



United States Department of Agriculture
US Forest Service
Natural Resource Manager (NRM)



FSVeg Common Stand Exam User Guide Bark Beetles (Category 11)

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INTRODUCTION

Most bark beetles attack weakened, stressed, or old trees. Adults attack trees in large numbers, boring into trees to create tunnels (egg galleries) and laying eggs on the inner surface of the bark along the bole. External signs of attack include pitch tubes and/or boring dust, depending on the tree species. Larvae usually construct separate tunnels away from the egg gallery in patterns that are characteristic for each species. Sometimes adult beetles introduce fungi into egg galleries. Egg galleries, larval mines, and the introduced fungi disrupt the carbohydrate and water transport systems within a tree and can cause death.

(11-001) ROUNDHEADED PINE BEETLE

<u>Species:</u>	<i>Dendroctonus adjunctus</i>
<u>Host:</u>	Ponderosa pine
<u>Secondary Host:</u>	Coulter pine, sugar pine, limber pine
<u>Range:</u>	Southwestern United States and Mexico
<u>Injury:</u>	Fresh attacks have soft pink to reddish pitch tubes on bole, dry reddish-brown boring dust in bark cracks and crevices and at the base of tree, eggs and larvae in inner and outer bark, egg galleries meander upwards one to four feet and are loosely packed with frass in the first several inches. Freshly attacked trees appear in November and December. In older attacks the needles change to sorrel or rusty brown and fall off, pitch tubes are hard and pinkish to red, and larvae and pupae are present in inner and outer bark. Outbreaks can cause mortality in all crown classes and diameter classes. Pole-sized trees are often killed. This beetle works in conjunction with the western pine beetle, mountain pine beetle, and Ips beetles.
<u>Description:</u>	Larvae are white with brown heads, legless, curved, and ¼-inch long when mature. Adult beetles are dark brown to black, ¼-inch long, and similar to the mountain pine beetle.

Figure 1: Adult



Figure 2: Larvae and pupa in bark



Figure 3: Galleries



(11-002) WESTERN PINE BEETLE

Species: *Dendroctonus brevicomis*

Host: Ponderosa pine, western white pine, Coulter pine

Secondary host: Lodgepole pine

Range: Most damaging in California, but its range extends northward into Oregon, Washington, and Idaho; eastward into Montana, Nevada, Utah, Colorado, Arizona, New Mexico, and western Texas. It is commonly found in forests with a mid-elevation level between 2,000 and 6,000 feet.

Injury:

Pitch tubes, $\frac{1}{4}$ to $\frac{1}{2}$ inch (6 to 13 mm) in diameter, formed on the tree trunks around entry holes made by attacking females beetles, are usually the first evidence of infestation. The pitch tubes are white to red-brown masses of resin and boring dust found in the crevices between the bark plates. Relatively few, widely scattered, white pitch tubes, 1 inch or larger in diameter, usually indicate that the attacks were not successful and that the tree will survive. Close examinations of successfully attacked trees, however, reveals small, reddish-brown pitch tubes and dry, reddish-brown boring dust in the bark crevices and around the base of the tree.

It initially attacks midway up the tree, but the first sign of attack may often be predaceous, checkered beetles seen at eye level scurrying over the bark in search of western pine beetle prey.

Attacking adult beetles carry spores of a blue-staining fungus in special pouch-like structures in their heads. As the beetles chew their way through the bark, the spores of this wilt-causing fungus dislodge and begin to germinate. In trees attacked in early or midsummer, it takes only a few weeks for the fungus to invade and block the conductive vessels of the inner bark and sapwood. Once the vessels are blocked, the foliage begins to fade, first to a pale green and then to yellow, straw, and sorrel. After a year, the foliage may turn red brown. In trees attacked in late summer or fall, the fungus develops more slowly, and many infested trees do not fade until the next spring. These green trees are often first infested when woodpeckers flake off the outer bark as they search for and feed on developing beetle larvae. This flaking exposes the bright-orange inner bark, making these trees visible from as far away as 300 feet.

Infestation can be confirmed by removing the bark to expose the winding, crisscrossing egg galleries in the inner bark and on the surface of the sapwood. The egg galleries are slightly wider than the adult beetles and usually tightly packed with boring dust. It is the only bark beetle with this type of egg gallery in ponderosa and Coulter pines.

Figure 4: Adult and larval galleries

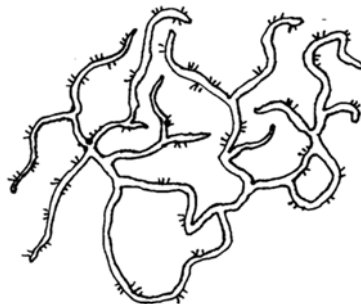


Figure 5: Range



Figure 6: Adult



(11-003) SOUTHERN PINE BEETLE

<u>Species:</u>	<i>Dendroctonus frontalis</i>
<u>Host:</u>	Loblolly, shortleaf, Virginia, pond, and pitch pines
<u>Secondary host:</u>	All pines within its range, Englemann spruce, Norway spruce, red spruce
<u>Range:</u>	Pennsylvania to Texas; New Mexico and Arizona

Injury:

The first indication of beetle-caused mortality is discolored tree foliage. Needles become yellowish, and then change to a red color, and within 1 to 2 months become brown. Typically, pines are killed in groups ranging from a few trees to those covering several hundred acres.

Pitch tubes, small yellowish-white masses of resin, $\frac{1}{4}$ to $\frac{1}{2}$ inch in diameter, mark the tree points of beetle attack. In unusually dry weather, drought-stressed host trees may produce no pitch tubes; a reddish boring dust lodged in bark crevices or in spider webs and leaves of under-story vegetation at the base of an infected tree may be the only indication of attack. Removal of bark from an infested pine will reveal S-shaped egg galleries that cross one another in the inner bark and on the wood surface. The S-shaped galleries distinguish the southern pine beetle from all other pine bark beetles in the South.

If the attack is recent, some living adult beetles may be observed in the galleries or very tiny, whitish larvae will be visible in thread-like mines that extend from the galleries. Later, most of the brood will be concealed within the bark.

Description:

The beetle is short-legged, stout, and about $\frac{1}{4}$ inch long. The front of its head is notched, and the hind end of the body is rounded. Mature beetles are dark reddish brown to black. The newly emerged adult beetle is soft bodied and amber colored, but quickly hardens and darkens.

Figure 7: Galleries with developing larvae



Figure 8: Distribution/range

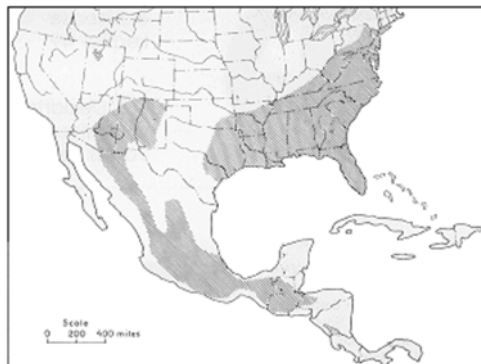


Figure 9: Pitch tubes



(11-004) JEFFREY PINE BEETLE

Species: *Dendroctonus jeffreyi*

Host: Jeffrey pine

Secondary host: May attack ponderosa pine on rare occasions

Range: California

Injury: Trees attacked are not usually detected until their foliage begins to change color. This change makes them conspicuous. Color changes take place very slowly but follow a typical sequence. Beginning at the top of the crown and gradually extending downward, the normal green of the needles gives way to greenish yellow to sorrel, and then to reddish brown. Fading does not start until after the attacking beetles are well established, and their progeny partly developed. When the crown turns sorrel, the new broods are usually about full-grown. When the foliage reaches the reddish-brown stage, the beetles have usually abandoned the tree.

