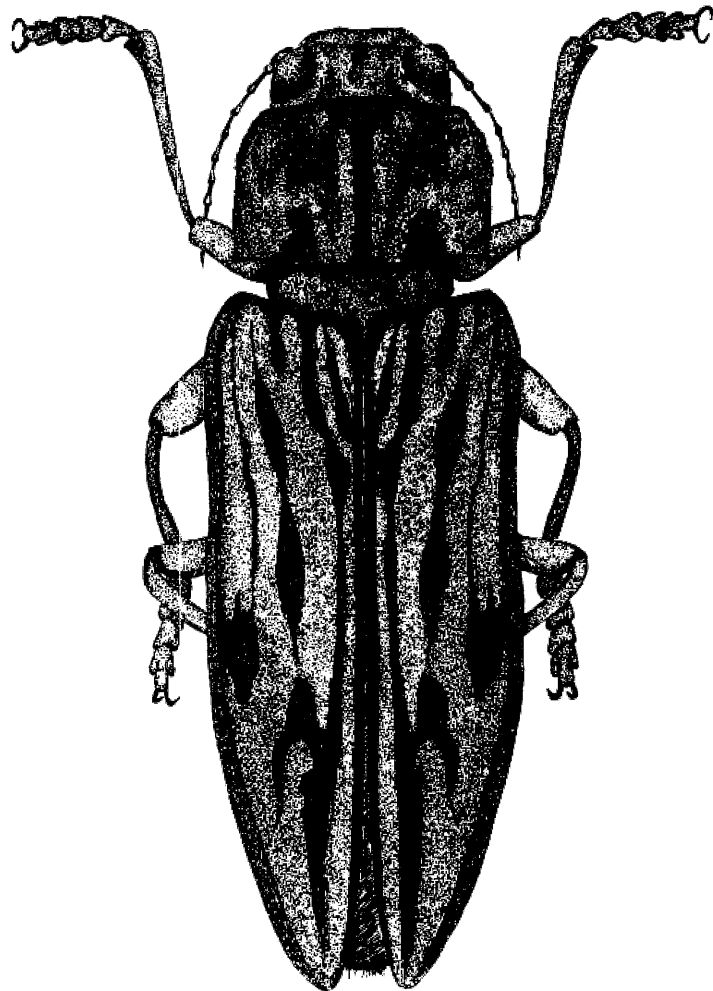


Insects Associated with Ponderosa Pine in Colorado

**Robert E. Stevens
J. Wayne Brewer
David A. Leatherman**



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Range Experiment Station
Forest Service
U.S. Department of Agriculture**

Abstract

Ponderosa pine serves as a host for a wide variety of insects. Many of these, including all the particularly destructive ones in Colorado, are discussed in this report. Included are a key to the major insect groups, an annotated list of the major groups, a glossary, and a list of references.

Acknowledgment

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INTRODUCTION

This report is about the insects associated with ponderosa pine, a major component of forests throughout the Front Range of the Rockies and also in parts of southwestern Colorado.

While many hundreds of kinds of insects can be found in the ponderosa pine forest, we are mainly interested in those that have close ecological ties with the pines—those that live in and on the trees themselves. Many of these insects are injurious to the trees and are thus particularly important to the landowner and the land manager.

Organization.—The report is divided into five sections:

1. A table listing by groups insects commonly seen in the ponderosa pine forest.
2. A key to insect-caused tree damage.
3. An annotated list of the groups and species referred to in sections 1 and 2.
4. A list of references, or sources of additional information.
5. A glossary of specialized terms.

We have kept the text as brief as possible. Readers who need help in identifying insects or recommendations on insect control should consult with specialists associated with federal, state, and local government forestry organizations. Consultation on control methods is particularly desirable, as recommended procedures are frequently updated.

General references.—There is abundant literature on the various insect groups. The book by Furniss and Carolin (1977)⁴ is currently the best single reference on western forest insects and contains detailed discussions of most insect species dealt with here. Essig (1958) and Borror et al. (1976) are also good sources of general entomological information; Borror and White (1970) is a good field guide to the major groups of insects.

Insects all have scientific names, and the more important species also have common names. The common names are used where possible in this report, but where there is none, we are obliged to use the scientific name only. The following three paragraphs describe the system of scientific names and are included to help the reader better understand it.

⁴*These refer to items in Section 4—References.*

Insects are generally categorized into 26 major groups, or orders. Only 10 of these orders are commonly seen in the ponderosa pine forest (section 1). Orders are further subdivided into families, genera (singular genus), and species (singular also species). Family names always end in "-idae." Genus and species names are always italicized in print or underlined when handwritten or typed.

The genus and species, along with the author (the scientist who named the insect species), make up the scientific name. For example, the scientific name for the mountain pine beetle is *Dendroctonus ponderosae* Hopkins. Sometimes the author's name is shown in parentheses: *Dendroctonus rufipennis* (Mannerheim). This indicates that the species was originally placed in another genus. For brevity, genus names are commonly abbreviated after the first use; for example, *D. ponderosae* Hopkins. Oftentimes also the author's name is dropped after initial use.

In rare instances, an additional element is required in a scientific name to identify a subspecies. For example, the scientific name for the pine tortrix is *Choristoneura lambertiana ponderosana* Obraztsov.

Insect life stages.—All insects pass through a series of distinctive developmental stages. Most that we are concerned with pass through four life stages: egg, larva (grub, caterpillar, maggot, etc.), pupa or resting stage, and adult. Others have an abbreviated pattern of egg, nymph (resembles adult but lacks wings), and adult.

Use of this report.—Many readers will use this report to find out what kinds of insects are damaging their trees. The best way to do this, once the insects have been found, is as follows:

1. Locate the proper part of the key (section 2) for your symptoms.
2. Use the key to tentatively identify the kind of insect.
3. Look up the insect in the annotated list (section 3).
4. If desired, look up extra reading material in the references (section 4).

SECTION 1

COMMON GROUPS OF INSECTS ASSOCIATED WITH PONDEROSA PINE IN COLORADO¹

Common names	Order	Main habitats
Grasshoppers and others	Orthoptera	On ground and foliage
Termites	Isoptera ²	In decaying wood
Earwigs	Dermoptera ²	In litter, under bark
True bugs	Hemiptera	On foliage, cones
Aphids, scales and others	Homoptera	On foliage
Lacewings and snakeflies	Neuroptera ²	On foliage, branches
Beetles and weevils	Coleoptera	In or on foliage, cones or branches in cambium area or in wood
Moths and butterflies	Lepidoptera	Larvae in or on foliage, shoots, cones, or cambium area
Flies and midges	Diptera	Larvae in foliage, shoots, or cones
Ants, bees, sawflies, and others	Hymenoptera	Larvae on foliage or wood; adults on or around trees

¹Groups of insects (e.g., dragonflies) found in the forest but not particularly associated with the trees are excluded.

²Orders that do not include species commonly destructive to living trees.

SECTION 2

KEY TO INSECT-CAUSED TREE DAMAGE

Index

	Page
Damage to Cones	4
Damage to Shoots, Twigs, or Terminals	4
Damage to Foliage (Needles) Only	5
Damage to Trunk, Entire Tree, or Wood	6

Damage to Cones

1. Entire cones distorted and/or discolored; may be pitchy; interior portions mined or otherwise damaged	30
..... cone moths	30
..... cone beetles	27
..... cone weevils	15
2. Cone scales and/or seeds stuck together; small maggots without distinctive head regions	34
..... cone midges	34
3. Seeds hollowed out or inside material shrunken; cones appear normal	36
..... seed chalcids	36
..... cone bug	8
4. Larvae and/or pupae in pith; larvae bore into seeds	32
..... seed moths	32

Damage to Shoots, Twigs, or Terminals

1. Terminals only affected. No fading, needles more or less shortened, not distorted, pith mined out, terminal thickened, terminal may continue to live although superseded by lateral(s)	32
..... shoot borer <i>Eucosma</i>	32
2. Terminals and/or laterals affected	
a. Needles faded	
(1) Shoots partly mined out	34
..... pitch midges <i>Cecidomyia</i>	34
..... twig weevils <i>Magdalis</i>	15
(2) Shoots completely mined out; wood destroyed ..	30
..... tip moths <i>Rhyacionia</i>	30

Page

(3) Cambial area only mined out	25
(4) Masses of pitch produced externally on shoots ...	
..... twig borers <i>Petrova</i>	30
..... <i>Dioryctria</i>	30
b. No fading; needles badly swollen at bases	
..... needle midges	34
c. No fading; shoots covered with masses of fluffy white wax	9
..... woolly aphids <i>Pineus</i>	9

