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FSVeg Common Stand Exam User Guide Defoliators (Category 12)

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INTRODUCTION

Defoliators consume all or portions of foliage (and sometimes buds) of host trees. Defoliating insects generally are easily visible only during outbreaks and for only a small portion of each year. Identifying defoliator activity is dependent upon identifying host species, pattern of defoliation, additional signs of insect activity, and knowledge of recent or current outbreaks. Thinned crowns with reduced foliage would seem to be the most obvious sign of defoliator activity, however thin crowns might be due to other causes. General indicators of defoliator activity are: needle loss, chewed needles, bud mining and feeding, webbed needles, discolored foliage as a result of partial consumption, branch dieback, and top-kill. Light and moderate feeding may leave crowns with a thinned appearance. Heavy feeding may result in complete defoliation. Severely defoliated trees are often attacked by secondary agents such as bark beetles. Different defoliating insects feed on trees in different patterns. Some insects prefer new foliage instead of older foliage; others consume all ages. Some defoliators remove entire needles others chew on portions of needles. Some prefer particular host species others are less discriminating, particularly when populations are high. Not all trees in a stand may be equally defoliated.

(12-001) CASEBEARER

This is a generic name for moths of the family Cleophoridae. Larvae of the casebearer moths start life as leafminers. Later they live and feed in case-like or tube-like shelters.

(12-003) LOOPER

<u>Host:</u>	Maple, oak, beech, birch, elm, hickory, and other hardwoods
<u>Injury:</u>	Larger loopers tend to feed voraciously, consuming all but the mid-rib and larger veins, younger larvae may work as skeletonizers or give leaves the appearance of Swiss cheese.
<u>Description:</u>	This is a generic name for geometrid moths of the family <i>Geometridae</i> . Other generic names include spanworms, inchworms, or measuring worms. They move along by grasping with the hind pair of prolegs while they extend the body forward, then holding the front legs while they hump their backs to bring up their rear. This produces a looping motion.

(12-005) SAWFLY

<u>Injury:</u>	Larvae consume the needles, feeding on the old and current year foliage. Defoliation is sporadic, occurring in localized or region-wide outbreaks lasting one or more years. Growth loss the year following a severe defoliation can average over 50% and mortality increases due to secondary invasion by bark beetles and pine sawyers.
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Description:

Members of the super family *Tenthredinoidea* are commonly called sawflies because of the saw-like ovipositor of the female. Sawfly adults resemble large houseflies but are actually broad-waisted wasps. Sawflies comprise one of the most destructive groups of insect defoliators in eastern forests.

Figure 1: Defoliation



Figure 2: Dead eggs



Figure 3: Defoliation



Figure 4: Larvae



(12-007) LARGE ELM LEAF BEETLE

<u>Species:</u>	<i>Monocystus coryli</i>
<u>Host:</u>	River birch, pecan, hawthorn
<u>Range:</u>	Throughout most of the eastern United States from Georgia and Alabama northward to Pennsylvania, Ohio, Indiana, Illinois, and westward to the Plains States.
<u>Injury:</u>	Adults fly to the top of their hosts, and feed on the leaves for several days. Eggs are deposited in masses on the undersides of leaves; the larvae are gregarious and skeletonize the foliage.
<u>Description:</u>	The adult is about 12 mm long. Its color is dull yellow to dark brown, with large greenish patches at the ends of each elytron. Full-grown larvae are reddish brown, metallic lustered, and about 20 mm long.

(12-008) SPANWORMS

This is a generic name for geometerid moths of the family *Geometridae*. Other generic names include loopers, inchworms, or measuring worms. They move along by grasping with the hind pair of prolegs while they extend the body forward, then holding the front legs while they hump their backs to bring up their rear. This produces a looping motion.

(12-010) PINE FALSE WEBWORM

<u>Species:</u>	<i>Acantholyda erythrocephala</i>
<u>Host:</u>	Eastern white and red pine

<u>Secondary host:</u>	Scotch, Austrian, and mugho pine
<u>Range:</u>	Connecticut to New Jersey and Pennsylvania and the Lake States
<u>Injury:</u>	Short rows of 3 to 10 eggs are deposited on the previous year's needles. The larvae spin loose webbing about them and feed gregariously on the old needles. Young larvae cut the needles off just above the bundle sheaths and pull them into the webbing, where they are consumed. Older larvae feed singly from within individual silken tubes spun around themselves along twigs.
<u>Description:</u>	Female adults have orange-red heads and steel blue bodies; males are almost entirely steel blue. Full-grown larvae are pale greenish gray and about 16 to 20 mm long. The head is clay yellow with dense, small dark brown spots, and there are longitudinal stripes of purplish red on the dorsum, venter, and sides.

(12-011) WESTERN BLACKHEADED BUDWORM

<u>Species:</u>	<i>Acleris gloverana</i>
<u>Hosts:</u>	Douglas-fir, white spruce, Englemann spruce, Sitka spruce, western hemlock, mountain hemlock, white fir, grand fir, subalpine fir, Pacific silver fir, black spruce
<u>Range:</u>	Northern California to western Montana and northward to southeast Alaska.
<u>Injury:</u>	Damage is confined to new foliage. It resembles damage done by the western spruce budworm. In the spring, young larvae mine and kill expanding buds; older larvae web needles together to form a loose shelter and feed primarily on new foliage. Trees may be killed, top-killed, or severely weakened and thus susceptible to bark beetle attack.
<u>Description:</u>	The black-headed larvae have pale yellow bodies and grow to ½ to 5/8 inch in length.

Figure 5: Larva



Figure 6: Larva in web



Figure 7: Defoliation



(12-012) EASTERN BLACKHEADED BUDWORM

Species: *Acleris veriana*

Host: Balsam fir

Secondary host: White spruce, red spruce, black spruce, and hemlock

Range: Eastern United States

Injury: Larvae feed on elongating buds and on needles of the new shoots

Description: Full-grown adults are about 15 mm long and head color varies from reddish to dark brown, sometimes with a mottled pattern. Larvae have a green body and red to near black head. Eggs are laid singly, usually on the underside of the needle.

(12-013) WHITE FLY

Species: *Aleyrodoidae*

Description: White flies are related to aphids and scale insects. Generally, they are about 1 mm long. The adults are winged and covered with a snowy white powder. The nymphs resemble scale insects but do not have a separate shell-like covering. They are naked or covered with waxy material and secrete honeydew, which becomes blackened by mold. They feed on leaves.

(12-014) FALL CANKERWORM

Species: *Alsophila pometaria*

Host: Elm

Secondary host: Sugar maple, birch, beech, willow, quaking aspen, red and white oak groups, maples, hickory, ash, boxelder, cherry

Range: Northeastern United States south to North Carolina and west to Missouri and Montana, westward to Colorado, Utah, New Mexico, and California.

Injury: Small holes in the leaves are early evidence of young larvae feeding on expanding foliage. Older larvae consume the entire leaf, except the midribs and major veins. Heavy defoliation usually occurs in May and June and can cause growth loss and mast reduction.

Description: The wings of male moths are light gray to tan, with wavy lines, and span about 1 to 1½ inches. Females are wingless. Mature larvae are about 1 inch long and vary from light green to black, with light yellow lines on the sides and a dark dorsal stripe. Coloring varies with population density.

Figure 8: Larvae



(12-015) ALDER FLEA BEETLE

<u>Species:</u>	<i>Altica ambiens</i>
<u>Host:</u>	White and red alder
<u>Range:</u>	California and New Mexico northward to Alaska
<u>Injury:</u>	The larvae skeletonize the leaves and the adults chew holes in the leaves.
<u>Description:</u>	The adults are shiny blue, and about 5 to 6 mm long. The mature larvae are a bit longer but narrower, brown to black above and yellowish below, with shining black head and thorax, and short legs. Clusters of yellow eggs are deposited sometime after the spring appearance of the adults.

(12-016) MOUNTAIN MAHOGANY LOOPER

<u>Species:</u>	<i>Anacamptodes clivinaria profanata</i>
<u>Host:</u>	Mountain mahogany
<u>Range:</u>	California, Oregon, Washington, Idaho, Utah, Colorado
<u>Injury:</u>	Feed upon leaves of their host
<u>Description:</u>	The larvae resemble the grayish-brown twigs of their hosts. The adults have a wingspan of 27 to 36 mm and are grayish with subdued black and brown markings.

(12-018) OAKWORMS

<u>Species:</u>	<i>Anisota spp.</i>
<u>Host:</u>	Oak
<u>Range:</u>	Eastern United States
<u>Injury:</u>	Young larvae feed in groups, skeletonizing the leaf. Later they consume all but the main veins and usually defoliate one branch before moving onto another. Older larvae are less gregarious. Defoliation takes place in late summer or fall.

Description: The larvae are greenish brown with four pink stripes, or tawny and pinkish with short spines. Larvae are about 2 inches long and have a pair of long, curved “horns.” The adult moths are yellowish-red, with a single white dot on each of the forewings.

(12-019) ORANGE-STRIPED OAKWORM

Species: *Anisota senatoria*

Host: Oak

Range: Northeastern United States to Georgia and westward to Minnesota, Iowa, Texas

Injury: Young larvae feed in groups, skeletonizing the leaf. Later they consume all but the main veins and usually defoliate one branch before moving onto another. Older larvae are less gregarious. Defoliation takes place in late summer or fall.

Description: The larvae are black with eight narrow yellow stripes. Larvae are about 2 inches long and have a pair of long, curved “horns.” The adult moths are yellowish-red, with a single white dot on each of the forewings.

(12-020) WESTERN LARCH SAWFLY

Species: *Anoplonyx occidens*

Host: Western larch

Range: Washington, Idaho, Montana

Injury: Younger larvae often feed in clusters on needles. Larvae feed heavily on foliage from late June through August and eat chunks out of needles.

Description: Larvae are hairless, have shiny heads with two single eyes, and have six or more pairs of prolegs on their abdomens. Full-grown larvae are 5/8 to 1 inch long. Larvae have brown heads and green stripes along the body.

(12-021) FRUIT TREE LEAFROLLER

<u>Species:</u>	<i>Archips argyrospila</i>
<u>Host:</u>	Oak, elm, aspen, ash, silver maple, buckeye, birch, hickory, black walnut, willow, poplar, maple
<u>Range:</u>	Transcontinental
<u>Injury:</u>	The early stage caterpillars feed on the swelling buds in May, injuring the terminal growth. Later, they feed on the unfolding leaves, rolling and webbing them. When the population is large, the terminal growth suffers considerable damage.
<u>Description:</u>	The moths are brownish. The wingspread is about 7/8 inch, and the forewings have a creamy or straw colored mottling. The full-grown caterpillar is about ¾ inch long, and has a light-green body and a dark-brown head.

(12-022) UGLYNES CATERPILLAR

<u>Species:</u>	<i>Archips cerasivorana</i>
<u>Host</u>	Black cherry
<u>Range:</u>	Coast-to-coast
<u>Injury:</u>	The caterpillars are gregarious and construct a web, tying the twigs and leaves into a dense nest and enlarging it as they feed on the foliage. Individual nests may be a foot or more long. Under heavy population conditions, the nests may be numerous and an entire small tree may be enclosed.
<u>Description:</u>	The moths are dull orange, with a wing expanse of about 1 inch and a reddish-brown speckling on the forewings. The full-grown caterpillars are about ¾ inch long, black-headed, and yellow-bodied. Pupation occurs within the web, and prior to moth emergence, the pupae wriggle part of the way out of the nest. The cast pupal skins remain attached to the nest and are a good indication that feeding has been complete.

(12-023) BOXELDER DEFOLIATOR

<u>Species:</u>	<i>Archips negundanus</i>
<u>Host:</u>	Boxelder
<u>Range:</u>	Throughout the range of boxelder tree
<u>Injury</u>	Skeletonizes and rolls the leaves, sometimes completely defoliating attacked trees.

(12-024) OAK LEAFROLLER

<u>Species:</u>	<i>Archips semiferana</i>
<u>Host:</u>	Oak
<u>Secondary host:</u>	Maple
<u>Range:</u>	Eastern United States
<u>Injury:</u>	Bud miner and defoliator. Two or three consecutive years of heavy defoliation can cause tree mortality. The eggs hatch in spring at or before the time the leaves appear. Larvae that emerge before the leaves unfold mine the leaf buds. Later, the larvae feed on expanding leaves, webbing them together until late June.
<u>Description:</u>	The egg masses are oval, flat, whitish gray, and 3/16 inch wide. The eggs are held together with compact hairs from the body of the female. The larvae, which grow to about 1 inch in length, have a pale yellowish-green body. The head is black with a lighter area on the upper surface. The female deposits eggs on the trunks and lateral branches of trees.

(12-025) BIRCH SAWFLY

<u>Species:</u>	<i>Arge pectoralis</i>
<u>Host:</u>	Paper birch
<u>Secondary host:</u>	Alder, willow
<u>Range:</u>	Range of birch in the northern United States

<u>Injury:</u>	Trees are particularly or wholly defoliated during August and September. The larvae are gregarious and cling to the edge of the leaves while feeding. When abundant, they may defoliate trees heavily over large areas.
<u>Description:</u>	The adults are about 3/8 inch long, with semi-membranous wings. The most characteristic feature of the adults is the three-segmented antennae. The full-grown larvae are about ¾ inch long; they are yellowish with six rows of conspicuous black spots down the back and have reddish-yellow heads.

(12-026) ARBORVITAE LEAFMINER

<u>Species:</u>	<i>Argyresthia thuiella</i>
<u>Host:</u>	Northern white cedar
<u>Secondary host:</u>	Scarlet oak
<u>Injury:</u>	As the larvae feed on and excavate the tissue between leaf surfaces, individual leaves or groups of leaves at the tips of branches become yellow or brown. If held to the light, the leaf will appear translucent. The larvae may be seen in the mines in late summer or early spring by holding the leaf to the light and probing the brownish area to make the caterpillars wiggle.
<u>Description:</u>	Leafminers over-winter as immature adults in the leaves. In late April and early May the larvae are feeding. The adult moths, which appear from mid-May through June, are light gray, with an average wingspan of 3/8 inch. They wedge their eggs between the tip of one leaf scale and the base of an adjoining one. On hatching, the larvae enter the leaf. Most moths have laid their eggs and died by July 1.

(12-027) COCONUT SCALE

<u>Species:</u>	<i>Aspidiotus destructor</i>
<u>Host:</u>	Coconut, avodado
<u>Range:</u>	Guam
<u>Injury:</u>	Commonly found in great numbers on the frond and underneath the leaf sheets. Nutrient movement in the frond's band leaves is hampered by the scale insect, causing discoloration of the leaves from the mature to the young leaves.

(12-028) TEXAS LEAFCUTTING ANT

<u>Species:</u>	<i>Atta texana</i>
<u>Host:</u>	Slash, longleaf pine, loblolly pine
<u>Range:</u>	Upland areas of west central Louisiana and east Texas
<u>Injury:</u>	These ants remove the needles, buds, and bark of seedlings during the winter and early spring when other green vegetation is available. Once the seedlings have reached a height of 2 to 3 feet, they are rarely killed.
<u>Description:</u>	These ants are rust colored with large heads. They live in large colonies. The queen is $\frac{3}{4}$ inch long, and lives in an underground chamber. The worker ants are most numerous and range in size from $\frac{1}{10}$ to $\frac{1}{2}$ inch long. Ant nests consist of numerous crescent-shaped mounds on the surface and extensive underground passageways and chambers. The mounds may be restricted to a small area or extend over an acre or more. Foraging trails cleared of vegetation are often present around the central nest area.

(12-029) OAK SKELETONIZER

<u>Species:</u>	<i>Bucculatrix ainsliella</i>
<u>Host:</u>	Northern red oak, white oak, black oak
<u>Range:</u>	Southern Canada and the Lake states to North Carolina and Mississippi
<u>Injury:</u>	The moths are creamy white and the wingspan is about $\frac{5}{16}$ inch. The forewings have a brown longitudinal band and a purplish-brown spot at the middle of the inner margin. The full-grown larvae are yellowish green and about $\frac{1}{4}$ inch long.

(12-030) PEAR SAWFLY

<u>Species:</u>	<i>Caliroa cerasi</i>
<u>Host:</u>	Cherry
<u>Secondary host:</u>	Hawthorn, black cherry
<u>Range:</u>	Coast-to-coast in northern states

<u>Injury:</u>	The larvae feed mostly from the upper surface of the leaf, eating the parenchyma only. Heavily infested trees appear as if scorched, and their leaves drop prematurely.
<u>Description:</u>	Full-grown larvae are tadpole-shaped, slug-like, and about 12 mm long. The body is covered with a shiny, olive-green material secreted by the larvae. Eggs are deposited singly in small semi-circular slits cut in the leaf tissue.