Large, reddish pitch tubes can be found projecting from the bark on the middle and lower trunk of an infested tree. Pitch tubes consist of boring dust and resin pushed out by the beetles when they bore into the tree. These tubes mark the first points of attack. By careful examination of the trunk, they can be found long before the foliage begins to fade. The egg galleries can be recognized by their characteristic "J" shape, their size, and their being packed with frass. No other insect that breeds in Jeffrey pine makes galleries like this. If the broods are fully developed, larval mines will be seen extending across the grain and ending in open, oval-shaped pupal cells. If the beetles have matured and left the tree, the outer bark will contain many scattered, circular holes. These are made when the adults burrow out from the pupal cells and disperse to attack other trees.

Description: It is one of the larger species of *Dendroctonus*. In the adult stage, it is a stout, cylindrical beetle about five-sixteenths of an inch long and black when mature. The egg is oval and pearly-white. The larva is a curved, white, legless grub with a yellow head and, when grown, it is about the same size as the adult. The pupa also is white but is slightly smaller than the mature larva.

Figure 10: Egg galleries, larval galleries, pupal cells on inner surface of bark

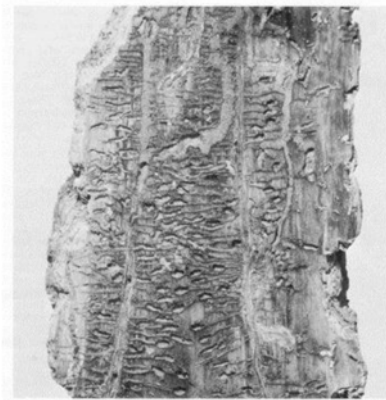


Figure 11: Range of beetles

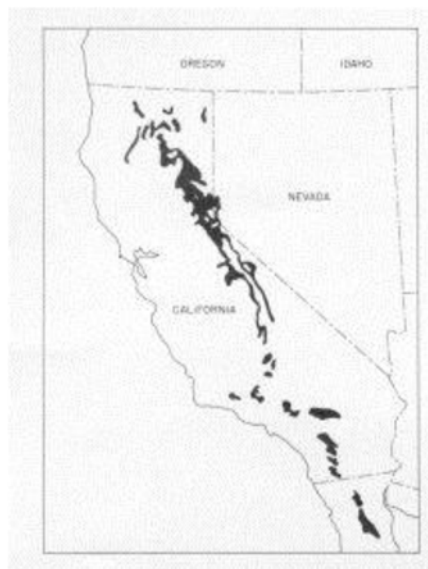
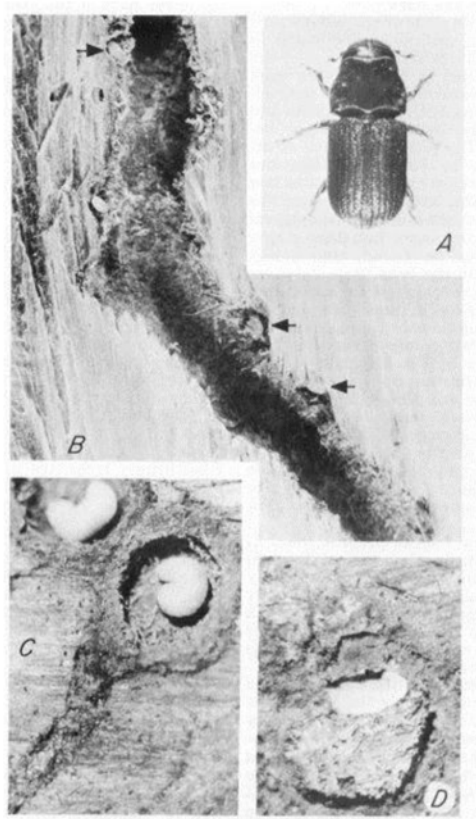


Figure 12: Life stages (A: adult, B: eggs, C: larvae, D: pupa)



(11-005) LODGEPOLE PINE BEETLE

<u>Species:</u>	<i>Dendroctonus murrayanne</i>
<u>Host:</u>	Lodgepole pine, jack pine
<u>Range:</u>	Idaho, Montana, Wyoming, Colorado, Utah
<u>Injury:</u>	It mines the lower bole and root crown of over-mature, injured, and weakened trees and in fresh stumps and windfalls.
<u>Description:</u>	Adult is black with reddish-brown elytra and is about 6 mm long.
<u>Defect:</u>	Whenever this insect is present, other defects are probable. At least the sapwood is devalued by stain.

Figure 13: Photo by E. Bradford Walker



(11-006) MOUNTAIN PINE BEETLE

<u>Species:</u>	<i>Dendroctonus ponderosae</i>
<u>Host:</u>	Lodgepole pine, ponderosa pine, sugar pine, whitebark pine, western white pine
<u>Secondary Host:</u>	Limber pine, Coulter pine, foxtail pine, pinyon pine, singleleaf pine, and bristlecone pine are also infested and killed. Scotch pine is highly susceptible to attack. Douglas-firs, true firs, spruce, western larch, and incense cedar are occasionally attacked, but broods rarely develop. Attacks on non-host trees usually occur when nearby pines are heavily infested.
<u>Range:</u>	Western United States from sea level to 11,000 feet in elevation
<u>Injury:</u>	The mountain pine beetle begins attacking most pine species on the lower 15 feet of the trunk. Trees are generally killed by beetles of a single generation. However, large sugar pine are first attacked in the crown. Two or more generations of beetles—each generation attacking a lower portion—may occur before the tree is killed. Examination of infested trees usually reveals the presence of pitch tubes. Pitch tubes are made when female beetles bore into the tree. There are two types of tubes. Pitch tubes on successfully infested trees are cream to dark-red masses of resin mixed with boring dust and are $\frac{1}{4}$ to $\frac{1}{2}$ inch in diameter. Pitch tubes on unsuccessfully infested trees are larger, $\frac{3}{4}$ inch to 1 inch in diameter, and widely scattered over the trunk. When beetles are not present in sufficient numbers, trees can produce enough resin to “pitch out” beetles as they bore into the inner bark. Besides having pitch tubes, successfully infested trees will have dry boring dust, similar to fine sawdust, in bark crevices and around the base of the tree. Sometimes, however, infested trees can have boring dust, but not pitch tubes. These trees, called blind attacks, are common during drought years when trees produce little pitch.

When the beetles attack, they carry blue-staining fungi into the tree. After one to several months, the sapwood begins to discolor. Woodpeckers, feeding on larvae under the bark, make individual holes in thick bark, or they may partially or completely remove thinner bark. These signs, plus the resulting pile of bark flakes around the base of the tree, are good evidence of bark beetle infestation. The first sign of beetle-caused mortality is generally discolored foliage. Needles on successfully infested trees begin fading and changing color several months to one year after the trees have been attacked. The needles change from green to yellowish green, then sorrel, red, and finally rusty brown. Fading begins in the lower crown and progresses upward. In large sugar pines, fading in the upper crown is the first evidence of infestation.

Defect: The sapwood, to a depth of 10 inches, will be heavily stained. Otherwise, no defect expect tree mortality is associated.