Damage to Foliage (Needles) Only

1. Foliage chewed, thin or sparse	
a. Masses of silken webbing mixed with frass, associated with defoliation	
(1) Throughout crown; webbing relatively sparse ...	
..... <i>Choristoneura</i>	32
..... <i>Zelleria</i>	34
(2) Throughout crown; webbing a dense, nearly spherical, frass-filled mass	30
..... pine webworm <i>Tetralopha</i>	30
(3) Mainly in tree tops; heavy silk webs	28
..... tiger moths <i>Halisidota</i>	28
b. Little or no webbing produced	
(1) Caterpillars, often clustering together	36
..... sawflies	36
..... pine butterfly	28
..... pandora moth	28
(2) Not caterpillars, insects sometimes not seen, "bites" taken out of needles	7
..... grasshoppers	7
..... weevils	15
2. Needles faded, mined out from within	32
..... ponderosa pine needle miner	32
3. Needles badly distorted, shortened, bases swollen	34
..... needle midges	34
4. Sucking insects, usually attached to or appearing to rest quietly on needles	9
..... scales	9
..... aphids	9

Damage to Trunk, Entire Tree, or Wood

- | | |
|--|----|
| 1. Pink or reddish frass in bark crevices and around base of tree, pitch tubes may be present, galleries in cambial area, entire tree eventually fades | |
| bark beetles | 20 |
| 2. White frass in bark crevices in basal 0.5 m of tree, no pitch tubes, fungus-stained galleries penetrate directly into wood; usually associated with successful bark beetle attack; also in lumber | |
| ambrosia beetles | 27 |
| 3. Large (up to golf ball size) masses of pitch on trunk (sometimes also on larger limbs) | |
| pitch moths | 30 |
| 4. Large larvae, pupae or adults in cambial area or in wood; found in dead trees, logs, or lumber; tunnels in wood, lumber | |
| a. Tunnels more or less flattened or oval in cross-section | |
| roundheaded borers | 12 |
| flatheaded borers | 12 |
| b. Tunnels circular in cross-section | |
| horntails | 36 |

SECTION 3

ANNOTATED LIST OF COMMON INSECT SPECIES AND GROUPS ASSOCIATED WITH PONDEROSA PINE IN COLORADO

Grasshoppers, Crickets, and Others—Order Orthoptera

Grasshoppers are known for great changes in numbers from one year to another. During outbreaks, feeding damage to a wide variety of plants is possible, including defoliation of young ponderosa pines.

Termites—Order Isoptera

Termites are soft-bodied, fragile insects that usually shun light and are secretive in their habits. They feed on nonliving wood and cause serious damage to structures in many parts of the country. In the forest they help speed decay and decomposition of dead wood. Colorado's climate is too cold for most termites, but two "subterranean" species—*Reticulitermes tibialis* Banks and *R. flavipes* (Kollar)—are known from the state. *R. flavipes* is rare. In the forest in Colorado, termites are usually found in logs or stumps, never in living parts of trees.

Earwigs—Order Dermaptera

Earwigs are scavengers on decaying plant and animal matter. Although sometimes found beneath the bark of dead or dying pines, they do no harm to trees. A large pincer-like structure at the end of the abdomen helps identify this group.

True Bugs—Order Hemiptera

Many bugs are plant feeders (also many species are predators on other insects) and are readily seen and collected as they rest on ponderosa pine foliage and branches. They are generally good fliers and have mouthparts adapted for piercing and

sucking. A few species are closely associated with the trees; many others feed on grass, herbs, and other vegetation.

Leaf-footed Bugs—Family Coreidae

One species of leaf-footed bug, *Leptoglossus occidentalis* Heidemann (fig. 1), is a large (about 15 mm long), conspicuous insect that feeds on the cones of several different conifers, including ponderosa pine. The beak is inserted through the cone scales into individual seeds, and the material within is dissolved and sucked up. A damaged seed is not readily distinguishable from a sound one; however, it will not produce a normal seedling. Under field conditions, it is doubtful that *L. occidentalis* causes enough damage to inhibit regeneration.

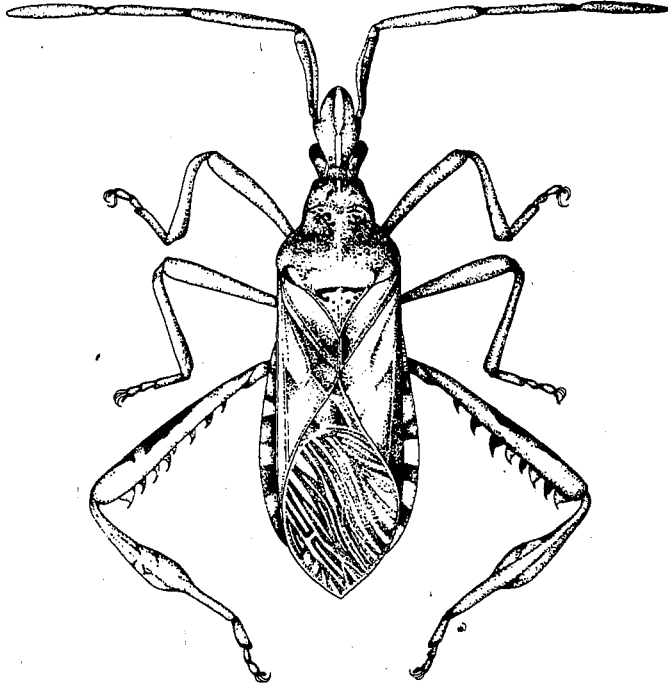


Figure 1.—*Leptoglossus occidentalis*, a seed-eating bug. Bug is about 15 mm long.

Plant Bugs—Family Miridae

Plant bugs and other small bugs are common on pine foliage and are readily collected by beating. Mirids are small (2-9 mm), fragile, and usually inconspicuous. Most are plant feeders, although none is known to feed on conifers. Members of one genus, *Neoborella*, feed on pine dwarf mistletoe.

Aphids, Scales, and Others—Order Homoptera

Members of the Homoptera are similar to the Hemiptera in that they have four wings (at least during some developmental stage) and sucking mouthparts. Many species of these insects infest Colorado ponderosa pine. The pine needle scale, *Chionaspis pinifoliae* (Fitch), is a common species, and the Prescott scale, *Matsucoccus vexillorum* Morrison, is occasionally a pest in southwestern Colorado (fig. 2). Woolly aphids, genus *Pineus*, are common on succulent new shoots in early summer. Palmer (1952) provides keys and descriptions of Colorado aphids. Other genera reported include *Cinara*, *Essigella*, *Eulachnus*, and *Schizolachnus*.

Cicadas are a group of large Homoptera that are common in the pine forest, although the adults usually do no more than rest in pine trees. Cicada nymphs (17-year locusts, etc.) live from several to many years in the soil, feeding on roots. Adults lay eggs in branches and shoots of many kinds of trees and shrubs, sometimes causing considerable shoot breakage.

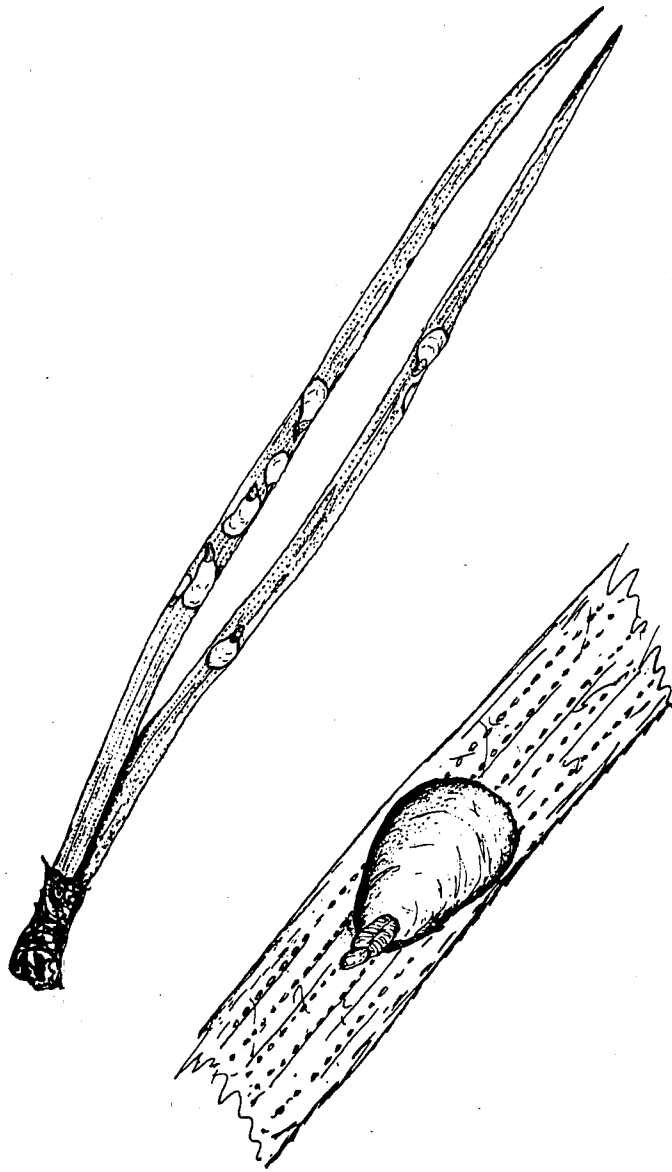


Figure 2.—Pine needle scales, 2 to 2.5 mm long.