(12-031) SCARLET OAK SAWFLY

<u>Species:</u>	<i>Caliroa quercuscoccinae</i>
<u>Host:</u>	Scarlet oak
<u>Range:</u>	Massachusetts, North Carolina
<u>Injury:</u>	Leaves are skeletonized. Larvae consume the lower surfaces of the leaves, making the leaf transparent and revealing a fine network of veins. Defoliation starts in the upper crown in early summer and progresses downward. By late summer, heavily infested trees may be completely defoliated or have a light reddish appearance.
<u>Description:</u>	Larvae are slug-like, yellowish-green, and shiny, with black heads and thoracic legs. They are about ½ inch long, and feed in groups. The adult is a typical sawfly, about ¼ inch long and light brown.

(12-032) ELM CALLIGRAPHA

<u>Species:</u>	<i>Calligrapha scalaris</i>
<u>Host:</u>	Elm
<u>Range:</u>	Eastern United States
<u>Injury:</u>	When adults emerge in the spring, they chew circular holes in the leaves. The larvae devour entire leaves except the veins. When they reach maturity, they crawl down the trunk. In heavy infestations, they frequently occur by the thousands on the trunk or under the larger limbs.
<u>Description:</u>	Adults are elongated-oval, creamy white beetles from 8 to 10 mm long. The head and thorax are dark, metallic green. Each elytron bears from 10 to 14 metallic green spots, a dark green, boot-shaped spot at the base, and a dark, metallic green irregular stripe along the inner edge. Full-grown larvae are humped-shaped and have a yellow head.

(12-033) BOXELDER LEAFROLLER

<u>Species:</u>	<i>Caloptilia negundela</i>
<u>Host:</u>	Boxelder
<u>Range:</u>	Colorado
<u>Injury:</u>	Defoliators
<u>Description:</u>	Very tiny, narrow-winged moths, small flat larvae

(12-035) SPRUCE WEBSPINNING SAWFLY

<u>Species:</u>	<i>Cephalcia fascipennis</i>
<u>Host:</u>	Englemann spruce, white spruce, blue spruce
<u>Range:</u>	Maine, New Hampshire, West Virginia
<u>Injury:</u>	Larvae construct shelters of silk and excreta at the crotch of a twig or branch. The larvae forage from these shelters by cutting the older needles and eating them from the base outwards. Tips of needles are usually not eaten and may be incorporated into the shelters.
<u>Description:</u>	The larvae have elongated antennae, lack abdominal legs, and bear a pair of jointed appendages at the posterior end. Color is variable, but the head is usually dark and the body brownish with a reddish line on the back. When full-grown and about 25 mm long, the larvae drop to the ground to over-winter.

(12-036) TWO-YEAR BUDWORM

<u>Species:</u>	<i>Choristoneura biennis</i>
<u>Host:</u>	Englemann spruce, white spruce, Sitka spruce, and subalpine fir
<u>Range:</u>	Alaska
<u>Description:</u>	Eggs are laid in even-numbered years and the larvae over-winter in the second instar. In odd-numbered years they develop to the fourth instar and gain over-winter. The following year they feed on both new and old needles and complete their 2-year life cycle. Adults are darker and slightly larger than those of the western spruce budworm.

(12-037) LARGE ASPEN TORTRIX

<u>Species:</u>	<i>Choristoneua conflictana</i>
<u>Host:</u>	Quaking aspen
<u>Secondary host:</u>	Balsam poplar, paper birch, willow, alder, and black cottonwood
<u>Range:</u>	Coast-to-coast and New Mexico to Alaska
<u>Injury:</u>	Defoliated trees usually refoliate in mid- to late-summer. Because new foliage is sparse and individual leaves are smaller, tree crowns appear thin.
<u>Description:</u>	The tortrix lays greenish, flat, overlapping eggs in round masses on upper leaf surfaces. The first instar larvae spin hibernating cocoons in protected locations on the tree trunk. In the spring, at the time of bud break, larvae emerge, climb the tree and mine the expanding buds. The mature larvae are green to black with a black head and anal plate. Pupation occurs in leaves trolled or webbed together on the tree.

Figure 9: Larva with parasitic fly maggot feeding on larvae



Figure 10: Adult



(12-038) SPRUCE BUDWORM

Species: *Choristoneura fumiferana*

Host: Balsam fir, white spruce, red spruce, blue spruce, Sitka spruce, and black spruce. Spruce mixed with balsam fir is more likely to suffer budworm damage than spruce in pure stands.

Secondary host: Tamarack, pine, hemlock

Range: Eastern states and Alaska

Injury: The newly hatched budworm larva is very small and difficult to find because it bores into and feeds on needles or expanding buds. These larvae can cause severe damage to the expanding buds. As the larva grows, needles are severed at the base and left hanging in a thin silken web. The severed needles turn brown, giving the defoliated tree a scorched appearance. This condition is apparent from about mid-June until late August, depending on the weather and latitude. Early in an epidemic, defoliation is usually most noticeable in the top portion of the crown. After several years of heavy defoliation, the forest turns gray as dead tops become conspicuous. Individual trees die after one or more years of heavy defoliation, depending on their general vigor.

Figure 11: Adult



Figure 12: Egg mass



Figure 13: Pupa



Figure 14: Balsam fir mined needles



(12-039) SUGAR PINE TORTRIX

<u>Species:</u>	<i>Choristoneura lambertiana</i>
<u>Host:</u>	Lodgepole pine, ponderosa pine, sugar pine, limber pine
<u>Range:</u>	California, Oregon, Idaho, Montana, Wyoming, Colorado
<u>Injury:</u>	In the spring, larvae mine needle sheaths and staminate flowers. Later, up to 90 percent of the new growth can be consumed. Repeated defoliation can cause top kill.

(12-040) WESTERN SPRUCE BUDWORM

<u>Species:</u>	<i>Choristoneura occidentalis</i>
<u>Host:</u>	Douglas-fir, white fir, grand fir, subalpine fir, white spruce, blue spruce, Englemann spruce, western larch
<u>Secondary host:</u>	Western larch, western white pine, ponderosa pine
<u>Range:</u>	Washington, Oregon, northern California, Idaho, Montana, Wyoming, Colorado, Arizona, New Mexico

Injury:

Larvae mine buds and old needles in spring then consume new foliage as it appears. After several years of heavy defoliation, branch dieback, and top kill, tree mortality can occur. Cones and seeds of all host species are also destroyed. Terminal and lateral new shoots of larch are severed.

Description:

Look for larvae or pupae in silken nests of webbed, chewed needles from June until August. Female moths lay eggs on needles in a shingle-like pattern in August. Older larvae and pupae are brown with ivory-colored spots. Sporadic outbreaks have occurred throughout eastern Oregon and Washington.

Figure 15: Adult



Figure 16: Green form adult



Figure 17: Larvae and defoliation



Figure 18: Sixth-instar larvae



Figure 19: Larvae



Figure 20: Topkill



Figure 21: Eggs



Figure 22: Fifth-instar larva



Figure 23: Distribution



(12-041) JACK PINE BUDWORM

<u>Species:</u>	<i>Choristoneura pinus</i>
<u>Host:</u>	Jack pine, Scots pine, red pine, lodgepole pine, eastern white pine
<u>Range:</u>	Northeastern states, including Michigan

Description: Defoliation reduces tree growth, retards regeneration, and causes mortality. Trees of all sizes are attacked, but trees with abundant mal flowers are preferred. Symptoms are brown or red needles loosely webbed onto shoots.

The budworm over-winters as second-instar larvae in bark crevices of branches and twigs. Spring activity begins about the time cones appear. Budworms feed at first on the flower cones and new needles, but later consume all the foliage. Mature larvae are reddish brown with cream-colored spots along the back. Eggs are laid in masses on the needles, and hatch by early August.

(12-042) MODOC BUDWORM

Species: *Choristoneura retiniana*

Host: White fir, Douglas-fir, western larch, spruce

Range: Northeastern California to south-central Oregon

Injury: In early spring, larvae mine needles or buds. Later, larvae make loose webs on newly expanded shoots and feed on new foliage. From late summer to late fall, empty pupal cases can be found in webbed needles. Feeding on older foliage or on non-preferred species such as pine may occur if new foliage becomes scarce.

Description: Young larvae are light green with dark brown heads. Older larvae and pupae remain greenish. Full-grown larvae are 1 to 1¼ inch long. Occasional outbreaks have been reported in the Warner Mountains of Oregon and California.

(12-043) ASPEN LEAF BEETLE

Species: *Chrysomela crotchii*

Host: Aspen, especially quaking aspen

Range: Transcontinental

Injury: Feed on the leaves

Description: Adults are light brown to dull orange and without markings moderately to strongly convex, elongate oval, and 5 to 10 mm long.

(12-044) COTTONWOOD LEAF BEETLE

Species: *Chrysomela scripta*

Host: Willow, poplar, aspen (not quaking aspen), alder

Range: Transcontinental

Injury: The young larvae skeletonize the leaves. Later they feed separately and consume the entire leaf, except the larger veins. Adults chew holes in the leaf, may attack tender shoots, sometimes killing the terminals, causing reduced growth, stem deformity, or tree mortality, stunting and multiple forked tops are especially severe in intensively managed cottonwood plantations. Damage is most critical 3 years after planting and may cause mortality.

Description: Adults are about $\frac{1}{4}$ inch long. The head and thorax are black, and the margins of the thorax are red or yellow. The wing covers are usually yellowish with broken black stripes, but are sometimes almost pure golden to black. Young larvae are black, but become light to dark brown with prominent white scent gland spots along their sides. Mature larvae reach about $\frac{1}{2}$ inch in length. The larvae emit a pungent odor when disturbed. Eggs are lemon yellow in clusters of 25 or more on the undersides of the leaves.

Figure 24: Photo by James Solomon



(12-045) LEAFHOPPER

Species: *Cicadellidae*

Description: Leafhoppers are plant feeders that suck the juices out of plants. Some carry diseases. The nymphs usually feed on only a few species of plants; the adults feed on many species. Leafhoppers are typically slender, delicate, boat-shaped insects, 3 to 10 mm long. They are various shades of brown, green, or yellow with contrasted markings. Their hind tibiae have numerous spines in longitudinal rows. They jump and fly readily when disturbed.

(12-046) POPLAR TENTMAKER

<u>Species:</u>	<i>Clostera inclusa</i>
<u>Host:</u>	Poplar, willow, cottonwood
<u>Range:</u>	New England to Georgia and Colorado
<u>Injury:</u>	Small groups of poplar and willow can be defoliated, especially trees growing in the open. Newly hatched larvae skeletonize the leaf; older larvae devour all except the leaf stalks. Severe defoliation occurs during summer and early fall. May one- or two-leaf webbed tents hang from the branches.
<u>Description:</u>	Full-grown larvae are light brown to nearly black and up to 1¾ inch long. They have four light yellow lines on the back, and a bright yellow and several distinct lines on each side. Adults are brownish-gray, with three whitish lines crossing each forewing. A wavy band crosses the hind wings.

Figure 25: Photo by Robert L. Anderson



(12-047) LARCH CASEBEARER

<u>Species:</u>	<i>Coleophora laricella</i>
<u>Host:</u>	Western larch
<u>Range:</u>	Washington, Oregon, Idaho
<u>Injury:</u>	Damage is most conspicuous during May and June when the mature larvae feed on new foliage and needles turn from yellow-brown to reddish-brown after being mined or “hollowed out” by larvae. Heavily defoliated trees may appear reddish or scorched as the new needles die. This damage can be mistaken for needle diseases.

Description:

Eggs hatch in mid- to late-summer, and larvae initially mine needles. Later each larva cuts off part of a hollowed-out needle and crawls inside it, so that the needle case protects most of its body as it feeds. The half-grown larvae spend the winter in needle cases on twigs, and complete their live cycle during the following spring and summer. Mature larvae are 1/5 to 1/4 inch long. In the early spring and late summer, look for “cases” (portion of hollowed-out needle with larva in it) attached to needles, or examine needles for entrance holes to determine if they are hollow. Hollow needles with holes are the only clues during the summer because new generation larvae do not make cases until September.

Figure 26: Defoliation



Figure 27: Adult



Figure 28: Larva in case



Figure 29: Defoliation



(12-048) BIRCH CASEBEARER

<u>Species:</u>	<i>Coleophora serratella</i>
<u>Host:</u>	Birch, cherry, hawthorn
<u>Range:</u>	Northern states
<u>Injury:</u>	It is most injurious in the spring when larvae feed on expanding foliage, flowers, fruit, and fruit stems.
<u>Description:</u>	The adult is dark gray to grayish brown and had a wingspan of about 12 mm. The larval case is brown, shaped like a cigar, and about 8 mm long.

(12-049) LODGEPOLE NEEDLEMINER

<u>Species:</u>	<i>Coleotechnites milleri</i>
<u>Host:</u>	Lodgepole pine
<u>Secondary host:</u>	Western white pine, red fir, mountain hemlock
<u>Range:</u>	West of the crest of the central and southern Sierra Nevada
<u>Injury:</u>	Trees may be killed through the cumulative effects of defoliation.
<u>Description:</u>	The adults are mottled light gray moths that have a wingspan of 8 to 13 mm and strongly fringed hind wings. The larvae are naked and black headed. Their bodies are uniformly colored, but individuals vary from lemon yellow to orange, pink, and red. This species has a 2-year life cycle.

Figure 30: Defoliation



Figure 31: Defoliation



Figure 32: Defoliation



Figure 33: Defoliation



(12-050) PONDEROSA NEEDLEMINER

<u>Species:</u>	<i>Coleotechnites spp.</i>
<u>Host:</u>	Ponderosa pine, lodgepole pine
<u>Injury:</u>	Miner larvae feed inside a needle or needle sheath. Mined needles turn yellowish, dry, and fall off twigs. Larvae mine needles all year. Needles have entrance holes in them and look hollow when held up to the light.
<u>Description:</u>	Moths are small, narrow-winged, mottled, and generally grayish. The larvae are leafminers.

(12-051) BLACK HILLS PANDORA MOTH

<u>Species:</u>	<i>Colorado doris</i>
<u>Host:</u>	Ponderosa pine
<u>Range:</u>	Colorado, Wyoming, Montana, South Dakota
<u>Injury:</u>	Heavy defoliation occurs only every other year, when feeding by large larvae take place. If feeding is heavy, stands viewed from the air are reddish. Later, crowns appear thin with remaining foliage chiefly at tips of branches. Feeding larvae are easy to detect because of their size. If feeding populations are present, larvae or stubs of needles and cast larval skins can be found on small trees. Once larvae have become large, greenish or brownish droppings under infested overstory trees indicate their presence. Full-grown larvae may be found crawling down tree trunks or wandering on the soil surface. Moth flights to lights of nearby towns are sometimes the first indications of an up surging population.
<u>Description:</u>	The large caterpillars have much longer and more conspicuously branched spines than the regular Pandora moth. The adults resemble the Pandora moth except the hind wings are more translucent and the eyespots on the forewings are not so prominent and are oblong instead of round.

(12-052) PANDORA MOTH

<u>Species:</u>	<i>Coloradia Pandora</i>
<u>Host:</u>	Ponderosa pine, Jeffrey pine, lodgepole pine
<u>Secondary host:</u>	Coulter pine, sugar pine

Range: Inland mountain areas from Montana to southern New Mexico and Arizona to the east, and from Oregon to southern California on the west

Injury: Outbreaks are limited to pine areas having loose soils. Heavy defoliation occurs only every other year, when feeding by large larvae take place. If feeding is heavy, stands viewed from the air are reddish. Later, crowns appear thin with remaining foliage chiefly at tips of branches. Feeding larvae are easy to detect because of their size. If feeding populations are present, larvae or stubs of needles and cast larval skins can be found on small trees. Once larvae have become large, greenish or brownish droppings under infested overstory trees indicate their presence. Full-grown larvae may be found crawling down tree trunks or wandering on the soil surface. Moth flights to lights of nearby towns are sometimes the first indications of an up-surging population.

Description: This moth is one of the largest forest insects in North America. Moths are 1 to 1½ inches long and have a wingspan of 3 to 4½ inches.