Figure 14: Galleries

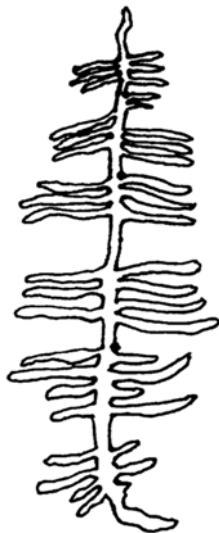


Figure 15: Range

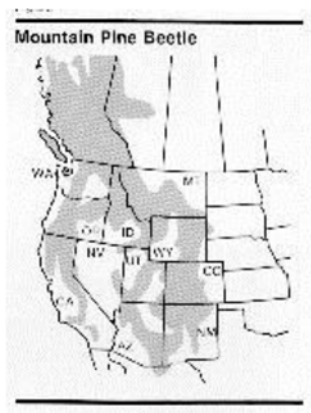


Figure 16: Pitch tubes



Figure 17: Galleries

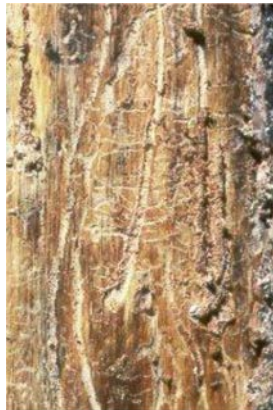


Figure 18: Adult



(11-007) DOUGLAS-FIR BEETLE

<u>Species:</u>	<i>Dendroctonus psuedotsugae</i>
<u>Host:</u>	Douglas-fir
<u>Secondary host</u>	Western larch
<u>Range:</u>	Range of Douglas-fir in the western United States

Injury:

It prefers wind thrown, budworm damaged, root diseased, or weakened trees. Also prefers large pieces of slash and fresh stumps. Reddish-orange boring dust can be found in the bark crevices and around the bases of infested trees (May-June). No pitch tubes are produced. Wind and rain remove boring dust, and these beetles may attack portions of the upper bore only, so trees must be examined carefully to detect the presence of beetles. Green trees with boring dust and/or obvious, abundant streaming pitch indicates a successful current attack. Trees with yellow, sorrel, or reddish brown needles and diagnostic gallery patterns indicate last year's successful attack. Trees lacking a full component of reddish brown needles or devoid of needles and diagnostic gallery patterns indicate an older dead tree. Needles are shed and conks of the pouch fungus *Cytospora volatus* form on the outer bark the year following infestation. It does not cause top-kill (Severity Code 4), but is commonly associated with root disease centers.

Egg galleries are straight or slightly wavy, vertical, approximately $\frac{1}{4}$ inch wide, and range from 5 to 35 inches long with an average length of 12 inches. Galleries are packed with frass. Eggs are laid in batches on alternating sides of the galleries; the larval galleries fan out horizontally, so gallery patterns are often most obvious on inner bark.

Beetles cause scattered mortality resulting in large volume loss. Epidemics can cause mortality of apparently healthy trees. Epidemics usually develop in trees felled by wind, broken by snow, or affected by drought. Trees infected by dwarf mistletoe and/or root disease are often attacked.

Description:

Adults are stout, cylindrical, and 4-6 mm long. Head and thorax are black; wing covers are reddish-brown, becoming darker with age. Eggs are white and 1 mm long. Larvae are white, legless, with brown heads. Pupae are white and have some adult features, including wings that are folded beneath the abdomen.

Defect:

Mortality results but is usually associated with root disease and the attendant cull.

Figure 19: Attacked tree



Figure 20: Gallery

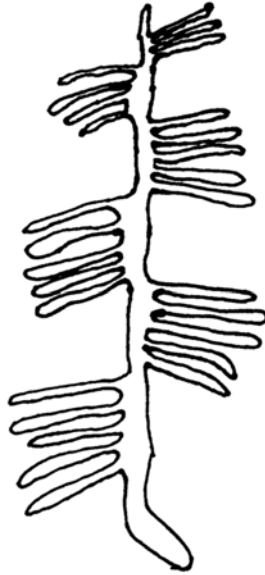


Figure 21: Adult beetle



(11-008) ALLEGHENY SPRUCE BEETLE

<u>Species:</u>	<i>Dendroctonus punctatus</i>
<u>Range:</u>	Alaska
<u>Injury:</u>	It is a little-known species, which attacks the lower bole and kills scattered trees.
<u>Description:</u>	The adult is uniformly brown and averages 6 mm long. The female cuts a "C-shaped" gallery and lays clusters of eggs along the outer edge. The larvae feed out en mass, forming a cavity that becomes filled with resinous frass.

(11-009) SPRUCE BEETLE

<u>Species:</u>	<i>Dendroctonus rufipennis</i>
<u>Host:</u>	Englemann spruce, white spruce, Sitka spruce
<u>Secondary host:</u>	Lodgepole pine
<u>Range:</u>	Alaska to Arizona where extensive stands of spruce are found
<u>Injury:</u>	Prefers wind thrown trees, weakened trees, large pieces of slash, and fresh stumps. Red boring dust accumulates in bark crevices around the bases of infested trees. Needles of infested trees turn yellowish-green and fall one year after attack. Needles do not turn reddish color. Recently killed trees appear yellowish-orange to a reddish hue after needle drop due to color of exposed twigs and is especially visible in the upper one-third of the crown. Dust-clogged entrance holes and fewer numbers of unclogged holes are visible in the back. Occasionally, manes of pitch may accumulate at entrance holes, which indicate unsuccessful attack (Severity Code 2). Trees with yellowish-green needles or devoid of needles but that appear yellowish-orange to red after needle drop (due to color of exposed twigs), and with diagnostic gallery patterns are evidence of last year's successful attack. Woodpeckers often search through the bark during winter months when larvae are large. Spruce beetle does not cause top-kill (Severity Code 4). Egg galleries are vertical and 2 to 7 inches in length and packed with frass at the basal or lower end. Eggs are laid in batches along alternating sides of the galleries. Larval mines radiate away from the egg galleries at first, but later may meander and cross each other. From 1 to 3 years may be required per generation, depending on latitude and elevation, with most populations requiring 2 years. Tree mortality ranges from scattered individual large trees to nearly 100 percent mortality on thousands of acres. Epidemics usually start due to stand disturbances and are often difficult to detect until mortality is severe.
<u>Description:</u>	The adult is dark reddish-brown. Older adults are usually entirely black. Beetles are cylindrically shaped, 4-7 mm long, 3 mm wide. Eggs are oblong, pearly-white, and 1-2 mm long. Larvae are stout, cylindrical, legless grubs and 6 mm long when full grown. Pupae are creamy white and similar in size to the adult.
<u>Defect:</u>	Tree mortality is the resulting defect, but is usually associated with root disease and the attendant cull.

Figure 22: Galleries



Figure 23: Pitch streamers



Figure 24: Tree mortality



Figure 25: Gallery



Figure 26: Adult male



Figure 4 - An adult spruce beetle.

Figure 27: Range



Figure 2 -- The geographic range of the spruce beetle.

(11-010) EASTERN LARCH BEETLE

<u>Species:</u>	<i>Dendroctonus simples</i>
<u>Host:</u>	Tamarack
<u>Secondary host:</u>	Red spruce
<u>Range:</u>	It is found in the northeastern states from West Virginia west to Minnesota, and Alaska
<u>Injury:</u>	It prefers dying or injured trees, but may kill trees already infested with the larch sawfly.
<u>Description:</u>	Galleries are longitudinal, winding, and eggs are deposited in niches arranged in alternate groups of 3 to 6 eggs. Larval mines are in the inner bark, and quite short. Adults are dark brown; the elytra having reddish cast, and are from 3.4 to 5 mm long.

