



# *Pest Watch:* California Fivespined Ips— A Pine Engraver Beetle New to Washington State

WASHINGTON STATE UNIVERSITY EXTENSION FACT SHEET • FS085E

WSU Extension *Pest Watch* fact sheets identify new agricultural pests in or near Washington State that pose environmental and economic threats. In the event of a severe pest outbreak, a *Pest Alert* will be issued with emergency pest management and control information.

## Introduction

CFI damages pines and land managers and homeowners will need to adopt effective management practices when localized outbreaks occur. (Management strategies vary widely and depend on which pest is present.) Other pine bark beetle pests include pine engravers (*Ips pini*), mountain pine beetles (*Dendroctonus ponderosae*), western pine beetles (*Dendroctonus brevicomis*), and red turpentine beetles (*Dendroctonus valens*) (Shaw et al. 2009). The purpose of this fact sheet is to alert forest land managers and homeowners with pines trees that there is now an additional species of the pine bark beetle in Washington State.

Before 1945, CFI was considered a bark beetle of little pest significance. Since then, it has caused significant damage to pines in California and Oregon. In California, increased post-war logging in second-growth ponderosa pine created ample slash and other conditions that allowed beetle outbreaks for short periods of time, resulting in significant tree mortality and topkill (Schultz and Bedard 1987). Although in more recent times logging practices have been altered to avoid CFI outbreaks, widespread tree mortality can still be observed when tree stress is high, such as during times of drought, or following fires where large numbers of trees are injured. Since 1999, increased beetle activity and associated damage has been observed in young stands of the Willamette Valley race of ponderosa pine established during the late 1980s and early 1990s (Flowers and Kanaski 2007).

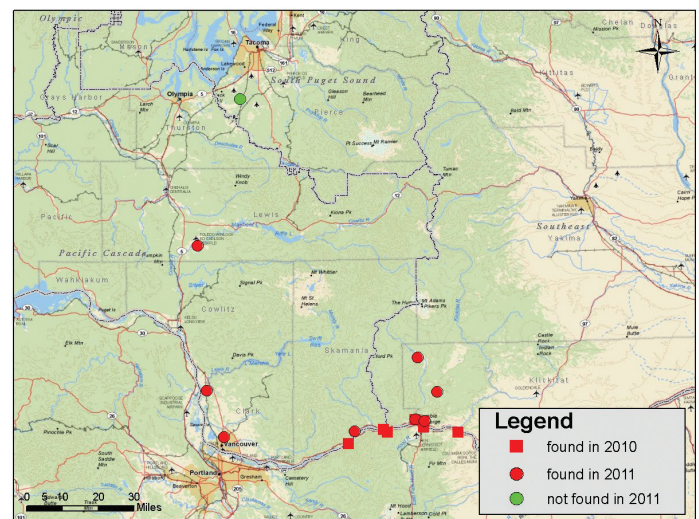
## Distribution

A pine engraver beetle native to California and Oregon has recently been found in Washington State, where it has damaged and killed ponderosa pines. Until 2010, the most northern reported distribution of California fivespined Ips (CFI), *Ips paraconfusus*, was in the northern reaches of the Willamette Valley of Oregon. In 2010, CFI was recorded

for the first time in Washington State. As of 2012, CFI has been collected on the eastern slopes of the Cascade Mountain Range east to Lyle and north to Trout Lake, along the Columbia River Gorge, and in the western valleys as far west as Vancouver and north to Toledo (Figure 1). It is unclear if this is a range expansion or a previously unknown historical range. Regardless, this is the first time outbreaks have been reported.

