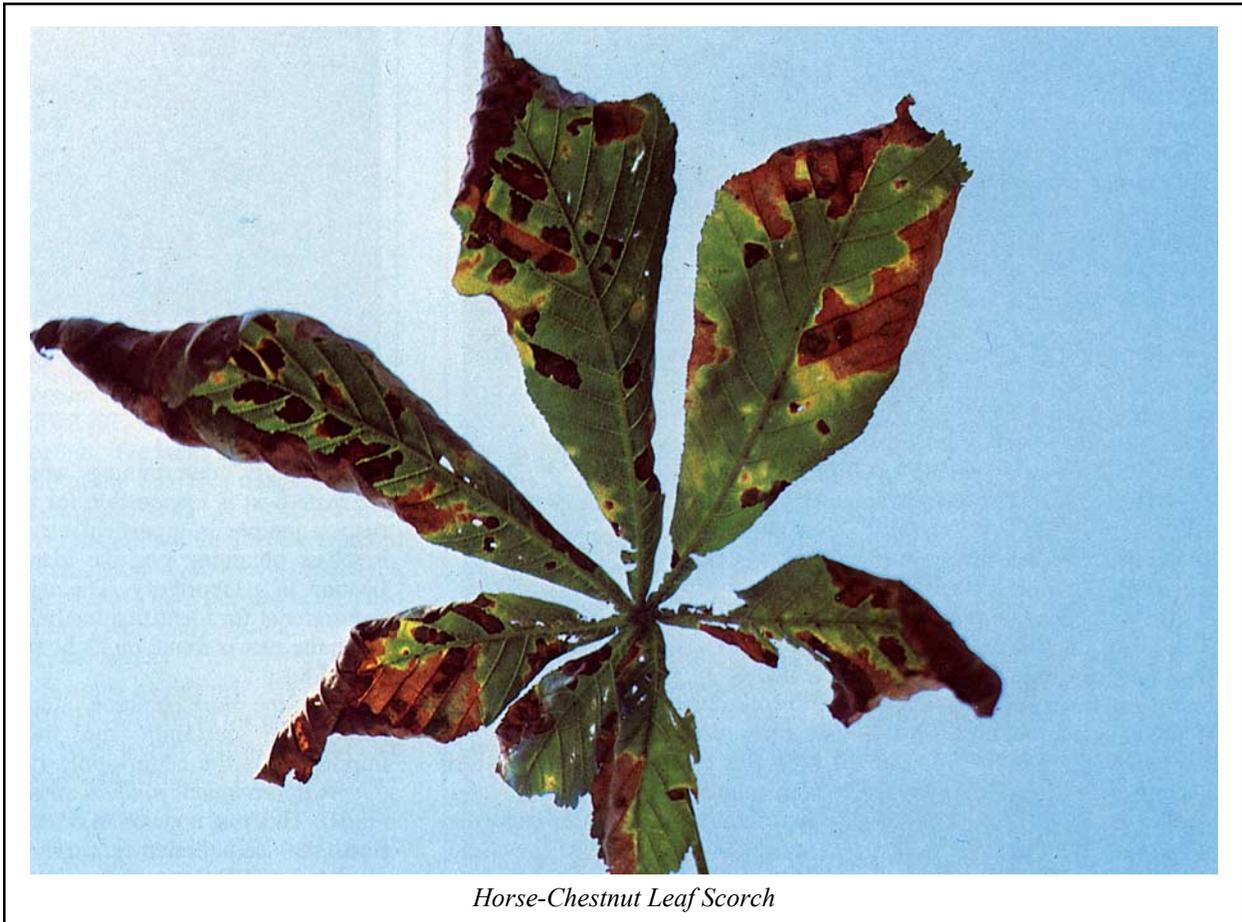
## **Horse-Chestnut Leaf Blotch**

*(Guignardia aesculi)*

Infections of this common foliar fungal disease appear in the spring as inconspicuous, discoloured, watersoaked spots. By mid-summer these change to small or large, triangular blotches of reddish-brown, dead leaf tissue. The brown areas are surrounded by a bright yellow, narrow band which merges outward into the green of healthy tissue. Most leaflets show one or more blotches which may become so large and numerous that leaves curl, turn brittle, and drop prematurely. These latter symptoms closely resemble those of scorch, a common condition affecting many kinds of trees along city streets. It is attributed to hot, dry, sunny weather, and horse-chestnut is very susceptible. However, in the case of leaf blotch, a distinction can be made by detecting the tiny, black, spore-producing structures on dead leaf tissue. A further distinguishing feature is the development of small, reddish-brown scars on the stalks of leaves and leaflets as a result of leaf-blotch infection.