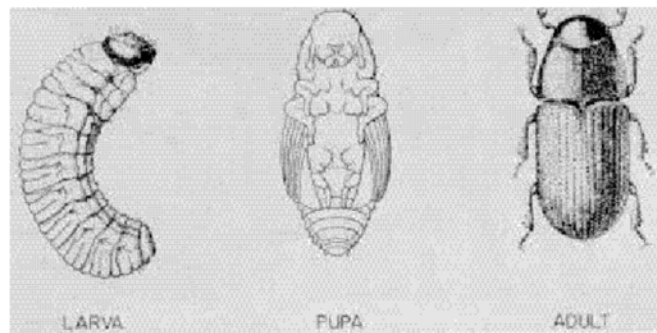
(11-011) BLACK TURPENTINE BEETLE

<u>Species:</u>	<i>Dendroctonus terebrans</i>
<u>Host:</u>	Slash pine, loblolly pine, longleaf pine
<u>Secondary host:</u>	All southern pines including shortleaf and Virginia pine
<u>Range:</u>	Texas to Virginia and southward through Florida
<u>Injury:</u>	Attacks are confined to the base of the tree and initial infestations are usually located in the lower 18 inches. The attack is characterized by large pitch tubes, which appear on the bark surface. These tubes are a mixture of pitch, frass, and bark borings and have reddish to white color, which quickly ages to a gray hue. Attacks are not always fatal. In killed trees, the needles begin to fade, first to a yellowish green and then to a reddish brown.
<u>Description:</u>	Males are robust, black and from 1/5 to 3/8 inches long.

Figure 28: Pupal cells located between bark and wood



Figure 29: Life stages



(11-012) RED TURPENTINE BEETLE

<u>Species:</u>	<i>Dendroctonus valens</i>
<u>Host:</u>	Red pine, lodgepole pine, jack pine in the north; white pine, pitch pine, shortleaf pine in the east; Monterey pine, ponderosa pine, and sugar pine in the west
<u>Secondary host:</u>	All pines including Virginia, western white, longleaf, scotch, loblolly, slash, limber, and Jeffrey. Infrequently attacks Douglas-fir, larch, and true fir.
<u>Range:</u>	All coniferous forest except those in the Southern Atlantic Coast and Gulf Coast states.

Injury:

It prefers weakened trees or fresh stumps. Attacks are usually concentrated in the basal 3 feet of the tree, but occasionally extend above a height of 12 feet. Pitch tubes vary in size, texture, and color. Resin is usually white to yellow, and borings are red. Tubes may be as large as 2 inches across. White-yellow (no boring dust) pitch tubes indicate unsuccessful attacks (Severity Code 1). Boring dust and small pitch pellets can be found on the ground around the base of the tree. Trees are usually not killed unless attacks are numerous and involve a large portion of the tree's circumference. As the tree dies, needles fade to yellowish-green then through shades of yellow, and sorrel to red. Red turpentine beetle does not cause top-kill (Severity Code 4), but attack may precede or accompany attacks by other bark beetles such as western pine beetle; upper boles should be carefully examined.

Galleries are generally vertical or cave-like and are usually packed with granular, reddish, pitchy borings and frass. Galleries vary in width from ½ to more than 1 inch and in length from a few inches to several feet. Larvae feed together, producing a cavity that ranges in size from 0.1 to 1.0 sq. ft. rather than individual larval mines.

Description:

The egg is shiny, opaque white, ovoid cylindrical, and a little over 1 mm long. Larvae are grub-like, legless, white with a brown head capsule with growth a row of small, pale-brown tubercles become evident along each side of the body. Beetles are 6-10 mm long and quite stout, and are reddish-brown at maturity.

Defect:

Beetles alone do not cause defect but usually associate with another severe condition.

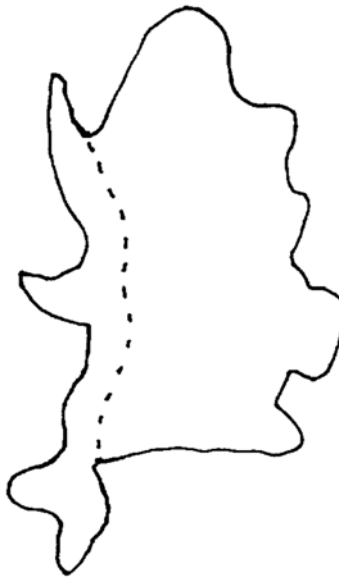
Figure 30: Adults



Figure 31: Pitch tubes



Figure 32: Egg gallery



(11-018) (*Dryocoetes affaber*)

<u>Species:</u>	<i>Dryocoetes affaber</i>
<u>Host:</u>	Englemann spruce, Sitka spruce
<u>Secondary host:</u>	Other spruce species, Douglas-fir, pine, larch
<u>Range:</u>	Alaska to New Mexico and the East Coast north of North Carolina

Injury: Infestations occur in felled trees, stumps, and the trunks of standing trees.

Description: The female is reddish-brown to black, abundantly clothed with long yellow hairs, and from 2.5 to 3.3 mm long.

(11-014) (*Dryocoetes autographus*)

Species: *Dryocoetes autographus*

Host: Spruce

Secondary host: Hemlock, Fraiser fir, Douglas-fir, pines

Range: All coniferous forest in North America

Injury: Infestations are usually found at the base and in the roots of dying or injured standing trees, or in stumps or felled trees.

Description: The adult is from 3.5 to 5 mm long. It has a distinctly punctured pronotal disk, and a convex declivity. The female does not have a dense mat of hair on the frons.

(11-015) WESTERN BALSAM BARK BEETLE

Species: *Dryocoetes confusus*

Host: Subalpine fir

Secondary host: Grand fir, Englemann spruce, larch, lodgepole pine

Range: Western states from Washington to Arizona and New Mexico

Injury: Trees are often attacked in groups. Detection of stem attack is through copious pitch flow and boring dust on the bole. Dead and dying trees become brick red in color, which develops the year following attack. Reddened needles may remain on trees up to five years.

Description: Galleries are star shaped. Blue stain fungi are introduced. Egg galleries radiate from the central nuptial chamber in a random pattern. Eggs are small, pearly-white and oval. Larva is 3-4 mm long; head pale tan, body yellowish-white, curved and wrinkled. Pupae are 3-4 mm long; yellowish-white with many of the adult parts recognizable. Adults are 3-4 mm long; dark brown at maturity with erect reddish-brown hairs; front of the female entirely covered with a dense brush of short, reddish-yellow hairs.

Defect: Is confined to the sapwood, which will be stained

Figure 33: Gallery



Figure 34: Tree mortality



(11-016) (*Dryocoetes sechelti*)

Species: *Dryocoetes sechelti*

Host: Subalpine fir

Range: Washington, Oregon, and east to Colorado

Injury: They breed in small suppressed, dying, dead, and down trees

Description: Adults are shiny, brown to black, cylindrical beetles ranging from 2 to 5 mm long. The thorax is evenly convex above and the elytra are abruptly rounded and unarmed behind. Several egg galleries radiate from a central nuptial chamber.