Lacewings and Snakeflies—Order Neuroptera

Many members of this order are predators of pest insects in both immature and adult stages and are considered beneficial. Lacewings (fig. 3a) are light green or brown. Adult snakeflies (fig. 3b), as their name indicates, resemble serpents. Both groups have large but delicate wings. Aphids and butterfly or moth larvae are common prey.

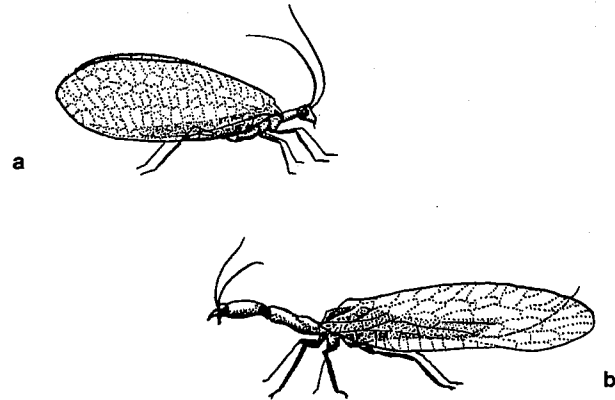


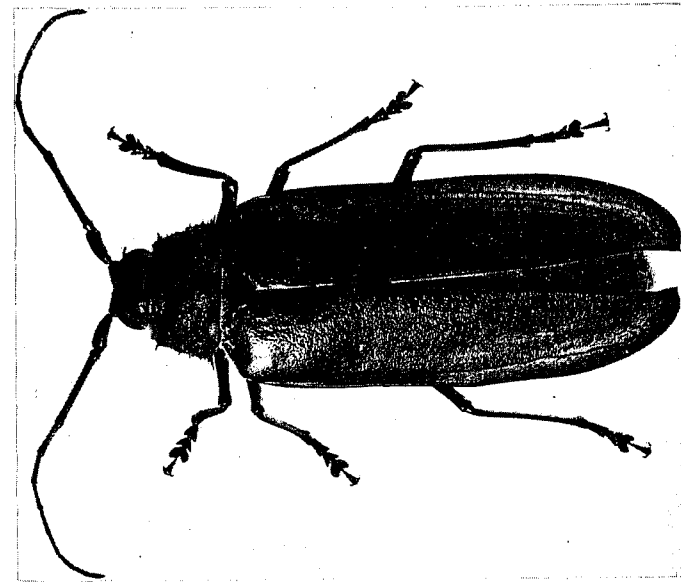
Figure 3.—Adults of (a) lacewing and (b) snakefly.

Beetles and Weevils—Order Coleoptera

Beetles are possibly the most numerous and most destructive group of insects associated with ponderosa pine. The bark beetles, family Scolytidae, are important tree-killers. Larvae of longhorned and flatheaded borers, families Cerambycidae and Buprestidae, commonly colonize recently killed trees, feeding in the cambial area and often later tunneling into the wood. Larvae of weevils, family Curculionidae, infest cones and root collars of dying trees, and adults often feed on pine foliage.

Flatheaded Borers, Metallic Wood Borers—Family Buprestidae Longhorned Beetles, Roundheaded Wood Borers, Sawyers— Family Cerambycidae

Insects belonging to these two families (figs. 4 and 5) have similar ecological roles with respect to ponderosa pine, and tree-infesting species have similar life cycles and habits. Adult females of both families lay eggs in niches in the bark of dying or recently killed trees. Larvae tunnel in the cambial area and may subsequently move into the wood. Larval galleries make irregular patterns and become larger as the insects grow. Buprestid larvae have a typical "horseshoe nail" shape; cerambycid larvae are less flattened. Life cycles may extend over several years. Buprestids and cerambycids are often responsible for chewing noises heard coming from infested pine firewood. Borer adults occasionally emerge in houses from studs sawed from fire-killed timber that was infested while still in the woods, or from logs used in rustic cabins. Larval galleries are packed with frass and wood shavings; emergence tunnels and holes in the bark through which the adults exit the tree are open, round or oval in cross-section, and up to 5 mm in diameter. Important genera of these two families include *Monochamus*, *Canonura* (= *Acanthocinus*), *Ergates*, *Asemum*, and *Tragosoma* (Cerambycidae); and *Chalcophora*, *Dicerca*, *Buprestis*, and *Melanophila* (Buprestidae).

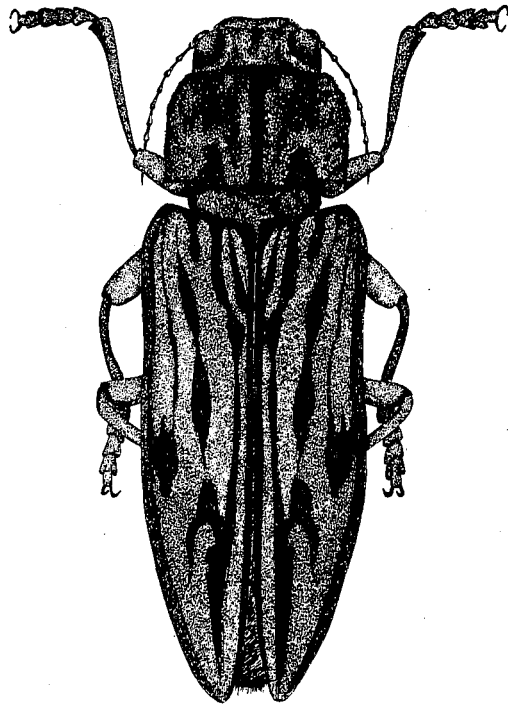


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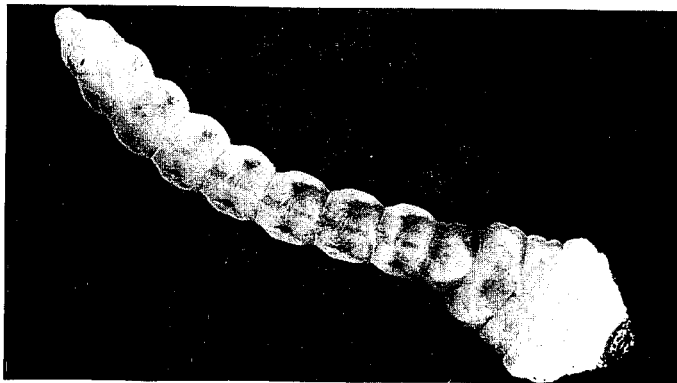


b

Figure 4.—Longhorned beetle (a) adult, 55 mm long; and (b) larva, 60 mm long, removed from feeding tunnel in wood.



a



b

Figure 5.—Metallic wood borer (a) adult, 20 mm long, and (b) horse-shoe-nail-shaped larva, 25 mm long.

Weevils—Family Curculionidae

Weevils, or “snout beetles” (some actually have very short “snouts”), are a large and highly variable group of beetles with an equally wide variety of habits. Many species are found in and on trees, but only four genera are important to us here:

Scythropus.—Weevils of this genus are often responsible for “saw-tooth” feeding seen on pine needles (fig. 6).

Pissodes schwarzi Hopkins (fig. 7).—Found in rare instances infesting the root-collar area of small (>2 m tall) trees. As a general rule *P. schwarzi* is not successful in attacking healthy trees, but succeeds only in hosts weakened by some other factor.



Figure 6.—Pine needles fed on by *Scythropus* beetles.