Figure 34: First-instar larvae



Figure 35: Egg mass



Figure 36: Larva



Figure 37: Larva



Figure 38: Defoliation



(12-053) SYCAMORE LACE BUG

Species: *Corythucha ciliate*

Host: Sycamore

Secondary host: Ash, hickory

Range: Colorado and New Mexico eastward

Injury: Feeding is done by developing nymphs. The undersurface of leaves is speckled with eggs, excrement, and cast nymphal skins, and the surface is discolored. In heavy infestations, trees lose most of their leaves.

Description: The adults have characteristic lacy wing covers with prothoracic expansion. The head is covered with a lacelike arching hood. The length varies from 1/8 to 1/4 inch. The nymphs are dark brown to black, have spiny projections, and increase in length as they develop.

(12-054) LACE BUGS

<u>Species:</u>	<i>Corythucha</i> spp.
<u>Host:</u>	Sycamore, oak, elm, hawthorn, beech, butternut, black walnut, maple, buckeye, paper birch, yellow birch, willow
<u>Injury:</u>	Infested leaves have chlorotic flecks or tiny chlorotic spots on the upper side. Heavily infested trees may be partially or fully defoliated, especially during dry weather.
<u>Description:</u>	Nymphs are usually dark colored and covered with spines. Adults have broad, transparent, lace-like wing covers. They are flattened, and about ¼ inch long. Some species are beautifully colored.

(12-054) LACE BUGS

<u>Species:</u>	<i>Corythucha</i> spp.
<u>Host:</u>	Sycamore, oak, elm, hawthorn, beech, butternut, black walnut, maple, buckeye, paper birch, yellow birch, willow

(12-055) OAK LEAFTIER

<u>Species:</u>	<i>Croesia semipurpurana</i>
<u>Host:</u>	Red oak, scarlet oak, black oak, pin oak
<u>Range:</u>	New York south to Texas, Massachusetts west to Minnesota
<u>Injury:</u>	Bud miner and defoliator. The eggs over-winter on branches, then hatch in the spring. Young larvae burrow into expanding buds, while older larvae tie sections of leaves together and feed inside the folds.
<u>Description:</u>	Full-grown larvae are dirty white to light green. The pale head capsule has black bars on the lower side of the head or cheek area. In May the mature larvae spin down to the ground and pupate in the soil litter. Eggs are deposited individually on the bark of second-year branches.

Figure 39: Oak leaftier



(12-056) DUSKY BIRCH SAWFLY

<u>Species:</u>	<i>Croesus latitarsus</i>
<u>Host:</u>	Birch, yellow birch
<u>Range:</u>	Alaska and Utah, south through the eastern states to Florida
<u>Injury:</u>	The larvae feed gregariously in S-curved posture on the edge of the leaf.
<u>Description:</u>	The larvae are yellowish green with three brown spots on each body segment. Females average 9mm long and have a black abdomen; males average 7 mm long and have a red-banded abdomen.

(12-057) WALNUT CATERPILLAR

<u>Species:</u>	<i>Datana integerrima</i>
<u>Host:</u>	Black walnut, butternut, pecan, hickory
<u>Range:</u>	Eastern United States
<u>Injury:</u>	Young larvae skeletonize the upper leaf surface. As they grow, they feed on the entire leaf except the petiole. Individual branches, entire trees, or groups of trees may be completely defoliated. Trees of all sizes are attacked. Damage is most severe on isolated individual trees. The greatest amount of feeding usually occurs in August. Trees can withstand 2 or 3 consecutive years of heavy defoliation before they die. Severe infestations occur infrequently and are usually restricted to small geographic areas. Epidemics seldom last longer than 2 years, during which tree growth and vigor are reduced.

Description:

Pale, green eggs with white caps are deposited in clusters of 120 to 880 on the lower leaflet surfaces. The eggs are spherical and about 0.03 inch high and 0.02 inch in diameter. As the embryo develops, egg color changes to light blue-gray.

A newly hatched larva is light green but changes to reddish brown as it grows older. Short white hairs cover most of the body. White lines on the top and sides extend the length of the body. A fully-grown larva is black, covered with long white hairs, and 1 to 2 inches long. The head color in all stages is black. The pupa is about 0.75 inches long, shiny, and dark reddish brown.

The moth has a wing expanse of 1.6 to 1.9 inches. Each forewing is dark tan with four rust-colored lines. The hind wings are light tan.

Figure 40: Egg cluster on lower leaf

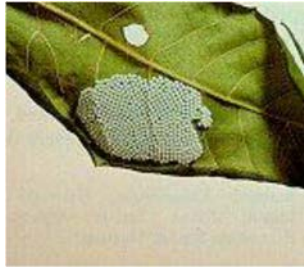


Figure 41: Adult female moth



Figure 42: Larvae



(12-058) YELLOWNECKED CATERPILLAR

<u>Species:</u>	<i>Datana ministra</i>
<u>Host:</u>	Oak, black walnut, cherry, willow, honey locust, butternut, maple, hickory, yellow birch, paper birch, pecan, hawthorn, elm
<u>Range:</u>	Northern and eastern states, mostly the Appalachian and Ozark Mountains and their foothills
<u>Injury:</u>	Newly hatched larvae skeletonize the leaf; older larvae devour all except the leaf stalk. Individual trees, or even stands, may be defoliated during late summer and early fall. Since defoliation is confined to the late part of the growing season, little damage is caused to the tree.
<u>Description:</u>	The larvae are yellowish and black striped, and moderately covered with fine, white hairs. The head is jet black. The segment behind the head is bright yellow-orange. Full-grown larvae are about 2 inches long. When disturbed, the larvae lift their heads and tails in a distinctive U-shape.

Figure 43: Photo by Robert L. Anderson



(12-059) WALKINGSTICK

<u>Species:</u>	<i>Diapheromera femorata</i>
<u>Host:</u>	Black oak
<u>Secondary host:</u>	Quaking aspen, white oak, paper birch, hickory, ash, dogwood
<u>Range:</u>	Eastern United States, nearly all the States east of the Great Plains plus parts of western Texas, New Mexico, and Arizona. Severe outbreaks rarely occur below a line drawn from southern Nebraska to Delaware.

Injury:

The entire leaf blade, except the basal parts of the stout veins, is consumed. During heavy outbreaks, large stands are often completely denuded. Trees may be defoliated two times in the same season in some outbreaks. Three or four heavy infestations are usually sufficient to cause some branch mortality. The walkingstick does not fly. Infestations expand only a few hundred yards during the season. A stream or road separating parts of a stand often retards the spread of the insect. One side of such barriers can have completely denuded trees while the other might have little or no injury.

Description:

The seed-like, oval egg is about 2.2 mm long, 1.5 mm wide, and 1.0 mm deep. It is very hard and shiny black or brown with a broad white or olive-colored band on one edge. One end has an indistinct brown cap by which the nymph emerges. The newly hatched nymph looks like a miniature reproduction of the adult. It is a delicate pale green and measures about 5/16 inch long. The adult is 2½ to 3½ inches long, the female being usually larger and thicker than the male. Both sexes are slender and wingless with long thin legs and antennae. Some adults are all brown or green, while others are mottled or multicolored with dark or light shades of grays, greens, reds, and browns. Their overall shape and coloration, plus their habit of remaining motionless for long periods, make them closely resemble the twigs of their hosts.

Figure 44: Walkingstick



Figure 45: Adult female

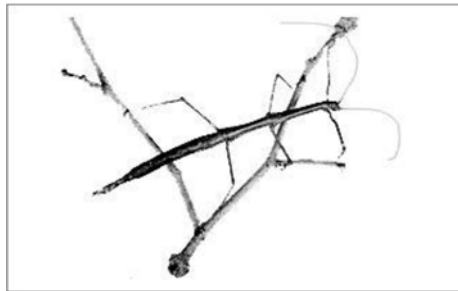
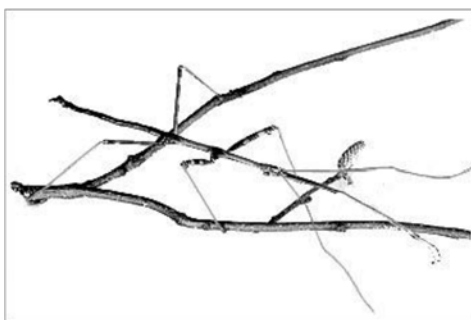


Figure 46: Adult male



(12-060) SPRUCE CONEWORM

<u>Species:</u>	<i>Dioryctria reniculelloides</i>
<u>Host:</u>	White spruce, balsam fir
<u>Secondary host:</u>	Douglas-fir, larch, alpine fir, Pacific silver fir, western hemlock, lodgepole pine, black spruce, blue spruce, Engelmann spruce, Norway spruce, red spruce, Sitka spruce, jack pine, tamarack
<u>Range:</u>	As far west as the Lake States in northeastern United States; Idaho, Montana, California
<u>Injury:</u>	Infested cones and shoots are enveloped in a mass of webbed frass. Infested cones hollowed out.
<u>Description:</u>	Adult wingspan is about 24 mm, fore wing is mottled dark gray with sharp white cross bands; hind wing dark gray with obvious pale band; first instar has nine broken stripes and is cinnamon brown; mature larvae about 17 mm long, with dark-brown head, brown body, five wide longitudinal stripes, three dorsal cinnamon colored and two lateral dark brown.

(12-061) INTRODUCED PINE SAWFLY

<u>Species:</u>	<i>Diprion similis</i>
<u>Host:</u>	Eastern white pine, shortleaf pine, Virginia pine
<u>Secondary host:</u>	Austrian pine, mugho pine, Scotch pine, jack pine, red pine
<u>Range:</u>	From Maine to North Carolina and the central and Lake States

Injury:

Defoliation first occurs in the upper crown, giving it a thin appearance. First generation larvae feed on old needles, and later generations feed on both old and new needles, and sometimes on the bark of twigs. Trees in the most exposed locations and in the overstory suffer the most defoliation. Repeated heavy defoliation can cause branch and even tree mortality.

Description:

The full-grown larva is about 1 inch long, with a shiny black head. The body has a black stripe on the back and numerous yellow and white spots on the sides. Larvae spin light brown, tough, leathery cocoons on the host tree, other vegetation, and ground litter. Adults resemble flies and are about 3/10 inch long and have four transparent wings. Eggs are laid in rows in the needles and covered with a light green substance.

Figure 47: Larvae

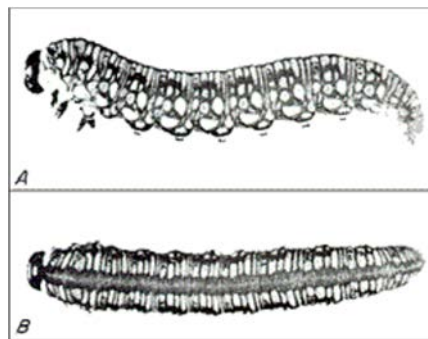


Figure 48: Cocoons



Figure 49: Larvae



(12-062) GREENSTRIPED MAPLEWORM

Species: *Dryocampa rubicunda*

Host: Maple, sugar maple, boxelder

Secondary host: Oak

Range: Widely throughout the eastern half of the United States. Its southern range extends from the Carolina coast to the gulf coast in Alabama and Mississippi. It has been recorded as far west as Nebraska and Kansas.

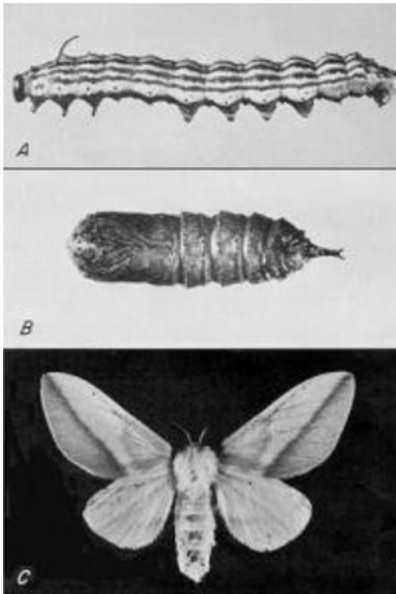
Injury: The larvae devour the entire leaf blade. Heavy infestations often cause complete defoliation on large acreages. Where two generations of the insect are produced in one year, the trees may be completely defoliated twice in the same season. Most of the hosts can withstand two or three complete defoliations without permanent damage.

Description: The new egg is round and slightly flattened, pale green and about 1 mm in diameter. The developing embryo can be observed through the thin shell as the egg ages. After the larva emerges, the eggshell is transparent and colorless.

The young larva is yellow, tinged with pale green. At first, its head is black and its body is covered with prominent black spines. The fully-grown larva is about 1½ to 2 inches long and very colorful. The head is cherry red, and the body is pale yellow green with seven dark green or nearly black lines running its entire length. Two prominent, slender horns are noticeable on the second thoracic segment, and two rows of short spines can be found on each side of the body. Four larger spines are present on the terminal abdominal segments. Other distinguishing marks are rose-colored areas on the sides of the two rear abdominal segments. The larva generally becomes dark brown, overall, just before pupation. The pupa is about 1 inch long, hard shelled, and uniformly dull dark brown. Parts of the thorax and the margins of the abdominal segments are armed with short spines. The anal segment terminates in a forked projection.

The moth has a wingspan of 1 ½ to 2 inches. The dorsal side of its wooly body is yellow; the ventral side and legs are rose pink. Each forewing is rose pink on the inner and outer border with a yellow band between. The hind wings are usually pure yellow, but each may contain a faint rose-pink streak. Several color variations, however, have been recorded. In some varieties, the rose pink on the forewings predominates, reducing the yellow to a narrow band. The opposite may occur, the yellow band predominating. In rare form, the coloration is similar, but some pink scales are scattered throughout the yellow areas. In another variety, the yellow areas are replaced by white.

Figure 50: Fully grown larvae; pupa; adult



(12-064) ELM SPANWORM

Species: *Ennomos subsignaris*

Host: Oak, hickory, ash

Secondary host: Pecan, yellow birch, red maple

Range: Eastern United States, west to Michigan, Colorado, Texas; especially destructive in the southern Appalachians

Injury: Repeated defoliation can cause growth loss, dieback, reduction in mast crops, and even mortality. Young larvae feed on the edge and undersides of leaves, causing a shot hole appearance at low population levels. When populations are high, they consume the entire leaf, except the main veins, giving a feathered appearance.

Description: Larvae are slate gray to brownish black, with yellowish body markings (yellow or green at low population levels), and 1½ to 2 inches long. The adults are snow-white moths. The small, barrel-shaped olive-green eggs are laid in masses on the underside of small branches in the Southeast. In the north, they are found more commonly on the bole.

(12-065) MAPLE TRUMPET SKELETONIZER

<u>Species:</u>	<i>Epinotia aceriella</i>
<u>Host:</u>	Red maple, sugar maple
<u>Secondary host:</u>	Hawthorn, beech
<u>Range:</u>	Southern Canada to North Carolina
<u>Injury:</u>	Look for trumpet-like tubes of silk and frass on undersides of leaves. A leaf may appear to have a pleat, where it has been folded back on itself to contain the "trumpet." Larvae feed from within their tubes, and skeletonize the part of the leaf covered by the web. Damage is usually not very serious.
<u>Description:</u>	The adult is white, with dustings of gray or brown and has a wing spread of about 15 mm. Each larva spins a trumpet-like tube of silk and frass on the underside of a leaf, causing the leaf to fold around it.

Figure 51: Close-up of trumpet construction



(12-066) WHITE FIR NEEDLEMINER

<u>Species:</u>	<i>Epinotia meritana</i>
<u>Host:</u>	White fir, grand fir, California red fir
<u>Range:</u>	New Mexico and Colorado to California and Washington
<u>Injury:</u>	Repeated defoliation causes extensive branch killing, deterioration of tree crowns, and increased susceptibility to <i>Scolytus</i> .
<u>Description:</u>	The forewings of the adult are dusty gray, alternatively banded with black scales, and fringed with long gray scales. Wing spread is 10 to 11 mm. The mature larvae are about 8 mm long; yellowish green to cream colored, and has a brownish black head and shield.