(11-017) ASH BARK BEETLE

<u>Species:</u>	<i>Hylesinus spp.</i>
<u>Host:</u>	Ash, alder
<u>Injury:</u>	They bore between the bark and wood.
<u>Description:</u>	The front margin of the elytra is raised and notched; the pronotum usually is unarmed, and the head usually visible from above.

(11-018) NATIVE ELM BARK BEETLE

<u>Species:</u>	<i>Hylurgopinus rufipes</i>
<u>Host:</u>	All elm species except Siberian and Chinese
<u>Range:</u>	Northeastern United States, westward to North Dakota and Nebraska
<u>Injury:</u>	The lethal injury is the development of Dutch Elm Disease in healthy trees through the feeding habits of the bark beetle. The beetle carries the fungus on their bodies and introduces the spores, principally at the twig axil, by chewing off the tender bark. The disease can be first suspected when the foliage on a branch or the entire crown suddenly wilts.
<u>Description:</u>	The adults are about 1/8 inch long and dull brown.

(11-019) PINION IPS

<u>Species:</u>	<i>Ips confuses</i>
<u>Host:</u>	Pinyon pine, single leaf pinyon pine
<u>Range:</u>	Arizona, New Mexico, Colorado, Utah, Nevada, California
<u>Injury:</u>	Infests trees injured or uprooted for range improvement. From November through March, adults hibernate en mass under the bark of standing trees, mostly in the basal portion of the bole.
<u>Description:</u>	Adults have five spines. The third and largest spine is notched on the lower side. Adults range from 3 to 5.5 mm long.

(11-020) SMALL SOUTHERN PINE ENGRAVER

<u>Species:</u>	<i>Ips avulsus</i>
<u>Host:</u>	Eastern white pine, loblolly pine, longleaf pine, pitch pine, pond pine, sand pine, shortleaf pine, slash pine, Virginia pine
<u>Range:</u>	Southern United States from Pennsylvania south to Florida and Texas
<u>Injury:</u>	Needles turn yellow or red. Infested trees will have dry, reddish-brown frass in the bark crevices. Some trees may have dime-sized or smaller, white to reddish-brown pitch tubes in the bark crevices. If a hole is not present in the pitch tube, the attack was not successful.
<u>Description:</u>	Newly emerged adults are light orange brown, mature adults vary from dark red brown to almost black. The posterior of the adults looks as if it has been cut off at an angle, and hollowed out. Adults are 1/8 inch long and have four spines on each side. The wing covers are lighter than the thorax. The eggs are about 1/32 inch long by 1/55 inch wide. Fresh, thin-barked logging debris, such as the upper portions of branches and tops of pines, is often infested. The crowns of large, living trees may be attacked and partially or completely killed.

Figure 35: Gallery



(11-021) SIXSPINED IPS

<u>Species:</u>	<i>Ips calligraphus</i>
<u>Host:</u>	Digger pine, eastern white pine, loblolly pine, longleaf pine, pitch pine, pond pine, ponderosa pine, red pine, sand pine, scotch pine, shortleaf pine, slash pine, spruce pine, Table Mountain pine, Virginia pine, knobcone pine, limber pine
<u>Range:</u>	All eastern pines

Injury: Needles turn yellow or red. Infested trees will have dry, reddish-brown frass in the bark crevices. Some trees may have dime-sized or smaller, white to reddish-brown pitch tubes in the bark crevices. If a hole is not present in the pitch tube, the attack was not successful.

Description: Newly emerged adults are light orange brown, mature adults vary from dark red brown to almost black. The posterior of the adults looks as if it has been cut off at an angle, and hollowed out. Adults are 1/5 inch long and have six spines on each side near the posterior. The eggs are oblong, pearly white and about 1/25 inch long by 1/50 inch wide. It commonly attacks portions of trunks 4 inches or more in diameter. This is often one of the first bark beetles to attack drought-stricken trees.

Figure 36: Gallery



Figure 37: Adult beetle



(11-22) EMARGINATE IPS

Species: *Ips emarginatus*

Host: Ponderosa pine

Secondary host: Lodgepole pine, western white pine, sugar pine, Jeffrey pine

Range: Idaho, Montana, Washington, Oregon, California

Injury: It is commonly associated with the mountain pine beetle and Jeffrey pine beetle. Occasionally it may kill a tree by itself. They have long, straight, nearly parallel egg galleries from 2 to 4 feet long, which run up and down the tree and connect at different points. The presence of a nuptial chamber and the absence of frass distinguish it from the mountain pine beetle.

Description: Adults are dark brown, shiny, cylindrical beetles

(11-023) SOUTHERN PINE ENGRAVER BEETLE

Species: *Ips grandicollis*

Host: Eastern white pine, jack pine, loblolly pine, longleaf pine, pitch pine, pone pine, sand pine, scotch pine, shortleaf pine, slash pine, Virginia pine

Range: Canada south to the Gulf and on some of the Caribbean Islands

Injury: Needles turn yellow or red. Infested trees will have dry, reddish-brown frass in the bark crevices. Some trees may have dime-sized or smaller, white to reddish-brown pitch tubes in the bark creviced. If a hole is not present in the pitch tube, the attack was not successful.

Description: Newly emerged adults are light orange brown, mature adults vary from dark red brown to almost black. The posterior of the adults looks as if it has been cut off at an angle, and hollowed out. Adults are 1/6 inch long and have five spines on each side. The eggs are about 1/30 inch long by 1/50 inch wide. Recently felled trees and fresh logging debris are favored breeding material. In standing trees, this species is usually found in the upper trunk and basal portions of large branches.

(11-024) (*IPS LATIDENS*)

Species: *Ips latidens*

Host: Ponderosa pine, lodgepole pine, Jeffrey pine, Coulter pine, sugar pine, western white pine in the west; white spruce, hemlock (Lake States), jack pine, red pine, scotch pine in the east

Injury: Attacks weakened or dying tree, usually in the tops and limbs of mature trees and in the bole of pole-sized trees. It may kill trees weakened by other sources.

Decription: The adults are from 3 to 3.5 mm long and the smallest of the western *Ips*. The elytral declivity is nearly vertical and is armed with three slender spines on each side. There are from 2 to 5 rather short, sometimes curved, egg galleries radiating from the central nuptial chamber.

(11-025) ARIZONA FIVE-SPINED IPS

Species: *Ips lecontei*

Host: Ponderosa pine

Range: Arizona and New Mexico

Injury: Kills sapling and pole-sized trees in groups of 100 or more. It is strongly attracted to freshly cut pine and lumber. The upper bole is attacked first; then the lower bole is filled in.

Description: Adults have five spines. The third and largest spine is usually notched on the lower side. Adults range in size from 3 to 5.5 mm long. There is an average of three galleries per nuptial chamber.

(11-026) MONTEREY PINE IPS

Species: *Ips mexicanus*

Host: Monterey pine

Secondary host: Lodgepole pine, whitebark pine, knobcone pine, limber pine, Bishop's pine

Range: Alaska to Mexico; eastward to Wyoming and Colorado

Injury: Attacks the bole of living, injured, dying, and recently down pines. It is usually associated with other bark beetles. Favors breeding grounds of fresh slash, and will attack nearby trees.

Description: The adults are from 3 to 3.5 mm long, and the smallest of the western *Ips*. The elytral declivity is nearly vertical and is armed with three slender spines on each side.