## Identification and Life Cycle

Adult beetles are small, only about 3 millimeters long, and reddish brown to nearly black in color. They have bullet-shaped bodies and clubbed antennae and have five pointed structures (referred to as spines) arising from the rear of



**Figure 1.** Map showing distribution of the California fivespined Ips throughout the Pacific Northwest. The legend indicates the various locations where CFI adults were caught in pheromone traps during a specific year. (Aleksandar Dozic, WADNR)



Figure 2. Adult male CFI. (LaBonte, ODA)

their hard wing covers, hence the name fivespined Ips (Figure 2). Overwintering adults emerge in early spring to disperse and mate, usually beginning in April. Newly emerged adults seek fallen branches or weakened trees to colonize.

The adult male is the first to attack a tree by boring into the bark and creating an enlarged “nuptial chamber.” Adult females are then attracted to the chamber by a combination of chemicals emitted by the tree and male beetle pheromones. Typically three females visit the nuptial chamber, where mating takes place. Each mated female will then chew a tunnel that leads away from the nuptial chamber and lay individual small white eggs along the sides of this tunnel. This creates a very characteristic gallery pattern on the sapwood surface, which is easily recognized when the bark is removed. CFI galleries can be recognized by the typical Y shape that is formed by the egg chambers that originate from the central nuptial chamber (Figure 3). As many as fifty percent of the adult beetles will reemerge to



Figure 3. A characteristic CFI inverted Y-shaped gallery found underneath the tree bark. (Todd Murray, WSU)

infest other trees, producing a second brood for this generation (Schultz and Bedard 1987). This reemergence allows CFI to build large populations in the early growing season.

Eggs hatch inside the egg chambers, and the young larvae begin to feed on the soft living cambium tissue underneath the bark. These C-shaped, legless grubs are white to cream-colored with tan head capsules. Larvae go through three growth stages and can develop as quickly as two weeks under optimal environmental and nutritional conditions. Under suboptimal conditions, larval development can take over five weeks to develop. Pupation takes place at the end of the larval chamber, and adults emerge in about two weeks.

The first generation’s peak emergence usually occurs in July. A second generation’s peak flight period occurs in September or October (Flowers and Whillhite 2010). This second generation is responsible for producing most of the overwintering insects. In general, CFI produces two generations per year in the Pacific Northwest. A third generation is possible during warmer years or in southern Oregon.

## Pest Damage

CFI can infest many pine tree species, including ponderosa pine, sugar pine, western white pine, lodgepole pine, and knobcone x Monterey pine hybrids (KMX), and they can seriously damage young trees under 26 inches in diameter at breast height. At times CFI can infest and kill the tops of large mature trees, while the western pine beetle, *Dendroctonus brevicomis*, attacks the lower bole (tree trunk) (Goheen and Willhite 2006).

CFI prefers to infest fresh slash (woody material, such as branches lying on the ground), which results from wind damage or tree cutting activities, or comes from diseased or stressed trees. CFI will attack trees of any size but is seldom found beneath bark more than 1-inch thick (Struble and Hall 1955). CFI outbreaks increase when large amounts of slash are available for infestation. Windstorms, fires, or poorly managed timber harvests can provide breeding material, such as downed trees and branch debris. When these materials are available, CFI has the potential to reproduce large broods that are capable of overwhelming nearby healthy trees. The risk of mortality increases when widespread tree health is compromised by fire or drought. Often other bark beetles, such as the red turpentine beetle, *Dendroctonus valens*, will also infest these slash materials.

Mature trees that become infested are most noticeable because of their ‘top killed’ stems (Figure 4). In fall and spring, infested trees will start to show symptoms, such as needle discoloration. Needles will fade from green to orange and finally to a reddish brown. On smaller trees, the entire tree may show these discolorations. At that point, the tree is dead and will not recover. Other symptoms of infestation include the accumulation of reddish bark dust (Figure 5) and the beetle’s numerous exit holes (Figure 6). An infestation of second or third generation beetles can cause the same symptoms, which become noticeable in August and September, although trees attacked in the fall often do not discolor until the following spring. CFI prefers



**Figure 4.** Symptoms observed on a mature ponderosa pine killed by a CFI infestation, at Underwood WA in the Columbia River Gorge. Recent fires and strong wind storms exposed susceptible trees to bark beetle infestation. (Todd Murray, WSU)



**Figure 5.** Red frass accumulations from adult beetles maintaining inside galleries, a telltale sign of CFI infestation. (Glenn Kohler, WADNR)

to infest the thinner bark at the top of the tree, while other bark beetles, such as the western pine beetle or red turpentine beetle prefer to infest the trunk.