### **CONTROL**

- Rake and destroy leaves as they fall, and in the autumn, since these are the main source of new infections in the spring.
- Apply dodine or zineb soon after bud-break when leaves are half-grown. Repeat at ten-day intervals if weather remains wet.
- Root-feed trees which have been affected severely for several successive years.



## Juniper (*Juniperus*)

### Juniper Scale

(*Carulaspis juniperi*)

The female juniper scale is small, circular, and white with a yellow centre. The male scale is long, narrower and smaller, with a median ridge. Only fertilized females overwinter. Egg-laying occurs in June. The newly hatched larvae, or crawlers, exit from beneath the mother scale and migrate to feeding sites. Once the female crawlers settle down to feed they do not move again. The males, however, develop wings in the adult stage and move from one location to another. They mate with the females and die early in the autumn. There is one generation per year.

All species of juniper are damaged, but Pfitzer, Savin, and Irish junipers are most commonly infested. White cedar is also attacked. The scale is a sucking insect and feeds on the needles, twigs, and cones. Heavily infested plants exhibit poor growth and the foliage becomes greyish-brown. Sometimes a sooty mold fungus develops in the honeydew secreted by the scales, giving the trees a dirty, shabby appearance.

#### CONTROL

- The overwintering scales may be controlled by a dormant treatment of superior oil before growth starts in the spring.
- Spray when the crawlers are moving on the needles about late June; repeat as needed. Use diazinon, carbaryl, malathion (do not use malathion on Savin or Canaerti junipers).

### Juniper Webworm

(*Dichomeris marginella*)

The juniper webworm has been very destructive to certain of the sharp-needled junipers, such as Meyeri and Suecica. The brownish-grey moths are present from late June to early August. They lay their eggs singly, usually in the axil of a leaf on the new terminal growth. The larvae feed gregariously at the bases of the needles. As they grow they spin webs of silk, tying the foliage together in masses. A nest may contain up to 15 or more brown caterpillars. They are only partly grown by autumn and hibernate within the webs. Development is completed in the spring. There is one generation a year.

The juniper webworm is an important pest in nurseries and on ornamental plantings, frequently causing serious losses from defoliation. The

young larvae feed on the epidermis of the needles, causing them to turn brown and die. The dead needles are incorporated into the silken webs which are unsightly. Small trees may have the whole top webbed together. Injury is greatest during the period of spring feeding.

#### CONTROL

- Apply a spray when webs first appear or in the spring. The spray should wet the needles and be applied with sufficient force to penetrate the webs. Use malathion, carbaryl, diazinon, or methoxychlor (do not use malathion on Savin or Canaerti junipers).



*Juniper Webworm colony*

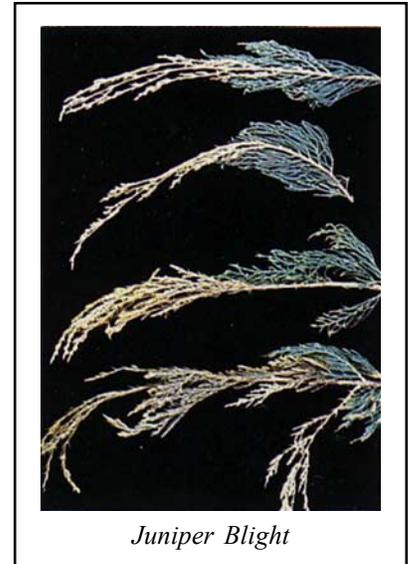
## Juniper Blight

*(Phomopsis juniperovora)*

This fungus can be very destructive, both on introduced varieties of juniper and on our two native species, red cedar and ground hemlock. In addition, eastern white cedar is somewhat susceptible. Usually the disease is most destructive in nurseries where the high humidity created by watering and plant density favours infection. However, stands of larger trees in low-lying areas near water sometimes become heavily infected and defoliated when unusually favourable conditions for infection prevail.

On diseased trees, branch tips turn brown and dieback progresses until the entire branch or young tree is killed. Sunken lesions cause flattened areas on the stems. Infectious spores, produced by the millions on killed twigs, are spread throughout the tree and to adjacent trees by rain and possibly insects. Living bark of twigs is infected directly.