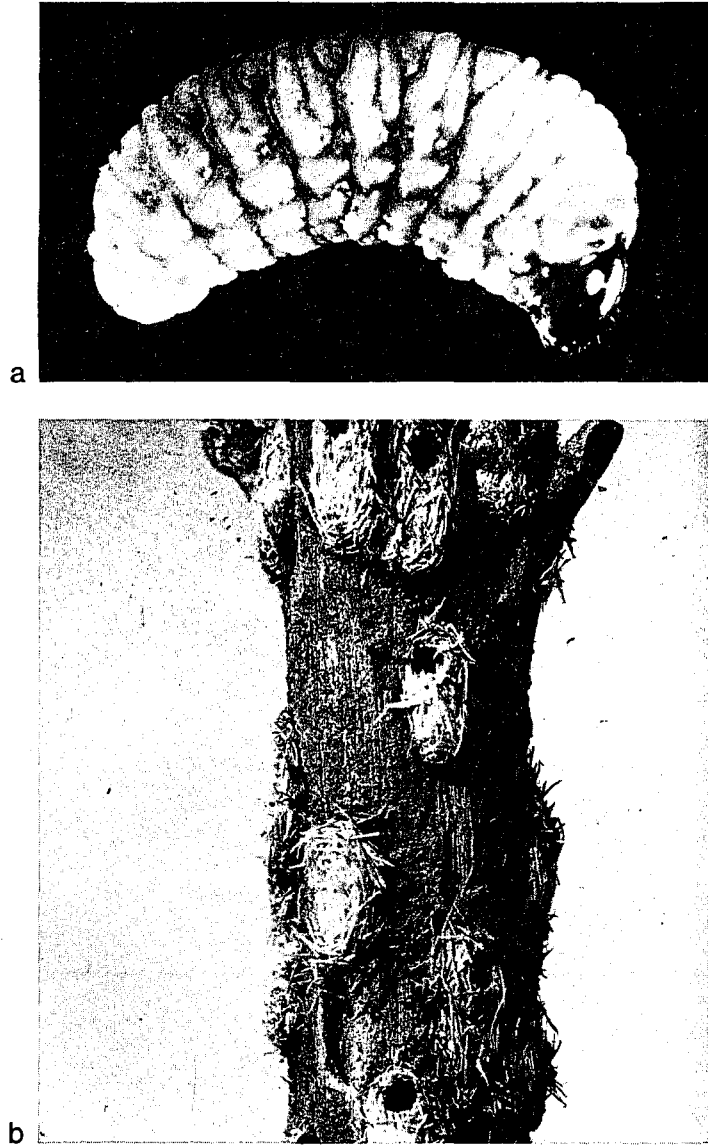


Figure 7.—*Pissodes* (a) larva, 4.5 mm long; and (b) "chip cocoons."

Conotrachelus neomexicanus Fall.—This weevil, known as the "ponderosa pine cone weevil," (fig. 8) has recently been identified as a cone pest. Larvae mine indiscriminately within the cone, reducing its interior to fine sawdust-like frass. Larvae drop to the ground in midsummer, pupate in cells in the soil, emerge in fall to feed on needles and shoots, and overwinter in the adult stage.

Magdalis.—Weevils of this genus develop in twigs and branches. The adults, often colored black, bright metallic blue, or green, are commonly found on ponderosa pine foliage.

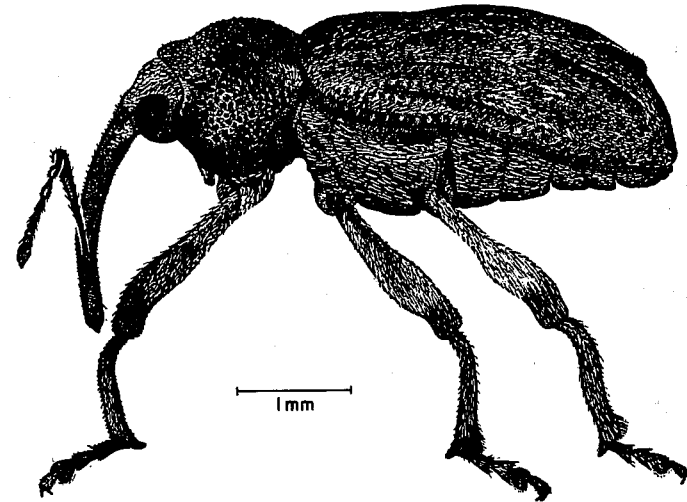


Figure 8.—Adult ponderosa pine cone weevil.

Checkedred Beetles or Clerids—Family Cleridae

Several species of clerids (fig. 9) are important bark beetle predators in Colorado. Clerid larvae operate in the bark beetles' galleries and adults capture bark beetle adults on the bark surface. Following are the most important species:

Enoclerus sphegeus (Fabricius)—red-bellied clerid
E. lecontei (Wolcott)—black-bellied clerid
Thanasimus dubius Fabricius
T. undatulus (Say)

Darkling Beetles—Family Tenebrionidae

Beetles of this family, highly varied in appearance, are commonly found under the bark in decaying wood of trees killed by bark beetles. Tenebrionids are mostly scavengers. The ones seen most often are small, slender, shiny, dark-red-colored beetles.

Trogositid Beetles—Family Trogositidae (= Ostomidae)

Temnochila chlorodia (Mannerheim), a metallic bluish-green trogositid beetle, is a common bark beetle predator in Colorado.

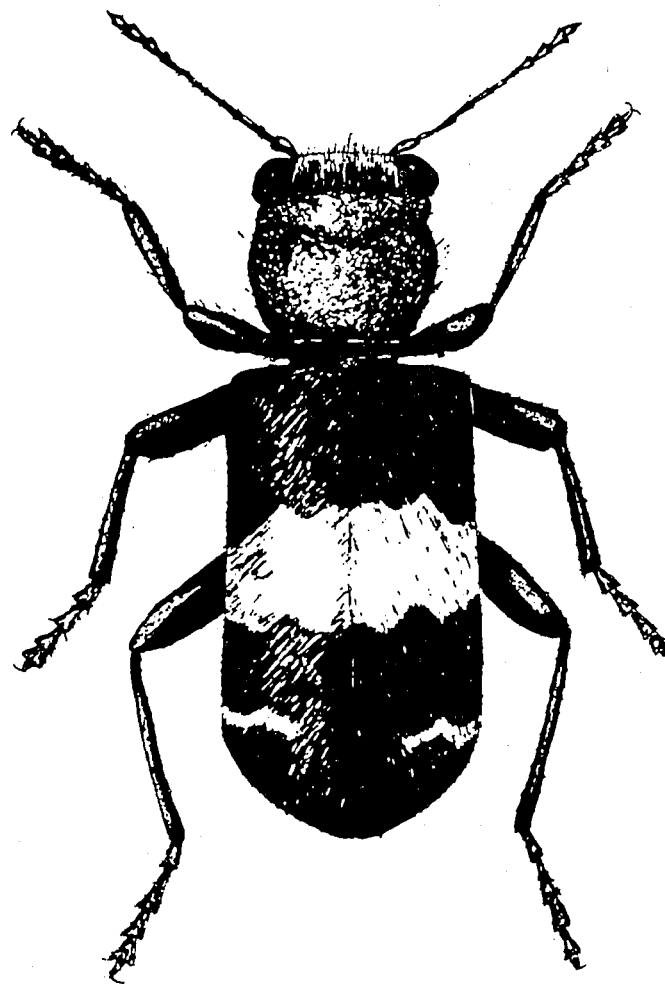


Figure 9.—Adult clerid beetle, about 10 mm long.

Bark Beetles—Family Scolytidae

Bark beetles, especially those in the genus *Dendroctonus*, are one of the most destructive groups of forest insects in western North America. Most Colorado species infesting ponderosa pine have 1-year life cycles, spending all but the summer dispersal period within the host tree. Adults of most genera bore through the bark to lay eggs in galleries (fig. 10) in the cambial area. Larvae generally mine in the same area. Their feeding galleries, in addition to the egg galleries made by the adults, create a lasting pattern of "tracks" by which the species can be identified even long after the insects themselves have disappeared.