(12-067) LINDEN LOOPER

<u>Species:</u>	<i>Erannis tiliaria</i>
<u>Host:</u>	Oak, maple, elm, hickory, birch
<u>Secondary host:</u>	Ash, cherry
<u>Range:</u>	Eastern United States
<u>Injury:</u>	Heavy defoliation occurs in the spring and can cause growth loss and mast reduction. Early evidences of feeding are small holes in the leaf produced by young larvae feeding on the expanding foliage. Older larvae consume the entire leaf, except midribs and major veins.
<u>Description:</u>	Male moth wings are light gray to tan, with wavy lines and a span of 1 to 1½ inches. Females are wingless. Mature larvae are 1 ½ inches long with a rusty brown head, a tan back with numerous wavy black lines, and yellow sides. Coloring varies with population densities. The larval segments have small, hairy tubercles.

Figure 52: Photo by John H. Ghent



(12-069) PINE NEEDLEMINER

<u>Species:</u>	<i>Exoteleia pinifoliella</i>
<u>Host:</u>	Jack pine, pitch pine, shortleaf pine
<u>Secondary host:</u>	Virginia pine, Scotch pine, longleaf pine, loblolly pine, red pine
<u>Range:</u>	Northeastern states south to Georgia and Texas
<u>Injury:</u>	Young larvae bore into the bases of current year needles, killing them within 2 to 3 weeks. Older larvae mine in both old and new needles, killing the portions beyond the entrance holes.

Description: The adult has a wingspan of about 9 mm. The forewing is reddish to golden brown and is marked by four narrow, grayish bands. The hind wings are wider than the forewings. Full-grown larvae are pinkish and about 6 mm long.

(12-070) BIRCH LEAFMINER

Species: *Fenusa pusilla*

Host: Gray birch, paper birch

Secondary host: Yellow birch, black birch, European white birch, river birch

Range: Oregon, Washington, Alaska; Maine to New Jersey and west to Ohio and the Lake States

Injury: Severe browning and distortion of foliage beginning in mid-May. Larval feeding causes irregular blotch mines that are translucent green at first, turning to gray and eventually brown. Mines contain black frass. Larvae feed on tissue between the leaf surfaces, creating irregular, brown, dry patches on the leaves. Full-grown larvae chew exit holes in the leaves and then drop to the ground, where they hibernate in the soil. Damage tends to be more serious on open-grown ornamental birches than on trees in forest stands.

Description: The flattened, yellowish-white larvae are about $\frac{1}{4}$ inch long with four black spots on the underside near the front thorax. Adults are small, black sawflies and emerge in May and early June.

Figure 53: Photo by E. Bradford Walker



Figure 54: Photo by E. Bradford Walker



(12-071) ELM LEAFMINER

<u>Species:</u>	<i>Fenusa ulmi</i>
<u>Host:</u>	American elm
<u>Range:</u>	Northeastern States west to the Lake States
<u>Injury:</u>	Large blotchy or blister-like larval mines are formed between the upper and lower leaf surfaces in late May and early June. Several larvae may be in a common mine. Small trees are most seriously injured, but large trees may also be heavily infested. In severe infestations the leaves fall prematurely.
<u>Description:</u>	The adults are sawflies, very similar in appearance to those of the birch leafminer. The legless, flattened larvae are white with a greenish cast and have a brown head.

(12-072) GEOMETRID MOTH

<u>Species:</u>	<i>Geometridae</i>
<u>Description:</u>	Larvae of this family usually have only two well-developed pairs of prolegs and they move by a looping process. Adults have broad wings, frequently marked by fine contrasting transverse lines.

(12-073) LEAFBLOTCH MINER

<u>Species:</u>	<i>Gracillariidae</i>
<u>Description:</u>	This is the largest family of leaf mining species. The adults are tiny and beautifully arrayed in shining scales and plumes, and their lanceolate wings are overlaid with glistening scales of silver or burnished gold. While the adult is at rest, the front part of the body is raised and the wing tips touch the surface on which it sits. Early instar is flat and usually feed first within mines in the leaves. Later, some feed mostly on the leaf tissues from within tent-like mines or they skeletonize the leaves from shelters made by folding over parts of the leaves.

(12-074) SPOTTED TUSSOCK MOTH

<u>Species:</u>	<i>Halisidota maculate</i>
<u>Host:</u>	Oak, poplar, willow
<u>Secondary host:</u>	Birch, beech, black locust, boxelder, black cherry, maple, willow
<u>Range:</u>	Coast-to-coast in the northern States and in the western States
<u>Injury:</u>	The larvae are solitary feeders except during outbreaks. The larvae feed on the foliage.
<u>Description:</u>	The adult is pale yellow, with long, pointed brown spotted forewings and has a wingspread of 37 to 50 mm. Full-grown larvae are about 30 mm long, dull black above, are thickly clothed with tufts of black and bright yellow to whitish hairs, and have a row of short tufts down the middle of the dorsum.

(12-075) PALE TUSSOCK MOTH

<u>Species:</u>	<i>Halisidota tessellaris</i>
<u>Host:</u>	Boxelder
<u>Range:</u>	Eastern United States and New Mexico
<u>Injury:</u>	The larvae usually feed singly
<u>Description:</u>	The adult is pale yellow and has a wingspan of about 50 mm. The forewings are translucent and crossed by five broad, darkish bands. Full-grown larvae are darkish and densely clothed with compact tufts of light yellow or dirty white fine hairs.

(12-076) HESPERIID MOTH

<u>Species:</u>	<i>Hasora choromus</i>
<u>Range:</u>	Pacific Islands, including Hawaii

(12-077) BROWN DAY MOTH

<u>Species:</u>	<i>Hemileuca eglanterina</i>
<u>Host:</u>	Willow, popular, birch, maple
<u>Range:</u>	New Mexico to California; Oregon, Washington, Wyoming
<u>Injury:</u>	Larvae feed on trees
<u>Description:</u>	Showy yellow to orange brown moth with black markings and pinkish overtones and has a wingspan of 75 mm. the caterpillars are shiny brown to black and have reddish spots on the back and a narrow red line on each side.

(12-078) BUCK MOTH

<u>Species:</u>	<i>Hemileuca maia</i>
<u>Host:</u>	Oak
<u>Range:</u>	New Hampshire to Georgia, Louisiana, Oklahoma
<u>Description:</u>	Adults have black, thin scaled, sometimes semi-transparent wings. A common white band crosses both the fore wings and hind wings near the middles. Full-grown larvae are about 62 mm long. The head is deep reddish brown; the body dull brownish to black and covered with small, yellowish dots.

(12-079) SADDLED PROMINENT

<u>Species:</u>	<i>Heterocampa guttivitta</i>
<u>Host:</u>	Beech, sugar maple, yellow birch, paper birch
<u>Secondary host:</u>	Cherry, oak, poplar
<u>Range:</u>	Eastern United States

Injury:

It is a late season defoliator; most of its feeding occurs from late July until early September. Several seasons of moderate defoliation (less than 50 percent) can lead to some branch mortality and crown dieback. Similar damage can result when a tree is severely defoliated. Severe defoliation (more than 50 percent) can cause a tree to refoliate—even in late summer. However, the new leaves are often killed by frost and very little normal bud set occurs. Although growth loss and some dieback are typical impacts, tree mortality may occur after two or more summers of severe defoliation, particularly during periods of drought.

Figure 55: Larva



Figure 56: Skeletonized leaves



Figure 57: Pupa and adults



Figure 58: Migrating larvae



(12-080) VARIABLE OAKLEAF CATERPILLAR

Species: *Heterocampa manteo*

Host: White oak, southern red oak, northern red oak, willow, black oak, laurel, bur oak, post oak, beech, paper birch, American elm

Secondary host: Black walnut, hawthorn, boxelder, cherry, persimmon

Range: North Dakota and all states east of a line drawn from western Ontario through eastern Texas

Injury: Trees of all sizes are attacked. The greatest amount of feeding usually occurs in August or later; consequently, saplings or larger trees can withstand 2 or 3 consecutive years of extreme defoliation before mortality occurs. Infestations seldom last longer than 2 years, during which time tree vigor and growth are impaired. In severe outbreaks, an occasional tree may be killed, but the major effect is defoliation.

Description:

Pale, cream-colored, glossy eggs are laid on the lower leaf surface. The eggs are spherical and about 1/32 inch in diameter. As the embryo develops, reddish bands appear. Just before hatching, purplish spots that are characteristic of coloration on the head of the young larva also appear. The fully-grown larva is about 1½ inch long and sparsely covered with short hairs. An individual larva may change color as feeding continues. The head varies in color from amber brown to yellow to green. Two lateral, curved bands adorn each side of the head: the outer band is a creamy white, the inner band is reddish brown to black. The overall body color may vary from light pink to dark red. The pupa is about ½ inch long, stout, dark reddish brown, and shiny. It has two small spines at the posterior tip. The moth has a wing expanse of 1½ to 1¾ inches. Each forewing may be light or dark ashy gray with three darker, wavy, and diffused lines and one inconspicuous black spot. The hind wings are light brown.

Figure 59: Fully grown larvae



Figure 60: Fully grown larvae



Figure 61: Egg cluster



Figure 62: Adult moth



(12-081) CHERRY SCALLOP SHELL MOTH

<u>Species:</u>	<i>Hydria prunivorata</i>
<u>Host:</u>	Black cherry
<u>Injury:</u>	Larvae fasten margins of leaves together and from an elongated nest, within which they feed on the upper tissues of the leaves. Progressive feeding defoliates entire trees. Two or three years of heavy defoliation may cause mortality.
<u>Description:</u>	Adults emerge in late spring or early summer from leaf litter. Females lay eggs in late June in pyramid-shaped masses, one to four layers deep, on the underside of leaves. Egg laying continues throughout the summer. Eggs hatch in a few days and larvae are present through early fall. Grown larvae are pale yellow with dark gray or black dorsal stripes; the head is usually orange-brown.

(12-082) FALL WEBWORM

<u>Species:</u>	<i>Hyphantria cunea</i>
<u>Host:</u>	Persimmon and pecan in the south; Pacific madrone, as, Oregon ash, cherry, willow, and cottonwood in the west
<u>Range:</u>	Throughout the United States
<u>Injury:</u>	Large, silken web and skeletonized leaves. The silken web usually contains large numbers of caterpillars.
<u>Description:</u>	The adult moth has a wingspan of 1 to 1¼ inches and is snowy white, usually with dark spots on the wings. The larvae are 1 to 1¼ inches long and covered with silky hairs. The color varies from pale yellow to green, with a black stripe on each side. The pupae are found inside a gray cocoon constructed of silk, frass, and debris. The eggs are small, yellow or light green, and turn gray before hatching.

(12-083) HEMLOCK LOOPER

<u>Species:</u>	<i>Lambdina fiscellaria</i>
<u>Host:</u>	Western hemlock, Pacific silver fir, balsam fir, grand fir, subalpine fir, white spruce, Sitka spruce, Englemann spruce, Alaska yellow cedar
<u>Secondary host:</u>	Douglas-fir, western white pine, western larch, red spruce, black spruce, larch, jack pine, paper birch, yellow birch, maple, western cedar, Oregon white oak

Range: Coast-to-coast, including Alaska

Injury: Larvae feed mostly at the base of needles and usually cut needles off from June to August. Old and new foliage are destroyed and mature larvae will feed on buds and tender shoots. The complete destruction of tissue can kill trees in 1 year. Heavy populations can cover a whole Forest with silken webs.

Description: Typical "inch worm" type larvae on needles, from June to August. Mature larvae are about 1–3/8 inches long, green to brown in color with diamond shaped markings on their backs.

Figure 63: Adult



Figure 64: Larva

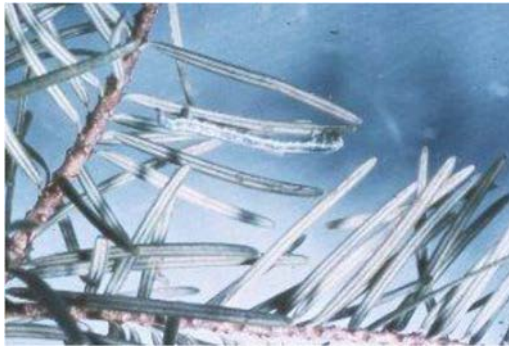


Figure 65: Larva



Figure 66: Adult



(12-084) (*LAMBDINA PUNCTATA*)

<u>Species:</u>	<i>Lambdina punctata</i>
<u>Host:</u>	Oak
<u>Range:</u>	Arizona, New Mexico, Colorado, Utah
<u>Injury:</u>	Larvae migrate up the tree and feed on the developing buds and leaves, gradually consuming all except the main veins of the leaves.
<u>Description:</u>	First instar larva is light gray with dark gray bands. The mature larva is light yellow with wavy black longitudinal lines and is about 38 mm long. Adults are similar in size, color, and markings to the hemlock looper.

(12-085) TENT CATERPILLAR MOTH

<u>Species:</u>	<i>Lasiocampidae</i>
<u>Description:</u>	The moths of this family are medium sized and stout bodied; the body, legs, and eyes are hairy; and the antennae are somewhat feathery. The larvae are very hairy.

(12-086) SATIN MOTH

<u>Species:</u>	<i>Leucoma salicis</i>
<u>Host:</u>	Poplar, Lombardy poplar, black cottonwood, willow
<u>Range:</u>	New England, northern California, interior of Oregon and Washington

<u>Injury:</u>	The young larvae feed for a short time, then spin hibernacula in bark crevices where they pass the winter. They resume feeding in the spring.
<u>Description:</u>	The adult is a white moth with a satiny luster, a wingspan of 37 to 50 mm, black eyes and legs, and a body clothed with long white satiny hairs. The full-grown caterpillar is about 50 mm long, blackish with a row of nearly square marks along the back and white markings on the sides.

(12-087) WILLOW LEAFBLOTCH MINER

<u>Species:</u>	<i>Lithocolletis spp.</i>
<u>Host:</u>	Cottonwood, poplar, Pacific madrone, sycamore, willow, California laurel
<u>Description:</u>	This is the largest genus of leafminers. Many species mine leaves of broad-leaved trees. The larvae of some are cylindrical, others are flattened. Practically all pupate in the larval mine. The adults are tiny moths. Their forewings are elongated and yellowish with white cross bars and diagonal markings. Wingspread is 5 to 10 mm.

(12-088) ASPEN BLOTCHMINER

<u>Species:</u>	<i>Lithocolletis tremuloidiella</i>
<u>Host:</u>	Quaking aspen, Freemont cottonwood
<u>Range:</u>	Lake States, Maine, California, Idaho, Utah
<u>Injury:</u>	Irregularly shaped blotchy tent-like mines are made in the leaves in June and early July and again in August. The mines may be nearly $\frac{3}{4}$ inch long and half as wide, and several may develop in each leaf. The upper surface of the mines is paler than the surrounding areas. The heaviest attack is on young trees or in the lower crown of larger trees. Forest trees are usually not seriously affected, but heavy feeding will cause premature dropping of the foliage.
<u>Description:</u>	The moths are white with brown bands across the forewings. The wingspread is about $\frac{1}{4}$ inch. The full-grown caterpillars are dark and about $\frac{1}{5}$ inch long.

(12-089) GYPSY MOTH

Species: *Lymantria dispar*

Host: Oak, white oak, northern red oak, black oak, maple, beech, birch, yellow birch, paper birch, poplar, willow, hawthorn, cottonwood, hemlock, pine, larch, spruce, Englemann spruce, blue spruce

Injury: During periods of feeding, they leave behind a mixture of small pieces of leaves and frass, or excrement. Infestations alternate between years when trees experience little visible defoliation (population numbers are sparse) followed by 2 to 4 years when trees are visibly defoliated (population numbers are dense).

Only the larvae damage trees. Egg masses are laid on branches and trunks of trees, but egg masses may be found in any sheltered location. Egg masses are buff colored when first laid but may bleach out over the winter months when exposed to direct sunlight and weathering. The hatching of eggs coincides with budding of most hardwood trees. Larvae emerge from egg masses from early spring through mid-May.

When population numbers are sparse, the movement of the larvae up and down the tree coincides with light intensity. Larvae in the fourth instar feed in the top branches or crown at night. When the sun comes up, larvae crawl down the trunk of the tree to rest during daylight hours. Larvae hide under flaps of bark, in crevices, or under branches—any place that provides protection. When larvae hide underneath leaf litter, mice, shrews, and beetles can prey to them. At dusk, when the sun sets, larvae climb back up to the top branches of the host tree to feed. When population numbers are dense, larvae feed continuously day and night until the foliage of the host tree is stripped. Then they crawl in search of new sources of food.