Junipers are also affected by other diseases such as winter browning and Sphaeropsis twig canker, which produce symptoms resembling those of Juniper blight.



### CONTROL

- Prune out twigs and branches with brown foliage after it becomes clear that they have died.



## Juniper Rusts

*(Gymnosporangium spp.)*

Most tree rusts require two kinds of plants in order to complete their life cycle. Some seven or eight species of juniper rusts occur in Ontario, all attacking various species and varieties of juniper, as well as apple, crabapple, hawthorn, juneberry, mountain ash, pear, and quince.

Consequently, determining which alternate host is responsible for the rust on juniper in a particular case involves obtaining positive identification in a laboratory. The same requirement for identification holds when the rust is found on its broadleaved host.

One of the more common juniper rusts, and certainly the most important, is the cedar-apple rust (*Gymnosporangium juniperi-virginianae*). This rust appears to be confined to red cedar (*Juniperus virginiana*) in Ontario and to the alternate hosts apple and crabapple. On red cedar, infections cause greenish-brown galls which, in the following spring, produce orange-coloured gelatinous, spore-producing tentacles. These spores infect apple trees. The galls then dry out and shrink to less than 25 mm in diameter, becoming dark and corky.

The infections on apple leaves produce yellowish-orange spots, which develop whitish hairs projecting from the lower surface. The hairs release spores which infect red cedar leaves, thus completing the lifecycle of the rust.

### CONTROL

- If feasible, cut galls from juniper as soon as they appear.
- Spray juniper about May 1 to prevent galls from releasing spores. Spray again about August 1 and repeat every two weeks for total of three sprays, to prevent infection. Use ferbam, sulphur, or zineb.
- Grow junipers and the rust-susceptible broad-leaved plants as far apart as possible.

## Larch (*Larix*)

### Larch Casebearer

(*Coleophora laricella*)

Larch casebearer adults are small grey moths. They emerge in June and deposit eggs singly on the needles. The larva bores directly into a needle, which it mines until late summer. Then it lines a hollowed portion of the needle with silk and detaches the section at both ends. The remaining larval period is spent in this case. In feeding, the larva attaches the fore-end of the case to a needle which it then mines as far as it can reach. It overwinters within the case which it fastens securely to a twig, usually at the base of a bud. Feeding is resumed in early May and continues for three or four weeks.

Feeding by this insect is restricted to larch, including native tamarack. Mining of the needles gives the trees a light brown appearance as though damaged by a late frost. Trees weakened by the casebearer can be susceptible to attack by secondary pests, such as the eastern larch beetle, *Dendroctonus simplex*.

#### CONTROL

- The case-dwelling habit of this insect makes chemical control somewhat difficult. Spray the foliage thoroughly during the spring feeding period. Use malathion or carbaryl.

### Larch Sawfly

(*Pristiphora erichsonii*)

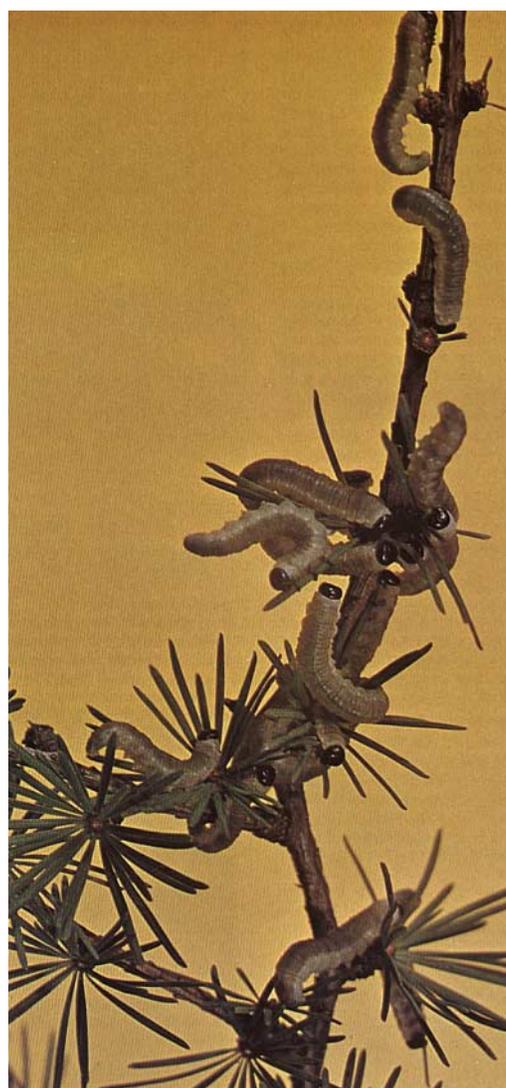
This pest is one of the most injurious insects attacking larch. The adult sawflies resemble small bees. They appear in June and early July, and the females lay their eggs in the young tender shoots. Sixty or more eggs are deposited in a series of slits cut along one side of the twig. This stops growth of that side so that the twig bends towards the injured portion, producing a characteristic hook. The presence of these curled tips is one of the first indications of a sawfly infestation. As a general rule the young larvae do not feed on the needles of the current growth on which they hatched but move to the clusters of needles on the woody twig next to the terminal. The larvae feed in colonies and migrate along the branch towards the trunk, stripping the foliage as they go. As defoliation progresses, the trees first appear thin-crowned and lacy. Later in the summer they may be completely denuded. The mature larvae are 20 mm long, greyish-green with conspicuous black heads. They descend to the ground and spin tough, brown cocoons in the litter. Here they overwinter and most emerge as adult sawflies the following June. Some larvae may remain in their cocoons for two or more seasons before transforming to adults. There is one generation per year, with a partial second in warm areas.