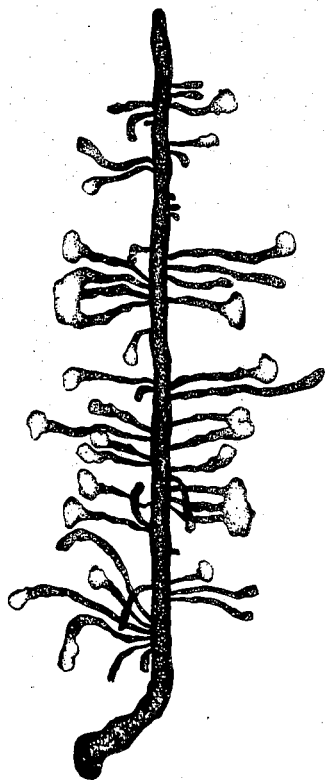


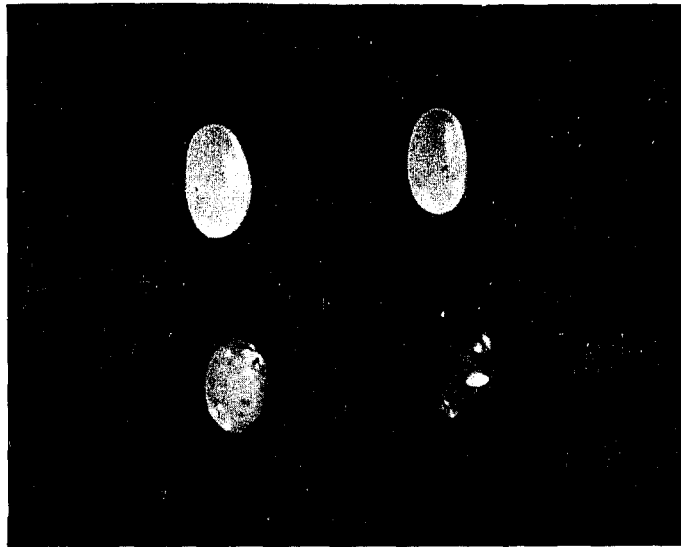
Figure 10.—Mountain pine beetle gallery system; entrance hole at bottom, vertical egg gallery, and horizontal larval galleries.

Dendroctonus ponderosae Hopkins, mountain pine beetle (fig. 11).— This is the most serious insect enemy of Colorado ponderosa pine. During outbreaks, it has destroyed thousands of healthy appearing trees annually. In late summer (August, generally), adult beetles bore through the bark and into the cambium area of living trees, mate, and then lay eggs in vertically oriented egg galleries. The eggs (fig. 11a) hatch in a few days and the tiny larvae (fig. 11b) begin feeding outward from the egg gallery, still in the region of the cambium. Pupae (fig. 11c) and adults (fig. 11d), develop at the ends of the larval galleries. Flight and egg laying occur generally during late July and August. Bluestain fungi introduced into infested trees by the adult beetles effectively block the trees' water and nutrient conducting system. Successfully attacked trees, although remaining green until the following summer, are in fact killed within just a few days. The beetle progeny mostly overwinter as small larvae, completing their development and emerging from their host trees to renew the cycle the following summer.

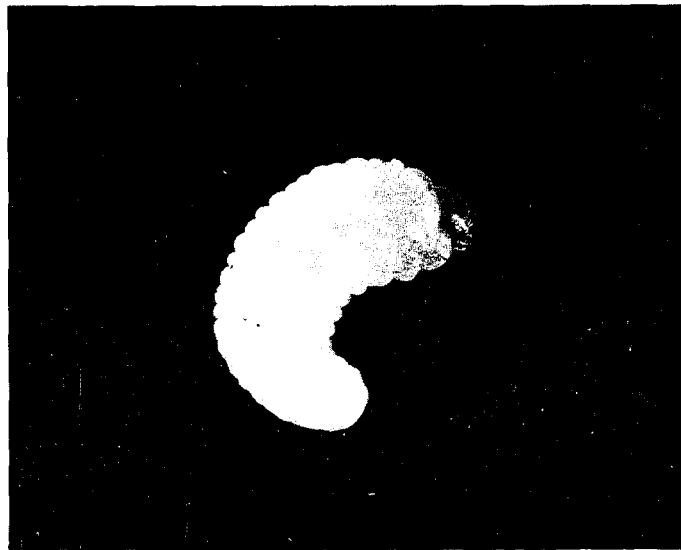
Efforts to minimize tree losses caused by bark beetles include killing beetles in infested trees before they are able to emerge to attack green living trees, spraying of individual living high-value trees to prevent beetle attack, and thinning to change conditions in forests that are susceptible to beetle outbreaks.

D. brevicomis Le Conte, western pine beetle.—This species is rare in Colorado ponderosa pine and is apparently restricted to the southwestern part of the state. Western pine beetle has meandering egg galleries, as opposed to the vertically oriented ones of *D. ponderosae*. The larvae, instead of remaining in the cambial area, do most of their mining in the inner and outer bark.

D. adjunctus Hopkins, roundheaded pine beetle.—This species is also restricted in Colorado to the southwestern part of the state and is not common.

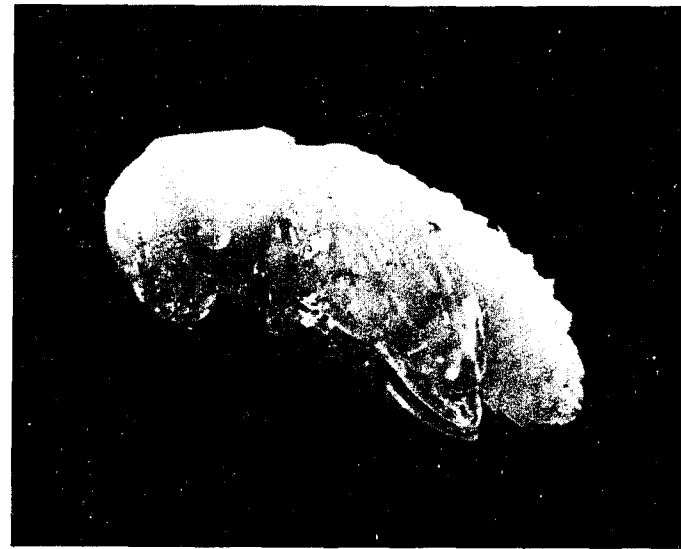


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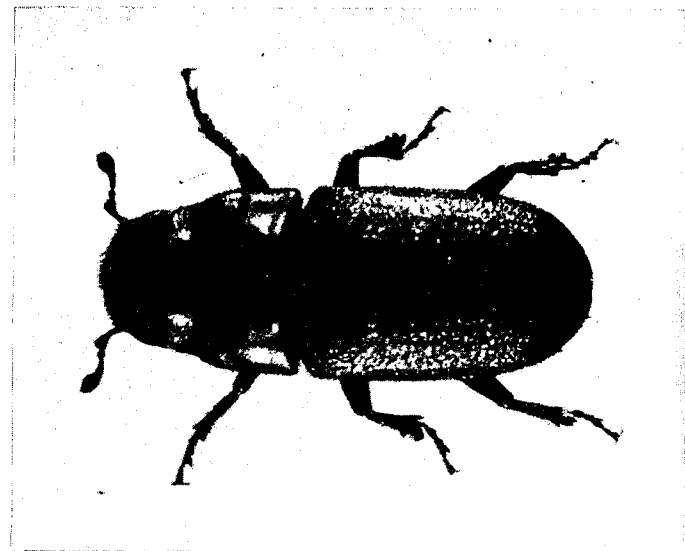


b

Figure 11a.—Bark beetle eggs, 0.9 mm long; 11b.—Bark beetle larva, 5 mm long.



c



d

Figure 11c.—Bark beetle pupa, 5 mm long; 11d.—Bark beetle adult, 4.5 mm long.

D. valens LeConte, red turpentine beetle.—This beetle is sometimes found in the basal (up to about 0.5 m) portion of damaged trees or trees infested with other *Dendroctonus* species (fig. 12).

