

PINE ENGRAVER



The pine engraver, *Ips pini*, is one of the most widely distributed bark beetles in North America. Its main hosts include seven species of pine. It is most important in Idaho as a pest in ponderosa pine; however, it also attacks and kills lodge pole pine and western white pine.

In most years, the pine engraver is not important as a tree killer. It commonly infests logging slash, cull logs, and windthrown trees. When populations are low, the beetle may kill widely scattered single trees or small groups of fewer than 10 trees. During outbreaks, beetles may kill groups of 50 to more than 500 trees, especially in unthinned young stands. Ponderosa pine in the 40-60 year age class averaging 5 to 16 inches dbh are most susceptible to attack. Older, larger trees are occasionally topkilled, and the lower bole may be attacked by other species of bark beetles.

Indicators of Attack

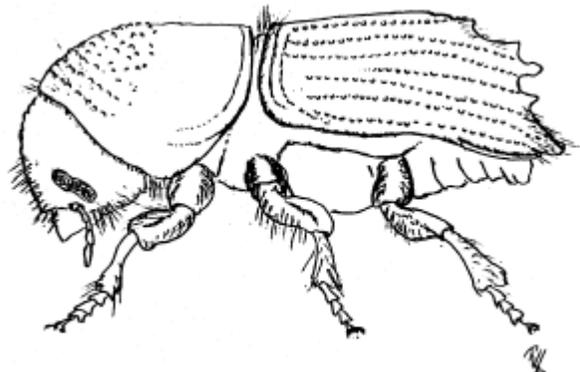
The faded, dried-out trees that are commonly seen from long distances are the most visible indicator of attack. The needles may be yellow-green by August, yellow-orange in fall and winter, and dark burnt-orange the following spring, nearly a year after the initial attack. Complete fading may occur by fall in seasons that are extremely dry.

The first indications of an attack in down material are small mounds of reddish-orange boring dust that appear at points of beetle entry on the upper surface of slash or logs. Spring rains may wash the boring dust off, but

it can usually be seen in bark crevices or on the ground beneath the slash. In standing trees, the boring dust can be found lodged in bark crevices and on the ground around the base of the tree.

Description

Ips pini has four stages in its life cycle: egg, larva, pupa, and adult. The egg is oval, pearly white, and the size of a pinhead. The larva is a yellowish-white, legless grub with a brown head. The pupa is shiny white and resembles the adult, but its wing covers are folded around its body. This is the stage when the insect changes from the larval form to the adult. A new (callow) adult is pale yellow, but turns dark reddish-brown before flying. The adults are cylindrical and 1/8th to 3/16th of an inch long. Their most distinguishing feature is the posterior end where the wing covers are cut at an angle, hollowed out or depressed slightly with four small spines on each side of the depression.



Pine Engraver Adult Beetle

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Life History and Habits

Beetles in Idaho overwinter most successfully as adults in the duff and litter of the forest floor. Sometimes they pass the winter under the bark or at the base of trees attacked in the summer. Survival of all life stages that overwinter in slash or standing trees is reported to be poor.

Spring beetle flight usually begins in April or May when the daily maximum temperatures reach 60-70°F. As overwintering beetles become active, they infest fresh slash or winter-damaged trees, but normally cannot successfully attack standing green trees. The distance traveled in their search for slash has been estimated to be at most 1/4 mile.

Attacks are initiated by the male beetle, which bores into the inner bark and excavates a chamber several times his size. Two or three females usually join the male. After mating, each female constructs an egg gallery or tunnel in the inner bark, slightly scoring the wood surface. During gallery construction, the boring dust or frass is pushed to the outside, leaving the tunnel clean. The egg galleries radiate from the nuptial chamber and frequently form an inverted-Y pattern aligned with the grain of the wood.

The female beetle lays her eggs in niches cut in the side of the gallery. The eggs hatch in 4-14 days. The larvae mine laterally from the egg gallery for 1 or 2 inches, feeding for 10-20 days. When fully developed each larva pupates,



Pine Engraver egg gallery

changing to an adult at the end of its tunnel. New adults begin to appear about 10 days after pupation, 40-55 days after the initial attack by the parent beetles. This generally occurs in late June or early July. This newly emerging generation of beetles is capable of attacking and killing standing green trees. However, when fresh slash is available, the beetles will attack it rather than standing trees.

The generation of beetles that develops from these early summer attacks normally matures in late summer, and the adult beetles search out protective sites in the duff or under bark to overwinter. During extended summers or in warmer areas such as southern Idaho, a third generation of beetles may develop. This third generation may not reach maturity before cold weather and is forced to overwinter as larvae or pupae. These life stages generally suffer higher winter mortality than adults.