Figure 67: Egg masses and first-instar larvae



Figure 68: Larva



Figure 69: Adult male and female



Figure 70: Adult female and egg masses



(12-090) COTTONWOOD LEAFMINERS

Species: *Lyonetia spp.*

Description: This family contains numerous species of small narrow winged moths. The larvae are leafminers when young. Most species become skeletonizers when older. Pupae are formed to elongate ribbed cocoons on the foliage and branches.

(12-091) DOGWOOD SAWFLY

<u>Species:</u>	<i>Macremphytus tarsatus</i>
<u>Host:</u>	Dogwood
<u>Range:</u>	Eastern forests
<u>Injury:</u>	Larvae feed on leaves
<u>Description:</u>	Full-grown larvae are creamy yellow on top with grayish black cross bands or spots, and the legs and venter are yellowish. The head is shiny black, and the body is covered with a white powder.

(12-092) ROSE CHAFER

<u>Species:</u>	<i>Macroductylus subspinosus</i>
<u>Host:</u>	Wide variety of trees
<u>Range:</u>	Eastern forests
<u>Injury:</u>	They appear in swarms in late May or early June and feed first on the opening buds. Later, they attack the flowers, fruit, and foliage. The larvae feed on the roots of seedlings where they are abundant.
<u>Description:</u>	Adults are tan to reddish brown, densely covered with dull yellow scales or hairs, and have long, reddish brown legs.

(12-093) EASTERN TENT CATERPILLAR

<u>Species:</u>	<i>Malacosoma americanum</i>
<u>Host:</u>	Species of Prunus are preferred, especially black cherry
<u>Secondary host:</u>	Hawthorn
<u>Range:</u>	Eastern United States
<u>Injury:</u>	Larvae construct a white web or tent in the crotch of a small branch. They consume the entire leaf, except the midrib.

Description: Grown larvae are between 2 and 2½ inches long. Caterpillars have black heads with long, light brown body hairs. The back has a light stripe, bordered on each side with yellowish-brown and black wavy lines. The sides are marked with blue and black spots. Moths have a wingspread of 2 to 2½ inches and are yellowish-brown, with two narrow, light lines across the front.

(12-094) WESTERN TENT CATERPILLAR

Species: *Malacosoma californicum*

Host: Aspen, quaking aspen, cottonwoods, willow, red alder, birch, cherry, mountain mahogany, oak

Range: Western and northern states

Injury: Moderate to complete defoliation of trees with large silken tents on branches, presence of larvae in and around tents. Heavy defoliation of aspen for many years will cause growth loss, top-kill, and mortality.

Description:

Figure 71: Larvae in web



Figure 72: Larvae in web



Figure 73: Larvae in web



Figure 74: Larva



(12-095) PACIFIC TENT CATERPILLAR

<u>Species:</u>	<i>Malacosoma constrictum</i>
<u>Host:</u>	Oak, blue oak
<u>Secondary host:</u>	Poplar, willow, alder, birch, cherry
<u>Range:</u>	Pacific coast states where oaks grow
<u>Injury:</u>	It can cause serious defoliation of oaks in the dry areas of the Sierra Nevada. The tent consists of a few thin layers of silk, which follow the shape of the twigs and leaves, and rarely exceeds 70 to 100 mm in width.
<u>Description:</u>	The adult male is usually straw yellow and the female is reddish brown. Lines on the forewings are darker than the ground color. The egg mass is laid as a spiral ring, encircling small twigs. The frothy substance covering the eggs is bright yellow and contains large bubbles. The mature larvae have a bluish black head and hourglass-shaped orange blotches, outlined in black.

(12-096) FOREST TENT CATERPILLAR

Species: *Malacosoma disstria*

Host: In the Northeast: sugar maple and aspen; in the Lake States: quaking aspen and oak; in the Appalachians and Central States: oaks; in the mid-south and southern coastal States: water tupelo, sweetgum, and blackgum; in the Mississippi valley: cottonwood; in Texas: oaks; in the Northwest: red alder and willow

Secondary host: Birch, cherry, ash

Injury: Often defoliates extensive areas. Outbreaks in the Lake States typically last for 3 years, and then subside. Diameter growth may be reduced as much as 90 percent. Such defoliation kills few trees except for those that are suppressed. Unusual outbreaks lasting 5 to 7 years have caused mortality up to 59 percent where aspen grew over a high water table. Water tupelo in southwest Alabama subjected to annual defoliation for nearly 20 years grew only .05 inch in diameter per year on average.

Sweetgums in adjacent areas begin drying after 3 successive defoliations. Three flowers may be eaten, nectar gathering by honeybees may be reduced, and seed production is diminished. During years when larvae hatch before leaves unfold, caterpillars mine buds. The quantity and quality of sugar maple sap are greatly reduced because of defoliation. New foliage appearing after spring defoliation may be stunted and thin.

Figure 75: Caterpillars



Figure 76: Moth



(12-097) SOUTHWESTERN TENT CATERPILLAR

<u>Species:</u>	<i>Malacosoma incurvum</i>
<u>Host:</u>	Cottonwood, Freemont cottonwood, cherry, willow
<u>Range:</u>	Colorado, Utah, Nevada, Arizona
<u>Injury:</u>	Moderate to complete defoliation of trees with large silken tents on branches, presence of larvae in and around tents.
<u>Description:</u>	Moths are darker in color than other species. Eggs are laid as a flat clasping mass, but the frothy covering ranges from nearly white to dark brown.

(12-098) LEAFCUTTING BEES

<u>Species:</u>	<i>Megachilidae</i>
<u>Host:</u>	Maple
<u>Range:</u>	Montana and the northern Great Plains
<u>Description:</u>	Leafcutting bees are small to medium sized. They range in color from black, brown, and gray, to metallic blue or green. Their name relates to their habit of cutting discs from leaves to line their cell-like nests.

(12-099) BLISTER BEETLE

<u>Species:</u>	<i>Meloidae spp.</i>
<u>Host:</u>	Young hardwoods in nurseries and shelterbelts
<u>Injury:</u>	The leaves are partially eaten at the margins, but heavy populations will cause noticeable defoliation.
<u>Description:</u>	The adults are ½ to 1 inch long and vary in color, generally being gray or black. The abdomen often is large and extends beyond the ends of the wing covers. The larvae of some of the species are predatory on grasshopper eggs in the soil.

(12-102) WILLOW SAWFLY

<u>Species:</u>	<i>Nematus spp.</i>
<u>Host:</u>	Willow, birch, black cottonwood, aspen
<u>Injury:</u>	The early stage larvae feed in compact colonies, making small holes in the leaves. As they develop each leaf, except the mid-rib, is eaten. The most severe damage occurs on willow along stream banks.
<u>Description:</u>	The sawflies are brownish-black with yellowish-white markings. They are about 1/3 inch long and have membranous wings with a spread of about 1/2 inch. The developing larvae are greenish-black with a row of large yellow spots on each side of the body; when full grown, the general body color is slate black, and the spots are somewhat faded. They rear back when disturbed.

(12-103) BALSAM FIR SAWFLY

<u>Species:</u>	<i>Neodiprion abietis</i>
<u>Host:</u>	Balsam fir
<u>Secondary host:</u>	Spruce, white spruce, black spruce, Englemann spruce, hemlock, white fir, Douglas-fir
<u>Range:</u>	New England to the Lake States and Missouri, and coast-to-coast in the northern states
<u>Injury:</u>	Although some tree mortality has occurred it is usually reported in conjunction with damage by the spruce budworm, the black headed budworm, or the balsam woolly aphid. Larvae feed on foliage from mid-May to early August. At first, they only eat part of a needle, but as they grow larger, the entire needle is consumed except for a stub. Young larvae feed in groups, the older ones feed separately.
<u>Description:</u>	The full-grown larvae are about 17 mm long; spin light-brown cocoons on the needles or in the ground litter.

Figure 77: Fourth-instar larvae



Figure 78: Third-instar larvae



Figure 79: Defoliation



(12-104) LODGEPOLE SAWFLY

<u>Species:</u>	<i>Neodiprion burkei</i>
<u>Host:</u>	Lodgepole pine
<u>Range:</u>	Montana and Wyoming
<u>Injury:</u>	Younger larvae often feed in clusters on needles. Larvae can strip all old needles from trees late May to late July. Larvae feed primarily on older foliage; they are rarely found on the current year's foliage.
<u>Description:</u>	Larvae are hairless, have shiny heads with two single eyes, and six or more pairs of prolegs on their abdomens. Full-grown larvae are 5/8 to 1 inch long. Adults are 6 to 8 mm long and are yellowish-green with black heads.

(12-105) BLACKHEADED PINE SAWFLY

<u>Species:</u>	<i>Neodiprion excitans</i>
<u>Host:</u>	Loblolly pine, shortleaf pine
<u>Secondary host:</u>	Slash, longleaf pine, pond pine
<u>Range:</u>	Virginia to Florida and east to Texas
<u>Injury:</u>	Defoliation during spring and summer is not serious because the larvae tend to feed on older foliage. In the fall, however, defoliation may exceed 90 percent of the total crown and result in a considerable growth reduction during the following season. Heavily defoliated trees may be killed following secondary attacks by bark beetles.
<u>Description:</u>	Older larvae are about 1 inch long and olive green with a glossy black head. Two longitudinal black stripes run along the top of the body, and a conspicuous row of black spots occurs on each side. The adult female is about ½ inch long with a light brown body. She lays her eggs singly at the bases of needles and the tips of shoots.

(12-106) PINE INFESTING SAWFLIES

<u>Species:</u>	<i>Neodiprionn fulviceps</i>
<u>Host:</u>	Ponderosa pine, Jeffrey pine, sugar pine, western white pine, Monterey pine
<u>Range:</u>	Western United States

- Injury: Can completely defoliate a tree. The larvae feed on foliage of the previous year or older.
- Description: There are several related species. Female adults are 6 to 9 mm long and brownish; males are from 5 to 7 mm long and shiny black. The younger instars are generally dark green and the older instars are dark green with light green longitudinal stripes

(12-107) REDHEADED PINE SAWFLY

- Species: *Neodiprion lecontei*
- Host: In the Northern United States: jack pine and red pine; in the Central and Southern United States: shortleaf pine, loblolly pine, longleaf pine, slash pine
- Secondary host: Scotch pine, eastern white pine, Mugho pine, pitch pine, Norway spruce, larch, tamarack
- Range: Eastern United States
- Injury: The insect feeds in colonies containing a few to over 100 larvae. Early damage is evidenced by the reddish-brown, straw-like remains of needles incompletely consumed by the young larvae. Older larvae consume the entire needle, generally stripping a branch of all of its foliage before feeding on another. Old needles are eaten first, but the trees may be completely defoliated particularly in areas where two or more generations occur annually. When foliage becomes scarce, the larvae feed upon tender bark. When a tree is completely defoliated, they migrate to adjacent trees and continue feeding until they are full grown.
- Moderate to heavy defoliation stunts height growth of infested trees and forking may result in the upper crown. Complete defoliation is usually sufficient to kill red pine and jack pine. The southern pines, however, often survive complete defoliation, even in areas where several generations of sawflies occur in the same season.

Figure 80: Colony of larvae



Figure 81: Cocoon



Figure 82: Eggs on needles



Figure 83: Defoliated tree



(12-110) WHITE PINE SAWFLY

Species: *Neodiprion pinetum*

Host: Eastern white pine

Secondary host: Migho pine, red pine, pitch pine, shortleaf pine

Range: Range of eastern white pine

Injury: It feeds on old and new foliage of trees of all sizes, implantations, and mixed stands. Mortality can follow complete defoliation.

Description: Adults emerge in spring and females deposit eggs in the needles. Larvae are present between mid-June and late-July and sometimes, as a second generation, between mid-August and late-September. Larvae are white with four rows of square black spots along the length of the body.

(12-111) JACK PINE SAWFLY

Species: *Neodiprion pratti banksianae*

Host: Jack pine

Secondary host: Red pine and Scots pine

Range: Lake States

Injury: The larvae attack old foliage on trees of all sizes, giving the trees a tufted appearance by leaving only current-season foliage at the branch tips. Defoliation results in growth reduction and some branch mortality.

Description: The over-wintering eggs, deposited in the needles, hatch in in late April or early May. The larvae feed in colonies until late June or early July. The full-grown larva is yellow-green with three greenish-gray stripes along the back and side of the body. The head is black. Pupation occurs in late summer, and adults lay eggs in early fall.

(12-112) VIRGINIA PINE SAWFLY

Species: *Neodiprion pratti pratti*

Host: Virginia pine, shortleaf pine

Secondary host: Pitch pine, loblolly pine, red pine, jack pine

Range: New Jersey and Maryland to North Carolina and westward to Illinois

Injury: Young larvae feed gregariously on the previous year's foliage. They consume the outer portion of the needle, causing the remaining part to take on a straw-like appearance, which is characteristic of early sawfly feeding. Mature larvae consume the entire needle and may feed on the buds and tender bark.

Description: Larvae are pale green, with black head capsules, and about 1/10 inch long when newly hatched. Full-grown larvae are spotted or marked with longitudinal black stripes and are from 6/10 to 9/10 inch long. The adults have four membranous wings.

(12-113) EUROPEAN PINE SAWFLY

<u>Species:</u>	<i>Neodiprion sertifer</i>
<u>Host:</u>	Scots pine, red pine, jack pine, Table Mountain pine, Mugho pine
<u>Secondary host:</u>	Pitch pine, shortleaf pine, eastern white pine, Austrian pine, ponderosa pine
<u>Range:</u>	New England to Michigan, and south and southwest to southern Ohio, southern Illinois, and southwestern Iowa
<u>Injury:</u>	The sawfly feed on tender bark, causing branch or terminal shoot deformation and occasional branch mortality. Trees of all sizes are defoliated, causing growth reduction but rarely mortality.
<u>Description:</u>	The sawfly over-winters in the egg stage; larvae emerge in mid-April to early May and begin feeding in colonies. Mature larvae have black heads and gray-green bodies with several stripes or rows of spots of varying shades of green. They pupate in cocoons in the duff or in protected places on the trees. Adults emerge in the fall and deposit eggs in slits on the needles. Eggs found on pitch pine do not hatch.

(12-114) LOBLOLLY PINE SAWFLY

<u>Species:</u>	<i>Neodiprion taedae linearis</i>
<u>Host:</u>	Loblolly pine
<u>Secondary host:</u>	Shortleaf pine
<u>Range:</u>	Maine and eastern Virginia, Arkansas, Louisiana, southeast Texas, Mississippi, South Carolina, Missouri, Ohio, Illinois
<u>Injury:</u>	Newly hatched larvae feed in groups on the old growth. They consume the soft outer tissue of needles, leaving the remainder to turn reddish brown. Twigs with damaged and discolored needles can be easily seen, and are called "flags." Older larvae feed singly or in pairs and consume the entire needle, leaving short stubs on the branch.
<u>Description:</u>	Larvae are dull green in color, with black stripes along each side and often two lighter stripes below the heavy ones. They are about 1 inch in length, with brown heads. The adult female has a brown body with black markings and is about 2/5 inch long with a saw-like apparatus for depositing eggs.

(12-115) HEMLOCK SAWFLY

Species: *Neodiprion tsugae*

Host: Western hemlock

Secondary host: Sitka spruce, mountain hemlock, Pacific silver fir

Range: SE Alaska, coastal Washington and Oregon, Montana and Idaho

Injury: Most outbreaks collapse with little or no mortality unless the insect is feeding in association with other defoliators. Trees may be top-killed. Young sawfly usually feed in colonies. Two or more larvae often feed on the same needle, starting from the tip and feeding back to the base. Immature larvae feed only on old foliage, but maturing larvae will also attack new foliage if all of the older foliage is depleted. High populations may remove all of the older foliage. This makes the crowns appear thin and gray. During outbreaks, many cocoons can be seen on twigs, foliage, underbrush, and the forest floor.

Description: The egg is pale yellow and surrounded by host needle tissue. Just before hatching it swells, darkens, and may bulge from the needle. The larvae are nearly black but later turns dark green. When full-grown, longitudinal stripes appear. The cocoon is cylindrical with bluntly rounded ends. Adults are “thick waisted” and 5-8 mm long. Females are larger than males, yellow or brownish, and have serrated antennae. Males are black with plumed antennae.

Figure 84: Adult female



Figure 85: Adult male



Figure 86: Larvae



Figure 87: Adult



(12-116) PINE BUTTERFLY

Species: *Neophasia menapia*

Host: Ponderosa pine, lodgepole pine, western white pine

Secondary host: Douglas-fir, western larch, western hemlock

Range: Northwestern states

Injury: Most damage occurs on ponderosa pine. The greenish, hairless larvae feed on older needles from late May to late July. Look for single rows of emerald green eggs from September to June on needles. After the first year of infestation, defoliated trees often have a tufted appearance.