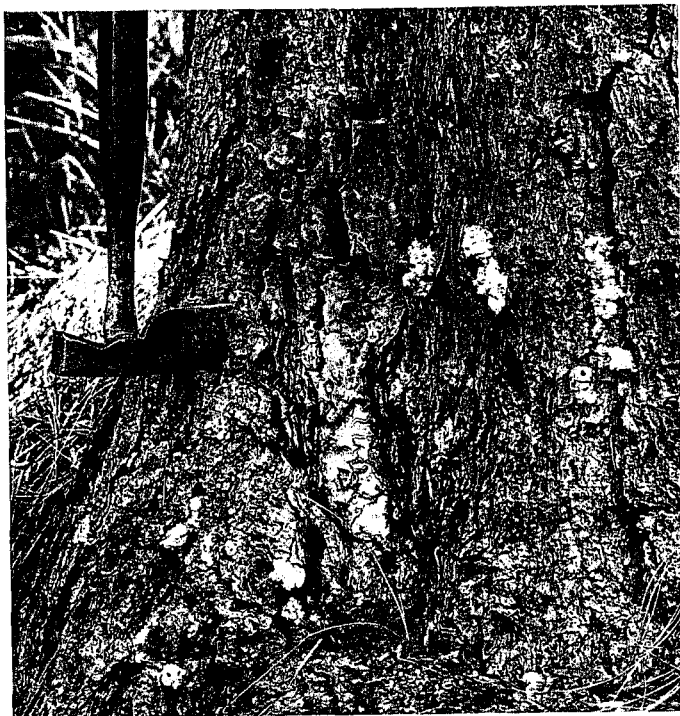


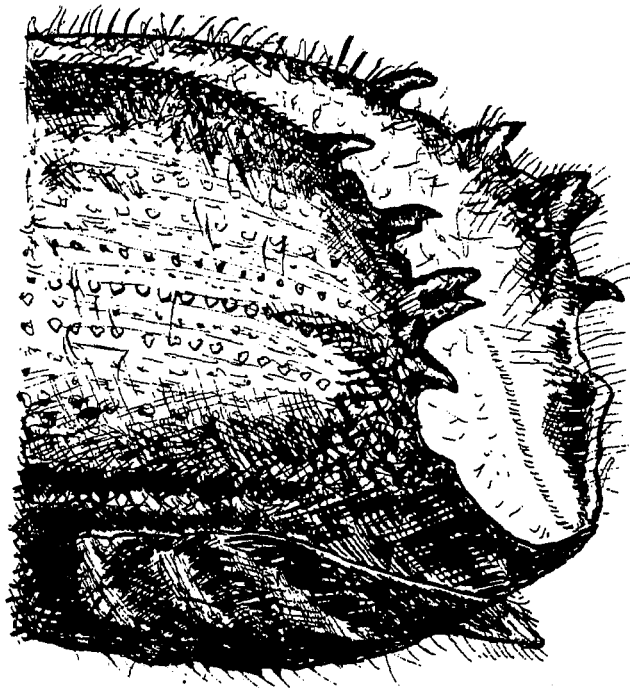
Figure 12.—Pitch tubes at base of tree resulting from attack of red turpentine beetle.

Ips spp., ips bark beetles; pine engraver beetles.—Ips beetles (fig. 13) are common associates of *Dendroctonus*. Their name is unusual in that it is both a common and a scientific name. Ips are generally secondary here in Colorado; that is, they are not usually tree-killers, but attack following more primary species. They commonly infest slash, creating numerous piles of frass in bark crevices. Also, fire-scorched trees are often susceptible to ips attacks and may, like slash, trigger short-lived outbreaks in standing healthy trees. *Ips* egg galleries (fig. 13b) are readily distinguished from those of *Dendroctonus*, as they are kept free of frass. Adult beetles (fig. 13a) are also easily separated from *Dendroctonus* by their concave posterior “declivity.” Colorado species in ponderosa pine include:

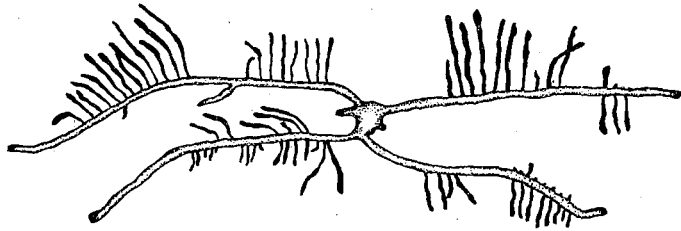
Ips calligraphus (Germar)
I. integer (Eichhoff)
I. knausi Swaine
I. pini (Say)

Hylurgops spp.—Adults strongly resemble *Dendroctonus*, but have noticeably rougher, less shiny bodies, and are substantially smaller. *H. subcostulatus* (Mannerheim) is known from Colorado ponderosa pine. It is also secondary (i.e., not a tree-killer) and is typically found in the basal portions of trees killed by *Dendroctonus*. Early spring-emerging *Hylurgops* beetles are often mistaken for mountain pine beetles.

Twig beetles.—Several genera of small (about 2 mm long) bark beetles sometimes infest ponderosa pine twigs and branches, causing them to flag (i.e., fade). This results in some of the natural pruning that goes on continually in the forest. Usually the infestation proceeds at low level and is inconspicuous; but, at times, high beetle populations develop, and the fading attracts attention. On rare occasions, trunks of small ponderosa pine saplings that are growing poorly can be invaded. Genera involved include *Pityophthorus*, *Pityogenes*, and *Carphoborus*.



a



b

Figure 13.—Ips beetles (a) concave spined declivity of adult, and (b) gallery system as in a down log. Note central "nuptial chamber" and radiating egg galleries. In a standing tree, gallery is oriented vertically.

Ambrosia beetles.—Ambrosia beetles are a group of bark beetles that bore directly through the bark into the wood, generally in dead or dying trees. Often they follow closely after *Dendroctonus* beetles, colonizing the basal portion of trees killed by the mountain pine beetle, attacking the following summer. The feeding habit of ambrosia beetles is different from other scolytid beetles; the larvae develop in short galleries, or "cradles," (fig. 14) prepared by the adults well within the sapwood. They feed on fungi that colonize the walls of the "cradles." The pinholes and associated stain caused by ambrosia beetles can result in downgrading of otherwise good quality lumber. Two species, *Gnathotrichus retusus* (LeConte) and *G. sulcatus* (LeConte), are common in Colorado ponderosa pine.

***Conophthorus ponderosae* Hopkins, ponderosa pine cone beetle.**—This is a small bark beetle that infests ponderosa pine cones throughout the West. Adults attack the stem of the cone, and the larval galleries, made within the cone itself, result in its destruction.

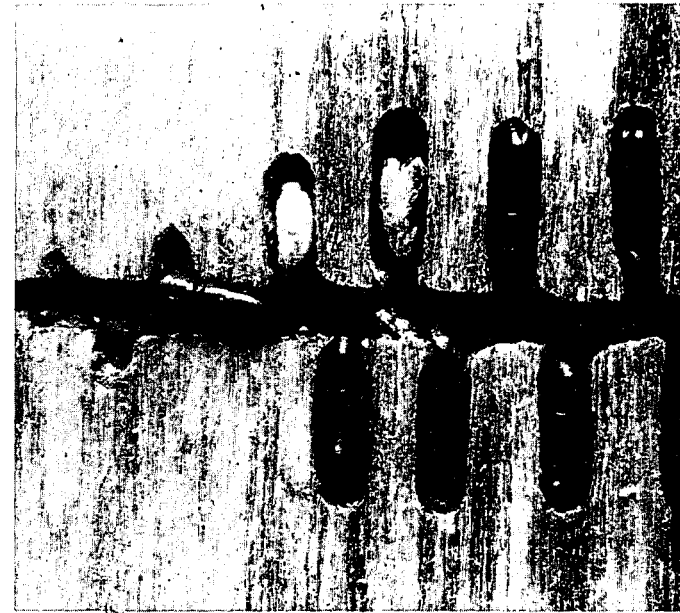


Figure 14.—Ambrosia beetles in "cradles" in wood.

Moths and Butterflies—Order Lepidoptera

Many species of moths and butterflies are closely associated with conifers, and some are destructive pests in the larval or caterpillar stage. The more important groups that feed on Colorado ponderosa pine are as follows:

Whites and Sulphurs—Family Pieridae

This family includes a number of destructive agricultural pests. One species, the pine butterfly, *Neophasia menapia* (Felder and Felder), is common throughout western ponderosa pine forests. The medium-sized, mostly white adults are often seen in the summer flitting about the tree tops. The larvae, less commonly seen, are green with white stripes, not hairy or fuzzy, and create no silken webbing as they feed on the foliage. Populations usually are maintained at low levels, but can increase to outbreak proportions and cause considerable damage.

Giant Silkworm Moths—Family Saturniidae

The genus *Coloradia* contains two species, *C. pandora* Blake, and *C. doris* Barnes, known to injure Colorado ponderosa pine. Larvae of both these so-called pandora moths feed on old needles, gregariously at first and individually when mature. Full-grown larvae are large, up to 80 mm long, and usually light yellow-green or gray-green. They have a white stripe running down the center of the back and short, stout black spines on each body segment. Pupation is in the soil under infested trees. The thick-bodied adults are dark gray with yellow antennae and often bright pink hairs on the hind wing bases and interior margins. Depending on species, the life cycle requires 1 or 2 years.

Tiger Moths—Family Arctiidae

Larvae of several species of tiger moths (genus *Halisidota*) build heavy webs (fig. 15) in terminals (and occasionally laterals) on pines and other western conifers. From these webs, the larvae move out to feed on the foliage. Little damage appears to result, but the webs are conspicuous and often attract attention. *H. ingens* Hy. Edwards, probably the main Colorado species, overwinters in the larval stage and can be found feeding on warm winter days.



Figure 15.—*Halisidota* web and defoliation caused by feeding larvae.