#### CONTROL

- Larvae of the larch sawfly may be controlled by almost any of the commonly available insecticides. Apply sprays to thoroughly cover the foliage when the larvae are about half-grown, sometime in July. Use malathion, carbaryl, or methoxychlor.



*Browning of tamarack needles by Larch Casebearer larvae*



*Larch Sawfly larval colony*

## Lilac (*Syringa*)

### Lilac Borer

*(Podosesia syringae syringae)*

The lilac borer has been recorded at widely separated points in Ontario but has never been abundant. In addition to lilac it also attacks ash, mountain ash, and privet.

The adult borer is a dark brown, wasp-like moth. The hind wings are transparent, marked with a dark border. The insect overwinters as a white larva within the stem of the host. It resumes feeding in the spring, constructs an exit hole, and pupates in May. About two weeks later the pupa wriggles halfway out of the exit hole, and the adult emerges in June. Moths are active for several days, during which time eggs are laid in rough bark, generally near the base of the tree. The larvae bore through the bark and feed in the sapwood and heartwood until late autumn, then they overwinter. There is a single generation annually.

Signs of borer activity are round holes in the rough bark characterized by protruding sawdust, oozing sap, and in the spring by brown pupal cases at emergence holes. Tunnelling by the larvae causes the leaves to wilt and the stems to break. The older, rough-barked stems are most susceptible to attack, particularly those with wounds or grafting scars.

#### CONTROL

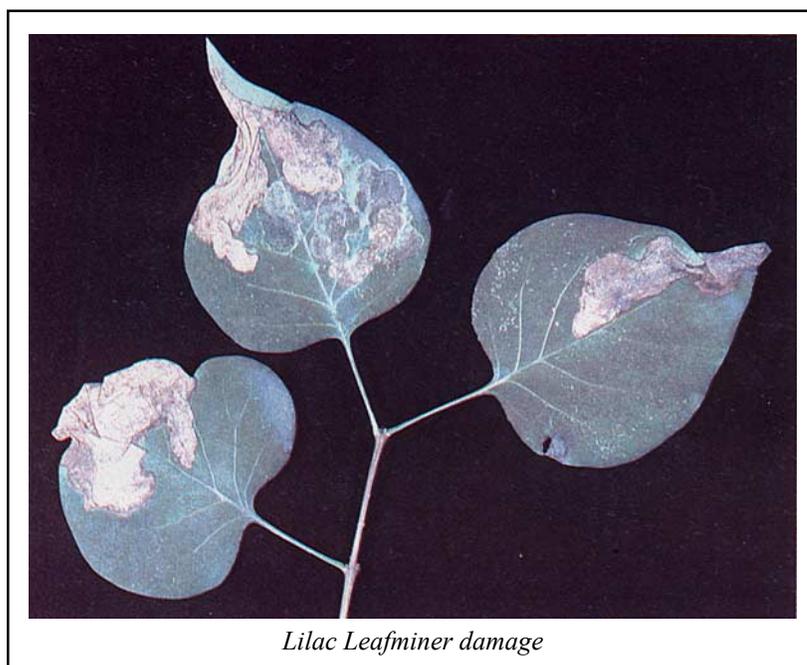
Control of the lilac borer is difficult.