Description:

Adult white butterflies can be seen flying around the crowns and branches of pines from late July into September.

Figure 88: Defoliation



Figure 89: Eggs



Figure 90: Adult



Figure 91: Larva



(12-117) FALSE HEMLOCK LOOPER

<u>Species:</u>	<i>Nepytia canosaria</i>
<u>Host:</u>	Douglas-fir
<u>Secondary host:</u>	Balsam fir, larch, spruce, white spruce, black spruce, hemlock
<u>Range:</u>	Northeastern states and westward into the Rocky Mountains
<u>Injury:</u>	Young larvae feed on underside of new foliage causing needles to shrivel and die. Later in the season, older needles are fed upon. Larvae are capable of striping foliage from the upper half of trees in one season from June to August. Top-kill and tree mortality have occurred.
<u>Description:</u>	Look for “inch worm” larvae on foliage from June into August. Mature larvae are about one inch long, a deep tan color, and contain a yellow, broad ventral stripe bordered by several darker stripes.

(12-118) CALIFORNIA TORTISESHELL

<u>Species:</u>	<i>Nymphalis californica</i>
<u>Host:</u>	Willow
<u>Range:</u>	Western states
<u>Injury:</u>	Caterpillars can seriously defoliate their hosts.
<u>Description:</u>	The black larvae are marked above the row of bright yellow spines mounted on blue tubercles between which are numerous yellow dots. The pupa is shiny brown with stout points above on the sides. The forewing of the butterfly is brown and deep orange, with black spots and a black border, and hind wing has a black dot and purple spots.

(12-119) LOCUST LEAFMINER

<u>Species:</u>	<i>Odontota dorsalis</i>
<u>Host:</u>	Black locust
<u>Secondary host:</u>	Beech, birch, cherry, oak, hawthorn
<u>Range:</u>	Eastern states
<u>Injury:</u>	Adults skeletonize and eat holes in the leaves, whereas larvae mine the leaves (the latter damage is more destructive). Under outbreak conditions, whole hillsides turn gray or brown, often suggesting fall color change.
<u>Description:</u>	The adult is small, elongated, flattish beetle, about ¼ inch long. The head is black, and the thorax and most of the wing covers are orange. The full-grown larvae are yellowish, flat, and slightly larger than adults. Eggs are deposited on the undersides of locust leaflets. They overlap like shingles in groups of three to five and are cemented together by excrement.

(12-120) BRUCE SPANWORM

<u>Species:</u>	<i>Operophtera bruceata</i>
<u>Host:</u>	Aspen, quaking aspen, sugar maple, willow, beech
<u>Secondary host:</u>	Northern red oak, birch, paper birch, cherry
<u>Range:</u>	Northwestern states, New England to the Lake States
<u>Injury:</u>	The larvae skeletonize the tender leaves at the branch tips. The adults eat the leaves partially, but in an outbreak all but the midribs and larger veins may be devoured. Heavy feeding occurs at intervals of 15 years and may last for 3 years. The early stage spanworms feed on the blossom buds.
<u>Description:</u>	The wingless females are light brownish gray and are about 1/3 inch long. The male moths are pale grayish with brownish flecks. The full-grown larvae are about one inch long and bright green with yellowish stripes.

(12-121) RUSTY TUSSOCK MOTH

<u>Species:</u>	<i>Orgyia antiqua</i>
<u>Host:</u>	Balsam fir, spruce, oak, willow, birch, larch, Douglas-fir, western hemlock
<u>Range:</u>	Northern states, California to Alaska, and eastward to Montana
<u>Injury:</u>	Defoliation
<u>Description:</u>	When full-grown, the larvae are about 28 mm long. They change to pupae in yellow-gray cocoons in a variety of niches. The adults, winged males and wingless females, emerge mainly in August and September. Eggs are deposited in a single-layered mass on the cocoon.

Figure 92: Rusty tussock moth larvae



(12-122) WHITEMARKED TUSSOCK MOTH

<u>Species:</u>	<i>Orgyia leucostigma</i>
<u>Host:</u>	Maple, silver maple, sycamore, yellow birch, paper birch, larch, balsam fir
<u>Secondary host:</u>	Willow, buckeye, live oak, white oak
<u>Range:</u>	Eastern states, Colorado, Texas
<u>Injury:</u>	Young larvae chew small holes in leaves. Older larvae feed on leaf edges, consuming entire leaves, except for larger veins and midribs. Entire tree may be defoliated.

Description: The larvae are 1 to 1½ inch long. It has a bright red head with a yellowish body, a pair of upright pencil tufts of black hairs on the prothorax, and four white to yellowish brush-like tufts of hair on the back toward the head.

The adult male moth is gray brown, with dark wavy bands and a white spot. The female is wingless and whitish gray.

(12-123) DOUGLAS-FIR TUSSOCK MOTH

Species: *Orgyia pseudotsugata*

Host: Douglas-fir, white fir, grand fir, subalpine fir

Secondary host: Englemann spruce, ponderosa pine

Range: Eastern half of the Pacific coast states and throughout the Rocky Mountain states, south to Arizona and New Mexico

Injury: Larvae feed from late May until August and prefer new needles, but will consume older needles; trees are often stripped from the top down. Newly expanded needles that are partially consumed die and turn red, giving stands a reddish hue until the needles drop. Treetops may have white caps due to silk from dispersing larvae.

Description: Young larvae are grayish with long hairs. Older larvae are orange-brownish with dense brushes of hairs on their backs and short hairs radiating from red "buttons" along their bodies; full-grown larvae are 1 to 1-3/16 inch long. From August to May, egg masses that are coated with hairs may be found on branches, twigs, and tree trunks.

Figure 93: New egg masses



Figure 94: Feeding on new foliage



Figure 95: Adult male



Figure 96: cocoons and larva on foliage



Figure 97: Pupa case and egg mass



Figure 98: Adult females



Figure 99: Larva



Figure 100: Late-instar larva



Figure 101: Webbing on tree top



Figure 102: Defoliation



(12-124) WESTERN TUSOCK MOTH

Species: *Orgyia vetusta*

Host: Willow, oak, cherry, California walnut, Arizona walnut, poplar

Range: Pacific coast states

Injury: Though the young caterpillars are present in spring, they are likely to escape detection because they are small and cause minor damage. In June, the larvae get large and they and their feeding injury become easily visible. Shrubs may be completely defoliated by mid-June. After larvae have transformed into adults and left the plants, the cause of defoliation can be inferred from their cocoons and the egg masses attached to the lower stems.

Figure 103: Adult male

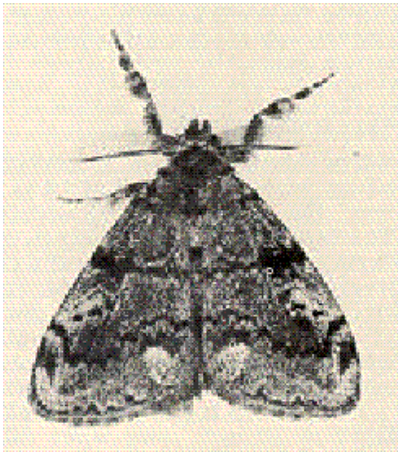


Figure 104: Adult female



Figure 105: Full grown larvae

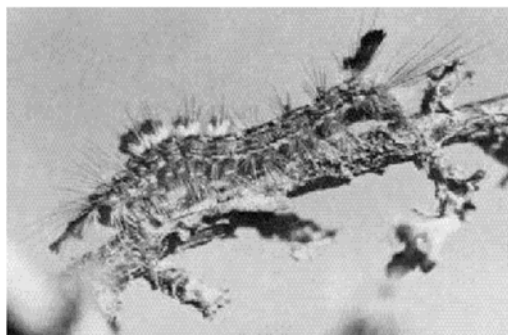
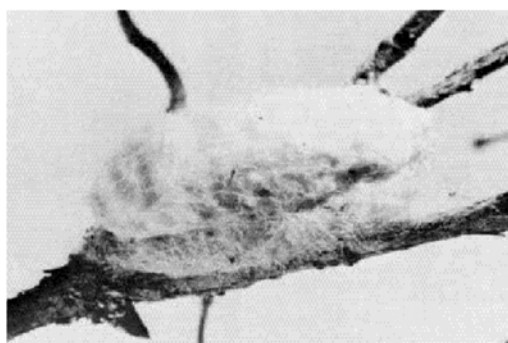


Figure 106: Egg mass on cocoon



(12-125) SPRING CANKERWORM

<u>Species:</u>	<i>Paleacrita vernata</i>
<u>Host:</u>	Oak, maple, sugar maple, hickory, beech, boxelder, ash, cherry
<u>Range:</u>	Eastern states, southwest into Texas, Colorado, and California
<u>Injury:</u>	Small holes in the leaves are early evidence of young larvae feeding on expanding foliage. Older larvae consume the entire leaf, except the midribs and major veins. Heavy defoliation usually occurs in May and June and can cause growth loss and mast reduction.
<u>Description:</u>	The wings of male moths are light gray to tan, with wavy lines, and span about 1 to 1½ inches. Females are wingless. Mature larvae are 4/5 to 1½ inches long and range in color from reddish to yellowish brown, yellowish green, or black. The head is light and mottled with a yellow stripe along each side of the body. Coloring varies with population density.

Figure 107: Photo by Jerald E. Dewey



Figure 108: Photo by Bill Carothers



(12-126) BLACK CURTIS SWALLOWTAIL BUTTERFLY

Species: *Papilio polytes*

Host: Lemon, lime, tangerine, other citrus trees

Range: Micronesia, Guam, the Marianas, Hawaii, Southeast Asia

Injury: The larvae consume new growth and the caterpillars eat the new leaves. Young trees may be defoliated.

Description: The butterfly lays a single, round, green egg on the new growth of the citrus plant. Eggs hatch in a few days into caterpillars, which resemble bird droppings. Older caterpillars are green with prominent eyespots on a humped area near the head. Disturbed larvae extend red tentacles and produce a lemony odor. Larval development usually takes less than 30 days. Larvae pupate on the plant and produce a green or brown pupa. Adults are black with white spots and a distinctive tail on hind wings. Adults feed on nectar.

(12-127) MAPLE LEAFCUTTER

<u>Species:</u>	<i>Paraclemensia acerifoliella</i>
<u>Host:</u>	Sugar maple
<u>Secondary host:</u>	Red maple, beech, birch
<u>Range:</u>	Northeastern states south to Virginia and west to Illinois
<u>Injury:</u>	When the larva hatch, they bore into the leaf tissues and feed as miners for about 10 days to 2 weeks. Then each larva cuts a round disc out of the leaf and makes an oval, movable case in which it resides as a casebearer. As it grows, it cuts out larger oval pieces and attaches them to its case. It attaches the case to a leaf and reaches out from it in a circle as far as it can.
<u>Description:</u>	The adult has long, narrow, pointed wings and a wingspread of 8½ to 13 mm. The forewings are steel blue and fringed with black; the hind wings are pale smoky brown, translucent, and bordered with a pale brown fringe of long hairs. There is a dense tuft of bright orange yellow hairs on the top of the head, and the thorax is steel blue, the legs whitish, and the abdomen dark brown. Full-grown larvae are slender, flattened, and usually dull white with amber brown heads and broad longitudinal strips.

(12-128) PINE TUSSOCK MOTH

<u>Species:</u>	<i>Parogyia grisefacta</i>
<u>Host:</u>	Ponderosa pine
<u>Secondary host:</u>	Jack pine, red pine, white pine, white spruce, Englemann spruce, balsam fir, western hemlock, Douglas-fir
<u>Range:</u>	Eastern Montana
<u>Injury:</u>	Pupation occurs in a cocoon of hairs, silk, and gray-brown moths emerge in July. Small, irregular egg masses are usually deposited near the female pupal case. During July, first-instar and second-instar feed on the needles. When populations are abundant, the larvae mature and feed on old needles down to the needle sheath.
<u>Description:</u>	The larvae are gray-brown, hairy and have four tufts of grayish hairs on the back. Tree shoots often appear ragged after larval feeding is completed. In August, third-instar larvae hibernate in a loose webbing of silk at the base of needles or under bark flaps. In spring, they resume feeding on new needles and staminate flowers.

(12-129) POINCIANA LOOPER

<u>Species:</u>	<i>Pericyma cruegeri</i>
<u>Host:</u>	Flame tree, yellow Poinciana
<u>Range:</u>	Southeast Asia, Guam, Micronesia, Hawaii, several Pacific Islands
<u>Injury:</u>	The caterpillar feeds on leaflets and strips the tree of most of the foliage, but does not eat the midribs. The loss of leaves results in smaller leaves, death of small branches, general loss of vigor, and poor, desynchronized flowering. Secondary infections by bark borers and fungal diseases can also occur.
<u>Description:</u>	Caterpillars are abundant in the wet season. The yellowish or bluish-green eggs are laid singly on the leaflets. The eggs hatch within 2-3 days and the larvae take about one month to mature. The caterpillars may be green or black and white. The caterpillars pupate on the trees in a cocoon constructed of webbing and leaves, and the moths emerge within 12 days.

(12-130) HALF-WING GEOMETER

<u>Species:</u>	<i>Phigalia titea</i>
<u>Host:</u>	Northern red oak, red maple, hickory
<u>Secondary host:</u>	Ash, cherry
<u>Range:</u>	Eastern states
<u>Injury:</u>	Heavy defoliation occurs in May and June and can cause growth loss and mast reduction. Early evidences of feeding are small holes in the leaf produced by young larvae feeding on the expanding foliage. Older larvae consumer the entire leaf, except midribs and major veins
<u>Description:</u>	Male moth wings are light gray to tan, with wavy lines and a span of 1 to 1½ inch. Females have wing pads, but cannot fly. Mature larvae are 1½ inch long with a tan body and head, with many lengthwise, black, wavy lines. The larval segments have small, hairy tubercles.

(12-132) CALIFORNIA OAKWORM

<u>Species:</u>	<i>Phryganidia californica</i>
<u>Host:</u>	California live oak

<u>Secondary host:</u>	California white oak, other oaks, tanoak, eucalyptus
<u>Range:</u>	Northern to southern California, mostly in coastal areas
<u>Injury:</u>	Slows growth of host trees, makes them unsightly, but seldom, if ever, kills them. The young larvae skeletonize the leaves in patches; the older larvae eat all except the main veins.
<u>Description:</u>	The adults are weak fliers. They have translucent, thin scaled, gray brown wings, with darker veins. Wingspread is 25 to 35 mm. the mature larvae are 25 mm long and olive green, with conspicuous black and yellow longitudinal stripes on the back and sides, and the head as wide or wider than the body.

(12-133) EUROPEAN SNOUT BEETLE

<u>Species:</u>	<i>Phyllobius oblongus</i>
<u>Host:</u>	Maple, willow, cottonwood, cherry
<u>Range:</u>	New York west to Ohio
<u>Injury:</u>	Adults feed on the leaves and young shoots of their hosts; the larvae feed on the roots.
<u>Description:</u>	Adults are typical snout beetles, the head bending downward and forming a well-defined and usually curved beak. The antennae are clavate and elbowed, and are located at about the middle of the beak.

(12-134) CITRUS LEAFMINER

<u>Species:</u>	<i>Phyllocnistis citrella</i>
<u>Host:</u>	Lemon, lime, tangerine, other citrus
<u>Range:</u>	Marianas, Southeast Asia, Philippines, Guam, Hawaii, other Pacific Islands
<u>Injury:</u>	Larvae create tracks in citrus leaves and reduce photosynthetic capability of the plant. Heavily infested leaves may dry up.
<u>Description:</u>	The moth lays 2-3 flattened, oval eggs under a leaf near the midrib. Eggs hatch in 3-5 days into tiny caterpillars, which burrow into the leaf. The caterpillars feed inside the leaf and leave a distinctive whitish track with a trail of black debris down the center. Larvae leave the mine to pupate at the edge of the leaf which becomes folded over to pupate inside. Adults are tiny, 2-3 mm long, with 4 black stripes on the wings. Feathery hind wings. The general color of the moth is gray.