Pyralid Moths—Family Pyralidae

Several species of the genus *Dioryctria* infest different parts of ponderosa pine (fig. 16). *D. cambiicola* (Dyar) is among the most common. Larvae of this species work mainly in branch tips, killing the outer several centimeters and producing a conspicuous mass of pitch and frass on the outside of the twig. This mass distinguishes the work of *D. cambiicola* from that of *Rhyacionia* (tip moth) larvae (Lepidoptera: Tortricidae) which also kill branch and leader tips, but do not stimulate the tree to produce pitch. Infestations of *Dioryctria* are rarely if ever heavy enough to be serious. *D. rossi* Munroe, *D. auranticella* (Grote), and *D. abietivorella* (Grote) are known to infest ponderosa pine cones in Colorado. Pine webworms, genus *Tetralopha*, have recently been reared from ponderosa pines in the vicinity of Fort Collins, Colo.

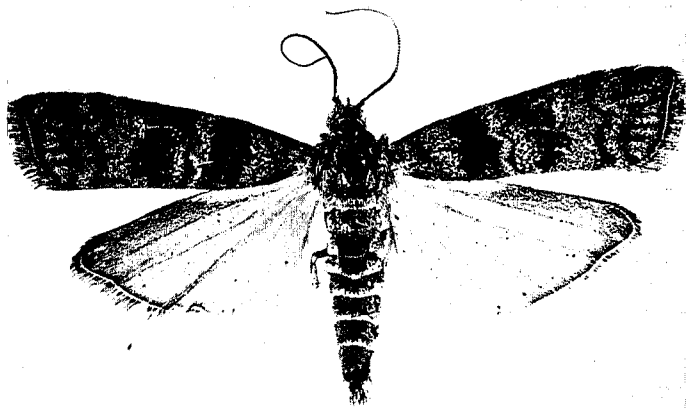


Figure 16.—Adult *Dioryctria* moth, wing span about 25 mm.

Leafroller Moths—Family Tortricidae

Four genera of tortricid moths are commonly found infesting Colorado ponderosa pines. Among them are several potentially serious pests of regeneration, stands being managed for high-value forest products, and/or high value individual trees growing as ornamentals in urban situations.

Rhyacionia spp.—Several species of *Rhyacionia* pine tip moths are known from Colorado ponderosa pine. These include the southwestern pine tip moth, *R. neomexicana* (Dyar), the western pine tip moth, *R. bushnelli* Busck, and *R. fumosana* Powell. All the pine tip moths infest new shoots, hollowing them out. Severe tree stunting is possible, but mortality is rare. *R. neomexicana* is a serious pest of pines planted for landscaping purposes along the Front Range and can also be important in windbreak and Christmas tree plantings. Fortunately, once trees grow beyond 3 to 4 m tall, they are no longer attacked severely. On smaller trees, though, damage can be so serious that chemical control measures may be required.

Petrova.—One species, *P. metallica* (Busck), is known from Colorado. These “pitch nodule moths” mine in new shoots and produce a consolidated mass of pitch at the site of entry into the shoot, like *Dioryctria cambiicola*. As in the case of *D. cambiicola*, the portion of the shoot beyond the pitch nodule dies, and stunting and deformation result.

Eucosma.—Larvae of the western pine-shoot borer, *E. sonomana* Kearfott, are responsible for reduced height growth of ponderosa pine in certain Colorado locations. The larvae infest new terminals, but feed only in the pith; the terminal often lives, but is stunted. Laterals assume dominance; or the leader retains dominance, but is short. A characteristic “shaving brush” appearance results as shoot length is reduced and needle bundles are more closely spaced than usual. After a short feeding period, the larvae abandon the aerial portion of the tree to overwinter in silken cocoons in the soil.

Cydia (= *Laspeyresia*).—This genus includes several species of “seed moths” reported from Colorado. Distribution and relative abundance of the insects are unknown, as is their impact on ponderosa pine seed production.

Pine tortrix, *Choristoneura lambertiana ponderosana* Obraztsov.—They are common in certain ponderosa pine areas in some years. Heavy defoliation has tended to be localized in canyons and along highways, rather than being extensive, and the tortrix is not considered a major pest. Larvae feed on new needles and can cause total loss of the current year's foliage. They chew through the needle sheath and feed on the succulent new needle tissue inside. Abundant unconsolidated webbing is produced. Damaged needles fade rapidly and drop by winter. The insects pupate in the tips near the feeding sites. Eggs are laid in overlapping rows on the older needles, and the tiny larvae overwinter in silken hibernacula in protected locations on the tree.

Gelechiid Moths—Family Gelechiidae

This family includes a group of moths known as needle miners (fig. 17). Larvae mine out the inside of needles, leaving them hollow. One species, *Coleotechnites ponderosana* Hodges and Stevens, has recently been recognized as a pest in the Front Range as well as in the Black Forest and Durango areas.

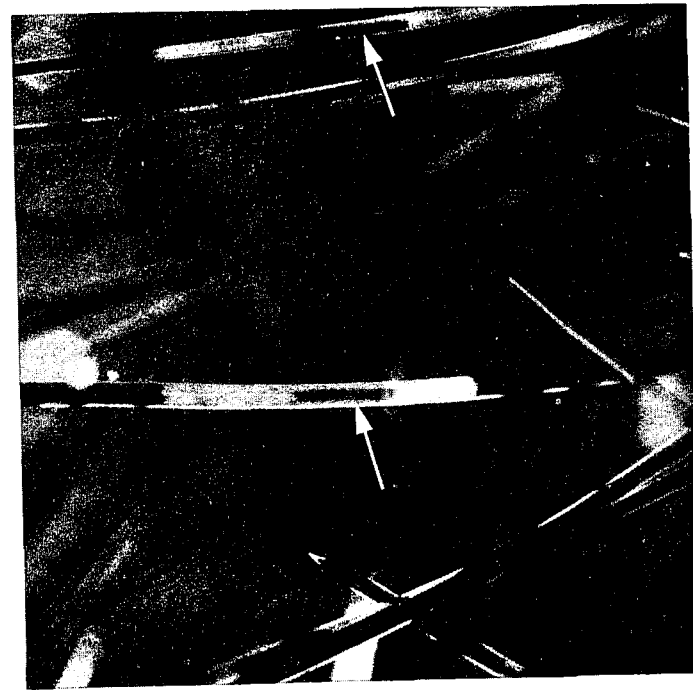


Figure 17.—Needle miner larvae inside ponderosa pine needles.

Ermine Moths—Family Yponomeutidae

One species of ermine moth, *Zelleria haimbachi* Busck, is known from Colorado ponderosa pine. *Z. haimbachi*, the pine needle sheath miner, feeds in the latter larval stages much like the pine tortrix, and defoliation caused by the two is superficially hard to separate. Both pupate in masses of silk in the mined shoots; however, *Z. haimbachi* larvae overwinter within pine needles while those of the pine tortrix overwinter within hibernacula in bark crevices.

Flies and Midges—Order Diptera

A few species of flies and midges damage Colorado trees. In ponderosa pine, these are mainly from two families of gall midges—Cecidomyiidae and Itonididae. *Contarinia coloradensis* Felt (Cecidomyiidae) causes excessive tissue growth of needles within the fascicle; galls (fig. 18) so formed are globular and 6 to 12 mm in diameter. Galled needles are short and drop prematurely; severe defoliation can result. Heavy infestations seem to be localized.

Cone midges are reported from Colorado ponderosa pine cones, but little is known about them. The larvae of these insects are tiny (3 mm), red, pink, or orange maggots found within and around cone scales and seeds. Adults are tiny, fragile, inconspicuous flies. *Rubsaamenia keeni* Foote is an example of one of these.

Larvae of pine resin midges, similar in appearance to the cone midges, occasionally colonize ponderosa pine shoots and cause flagging much like that resulting from work of tip moths, twig beetles, and the like. The gouty pitch midge, *Cecidomyia piniinopsis* Osten Sacken, is a widely distributed species known from Colorado ponderosa pine.