Factors That Stimulate Pine Engraver Activity

Most pine engraver problems are associated with pine slash. This may result from disturbances such as wind throw, snow or ice breakage, logging, thinning, fires, road construction, or housing developments. Pine slash or trees weakened by extreme drought in spring or summer also attract beetles and provide ideal conditions for beetle attack and population buildup. Beetles making attacks produce chemical odors (pheromones) that attract more beetles to the site. This often results in increased numbers of killed trees.

Because overwintering beetles normally only infest fresh green pine slash, logging or thinning slash created from January through June can be especially hazardous by providing large amounts of breeding material. Ideally, such slash should not be created during this period unless it can be treated before the beetles emerge.

During years of extremely low winter and spring precipitation, trees may become severely stressed. When this occurs, the overwintering pine engraver has been known, on rare occasion, to attack and kill living trees.

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Predicting Pine Engraver Outbreaks

When large amounts of slash are available in the spring as the overwintering population becomes active, there will likely be tree mortality later in the year. Also, lower than normal precipitation between April and July has been used to predict the intensity of pine engraver outbreaks. If precipitation is 75% of normal or less, moderate to heavy tree mortality has occurred in overstocked, second-growth ponderosa pine stands up to 80 years old. Damage may continue for 2 to 3 years. Large groups of young saw timber, up to 30 inches dbh, have been attacked and killed under conditions of extreme drought.

Preventive Measures for Minimizing Tree Mortality

1. Thinned, vigorous stands of ponderosa pine are less attractive to pine engraver attack, particularly during drought years. A residual basal area of 80-100 sq. ft. has been found to provide good stand resistance. However, recently thinned stands may temporarily be more attractive to the beetles until the trees increase their vigor.
2. The optimum period for logging or thinning activity in ponderosa pine where slash will be created is late July to November. Activity either earlier or especially later increases the potential for subsequent tree mortality.
3. Fresh pine slash should be minimized or not created during the months of December through May. If the beetles do not have fresh slash in the spring, the population dies down. Slash created in late summer or fall generally does not contribute to population buildup.
4. When creating slash in the high-risk months of December through May cannot be avoided, several management practices can minimize the potential impact:
 - a. Prompt slash disposal: Dozer trampling of slash or pulling new drags of logs

across the slash to dislodge the bark is effective in reducing the amount of breeding material. Chipping the slash completely eliminates the food source. This is especially usable in urban developments. Spring burning of slash is also effective, but care needs to be taken that fires do not escape and scorch the remaining trees. Scorched trees sometimes are very attractive to both bark beetles and wood-boring beetles.

- b. When general slash disposal is impractical, scattering the slash into openings where it is exposed to direct sunlight dries it out faster and may make it less suitable for use by the pine engraver.
 - c. When beetle populations in spring slash constitute a threat, the creation of a continuous supply of fresh slash during the flight period of the emerging adults will generally attract the beetles and keep them out of the standing trees. This technique is known as providing a "green chain". New slash should be produced just as the beetles enter the pupal stage. For the first generation this is usually in mid June. It is important to remember that the beetles are not known to fly more than 1/4 mile in search of slash. For this reason, the green-chain slash needs to be well distributed throughout the area of activity.
5. Logging or thinning operations at the wrong time can create many problems that lead to excessive killing of residual trees. Methods that may help reduce the risk include:
 - a. Creating large piles of slash (at least 10 feet wide by 20 feet long) often serves to create traps for the beetles. The slash deep in the pile stays fresh enough to be attractive to the beetles for two or three months. Attacks are made in the top layers, then the next generation drops deeper into the pile to make new attacks. Piles need to be distributed throughout the sale area, keeping in mind the 1/4 mile flight capability of the beetles. The

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population cycle is broken either by burning the piles in the fall, which will destroy any beetles that are overwintering at that site, or by not having a fresh supply of slash the following spring.

- b. Use the “green chain” technique by leaving portions of the stand to be cut just before the flight of the next generation of adults. To be most effective in attracting beetles, the cut trees should be left in place with the branches intact. Trees cut for lumber purposes should be left on the site for two weeks or until the main flight has finished. They should then be picked up and removed from the area. The beetles will be killed in processing at the mill. Beetles from precommercial thinning operations will be controlled by not having a fresh supply of slash the next spring.
 - c. Fall and remove trees with exposed or disturbed roots or that have large patches of bark broken off.
6. Pheromones of species of beetles that compete with the pine engraver are being developed for use to keep the pine engraver out of slash. At some point in the future, we hope to have a commercially available product that can be spread through slash that will prevent pine engraver attacks from taking place. Once this product is ready, we will be able to protect the standing trees from attack.
7. In housing or other development projects, avoid disturbing the roots of trees that are left. Damaging roots often weakens the trees and they become susceptible to attack. Weakened or badly damaged trees should be removed before completion of the project. Pine slash created by housing developments should be disposed of as soon as possible; it should not be left near ornamental pines because attacking beetles may overflow the slash and infest standing trees.