(11-027) CALIFORNIA FIVE-SPINED IPS

<u>Species:</u>	<i>Ips paraconfusus</i>
<u>Host:</u>	Ponderosa pine, Monterey pine, Digger pine, Coulter pine, lodgepole pine, knobcone pine, Bishop pine, western white pine, sugar pine
<u>Range:</u>	Oregon, California
<u>Injury:</u>	All species of pine in its range may be attacked. It kills saplings, poles, and younger trees up to about 26 inches in diameter and the tops of larger trees. It breeds in fresh slash and recently down trees; the broods emerge and kill nearby living trees.
<u>Description:</u>	The adults have five spines, with the third and largest spine notched on the lower side. Adults range from 3 to 5.5 mm long. Galleries comprise from 3 to 5 nearly straight tunnels radiating from a central entrance chamber. The typical pattern consists of three galleries in the form of a "Y."

(11-028) NORTHERN SPRUCE IPS

<u>Species:</u>	<i>Ips perturbatus</i>
<u>Host:</u>	White spruce
<u>Secondary host:</u>	Englemann spruce, Sitka spruce
<u>Range:</u>	Alaska and Montana
<u>Injury:</u>	It breeds in slash and the tops of trees killed by <i>Dendroctonus</i> . It sometimes kills trees in strips adjacent to logging operations.
<u>Description:</u>	Adults have four spines with the third declivital spine being enlarged and conical at the outer end of both sexes. Adults are 3.5 to 5.2 mm long and stouter than most <i>Ips</i> .

(11-029) PINE ENGRAVER

<u>Species:</u>	<i>Ips pini</i>
<u>Host:</u>	Ponderosa pine, lodgepole pine, limber pine, Jeffrey pine
<u>Secondary host:</u>	Englemann spruce, jack pine
<u>Range:</u>	Western United States including Alaska

Injury:

The first indication of attack is reddish-orange boring dust, which appears in small mounds on the surface of logs or logging slash at points of beetle entry. Spring rains may wash the boring dust off the top surfaces, but it can usually be found in bark crevices or on the ground beneath the slash. In standing trees, boring dust lodges in bark crevices, spider webs, and on the ground at the base of the tree. Foliage of infested standing trees usually begins fading within a few months of attack. The rate of fading depends on tree species and weather. Some infested trees may fade by late summer or early fall during the same year they are attacked, while others may not fade until the following spring.

Description:

This beetle has four stages in its life cycle: egg, larva, pupa, and adult. eggs are oval, pearly white and about the size of a pinhead. Larvae are creamy-white, legless grubs with brown heads. When full grown, the larvae are about 3/16 inch long. The pupa is soft and white, with some adult features such as eyespots and wing covers. The adult is cylindrical, about 1/8 to 3/16 inch long, and has four small spines on each side of the declivity at its posterior. The third spine in the male is more prominent than that of the female. A new adult is pale yellow at first (a "callow" adult) but usually turns dark brown or black before flying.

Figure 38: Adult male



Figure 39: Range

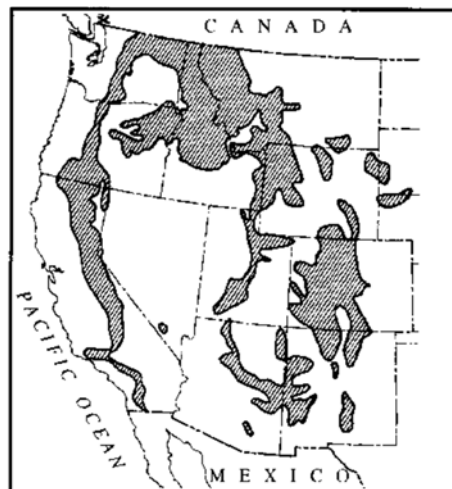
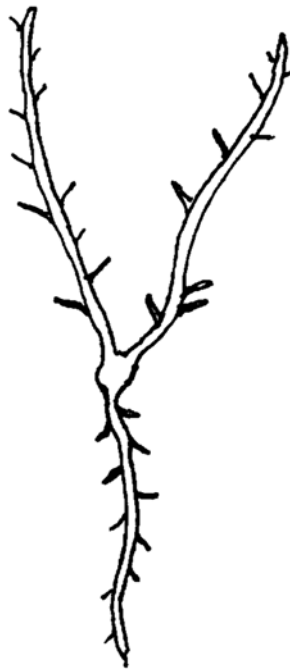


Figure 40: Egg and larval galleries



Figure 41: Galleries



(11-030) IPS ENGRAVER BEETLE

Species: *Ips spp.*

Host: Ponderosa pine, lodgepole pine, Jeffrey pine

Secondary host: Limber pine, western white pine, eastern white pine, pitch pine, digger pine, knobcone pine, Monterey pine, jack pine, pinyon pine, singleleaf pine, slash pine, Engelmann spruce, Sitka spruce, blue spruce, white spruce

Injury:

Populations commonly infest slash, wind throw, the tops of live trees, or whole, live trees. In low population years, infestation in standing trees occurs in groups of fewer than 10 trees. In warm, dry years, beetles kill large numbers of apparently healthy saplings. In unthinned young stands, groups of 50-500 trees may be killed. Top killing of older trees is followed by successive attacks in the lower boles. The first indication of attack on down material is reddish-orange dust in small mounds at beetle entrance holes. In standing trees, infestation progresses from top downward. Boring dust lodges in bark crevices and upon the ground near infested trees. Foliage begins fading within a few weeks after attack; most killed trees are completely faded by late summer or early fall, but some may not fade until the following spring.

Green trees with boring dust (no pitch tubes) indicate a current successful attack. Trees with reddish-brown needles and diagnostic galleries indicate last year's successful attack. Pine engraver beetle is highly associated with top-kill of larger pines (Severity Code 4). Other bark beetles often attack trees whose tops were previously infested by pine engravers.

Description:

Three to four egg galleries branch from a central nuptial chamber. Egg galleries generally run with the grain of the wood, and are typically 5 to 10 inches long. There may be from one to five generations per year, depending on local weather. The egg is oval, pearly-white about the size of a pinhead. The larva is a yellowish, legless grub with a brown head. Pupae are shining white with wing covers folded under the abdomen. The adult is cylindrical, 1/8 to 3/16 inches long. It has four small spines on each side of the declivity at the hind end of the wing covers. The new adult is pale yellow at first, darkening to reddish-brown then to black at maturity.

Defect:

Successful attacks will kill a tree, and introduce blue stain that will devalue wood. In pines, this stain may be up to 10 inches deep.

Figure 42: Topkill



Figure 43: Egg gallery

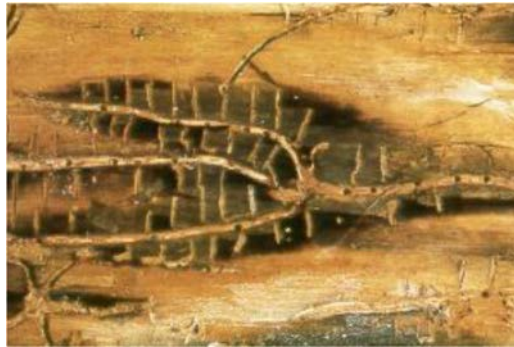


Figure 44: Adult



(11-031) (*IPS TRIDENS*)

<u>Species:</u>	<i>Ips tridens</i>
<u>Host:</u>	Englemann spruce, white spruce, Sitka spruce
<u>Range:</u>	Alaska, Idaho, Montana, Wyoming, Oregon, California
<u>Injury:</u>	Attacks only weakened and down trees, is not a serious pest
<u>Description:</u>	Females take several forms. Adults have four spines. The lower front portion of the female head is usually swollen and it may contain a brush of hairs.