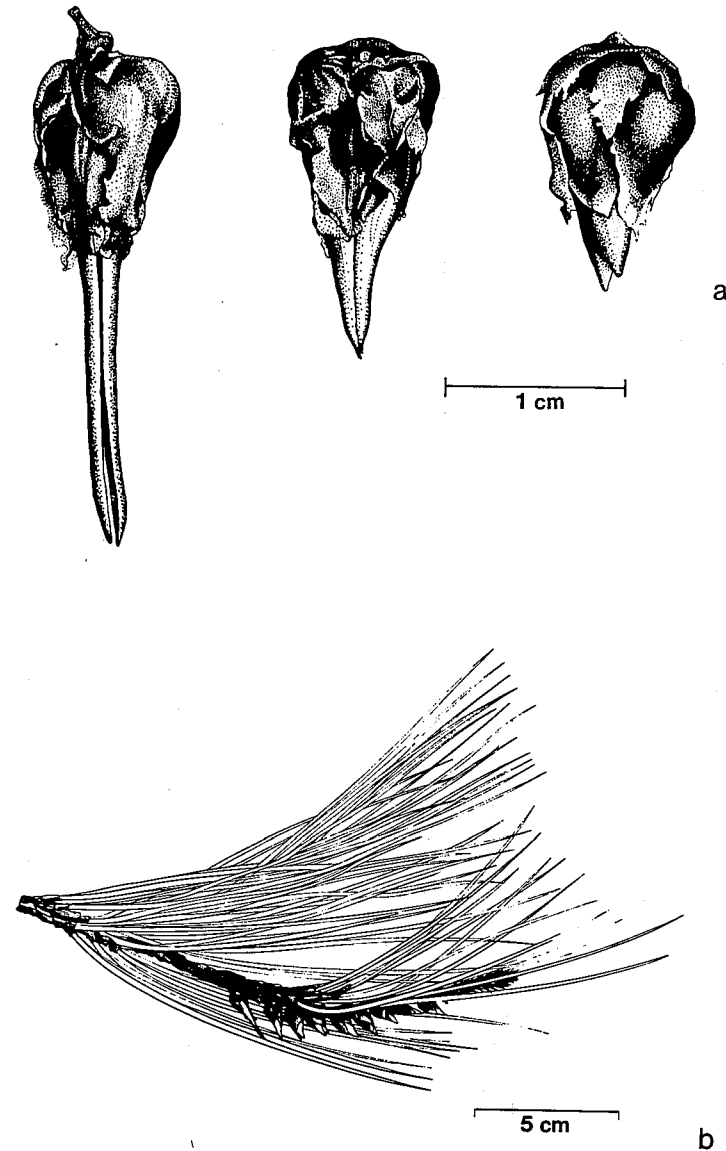


Figure 18.—Galls in ponderosa pine due to infestation by gall midges (a) shows variability; (b) shows galls in place on shoot.

Ants, Bees, Sawflies, and Allies—Order Hymenoptera

Members of the Hymenoptera are not usually serious forest pests in Colorado. Sawflies, family Diprionidae, are the most common; *Neodiprion fulviceps* (Cresson), *N. gilletti* (Rohwer), and *Zadiprion townsendi* (Cockerell) are among the species found. The name "sawfly" refers to the saw-like ovipositor with which females make the slits in pine needles where they deposit their eggs. Larvae (fig. 19) of these sawflies feed on the foliage and drop to the soil to pupate. Like many other defoliators, they may also feed on the exterior surfaces of young tender shoots. Young sawfly larvae feed in clusters on individual needles. No webbing is produced. The larvae have shiny (often black) heads and a distinctive habit of rearing back from their feeding position when disturbed. Each species overwinters in one of three life stages: egg, larva, or pupa. *Z. townsendi* overwinters in the larval stage.



Figure 19.—Young sawfly larvae, about 12 mm long, clustered characteristically on pine needles.

Horntail Wasps—Family Siricidae

Larvae occupy ecological niches similar to those of the wood-boring beetles. Larvae tunnel in the sapwood of recently killed trees, including ones killed by forest fires. *Sirex*, *Xeris*, and *Urocerus* are common genera in Colorado. The name "horn-tail" refers to the dangerous-looking ovipositor on the adult female and also to a posterior projection on the larvae.

Ants—Family Formicidae

Ants are commonly found in and around pine trees. They have no direct effect on living trees, but presence of ants often indicates the presence of aphids, from which the ants obtain honeydew. In some cases, protection afforded aphids by ants may favor aphid population increases. Several species of ants commonly obtain nectar from ponderosa pine dwarf mistletoe, and in the process pollinate dwarf mistletoe flowers. Carpenter ants, large black species, often tunnel extensively in down and decaying wood and sometimes colonize unfinished wood in cabins and other structures.

Braconids, Chalcids, and Ichneumons—Families Braconidae, Chalcididae, and Ichneumonidae

Many insect species in these families are parasites of other—often harmful—insects. One genus of chalcids, *Megastigmus*, includes several species that colonize conifer seeds and can be pests. *M. albifrons* Walker may occur in Colorado.

SECTION 4

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SECTION 5

GLOSSARY

- Antennae (sing. antenna): The pair of jointed appendages on the insect head, commonly called feelers.
- Beak: The protruding mouthparts of certain kinds of insects (e.g., aphids and cicadas) through which the insect feeds.
- Beating: A method of collecting insects in which foliage or branches are beaten over a cloth onto which the insects drop.
- Blue stain: Discoloration in wood caused by fungi, usually genus *Ceratocystis*, which are carried by bark beetles.
- Cambium: In a tree, the growing part between the inner bark and the wood.
- Cambial: Pertaining to the area of the cambium.
- Chalcid: A small (1- to 3-mm long), heavy-bodied wasp belonging to the family Chalcididae.
- Cone: The female reproductive structure of a conifer; the part that bears the seeds.
- Cone scales: The woody (in pines) individual elements of a cone attached to the central core.
- Conifer: A member of the group of cone-bearing trees; generally have needles.
- Crown: The part of the tree having branches and foliage; the upper part.
- Declivity: In bark beetles, the sloping upper rear portion of the abdomen.
- Defoliator: An insect that chews foliage from trees.
- Dominance: In conifers, the tendency of the topmost shoot to remain the tallest as the tree grows.
- Dwarf mistletoe: A fleshy parasitic plant that grows on conifers.
- Fading: Yellowing or similar discoloration of foliage, often resulting from insect activity.
- Fascicle: In conifers, particularly pines, an individual bundle of needles.
- Flag: To fade.
- Flagging: A conspicuous clump of fading foliage; dead needles, usually on the ends of branches.
- Frass: The mixture of feces and sawdust left behind by many chewing insects.
- Gall: An abnormal growth of plant tissues, normally stimulated by some outside factor, often insects or mites.

Gallery: A series of chambers and/or tunnels in which insects, particularly bark and ambrosia beetles, live. Each species has its particular kind of gallery, and can often be identified by it.

Habitat: The place where an insect lives.

Hibernaculum (pl. hibernacula): A tiny shelter constructed of silk or some other material in which an insect (usually a larva) overwinters or hibernates.

Honeydew: A sugary excretion produced by aphids and other sucking insects.

Host: The plant (or animal) on which an insect feeds.

Lateral: On a pine tree—a more or less horizontal limb or branch, as opposed to the leader, or topmost tip of the tree.

Maggot: Legless, worm-like fly larva (Diptera).

Midge: A small, fragile fly, often resembling a mosquito.

Mine: To bore or dig beneath the surface (e.g., the activity of certain kinds of insects). n., the hollowed-out area resulting from mining.

Needle sheath: On pines, the fibrous wrapping of the needle bundle that helps hold the bases of the needles together.

Niche: What the insect does; the role it plays in the environment.

Overwinter: In the case of insects, to pass the winter, often in an active developmental stage.

Oviposit: To lay eggs.

Ovipositor: In certain female insects, the structure with which the eggs are placed.

Pith: In twigs of trees and shrubs, the more porous, central part.

Population dynamics: How populations change in number of individuals from generation to generation.

Predator: An organism that feeds, usually externally, on another.

Regeneration: In forestry, this generally refers to young seedling or sapling trees.

Root collar: The part of the stem of a tree just below the surface of the ground.

Scale, Scale insect: One of a group of sucking insects that become fixed at feeding locations, covering themselves individually with a more or less hard protective coating.

Slash: Branches, treetops; generally parts of trees left in the woods after logging.

Stage: In insects, any of the developmental periods (e.g., larval stage).

Terminal (syn. leader): The topmost shoot of the main stem of a tree.

Stevens, Robert E., J. Wayne Brewer, and David A. Leatherman. 1980. Insects associated with ponderosa pine in Colorado. USDA Forest Service General Technical Report RM-75, 42 p. Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colo.

Ponderosa pine serves as a host for a wide variety of insects. Many of these, including all the particularly destructive ones in Colorado, are discussed in this report. Included are a key to the major insect groups, an annotated list of the major groups, a glossary, and a list of references.

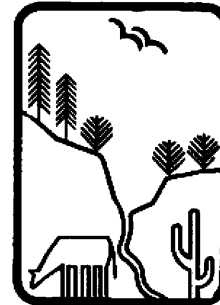
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