- a. Avoid digging or removing topsoil that covers the roots. Also avoid back-filling with dirt over root areas. Four inches or more of extra dirt over the roots may stress the trees, making them attractive to attacking beetles.
- b. When green pines are cut, do not leave the slash, fresh logs, or pieces against standing living trees. Beetles that develop in this material tend to crawl directly to the standing trees to make their attack. Snags or dead wood that is dry and has loose bark are not a threat as they will not support beetle development.

Useful links:

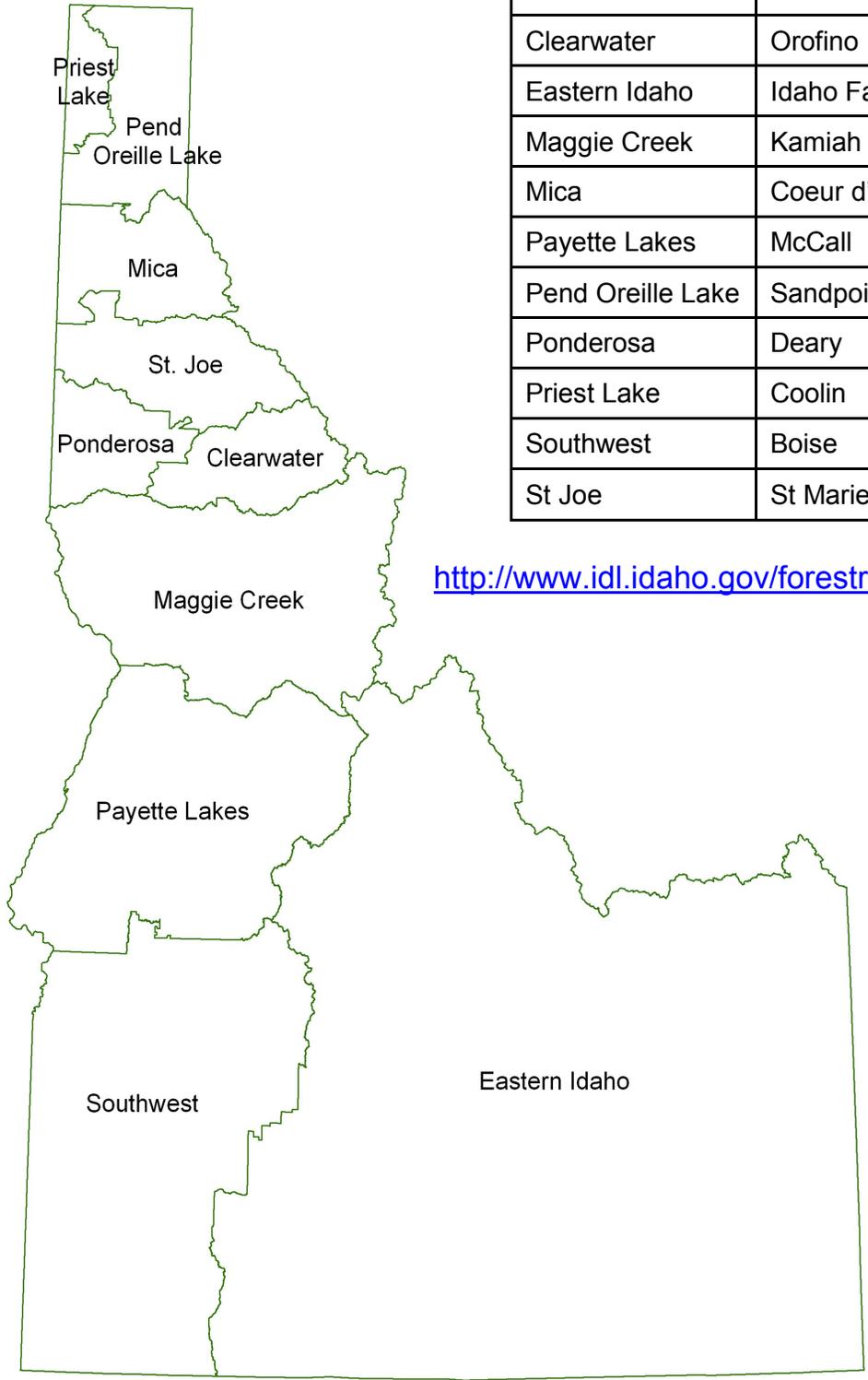
[Forest Insect and Disease Leaflet](#)

[USFS Region 1 Field Guide](#)

[USFS Region 1 Management Guide](#)



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<http://www.idl.idaho.gov/forestry/forest-health/index.html>