- Badly infested shoots should be cut off before May and destroyed.
- Crush borers with a flexible wire probe or excise with a knife.
- Spray the woody stem portion to kill adult moths before they lay eggs or to kill larvae before they bore into the bark. Three sprays should be applied at three-week intervals beginning in early May. Use endosulfan.

### Lilac Leafminer

*(Caloptilia syringella)*

Lilac leafminer adults are small, dark-brown moths. They appear in late May or early June and are most active in the early hours of the evening. Eggs are deposited in groups of five to ten in the axils of the veins on the undersides of the leaves. The pale yellowish larvae bore upward into the leaf where they mine between the leaf surfaces. The pale yellowish larvae bore upward into the leaf where they mine between the leaf surfaces. The point of feeding at first appears simply as a discoloured spot but soon becomes irregularly enlarged. As the mines of several larvae coalesce, the leaf takes on a bladderly appearance. After feeding this way for three weeks the larvae come to the exterior and curl the leaf. They retain their gregarious habits and skeletonize the upper surface of the leaf as they roll it. About ten days later they descend on threads of silk and pupate in the debris on the ground. In early August the moths emerge and the life cycle is repeated. The larvae of this generation feed until the middle of September then enter the soil and overwinter as pupae.



The favoured host is lilac, but ash, privet, euonymus, and deutzia are also attacked. The injury is seldom important so far as plant growth is concerned, but the beauty and symmetry of the trees is often ruined. Damaged leaves dry up, and when the insects are abundant, the foliage may be completely browned as if scorched by fire.

CONTROL

- In light infestations on small shrubs, picking the spotted leaves early in the season and destroying them should hold this pest in check.
- Spray the foliage as soon as leafminer activity is observed, or make first application in early June and repeat six weeks later. Use dimethoate, diazinon, or malathion.

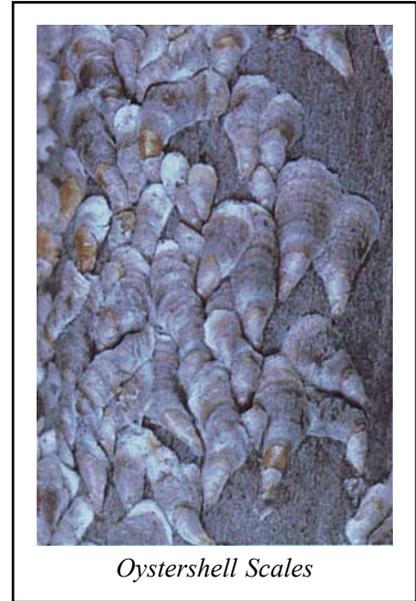
**Oystershell Scale**

*(Lepidosaphes ulmi)*

This widespread pest attacks more than 125 species of forest, shade, and fruit trees. In addition to lilac, common hosts are apple, ash, beech, birch, cotoneaster, dogwood, elm, linden, maple, poplar, and willow.

The oystershell scale is referred to as an armoured scale because the body is protected by a covering composed of moulted skins and waxy secretions. Mature females are 3 mm long, narrow in front, and broad and rounded at the rear. The males are similar in shape but smaller and are quite rare. The scales are usually strongly curved but when crowded their shape is considerably distorted. The nymphs are pale yellow to orange, very small, and somewhat flattened.

The insect overwinters as eggs beneath the scale of the dead female. Hatching occurs from late May to mid-June, and the nymphs crawl to younger wood where they settle down to feed. Soon a white flocculent mass of wax is produced which later mats down and becomes the outer scale. This is enlarged from time to time to accommodate the growing insect. The female never moves again. The male develops wings, escapes from the shell, and searches for a mate, although his presence is not necessary for the female to produce fertile eggs. In late August or September the female lays 40 to 100 eggs and then dies. There is a single generation annually.



*Oystershell Scales*

Because of the small size and bark-like colour of the scales, infestations often pass unnoticed until a retardation of twig and branch growth causes an early yellowing of the foliage as a result of the withdrawal of sap from the tree. Branches are frequently killed back from the tips. Lilacs and ash often become so encrusted with scales that entire trees are killed. Spread of the oystershell scale from tree to tree is quite slow since the females cannot fly.