(11-032) WESTERN ASH BARK BEETLE

<u>Species:</u>	<i>Leperisinus californicus</i>
<u>Host:</u>	Ash
<u>Range:</u>	Washington south to California and east to North Dakota, Colorado, Oklahoma

<u>Injury:</u>	Breed in felled, injured, or weakened trees, causing little economic damage. They can be abundant in cordwood.
<u>Description:</u>	Construction uniform, transverse egg galleries that score both the wood and inner bark of the bole and branches. The adults are robust beetles, 2 to 4 mm long, evenly rounded behind, and covered in scales that give them a mottled appearance.

(11-033) OREGON ASH BARK BEETLE

<u>Species:</u>	<i>Leperisinus oregonus</i>
<u>Host:</u>	Oregon ash
<u>Range:</u>	Washington to California
<u>Injury:</u>	Breed in felled, injured, or weakened trees, causing little economic damage. They can be abundant in cordwood.
<u>Description:</u>	Construct uniform, transverse egg galleries that score both the wood and inner bark of the bole and branches. The adults are robust beetles, 2 to 4 mm long, evenly rounded behind, and covered in scales that give them a mottled appearance. This beetle is a little darker than <i>L. californicus</i> .

(11-034) (ORTHOTOMICUS CAELATUS)

<u>Species:</u>	<i>Orthotomicus caelatus</i>
<u>Host:</u>	Lodgepole pine, western white pine, Englemann spruce, white spruce, Sitka spruce, western larch, Balsam fir
<u>Secondary host:</u>	Shortleaf pine
<u>Range:</u>	Eastern and western states
<u>Injury:</u>	It is a secondary species and attacks are made in fresh stumps and the lower bole of large standing trees, often in combination with other bark beetles.
<u>Description:</u>	The gallery pattern is radiate, similar to <i>Ips</i> , but smaller.

(11-035) CEDAR BARK BEETLE

<u>Species:</u>	<i>Phloeosinus spp.</i>
<u>Host:</u>	Incense cedar, sequoia, white cedar, Arizona cypress, Monterey cypress, western redcedar, Port Orchard cedar, Alaska yellow cedar
<u>Injury:</u>	These beetles are not aggressive and are found working under the bark of trunks, tops, and limbs of weakened, dying, or felled trees, or of broken branches. Occasionally they become numerous and aggressive and attack and kill apparently healthy trees. This is the only genus of beetles to attack these species.
<u>Description:</u>	Adults are reddish brown to black, often shiny beetles, ranging from 2 to 4 mm long.

(11-036) WESTERN CEDAR BARK BEETLE

<u>Species:</u>	<i>Phloeosinus punctatus</i>
<u>Host:</u>	Western red cedar, incense cedar, giant sequoia, western juniper
<u>Range:</u>	Oregon, Washington, Idaho, California
<u>Injury:</u>	These beetles are not aggressive and are found working under the bark of trunks, tops, and limbs of weakened, dying, or felled trees, or of broken branches. Occasionally they become numerous and aggressive and attack and kill apparently healthy trees. This is the only genus of beetles to attack these species.
<u>Description:</u>	Adults are reddish brown to black, often shiny beetles, ranging from 2 to 3 mm long. Egg galleries consist of one longitudinal tunnel about 25 mm long or two shorter ones in the form of a "V."

(11-037) TIP BEETLE

<u>Species:</u>	<i>Pityogenes spp.</i>
<u>Host:</u>	Pines, including: ponderosa, red, eastern white, loblolly, whitebark, bristlecone, foxtail, jack, lodgepole, shortleaf, pinyon, limber, Jeffrey, western white
<u>Secondary host:</u>	Englemann spruce, red sprue
<u>Injury:</u>	They are of secondary importance and attack the tops and limbs of weakened, dying, and newly fallen trees. In large numbers, they may kill small trees growing near their breeding place.

Description: Adults are slender, dark brown beetles, 2 to 3.5 mm long. They have two or three spine-like teeth on the sloping rear end of each wing cover. The females have a hole in the front of the head. Several egg galleries radiate from the nuptial chamber containing one male.

(11-038) DOUGLAS-FIR TWIG BEETLE

Species: *Pityophthorus pseudotsugae*

Host: Douglas-fir and true firs including Pacific Silver fir

Secondary host: Hemlock

Range: Western United States

Injury: Injured, dying, dead, and down trees are attacked. They breed in twigs and small branches. Sometimes they attack larger branches and the thin barked portions of the bole.

Description: Adults range from 1.5 to 3.0 mm long, but identification is difficult. Galleries under the bark consist of a central nuptial chamber from which radiate several egg galleries.

(11-039) TWIG BEETLE

Species: *Pityophthorus spp.*

Host: Balsam fir, maple, walnut, hemlock, larch, Douglas-fir, sweetgum, spruce, pine

Injury: Twig beetles rarely cause serious direct seed losses, but some species may affect future cone crops by destroying shoots containing flower primordial or shoots bearing first-year cones and young maturing cones. Occasionally, twig beetles attack and kill grafted scions and air layered shoots, thus preventing successful vegetative propagation in genetics and seed orchard establishment.

(11-040) FOUREYED SPRUCE BEETLE

Species: *Polygraphus rufipennis*

Host: Sitka spruce, white spruce, black spruce

Secondary host: Lodgepole pine, limber pine, Balsam fir, larch

<u>Range:</u>	All spruce forest in the United States, including Alaska
<u>Injury:</u>	It is a secondary species. It breeds under the bark of smaller and drier portions of the bole of dead and dying spruce.
<u>Description:</u>	Adults are 2 to 3 mm long, stout, black, and moderately clothed with scale-like hairs. They construct a nuptial chamber in the inner bark from which radiate one to five short, curved egg galleries.

(11-041) FIR ROOT BARK BEETLE

<u>Species:</u>	<i>Pseudohylesinum granulates</i>
<u>Host:</u>	True fir
<u>Secondary host:</u>	Douglas-fir, hemlock
<u>Range:</u>	Washington, Oregon, California
<u>Injury:</u>	It is usually a secondary species. Attacks are made in the basal portion of the tree, and they often extend below ground.
<u>Description:</u>	Adult is 4.1 to 5.5 mm long. Egg galleries are short and irregularly transverse.

(11-042) (PSEUDOHYLESINUS DISPAR)

<u>Species:</u>	<i>Pseudohylesinus dispar</i>
<u>Host:</u>	White fir, grand fir, noble fir, California red fir
<u>Range:</u>	Central California to Washington, Idaho, Montana
<u>Injury:</u>	Attacks the bole and larger branches of decadent trees, ranging from saplings to mature trees. They construct egg galleries that are 4 to 12 cm long.
<u>Description:</u>	The adult is 2.9 to 4.7 mm long and clothed with light brown and ash-gray scales in a variegated pattern.

(11-043) DOUGLAS-FIR POLE BEETLE

<u>Species:</u>	<i>Pseudohylesinus nebulosus</i>
<u>Host:</u>	Douglas-fir and bigcone Douglas-fir

<u>Range:</u>	Throughout the range of Douglas-fir stands
<u>Injury:</u>	Attacks thin barked portions of slash, wind thrown trees, and the dead tops and branches of trees. It attacks saplings and poles infected with root rots. Adults bore into the twigs of live trees.
<u>Description:</u>	Adult is 2.4 to 3.1 mm long. A well-defined nuptial chamber is not easily visible from the inner surface of the bark.
<u>Defect:</u>	The beetles alone do not cause defect, but are associated with other severe problems, particularly cull from root rot.

