

Pine Bark Beetles

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Pine bark beetles in Arizona are generally of the genus *Ips* or *Dendroctonus*. However, several other genera also attack pine, including: *Hylastes*, *Hylurgops*, and *Pityogenes*. Often several species will attack at the same time. Identification of specific beetle species can be difficult. Identification can be aided by knowing the host species attacked, time of year, and the design of the galleries (tunnels) created by the adults and larvae.

Bark beetles contribute to the death of thousands of ponderosa pines in Arizona each year. Most often when larger trees are attacked and killed they have been weakened by drought, lightning, construction activity or they have been growing on poor sites. Of special concern is the loss of high-value trees at home sites or in developed recreation areas.

Evidence of infestation

Fading foliage in the tree is often the first sign of a beetle attack. Trees attacked by *Ips* spp. typically fade from the top of the crown downward, while *Dendroctonus* spp. killed trees fade from the bottom of the crown upward. The needles change from green to a light straw color within a few weeks to one year after attack and eventually become brown or red. Dust caused by boring in the bark crevices and at the tree base is another sign. Often, numerous small pitch tubes (globules of pitch $\frac{3}{4}$ to 1 $\frac{1}{4}$ " diameter) appear on the trunk of infested trees. The pitch tubes generally have a creamy appearance, much like crystallized honey. A pink or red tint may be present in the pitch. The presence of one or two pitch tubes may not mean that a beetle was successful. Often a few pitch tubes can indicate that the tree successfully repelled the attacking beetles. Clear sap that runs down the bole (trunk) or limbs is generally not from pine bark beetles.

Life history

Life history varies with each species; the following description is true for most. Beetles become active in April and early May. Adults emerge from trees, slash, or



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Typical bark beetles are $\frac{3}{16}$ – $\frac{1}{4}$ " (4–6 mm) in length.

firewood infested the previous fall. Adults prefer freshly cut green trees or trees stressed from drought but when a large number of beetles are present, they attack live pines. *Ips* spp. beetles characteristically attack the upper portion of the tree, but when beetles are abundant, the entire tree can be invaded and killed. Several species will only attack the base of the bole (see Table 1).

Adults bore through the outer bark and then tunnel and lay eggs in the soft inner bark. Eggs hatch in about a week and larvae feed on the inner bark for six to eight weeks before they pupate. It is the boring activity of the adults and larvae that kills trees by girdling in combination with stain fungi the beetles introduce. The development of larvae and pupae of some beetles is completed in the outer bark. Adults develop from pupae and emerge by boring out through the bark. After emergence, adults fly and attack freshly cut material or susceptible trees and start the next generation. Most beetles produce one to two generations each year but some may have three or four. The overlap of generations during the summer may produce continuous attacks.

Table 1. *Dendroctonus* and *Ips* Species that Attack Pines in Arizona

Species	Hosts	Comments
<i>Dendroctonus adjunctus</i> – roundheaded pine beetle	<i>Pinus ponderosa</i> , <i>P. flexilis</i>	Attacks the basal portion of the bole of overstocked and pole sized trees. Flies during the fall.
<i>D. approximatus</i> – larger Mexican pinebeetle	<i>P. ponderosa</i>	Attacks the basal portion of the bole.
<i>D. brevicomis</i> – western pine beetle	<i>P. ponderosa</i>	Attacks mid bole of over mature or trees weakened by drought > 6 in. diameter. Introduces blue stain fungi. Can kill vigorous trees during outbreaks.
<i>D. frontalis</i> – southern pine beetle	<i>P. ponderosa</i> , <i>P. leiophylla</i> , and <i>P. engelmannii</i>	Rarely a pest in the Western states, but has been killing pine in combination with <i>D. mexicanus</i> and <i>Ips</i> in the Chiricahua Mountains of southern Arizona.
<i>D. ponderosae</i> – mountain pine beetle	<i>P. ponderosa</i> , <i>P. edulis</i> , <i>P. flexilis</i> , <i>P. aristata</i> , and <i>P. monophylla</i>	Attacks the entire bole of trees > 4 in diameter. Can kill numerous trees during outbreaks.
<i>D. valens</i> – red turpentine beetle	<i>P. ponderosa</i>	Attacks lower bole and root crown of weakened or injured trees.
<i>Ips calligraphus</i> – six spined ips	<i>P. ponderosa</i> and <i>P. flexilis</i>	Attacks the lower bole of large trees.
<i>Ips confuses</i> – pinyon ips	<i>P. edulis</i> and <i>P. monophylla</i>	Attacks basal part of the bole of injured trees.
<i>Ips integer</i>	<i>P. ponderosa</i>	Attacks the entire bole of weakened and felled trees.
<i>Ips hoppingi</i>	<i>P. cembroides</i>	
<i>Ips knousi</i>	<i>P. ponderosa</i>	Usually associated with tree killing <i>Dendroctonus</i> species.
<i>Ips woodi</i>	<i>P. flexilis</i>	
<i>Ips lecontei</i> – Arizona five-spined ips	<i>P. ponderosa</i>	Attacks upper bole followed by lower of sapling and pole size trees.
<i>Ips fonanseai</i>	<i>P. ponderosa</i> and <i>P. flexilis</i>	Attacks resemble those by <i>Ips pini</i> .
<i>Ips mexicanus</i> – Monterey pine ips	<i>P. flexilis</i>	Attacks the bole of living, injured or dying trees.
<i>Ips latidens</i>	<i>P. ponderosa</i>	
<i>Ips pini</i> – pine engraver	<i>P. ponderosa</i> and <i>P. flexilis</i>	Attacks 2-8 in. diameter trees and the tops of large trees when drought stressed. Also feeds in windfalls, logs, and slash.