CONTROL

Natural control factors are very important in reducing scale numbers. Direct control is of two types:

- Apply a dormant spray of superior oil.
- Spray when the crawlers are moving to new feeding sites in late May or June and repeat treatment in ten days. Use malathion or diazinon.

**Powdery Mildew**

*(Microsphaera alni)*

This disease affects leaves in late summer and early autumn when growth has ceased. Accordingly, damage is negligible. Infections are often worse in wet weather. The succulent leaves of sucker growth are particularly susceptible.

Leaf surfaces become coated with a white layer of fungal threads that parasitize underlying tissues. Later the colour changes to dirty white as tiny, dark, spore-forming structures develop on the white coating. Eventually leaves turn brown and drop.

Numerous other kinds of trees and shrubs are affected by powdery mildews caused by related fungi. Prominent among these are apple, rose, and euonymus.

CONTROL

- Ordinarily, control measures are not needed. However, if spraying is justified, use benomyl or sulphur.

## Linden (*Tilia*)

### Fall Cankerworm

(*Alsophila pometaria*)

### Spring Cankerworm

(*Paleacrita vernata*)

These insects attack the foliage of nearly all kinds of deciduous forest, shade, and fruit trees, and shrubs. The larvae are commonly called loopers (inch worms) because of their peculiar manner of moving about. They have two or three pairs of false legs, and vary greatly in colour from pale green to almost black, with several longitudinal lines on the body. The adults are greyish moths; the males have a wingspread of 25 mm but the females are wingless.



Fall cankerworm in typical looper posture

Eggs of both cankerworm species hatch when the leaves are beginning to unfold in late April or early May. The larvae feed together for a month to six weeks, then drop or crawl to the ground and pupate. Adults of the fall cankerworm emerge during late October and November and remain active until early December. The females crawl up the trunk of the tree and lay their eggs in single layers around small twigs. Adult spring cankerworms do not emerge until the spring and deposit their eggs in irregular clusters in crevices in the thick bark. Each species produces one generation per year.

The caterpillars feed first on the tender unfolding leaves and buds in which they gnaw small pits. Later they consume entire leaves except the midribs or larger veins. Complete defoliation in two or more consecutive years may kill the tree. Cankerworm infestations are sporadic; there may be about ten years between peaks in the cycle of abundance.

#### CONTROL

- Banding tree trunks with a sticky material may be of value in trapping the wingless females as they ascend to lay their eggs. However, this is dependable only when trees are isolated, and the bands must be applied in both the autumn and early spring to be effective.
- Spray the foliage in the spring when the leaves are about one-quarter grown. Most insecticides give effective control, especially B.t., carbaryl, malathion, methoxychlor, or endosulfan.

### June Beetles

(*Phyllophaga spp.*)

June beetles are the familiar robust, brown, hard-shelled beetles which emerge from the soil in late May. They fly about at dusk and defoliate trees at night. They are especially active in warm, cloudy weather, but are seldom seen actually attacking the foliage. The eggs are laid in the ground, mainly in sod growing upon loose soil. They hatch in about four weeks. The larvae, commonly referred to as white grubs, are soft, plump and usually curled in a half circle. By September the grubs have reached a length of 18 mm and are capable of causing severe damage to plant roots. They descend in the soil to overwinter. In May they come near the surface again and feed vigorously all season, then overwinter a second time, rising again in May to feed for a short time before pupating. The adult beetles emerge the following spring. Thus the life cycle is spread into four calendar years.

While generally considered an agricultural pest of field crops and turf, white grubs injure nursery seedlings and newly transplanted trees by chewing off, or girdling, the roots. The severest damage is inflicted by the second-year grubs. Feeding by adult beetles in years of abundance may completely defoliate trees. There are but few species of hardwood trees that are not subject to some degree of attack. Linden, oak, poplar, elm, and birch are preferred hosts. There are several species of June beetles, and in Ontario they occur as far north as the limits of agriculture.

#### CONTROL

- In years of high beetle populations spray the foliage in late May and early June. Use malathion or diazinon.



*Linden Looper*

### **Linden Looper**

*(Erannis tiliaria)*

The linden looper, more commonly known as the basswood looper, is a general feeder on the foliage of a wide range of deciduous trees, particularly basswood, oak, birch, maple, elm, hickory, and apple. Typically the individual leaves are only partially eaten, but serious defoliation over extensive areas may result when this pest occurs in combination with other species of loopers, particularly cankerworms.