Healthy trees are able to ‘pitch’ adult beetles out. In response to a beetle attack, trees exude sap to physically flush the invading insect out from underneath the bark. However, when trees are weakened or beetles too numerous, this natural resistance does not function effectively. Adult beetles chew into the bark, mate, and lay eggs. Hatched larvae then feed on the living tissues of the inner bark (the phloem). Adult beetles can also introduce a fungus that kills tissue around the attack area. The fungus aids in weakening the tree and its ability to produce resin flows. The fungus is often recognized after tree death by the blue staining of the wood. When beetle populations are high enough, the beetle and fungus activity can girdle a tree.



**Figure 6.** Holes formed in the outer tree bark by emerging beetles. (Beth Willhite, USDA FS FH)

## Pest Management

Healthy stands of pine can tolerate CFI under normal conditions. So it is important to properly thin trees to maximize tree health and manage timing of slash treatment to prevent population buildups. Prompt removal and treatment (sanitation) of infested trees with yellowing or orange foliage also helps reduce beetle populations. Timing is also important. It is best to time tree thinning and other tree cutting operations so that none of the green slash is greater than 3 inches in diameter from January through June.

The risk of CFI outbreaks can be reduced by managing or manipulating preferred host materials. Make sure that fresh slash material and downed trees are not available during initial adult flights from March to July. This material can be removed, burned, chipped, or dried. Wood chips should not be piled near live trees because volatile chemicals from the wood may attract bark beetles. If it is not possible to destroy slash, then it should be chopped into small sections and scattered evenly on the ground to hasten its drying time. Slash that has been heated and dried is no longer viable for CFI breeding. Downed trees should be cut into small sections or debarked. If slash is not managed and becomes infested, it should be destroyed (chipped or burned) before emergence of the first CFI generation in May or June.

In eastside areas of the state that have extended periods of warm and sunny weather during the spring and summer months, clear plastic can be placed over piles of infested logs to kill beetles with solarization. It is important to secure the plastic so it remains closed and does not allow beetles (or heat) to easily escape. Currently this solarization technique for treating wood has only been tested in the warmer climates of the southwestern U.S. (DeGomez et al. 2008). If this technique is attempted, be sure to check that it has effectively treated the wood since results may be different in the Pacific Northwest.

Insecticides are not recommended for managing CFI. Insecticides will not kill beetles already in a tree but may be

effective in preventing attacks by treating single high-value trees before attack. Visit HortSense (<http://pep.wsu.edu/hortsense/>) or consult the Pacific Northwest Insect Management Handbook (<http://insects.ipcc.orst.edu/pnw/insects>) for current bark beetle management recommendations for highly valued or landscape pine trees. Silvicultural management to improve tree health and removal of susceptible materials are paramount to avoiding problems with CFI.

Bark beetle repellants, such as the pheromone verbenone, are being explored for their effectiveness in bark beetle management, and there is some evidence that these substances may someday prove useful for management of CFI (Paine and Hanlon 1991; McPheron et al. 1997). However, the current body of research is limited, and results are inconsistent. Contact your state forestry department or local extension office for up-to-date research information on the effectiveness of these bark beetle repellents.

Localized CFI outbreaks generally last for only one to two years. This is due to high overwintering mortality, natural predation, and the beetles' requirements for freshly fallen debris (from storms and other bad weather, fire stress, or resulting from forest management practices) in order to build up large populations. If a continual supply of fresh debris is not available, CFI populations will subside to normal levels after one or two years.

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