Figure 45: Gallery



(11-044) SILVER FIR BEETLE

<u>Species:</u>	<i>Pseudohylesinus sericeus</i>
<u>Host:</u>	Pacific silver fir, Douglas-fir, western hemlock
<u>Range:</u>	Alaska to California, eastward to Montana
<u>Injury:</u>	This beetle prefers weakened trees or fresh slash. It creates small, inconspicuous entrance holes. Small amounts of reddish boring dust can sometimes be found under each entrance hole and around the base of an infested tree. Foliage of attacked trees turns yellow, then bright red, and then gradually brown, remaining on the tree about 2 years. Silver fir beetle is not usually associated with top-kill (Condition Code 5).
<u>Description:</u>	Galleries are similar to the fir engraver except they are not deeply scored into the sapwood and are generally shorter (1/2 to 5 inches on average).

Figure 46: Gallery



Figure 47: Gallery



(11-045) SMALL EUROPEAN ELM BARK BEETLE

Species: *Scolytus multistriatus*

Host: Elms

Range: Most of the United States

Injury: Beetles excavate a 1 to 2 inch straight egg gallery parallel with the wood grain. Larval mines are roughly perpendicular to the egg gallery. The result is a design resembling a long-legged centipede on the inner bark and wood distance. These beetles are a prime vector of the Dutch elm disease.

Description: Adults are reddish-brown beetles about $\frac{1}{4}$ inch long. The underside of the posterior is concave and armed with a prominent projection or spine on the undersurface of the abdomen. The larvae are typical, white or cream-colored, legless grub, about the same size as adults.

Figure 48: Adult with parasite



(11-046) SPRUCE ENGRAVER

<u>Species:</u>	<i>Scolytus piceae</i>
<u>Host:</u>	Spruce
<u>Secondary host:</u>	Fir and larch
<u>Injury:</u>	Secondary species, which attacks bole and larger limbs
<u>Description:</u>	Adults are shiny, dark brown to black beetles 2 to 5 mm long. The second abdominal segment is armed with a spine in both sexes. The spine is separated at the base from the margin of the segment on which it stands. The gallery pattern is usually the bayonet type. It breeds in broken limbs and tops.

(11-047) HICKORY BARK BEETLE

<u>Species:</u>	<i>Scolytus quadrispinosus</i>
<u>Host:</u>	Hickory
<u>Secondary host:</u>	Butternut, pecan
<u>Range:</u>	Quebec to Georgia, Alabama, Mississippi; west to Minnesota, Kansas, Oklahoma, Texas
<u>Injury:</u>	Dying leaves, twigs, and trees with red foliage are the first evidence of attack. Short, vertical egg galleries with radiating larval galleries etched in the sapwood are good indicators of damage.
<u>Description:</u>	The adult is short, stout, black, and nearly hairless and 1/5 inch long. The underside of the posterior is concave and has spines. The larvae are typically white or cream-colored, legless grubs, about the same size as the adults.

(11-048) TRUE FIR BARK BEETLE

<u>Species:</u>	<i>Scolytus spp.</i>
<u>Host:</u>	True fir and Douglas-fir
<u>Secondary host:</u>	Spruce, pine, larch
<u>Description:</u>	Adults are shiny, dark brown to black beetles 2 to 5 mm long. They are easily recognized by the "sawed off," sometimes concave, rear end of the abdomen.

(11-049) DOUGLAS-FIR ENGRAVER

<u>Species:</u>	<i>Scolytus unispinosus</i>
<u>Host:</u>	Douglas-fir
<u>Secondary host:</u>	Hemlock, true fir
<u>Range:</u>	Washington, Oregon, California, Idaho, Montana
<u>Injury:</u>	Attacks weakened, injured, dying, and recently dead young trees. It often attacks in conjunction with other bark beetles.
<u>Description:</u>	Adults are less than 3 mm long. The male has a prominent spine projecting from the middle of the nearly vertical second segment of the abdomen.

Figure 49: Gallery



(11-050) FIR ENGRAVER

<u>Species:</u>	<i>Scolytus ventralis</i>
<u>Host:</u>	White fir, grand fir, California red fir, Shasta red fir
<u>Secondary host:</u>	Douglas-fir, subalpine fir, western hemlock, Englemann spruce
<u>Range:</u>	Washington, Oregon, California, Wyoming, Colorado, Arizona, New Mexico

Injury:

Fir engravers bore entrance holes along the main stem, usually in areas that are greater than 4 inches in diameter. These holes are about 0.1 inch wide and are most often located in bark crevices or in the roughened bark at the junction of a branch and the trunk, but other sites may be attacked as well.

Reddish-brown or white boring dust may be seen along the trunk in bark crevices and in cobwebs. Streams of clear pitch often flow from the entrance holes down the bole, and vigorous firs may exude enough pitch to drown the beetles or cause them to abandon their entrance holes. The creamy pitch tubes that are often formed when bark beetles attack pines are not produced on firs.

Once under the bark, the adults excavate egg galleries that engrave the sapwood, the layer of wood under the cambium. The egg gallery is horizontal, cutting across the grain; the larval galleries extend at right angles, along the grain.

Initial attacks in the crown may girdle the branches, disrupting the flow of water and nutrients and killing the branch. The appearance of yellowed or red branches in an otherwise green tree, commonly called "flagging," is the first easily seen sign of infestation. Numerous attacks over part of the entire bole may kill the upper portion of the crown or the entire tree in a single summer. The foliage turns yellow and then red over the 3 to 6 months after an attack. Sometimes, however, only strips or patches of the bole are attacked. A healthy tree can recover if sufficient areas of cambium (the layer of growth cells) remain, and top-killed trees can produce new leaders. When the cambium heals over, a brown pitch pocket marks the injury. The usual evidence of such attacks is a roughened patch of bark or scattered dead branches girdled at the base by the egg galleries.

Defects:

Lumps on the bark are healed attack points and indicate defect at least 3 inches into the stem and 6 inches around each lump. Heavily attacked trees will die. This beetle is usually associated with root problems such as root rot.

Figure 50: Adult



Figure 51: Distribution



Figure 52: Gallery



(11-052) SITKA SPRUCE ENGRAVER BEETLE

Species: *Ips conncinnus*

Host: Sitka spruce

Range: Alaska to northern California

Injury: Attacks the bole of injured, dying, and down Sitka spruce.

Description: The adults are from 3.0 to 3.5 mm long, and the smallest of the western *Ips*. The elytral declivity is nearly vertical and is armed with three slender spines on each side.

(11-053) FOUREYED BARK BEETLE

<u>Species:</u>	<i>Polygraphus spp.</i>
<u>Host:</u>	Spruce
<u>Range:</u>	Western United States
<u>Injury:</u>	Usually a secondary species that attack dying, dead, and down trees.
<u>Description:</u>	They have a completely divided set of eyes, which resemble “four eyes.”

(11-054) HEMLOCK BEETLE

<u>Species:</u>	<i>Pseudohylesinus tsugae</i>
<u>Host:</u>	Western hemlock
<u>Secondary host:</u>	Mountain hemlock, Pacific silver fir, subalpine fir
<u>Range:</u>	Alaska to California
<u>Injury:</u>	It breeds in the lower boles of dying trees and in recent slash and down trees.
<u>Description:</u>	The adult is 3.2 to 4.5 mm long.

Figure 53: Hemlock hylesinus gallery