The female moth is wingless and varies in colour from light grey to brown, with two rows of black spots on the back and side. The male is buff coloured with two transverse wavy brown bands on the forewings. The caterpillar is a looper with a rusty brown head and a bright yellow body bearing ten longitudinal wavy black lines along the back.

The moths are present from mid-August to late November. The females crawl up the trees and deposit their eggs in crevices of the bark. The eggs overwinter and hatch when the buds begin to burst in the spring. The caterpillars feed on the leaves until late June or July, then descend to the ground and burrow beneath the surface where they pupate in earthen cells. The moths emerge in late summer. There is a single generation annually.

#### **CONTROL**

- The trunks of isolated shade trees may be banded with a sticky material in late summer to entrap the wingless females as they ascend to lay their eggs.
- If necessary, spray the foliage about the end of May. Use B.t., carbaryl, malathion, methoxychlor, or endosulfan.

## Locust (*Robinia*)

### Locust Borer

(*Megacyllene robiniae*)

This native insect is a major pest of black locust. Signs of infestation are dead and broken limbs, knotty swellings on the trunk, wet spots on the bark in early spring, and accumulations of wood dust in the crevices of the bark or at the base of the tree in late summer. Thin-barked young trees are more severely damaged than are old trees with coarse thick bark. However, the branches of older trees are often infested. Nursery plantings are sometimes completely destroyed as pruning scars offer ideal sites for egg deposition.



*Locust Borer adult*

The adult borer is a longhorned beetle, black with yellow bands, one of which is W-shaped. Adults are present during late August and September when they are commonly found feeding on the pollen of goldenrod. Eggs are laid in crevices of the bark or around wounds. The larvae bore into the bark where they feed during the autumn. In the spring they tunnel into the wood, physically weakening the tree and making it susceptible to wind breakage. Mature larvae are robust, white, legless, club-shaped grubs about 20 mm long. There is one generation per year.

#### CONTROL

- Maintain good tree vigour by planting superior varieties of locust, selecting good planting sites, fertilizing, and watering.
- Remove and destroy heavily infested trees.
- Probe borer tunnels with a flexible wire to kill the larvae.
- Wrap the larger limbs with paper in August to prevent egg laying.
- Chemical control is difficult. Sprays to wet the trunk and limbs in late August may help to kill adult beetles and prevent egg-laying. Use endosulfan.



*Locust Borer damage by larval stage*

### Locust Leafminer

(*Odontota dorsalis*)

The adult of this pest is a small, slightly wedge-shaped black beetle; the outer margin of the wing covers is bright orange. It overwinters in bark crevices or under debris on the ground. Emergence from hibernation occurs when the leaves are unfolding. The beetles feed for a short time on the foliage, eating small, irregularly shaped holes in the leaves and skeletonizing the lower surface. Eggs are deposited in small groups on the underside of the leaves, and the larvae from a given group of eggs bore directly into the leaf and feed in a common mine. Later, they separate, and each larva feeds in its own mine. Before reaching maturity a single larva may mine several leaves. The mines eventually turn into brown blotches and infested leaves drop prematurely. Trees



*Locust Leafminer damage*

*Common Pests of Trees in Ontario*

are rendered unsightly and are often defoliated but are seldom killed unless the damage is incurred during poor growing seasons. Black locust is the favoured host but apple, beech, birch, cherry, dogwood, elm, hawthorn, and oak are also occasionally attacked. There may be two generations per year.

**CONTROL**

- Spray the foliage in the spring as soon as the leaves are fully developed, or in early July, to control the adult beetles. Use carbaryl.

**Locust Twig Borer**

*(Ecdytoplopha insiticiiana)*

In Ontario, the locust twig borer, which attacks black locust and honeylocust, is found only in the southern parts of the province. The adult is a small, ashy-brown moth, and the larva is a reddish to straw-yellow caterpillar about 20 mm long.

The moths are present in May and June, and the females deposit their eggs on twigs of locust. The eggs hatch in a week, and the larvae bore for a month in the twigs. When mature, the larvae leave the twigs and drop to the ground where they spin cocoons among the leaf litter and overwinter. There is one generation per year.

Locust twig borer larvae produce irregular, oval galls about 50 mm long on small branches. These split open with age and mar the appearance of the trees. In heavily infested areas seedling mortality may be high.

**CONTROL**

- Chemical control is difficult. Cut and destroy infested twigs in August before the larvae escape. Rake and destroy leaves in the autumn to kill the pupae.



*Locust Twig Borer larva*