(12-135) ASPEN LEAFMINER

<u>Species:</u>	<i>Phyllocnistis populiella</i>
<u>Host:</u>	Quaking aspen
<u>Range:</u>	Coast-to-coast in the northern states including Alaska, in the east as far south as West Virginia
<u>Injury:</u>	The larvae are sap-feeding leaf miners; their meandering mines on the under leaf surface appear as small tracks. Forest trees are not seriously damaged.
<u>Description:</u>	The moths are silvery white and have a wingspan of about $\frac{1}{4}$ inch. The larvae are flat in the early instars but become cylindrical when mature. They are white to light cream, and when full-grown are less than $\frac{1}{4}$ inch long.

Figure 109: Larval galleries of the aspen leaf miner



(12-136) YELLOWHEADED SPRUCE SAWFLY

<u>Species:</u>	<i>Pikonema alaskensis</i>
<u>Host:</u>	White spruce, black spruce, blue spruce, red spruce, Englemann spruce, Norway spruce, Sitka spruce
<u>Range:</u>	Wyoming, Idaho, Alaska, and from Maine to Idaho
<u>Injury:</u>	Successive complete defoliations cause mortality. Stand with closed crowns are not attacked. Pupation occurs in the spring, and adults emerge about when the bud scales fall from expanding hosts. Eggs are deposited singly in the base of new needles.

Description: Mature larvae are olive green above and lighter green below, with several darker stripes of variable width along the back and sides. The head is yellowish-brown and may have brown spots. When mature, the larvae migrate from the trees to the ground to hibernate in cocoons spun in the soil.

(12-137) TENLINED JUNE BEETLE

Species: *Polyphylla decemlineata*

Host: Douglas-fir, hemlock, spruce, grand fir, pine, Monterey pine, Scotch pine

Range: Western states

Injury: Adults feed on the foliage. On sandy grassy land in western Washington the larvae have been known to kill 20 percent of trees in a Christmas tree plantation.

Description: Adults are 25 to 35 mm long and the mature larvae range up to 50 mm.

Figure 110: Adult tenlined june beetle



(12-138) JAPANESE BEETLE

Species: *Popillia japonica*

Host: Buckeye, sycamore, black walnut, Lombardy poplar, American elm

Range: Eastern states from New Hampshire and Vermont to North Carolina and Ohio, rare occurrences in California

Injury: Feeds on foliage, flowers, and fruits. Feeding is usually confined to young, tender leaves. Damaged leaves may be skeletonized or they may also have large, irregular holes chewed out. In heavily infested areas, trees may be almost entirely defoliated.

Description: The adult is broadly oval and nearly 12 mm long. The body is a bright, metallic green; the legs are a darker green; the elytra is a coppery brown. There are two small tufts of white hairs just behind the wing covers and five patches of white hairs on each side. The wing covers are shorter than the abdomen. Full-grown larvae are about 25 mm long, typically grub-shaped, and have two rows of spines on the undersides of the last abdominal segment.

(12-139) LARCH SAWFLY

Species: *Pristiphora erichsonii*

Host: Western larch, subalpine larch, tamarack

Range: Alaska and the northern tier of states except Ohio and Indiana

Injury: Larvae feed heavily on foliage from late June through August and eat chunks out of needles. They feed first on the edges of needles on elongating shoots, then later move to needle clusters on older twigs. Epidemics seldom last more than 2 years and permanent damage to trees is uncommon.

Description: Larvae are hairless, have shiny heads with two single eyes, and have six or more pairs of prolegs on their abdomens. Full-grown larvae are 5/8 to 1 inch long. Larvae are gray-green along the back and whitish beneath with shiny black heads. Younger sawfly larvae often feed in clusters on needles.

Figure 111: Larch sawfly larva



Figure 112: Larch sawfly larva



(12-140) MOUNTAIN-ASH SAWFLY

<u>Species:</u>	<i>Pristiphora geniculata</i>
<u>Host:</u>	Ash
<u>Range:</u>	New Jersey, New York, Pennsylvania, Michigan, all of the New England states except Rhode Island
<u>Injury:</u>	The early stage larvae skeletonize the leaves between the veins; as they develop, they devour all but the midrib. This species feeds in colonies, usually eating all the leaves on one small branch before moving to another branch.
<u>Description:</u>	The sawflies are stout and shiny black, and vary from 3/16 to 5/16 inch long. The males are smaller than the females. The full-grown larvae are yellow, with numerous black spots on the body segments, and are about ¾ inch long.

(12-141) ELM LEAF BEETLE

<u>Species:</u>	<i>Pyrrhalta luteola</i>
<u>Host:</u>	Elms, especially Siberian and American elm
<u>Range:</u>	Everywhere that elms grow
<u>Injury:</u>	Adults chew holes in the leaves, particularly on new growth. The larvae feed on the under surfaces of leaves, leaving upper surfaces and the veins intact. Leaves shrivel and turn brown when damage is severe. When defoliation is severe for several consecutive years, limbs and sometimes trees may be killed.

Description:

The larvae are green to yellow, with a black head and two black stripes on the back. Pupae are about ¼ inch long and bright orange-yellow. The adults are approximately ¼ inch long and yellowish to green with a black stripe on each wing margin.

Figure 113: Elm leaf beetle, Southern Forests Archives



(12-142) SPEAR-MARKED BLACK MOTH

Species:

Rheumaptera hastate

Host:

Paper birch

Secondary host:

Willow

Range:

Northern tier of states including Alaska

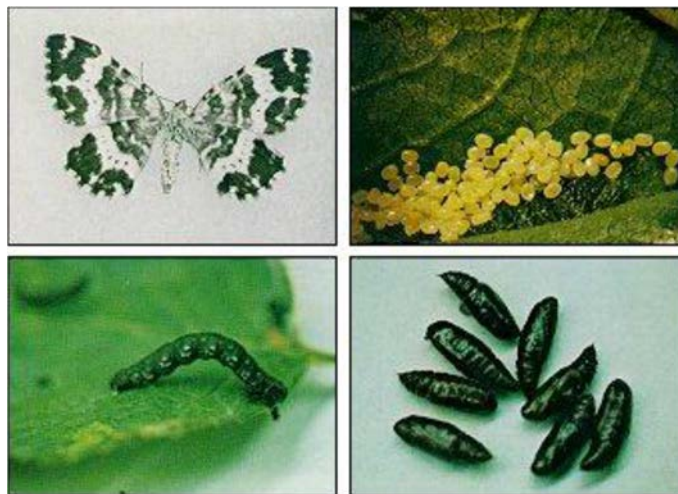
Injury:

Larvae feed predominantly on the upper layers of leaf tissue. Early feeding is often inconspicuous because the larvae feed within enclosures formed by leaf rollers or within two leaves webbed together in a sandwich-type enclosure. Defoliation is evident by early August when damaged leaves remaining on the tree begin to turn brown. Residents of interior Alaska often think the browning is early development of fall leaf coloration. Tree mortality has not been reported from past epidemics, primarily because the epidemics collapsed after two growing seasons. However, radial and terminal growth is substantially reduced, spring bud development is delayed 2 to 3 weeks on previously defoliated trees, and branch dieback is quite common.

Figure 114: Distribution of spear-marked black moth



Figure 115: Spear-marked black moth adult, eggs, larva, pupae



(12-143) GIANT SILKWORM MOTH

Species: *Saturniidae*

Description: This family contains some of the largest and most colorful moths in eastern United States. The larvae, also large and conspicuous, are more or less armed with tubercles and spines. Because of their habit of spinning large, dense silken cocoons in which to pupate, they are known as giant silkworms. The larvae feed on a large variety of trees and shrubs. They usually occur in low numbers.

(12-144) REDHUMPED CATERPILLAR

<u>Species:</u>	<i>Schizura concinna</i>
<u>Host:</u>	Quaking aspen, willow, hickory, black locust, dogwood, sweetgum, persimmon, oak, cherry, maple, sugar maple, paper birch
<u>Range:</u>	Throughout the United States
<u>Injury:</u>	The larvae are gregarious. At first, they skeletonize the undersurfaces of the leaves. Later, they devour entire leaves, except the midribs. During their feeding, the completely defoliate one branch before moving on to another.
<u>Description:</u>	The adult is grayish brown and has a wingspread of about 30 mm. full-grown larvae are about 25 mm long. The head and a hump on the eighth abdominal segment are red. The body is marked with black and yellowish lines. It bears a double row of short, stout, black lines on top. When it rest, the larva holds the rear in an elevated position, and, when handled, it gives off a pungent, disagreeable odor.

(12-145) REDBANDED THRIPS

<u>Species:</u>	<i>Selenothrips rubrocinctus</i>
<u>Host:</u>	Mango, cashew, cocoa, avocado
<u>Range:</u>	Guam, Marianas, Hawaii, Pacific Islands
<u>Injury:</u>	The insect feeds on the underside of the leaf. The lower surface of heavily infested mango leaves has a dark, rusty appearance with numerous small shiny spots of excreta. Leaf edges becomes curled. Seedlings may be severely damaged, so that growth is set back. Older trees may lose their leaves prematurely.
<u>Description:</u>	The eggs are inserted into the leaf and hatch in about two weeks. The nymphs are yellow with a bright red band around the abdomen and carry a drop of reddish excrement on the tip of their upturned abdomen. The drops are periodically left on the leaf and make shiny black spots. The nymphal and pupal states last altogether about two weeks. The adults are dark brown and about 1 mm long.

(12-146) LARCH LOOPER

<u>Species:</u>	<i>Semiothisa sexmaculata</i>
<u>Host:</u>	Western larch
<u>Secondary host:</u>	Tamarack and Douglas-fir
<u>Range:</u>	Northern tier of states
<u>Injury:</u>	Feeds on the foliage
<u>Description:</u>	Full-grown larvae are about 15 mm long. The body is greenish or brownish, marked with off-white.

(12-147) MAPLE LEAFROLLER

<u>Species:</u>	<i>Sparganothis acerivorana</i>
<u>Host:</u>	Sugar maple, red maple, silver maple
<u>Secondary host:</u>	Red pine, Scotch pine
<u>Range:</u>	Lake states
<u>Injury:</u>	The caterpillars appear in May as solitary feeders, rolling the leaves and using them as resting places from which they move out to feed on adjacent leaves.
<u>Description:</u>	The moths are reddish yellow with reddish brown spots, and with a wingspread of about one inch. The full-grown caterpillars are yellowish green with a tan head and are about 1 inch long.

(12-148) REDHUMPED OAKWORM

<u>Species:</u>	<i>Symmerista canicosta</i>
<u>Host:</u>	White oak, bur oak
<u>Secondary host:</u>	Paper birch, beech, sugar maple
<u>Range:</u>	Northeastern United States

- Injury: Adult females lay eggs in June and July in batches of about 50 on the undersides of leaves. The eggs hatch in 10 days, and the caterpillars feed in colonies on the upper surface of leaves, consuming more leaf tissue as they grow. When the caterpillars are about 1 inch long, the colonies begin to break up.
- Description: The moths are ash gray with a wing expanse of about 2 inches. The forewings have a whitish streak along the front margin. The full-grown caterpillars are yellowish; the distinguishing characteristic is three black dorsal lines. Pupation takes place in a rolled leaf.

(12-150) SPRUCE NEEDLEMINER

- Species: *Taniva abolineana*
- Host: Englemann spruce, white spruce, black spruce, Sitka spruce
- Range: Coast-to-coast in the northern states including Alaska, from Maine to North Carolina, Colorado, Idaho, the western states
- Injury: Larvae feed inside a needle or needle sheath. Mined needles turn yellowish, dry, and fall off twigs; entrance holes are usually visible, and the mined needles appear hollow when held up to the light. Larvae mine needles in summer and attach them to a twig to form a funnel-shaped web that becomes full of frass. Mortality rarely occurs.
- Description: Full-grown larvae, about 8 mm long, change to green pupae in gray cocoons in the nest of dead needles from May to July.

Figure 116: Spruce needle miner damage



(12-151) MAPLE WEBWORM

<u>Species:</u>	<i>Tetralopha asperatella</i>
<u>Host:</u>	Sugar maple, red maple, silver maple
<u>Secondary host:</u>	Aspen, quaking aspen, beech, willow, oak
<u>Range:</u>	Eastern states
<u>Injury:</u>	Gregarious, they feed in the leaves rolled by leaf rollers, skeletonizing the inner surface. After a brief period they web groups of leaves and feed on them, sometimes enclosing a whole branch.
<u>Description:</u>	The moths are powdery gray and have a wingspan of nearly 1 inch. The full-grown caterpillars vary in color from yellow to green and brown to nearly black. They are about $\frac{3}{4}$ inch long.

(12-152) PINE WEBWORM

<u>Species:</u>	<i>Tetralopha robustella</i>
<u>Host:</u>	Pitch pine, jack pine, Austrian pine, Scotch pine, Virginia pine, eastern white pine, shortleaf pine, longleaf pine, loblolly pine, slash pine
<u>Range:</u>	It usually attacks one and two year old seedlings. The most noticeable sign of attack, and usually the first, is a large mass of frass and excrement pellets entangled in a network of silken webbing. Close examination of this mass of material will usually reveal one or more larvae.
<u>Description:</u>	The adult moth is dark to medium gray, with dark gray to black forewings on the basal third and outer half. Wingspread is approximately 1 inch. The larvae are light gray with darker tan stripes along the body. They are approximately $\frac{3}{4}$ inch long when fully grown. The pupae are reddish in color and approximately $\frac{1}{2}$ inch long.

(12-154) BAGWORM

<u>Species:</u>	<i>Thyridopteryx ephemeraeformis</i>
<u>Host:</u>	Juniper, cedar
<u>Secondary host:</u>	Maple, oak, dogwood, willow
<u>Range:</u>	Southeastern states westward through Texas into southeastern New Mexico

Injury: Bagworms consume the entire needle or leaf, leaving only the needle sheath or mid-rib. They usually feed on one branch at a time. An indication of damage is the presence of bags suspended from twigs and branches.

Description: Bagworms are larvae and are rarely seen outside the bags they construct. The wingless female moth is grub-like and remains inside this tough, silken bag her entire life. Males are nimble fliers, and in the fall can be seen circling around infested trees in search of a mate.

(12-155) LEAFROLLER/SEED MOTH

Species: *Tortricidae spp.*

Description: Adults are similar to Olethreutidae, but lack the fringe of hairs on the underside of the hind wing. Larvae tend to be foliage feeders, often as leaf rollers or tiers.

(12-156) WILLOW DEFOLIATION

Species: *Tortricidae*

Description: Members of this family eat the foliage of a wide variety of coniferous and deciduous trees of all sizes and ages. The larvae either fold or roll individual leaves or parts of leaves or tie several leaves or shoots together forming enclosures in which to rest and feed or from which they move out to feed. The adults are usually small and have wide, oblong, fringed wings. The wing expanse is usually 25 mm or less and appear bell-shaped while folded. The larvae are usually some shade of green, seldom more than 225 mm long, and they pupate in flimsy silken cocoons.

(12-157) EUONYMUS CATERPILLAR

Species: *Yponomeuta spp.*

Description: Adults are moderately small moths with fore wings usually patterned in contrasting colors. Larvae are variable in habits, frequently having web structures associated with foliage feeding habits or are miners or borers.

(12-158) SPRUCE BUD MOTH

<u>Species:</u>	<i>Zeiraphera Canadensis</i>
<u>Host:</u>	Sitka spruce, white spruce, tamarack
<u>Secondary host:</u>	Balsam fir, Englemann spruce
<u>Range:</u>	Pacific coast, Alaska
<u>Injury:</u>	Stunt and deform young trees. The young caterpillar enters an opening bud and feeds on the tender new needles, webbing them together to form a shelter under the bud cap. As the twigs elongate, the partially eaten needles die and cause the tree to appear reddish brown early in the season. The dead needles drop off by midseason leaving little evidence of feeding.
<u>Description:</u>	Adults are inconspicuous, mottle, and grayish to brownish moths, with a wingspread of about 10 to 20 mm. Larvae are dirty white or pale yellow and up to 14 mm long, and have dark brown heads.

Figure 117: Spruce bud moth adult



(12-159) LARCH BUD MOTH

<u>Species:</u>	<i>Zeiraphera improbana</i>
<u>Host:</u>	Western larch, white spruce, Sitka spruce
<u>Secondary host:</u>	White fir, tamarack
<u>Range:</u>	Alaska, Washington, Idaho, Montana

Injury:

It is found mainly in high altitude, overstory stands. Larvae consume needles and frequently gouge out one side of new shoots. Outbreaks usually last one to two years with little permanent damage. Look for larvae in needle clusters, needle tubes lined with silk or webbed needles from May through July. Larvae drop to the ground by August and pupate in the duff. Moths fly in August, lay eggs, and over-winter under lichens and in other niches on a tree.