Pinus ponderosa–ponderosa pine; *P. leiophylla*–Chihuahua pine; *P. engelmannii*–Apache pine; *P. edulis*–pinyon pine; *P. flexilis*–limber pine; *P. aristata*–bristlecone pine; *P. monophylla*–single leaf pine; *P. cembroides*–Mexican pinyon pine.

Prevention and control

Freshly cut ponderosa pine slash and firewood are subject to attack by bark beetles. The success of beetle attacks and production of young beetles are greatly influenced by when trees are cut. Trees cut during the late summer and fall are seldom successfully attacked, because the inner bark dries during the fall and winter. The inner bark of green trees cut from January to July remains moist and suitable for beetle habitat. An exception to this is the round headed pine beetle, which flies during the fall, and attacks trees at that time. The Arizona State Land Department found this beetle attacking trees near homes in the Santa Catalina Mountains. Round headed pine beetle activity was found near trees that had been thinned and chipped in October.

The slash and limbs of green pine trees should be treated (according to safe conditions and laws) within 30 days after a tree has been cut down. For more information on slash management refer to “Managing Slash to Minimize Colonization of Residual Leave Trees by *Ips* and Other Bark Beetle Species Following Thinning in Southwestern

Ponderosa Pine”, University of Arizona, College of Agriculture and Life Sciences, Bulletin AZ1448. The bole of the tree should receive the same treatment, unless it is needed for firewood or poles. Then the material should be piled away from living pine trees and covered securely to the ground with heavy, clear plastic. The plastic covering should be left on the pile at least 60 days if the trees are cut during the April through October period. Heat builds up under the plastic and kills or traps the beetles. This treatment also dries the inner bark limiting the food for the beetles. Trees cut in winter should be used in a fireplace or disposed of before April. If not used, the firewood that is left at the end of March should be covered for 60 days. If logs are to be used as poles they should be peeled as soon as possible. For more information on treating firewood to prevent bark beetles refer to “Firewood and Bark Beetles in the Southwest”, University of Arizona, College of Agriculture and Life Sciences, Bulletin AZ1370.

Once a beetle build-up starts in the neighborhood all live pine trees are targets for an attack, but some trees are easier targets than others. Trees that have been damaged or weakened by blasting, excavation, raising of the soil grade, lightning, disease, lack of water, septic systems, or other stresses are usually not able to withstand an attack as well as healthy trees. An attack by the beetle may not be detected until the beetle has completed its life cycle and the tree starts to fade and die. At this time, the beetle build-up can be stopped if the tree is immediately cut and the material treated within a few days as described above.

There are no practical and effective sprays or injections to stop an attack on green trees. Insecticides are not recommended once bark beetles have successfully attacked. Un-infested trees can be protected from beetle attacks by spraying with insecticides. When spraying, the entire trunk of the tree up to 4” diameter must be covered. This is a protective measure only. Insecticide will not kill beetles once they enter the tree. The available chemicals for this purpose can vary from year to year. You must use a product that is especially formulated for bark beetles. Typical home and garden insecticides will be ineffective. Check with your local county Extension office for current recommendations on the proper insecticides to use as a preventive measure or refer to “Preventing Bark Beetle Attacks on Conifers with Insecticides”, University of Arizona, College of Agriculture and Life Sciences, Bulletin AZ1380.

Healthy trees offer some resistance to attack. Watering during dry periods (when less than 2 in. of moisture per month occurs) can help keep trees healthy. Thinning out dense stands of trees will make more water available for the remaining trees. Insecticides can be sprayed on the bole of the tree to prevent initial attack by beetles. This must be done prior to beetle emergence in the spring to be effective. A fading crown and boring dust are the surest signs that a live tree has been attacked. When the entire crown begins to fade, there is no hope of saving the tree, and it should be removed as quickly as possible to prevent emerging



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Bark Beetle Killed Trees

beetles from attacking other trees. Once the entire crown has turned yellowish brown, it is generally too late to stop the spread because the beetles have already flown to attack nearby trees.

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