Figure 118: Larch bud moth defoliation



Figure 119: Larch bud moth defoliation



Figure 120: Larch bud moth larva



(12-160) PINE NEEDLE SHEATHMINER

<u>Species:</u>	<i>Zelleria haimbachi</i>
<u>Host:</u>	Ponderosa pine, lodgepole pine, Jeffrey pine, jack pine
<u>Range:</u>	Lake states, western California, Oregon, Washington, Nebraska, Colorado, Arizona
<u>Injury:</u>	Larvae feed within the needle sheath in the spring, weaving silken webbing around needle bases and causing the needles to droop and the die. Mined needles turn yellowish, dry, and fall off twigs. Entrance holes are usually visible, and the mined needles appear hollow when held up to the light.

Figure 121: Pine needle sheathminer defoliation



Figure 122: Pine needle sheathminer defoliation



Figure 123: Pine needle sheathminer defoliation



Figure 124: Pine needle sheathminer defoliation



(12-161) CYPRESS LOOPER

<u>Species:</u>	<i>Anacamptodes pergacilis</i>
<u>Host:</u>	Cypress
<u>Range:</u>	Southern states
<u>Injury:</u>	Feed on the foliage
<u>Description:</u>	Full-grown larvae are greenish and about 30 mm long. Larvae walk in a “looping” motion.

(12-162) COTTONWOOD LEAF BEETLE

Species: *Chrysomela spp.*

Host: Cottonwood, willow, birch, balsam poplar, quaking aspen, black cottonwood

Injury: This is a large family. A few species are important economically on forest trees. The larvae and adults of most species feed upon leaves. The larvae of some feed on roots.

Description: The adults are small to medium sized, compact, generally oval, often brightly colored, and variously marked beetles.

Figure 125: Cottonwood leaf beetle larvae



Figure 126: Adult cottonwood leaf beetle



(12-162) PINE COLASPIS

<u>Species:</u>	<i>Colaspis pini</i>
<u>Host:</u>	Slash pine
<u>Secondary host:</u>	Shortleaf pine, loblolly pine, cypress
<u>Range:</u>	Maryland to Florida, westward to east Texas
<u>Injury:</u>	Adult beetles chew the edges of needles, producing irregular, saw-like edges that turn brown. Later the entire needle may die, causing the whole tree to become brown as though scorched by fire. Occasionally, on the tips of needles show signs of injury. Trees do not die, and little or no growth loss results. Attacks usually occur in early summer. By late summer, the trees appear green and healthy again.
<u>Description:</u>	Adults are elongated-oval, convex, and rusty yellow or brown with green reflections. These moderate sized beetles are about ¼ inch long. Full grown larvae are sparsely covered with short hairs. Small clusters of longer hairs occur at the lower outer edges of each body segment.

(12-164) SADDLE-BACKED LOOPER

<u>Species:</u>	<i>Ectropis crepuscularis</i>
<u>Host:</u>	Western hemlock, Alaska yellow cedar
<u>Secondary host:</u>	Douglas-fir, western red cedar, oak, birch, maple, spruce, willow, poplar
<u>Range:</u>	Northern tier of states, including Alaska
<u>Injury:</u>	The larvae first feed on underground and understory. Later they move upward on the trees.
<u>Description:</u>	Full-grown larva is about 35 mm long. The head is brownish, often mottled. The body is mottled dark gray to brown, sometimes reddish. A pair of blunt tubercles tops the eighth abdominal segment. The young larvae have a V-shaped marking on the dorsal side of the second abdominal segment.

(12-165) LEAF ROLLER

<u>Species:</u>	<i>Epinotia solandriana</i>
<u>Host:</u>	Willow, black cottonwood, quaking aspen, paper birch
<u>Range:</u>	Northeastern states including Alaska
<u>Injury:</u>	Skeletonizes the leaves

Figure 127: Adult leaf roller



(12-167) STRIPED ALDER SAWFLY

<u>Species:</u>	<i>Hemichroa crocea</i>
<u>Host:</u>	Red alder
<u>Secondary host:</u>	Birch
<u>Range:</u>	Coast-to-coast in the northern tier of states including coastal Alaska
<u>Injury:</u>	Heavy defoliation slows growth. The larvae are gregarious. Recently emerged larvae commence feeding by eating holes through the leaf from the underside, giving it a riddled appearance. Feeding continues until only the midrib remains.
<u>Description:</u>	When larvae are disturbed, they assume a fishhook posture with the tail end curled under and upward. Full-grown larvae are about 20 mm long and have a shining black head and yellow-amber body marked by dark brown lateral stripes one above and two below.

Figure 128: Striped alder sawfly larvae



(12-168) GREEN-STRIPED LOOPER

<u>Species:</u>	<i>Melanoplophia imitate</i>
<u>Host:</u>	Douglas-fir, western hemlock, western redcedar, Alaska yellow cedar
<u>Range:</u>	Pacific coast from Alaska to southern California
<u>Injury:</u>	The larvae feed on foliage of all ages, but 1-year old foliage is preferred. Feeding is heaviest in the upper crown.
<u>Description:</u>	The adults are mottled gray brown with a wingspan of 25 to 39 mm. the mature larva is apple green with whitish and yellowish stripes and is 30 to 37 mm long.

(12-169) WILLOW LEAF BLOTCHMINER

<u>Species:</u>	<i>Micrurapeteryx salicifoliella</i>
<u>Host:</u>	Willow, except feltleaf willow
<u>Range:</u>	Interior Alaska
<u>Injury:</u>	It creates necrotic blotches on the upper and lower surfaces. Willows can be completely defoliated for many consecutive years. Mortality has been observed.
<u>Description:</u>	Later instars are pale yellowish in color and are approximately 4.4 – 6.5 mm long. Adults are small grayish moths with mottled areas of dark and lighter areas on the forewings. Eggs are laid solitarily on the epidermis of the underside of leaves.

(12-171) PINON SAWFLY

<u>Species:</u>	<i>Neodiprion eduliculus</i>
<u>Host:</u>	Pinyon pine, single leaf pinyon pine
<u>Range:</u>	Colorado, New Mexico, Utah, Nevada
<u>Injury:</u>	Defoliation
<u>Description:</u>	The adult female is 6 to 8 mm long, with a golden brown body. The male is 5 to 7 mm long, with a greenish black body. The mature feeding larva is pale green with a dark green stripe on each side and a greenish-white stripe down the back.

(12-172) (NEODIPRION GILLETTI)

<u>Species:</u>	<i>Neodiprion gilletti</i>
<u>Host:</u>	Ponderosa pine
<u>Range:</u>	Colorado, New Mexico, Arizona

(12-173) (NEODIPRION VENTRALIS)

<u>Species:</u>	<i>Neodiprion ventralis</i>
<u>Host:</u>	Ponderosa pine
<u>Range:</u>	Colorado

(12-174) PINE LOOPER

<u>Species:</u>	<i>Phaeoura mexicanaria</i>
<u>Host:</u>	Ponderosa pine
<u>Range:</u>	Montana, Wyoming, South Dakota, New Mexico, Arizona, California
<u>Injury:</u>	Larvae feed on old and new needles from late June until September. Needles are often eaten down to the sheath. Trees of all sizes are attacked and mortality results if all the foliage is stripped. Weakened trees are often attacked by bark beetles.

Description: Adults are hairless, various shades of brown, and resemble pine twigs. They walk like “inch worms.”

(12-175) (*ZADIPRION ROHWERI*)

Species: *Zadiprion rohweri*

Host: Pinyon pine, singleleaf pinyon pine

Range: California, Nevada, Utah, Colorado, New Mexico

Injury: Larvae feed on old needles, sometimes completely defoliating small trees.

Description: Mature larvae are nearly black except for the whitish underside.

(12-176) (*ZADIPRION TOWNSENDI*)

Species: *Zadiprion townsendi*

Host: Ponderosa pine

Range: Nebraska, South Dakota, Utah, Colorado, Arizona, New Mexico

Injury: This species is a potential pest of plantations. Larvae feed on old needles, sometimes completely defoliating small trees.

Description: Mature larvae are nearly black except for the whitish underside.

(12-177) DOUGLAS-FIR BUD MOTH

Species: *Zeiraphera hesperiana*

Host: Douglas-fir

Range: Oregon

Description: Adults are inconspicuous, mottled, and grayish to brownish moths, with a wingspread of about 10 to 20 mm. Larvae are dirty white to pale yellow and up to 14 mm long, and have dark brown heads.

(12-178) WESTERN OAK LOOPER

<u>Species:</u>	<i>Lambdina fiscellaria somniaria</i>
<u>Host:</u>	Oregon white oak
<u>Range:</u>	Oregon
<u>Injury:</u>	Defoliation
<u>Description:</u>	Identical to the western hemlock looper

Figure 129: Adult western oak looper



Figure 130: Western oak looper defoliation



Figure 131: Western oak looper defoliation



(12-179) PHANTOM HEMLOCK LOOPER

Species: *Nepytia phantasmaria*

Host: Douglas-fir, western hemlock

Secondary host: Western redcedar, Sitka spruce, white fir, pine

Range: Oregon, California

Injury: Larvae feed first on the new foliage, then on the old.

Description: Adults are generally white to very light gray with strong black markings and the vertex of the head is yellowish. The mature larvae are 28 mm long; head green with black dots; body smooth, lime green with dark-edged, yellowish subdorsal and spiracle lines.

Figure 132: Phantom hemlock looper larva



Figure 133: Phantom hemlock looper larva



Figure 134: Phantom hemlock looper pupa



(12-180) TENT CATERPILLAR

Species: *Malacosoma spp.*

Host: Oak

Description: In the spring, their white silken tents often are conspicuous on trees. Clusters of hairy larvae are found nearby or in the tents. During periods of abundance, larvae may strip the foliage from trees over wide areas and wander in groves across open ground. Their feeding can result in reduced growth.

(12-181) ABBOT'S SAWFLY

Species: *Neodiprion abbottii*

Host: Loblolly pine, slash pine, longleaf pine, shortleaf pine, red pine

Range: Wisconsin, Virginia, North Carolina, South Carolina, Georgia, Florida

Injury: Newly hatched larvae feed gregariously; older ones tend to feed singly. Mature larvae spin cocoons on the needles. Light defoliation may not be noticeable.

Description: Full-grown larvae have a brown to black head with a light spot on the frons and the thorax and abdomen are pale green. There are four dark green to black lateral stripes.

(12-182) SLASH PINE SAWFLY

<u>Species:</u>	<i>Neodiprion merkei</i>
<u>Host:</u>	Slash pine
<u>Range:</u>	Southern Florida
<u>Injury:</u>	Defoliation
<u>Description:</u>	The head of full-grown larvae is reddish above the eyes and sooty black below, with a reddish infusion.

(12-183) SAND PINE SAWFLY

<u>Species:</u>	<i>Neodiprion pratti</i>
<u>Host:</u>	Sand pine
<u>Injury:</u>	Defoliation

(12-185) CYPRESS LEAF BEETLE

<u>Species:</u>	<i>Systema marginalis</i>
<u>Host:</u>	Oak in the Midwest; cypress in northern Florida and southern Georgia
<u>Injury:</u>	Adults feed by gouging out linear-shaped punctures in the leaves. This usually causes part or all of a cypress leaflet to turn red and die. The beetles occur in large swarms, which tend to move about, spending only one to three days in any one place. A single swarm may encompass more than a dozen trees.
<u>Description:</u>	The adult is dull pale yellow except for two black lines along the front margin of the elytra and a single black line along the hind margin. The wing covers are densely and coarsely punctate.

(12-188) ELM SAWFLY

<u>Species:</u>	<i>Cimbex Americana</i>
<u>Host:</u>	Willow
<u>Secondary host:</u>	Birch, poplar, aspen

<u>Range:</u>	Throughout the northern tier of states
<u>Injury:</u>	The leaves may be partially or wholly devoured, even the veins, by the larvae. The adults sometimes chew the thin, tender bark of twigs, girdling and killing them and causing noticeable crown injury.
<u>Description:</u>	The adult females range from $\frac{3}{4}$ to 1 inch long. Their robust bodies are steel blue with oval yellow spots on each side. The semitransparent wings are smoky brown in color. The wingspread is about 2 inches. The dorsal line on the pale yellowish-green larvae is an excellent means of recognition. When at rest, they coil up like snails, around a twig.

(12-189) JUNE BEETLES/LEAF CHAFERS

<u>Species:</u>	<i>Phyllophaga spp.</i>
<u>Host:</u>	Oak, birch, beech, pecan, dogwood, maple, buckeye, hickory, persimmon, black walnut, magnolia, sycamore, willow, longleaf pine, red pine, loblolly pine
<u>Range:</u>	Mainly the eastern states, sometimes found in Arizona and South Dakota
<u>Injury:</u>	Damage to seedlings and transplants, by the larvae, is the most important type of injury. The adults also feed on the foliage. The heaviest damage occurs in spring when the leaves are tender.
<u>Description:</u>	The robust beetles are $\frac{1}{2}$ to 1 inch long and vary in color from light brown through dark brown to brownish black. They have powerful biting jaws, which are used in cutting the leaves. In a typical feeding position, the legs on one side of the body are on the upper surface of the leaf and those on the other side are on the lower surface, with the edge of the leaf between the mandibles.

(12-190) HICKORY TUSSOCK MOTH

<u>Species:</u>	<i>Halisidota caryae</i>
<u>Host:</u>	Black walnut, butternut, hickory
<u>Secondary host:</u>	Willow, birch, black locust, aspen
<u>Range:</u>	Northeastern states south to North Carolina
<u>Injury:</u>	Adults appear in late May to early June and deposit masses of 50 to 400 eggs on the underside of leaves. In several weeks, the larvae emerge and begin feeding.

Description: The head of the caterpillar is black, and the body is covered with short tufts of grayish-white hair on the first and seventh abdominal segments.

(12-191) PIN OAK SAWFLY

Species: *Caliroa lineata*

Host: Pin oak

Secondary host: Northern red oak, white oak

Range: New Jersey, North Carolina, Missouri

Injury: Feeds on the lower surface of oak leaves, leaving only the upper surface and a fine network of veins. Defoliation first appears in the upper crown, but complete defoliation can occur by the end of September.

Description: Adults are small, shiny black, four-winged insects. The yellowish-green larvae or slugs are about ½ inch long. The thoracic legs and head are shiny black.

(12-192) PALMERWORM

Species: *Dichomeris ligulella*

Host: Oak, cherry

Range: Northern states from Maine to Minnesota

Injury: The larvae skeletonize the leaves and may fold or roll them during feeding. Outbreaks rarely last more than 1 to 2 years, and usually occur during unusually hot, dry springs. Outbreaks may cause defoliation, but rarely causes permanent tree damage.

Description: Eggs are deposited singly on the expanding leaves. Full-grown larvae are about ½ inch long and have one narrow and two wide green stripes running down the back. The grayish to brownish adult moths are about 2/3 inch long.

(12-193) PITCH PINE LOOPER

<u>Species:</u>	<i>Lambdina athasaria pellucidaria</i>
<u>Host:</u>	Pitch pine, red pine, shortleaf pine
<u>Secondary host:</u>	Virginia pine
<u>Range:</u>	Atlantic coastal states
<u>Injury:</u>	They feed singly on needles instead of in colonies, and they chew only a portion of each needle. Injured needles turn brown and, if the infestation is heavy and persists for two or more years, serious tree injury and mortality may occur.
<u>Description:</u>	Shiny pale green eggs are laid on the undersides of the needles. Full-grown loopers average 1 to 1 ½ inches in length. They have pale-straw to greenish-yellow bodies with black marking on their sides and black dots on their backs. Their heads are marked with dark and light brown spots.

(12-194) RED PINE SAWFLY

<u>Species:</u>	<i>Neodiprion annulus annulus</i>
<u>Host:</u>	Red pine, jack pine
<u>Secondary host:</u>	Eastern white pine, mugho pine
<u>Range:</u>	Northeastern states west to Wisconsin
<u>Injury:</u>	Because only the needles are consumed, vigorous trees are rarely killed by a single defoliation. Successive defoliations can kill or reduce the growth rate of overmature trees.
<u>Description:</u>	Larvae are dull grayish-green with two olive-colored stripes along the back and two dark stripes on each side. They have black heads.