State & Private Forestry

FOREST HEALTH PROTECTION

Northern California Shared Service Area

Date: November 6, 2024

Topic: Update on identification of spruce engraver beetles in the Russian Wilderness, Klamath National Forest (FHP Report NC25-001).

Spruce Engraver Beetle (*Ips tridens*) in Northern California

Spruce mortality was reported in July 2023 in South Russian Creek and Blake's Fork drainages in the Russian Wilderness by Micheal Kaufmann with the thought that it might be a spruce beetle outbreak. Kauffmann's report of "recent mortality (looked like from a year or two ago) in both Engelmann spruce and ponderosa pine" prompted an assessment on August 9, 2023. The mortality pocket on South Russian Creek is about 1.5 miles in from the trailhead, along South Russian Creek in a low-lying area with springs seeping across the trail and forming pools and boggy areas around the bases of Englemann spruce (*Picea engelmannii*) mixed with ponderosa pine (*Pinus ponderosa*), white fir (*Abies concolor*) and incense cedar (*Calocedrus decurrens*) (Figure 1). Ferns and Pacific yew (*Taxus brevifolia*) along with other plants associated with wet areas lined both sides of the trail and continued down to South Russian Creek.

Figure 1. Englemann spruce and ponderosa pine mortality along South Russian Creek, Klamath National Forest, Siskiyou County.

Engelmann Spruce mortality was apparent as was mortality in ponderosa pine and white fir. Much of the mortality in spruce and pine seemed older, 3-5+ years. Some older mortality was expected as this entire area was burned in the Whites Fire, part of the 2014 Happy Camp Complex. On first inspection, wood borer activity was found in dead spruce, old western pine beetle galleries in ponderosa pine along with wood borer activity, and old fir engraver beetle galleries in dead white fir along with wood borer activity. In the more recent spruce mortality, there were suspicious gallery patterns beneath some of the wood borer galleries, but not clear enough to identify the bark beetle responsible. Heterobasidion root disease (*Heterobasidion occidentale*) was suspected as a contributor in the white fir and possibly Englemann spruce mortality due to the mortality pattern of old and new dead white fir and spruce and openings filled with pine and cedar saplings as well as laminated-type rot in both fir and spruce down trees. No conclusive evidence (conks) was found at the time to support the suspicion.

Added stress to the environment is the severe to extreme drought conditions throughout the area from 2020-2023. While drought conditions in Siskiyou County, and the entire state, eased in 2016-2018, drought conditions appeared to start in the northern counties in 2019 with conditions in Siskiyou County being

extreme in May 2020 and remaining in drought until early 2024 (https://droughtmonitor.unl.edu/Maps/MapArchive.aspx).

A second site visit was made October 11. It was cold and wet with recent rain fall. This benefitted the pathologist in determining that there was *Heterobasidion occidentale* infecting white fir and possibly spruce. Armillaria was also found in the white fir and spruce for which fruiting bodies had emerged in the fall rains. Armillaria has become a much more interesting organism here in California over the past few years with new research into what species are here and how many are acting pathogenically like this one appears to be acting. This does not fully determine the cause of the spruce mortality, but it gives insight into the forces that shape our old growth forests. Insects, pathogens, fire, and drought all have a hand in creating and re-creating this landscape.

Figure 2. Downed Englemann spruce with frass along the stem indicating colonization by Ips beetles.

A third site visit was made June 25, 2024 to further investigate the Heterobasidion and Armillaria and collect samples of each. At this time an Englemann spruce was found newly down and still green foliage (Figure 2) with piles of frass along the stem.

Beetles were collected from the tree and determined to be Ips species. These collections were identified to the "fuzzy pig-snout Ips" using the Ips key (Labonte and Valley 2011) by two separate entomologists. Samples were sent to California Food and Agriculture and confirmed to the earlier identification and forwarded on to Jim LaBonte at Oregon Food and Agriculture who identified them as *Ips tridens*.

Ips tridens is distributed throughout the western spruce forests from Alaska to northern California and east to the Rocky Mountains where it attacks Sitka, white, and Engelmann spruce. California records from the California Insect Survey include Crescent City (Del Norte County), on *Picea sitchensis* and 7 mi N. Callahan (Siskiyou County), on *P. engelmannii* (Bright and Stark 1973). It is most notable for its many aliases due to the polymorphic forms of the females (Furniss and Carolin 1977, Bright and Stark 1973).

Ips tridens, spruce engraver, is not considered economically important (Furniss and Carolin 1977) as its attacks are most often limited to weakened or windthrown trees. Outbreaks in standing, healthy trees are uncommon and considered short-lived. Spruce engraver beetles are usually found colonizing the upper surfaces of windthrown trees and broken tops. They are much more tolerant of sun-exposed surfaces than are spruce beetles and fresh piles of boring dust are key indicators of recent infestation. If external signs of infestation are present, removing a small section of bark will likely reveal the Y-shaped, frass-free galleries in the inner bark; the same pattern engraved on the face of the sapwood; and possibly various life stages (larvae, pupae, or adults) of the beetles (Furniss and Carolin 1977, Wood 1982, Wood and Bright 1992).

Flight begins in May in coastal areas where Sitka spruce, *Picea sitchensis*, dominates and mid-June in the mountains where Englemann spruce is found in California (Bright and Stark 1973). Attacks by re-emerging parent adults continue through July. As in other species of Ips, males locate suitable host material, initiate the attack, construct a nuptial chamber, and release a powerful sex pheromone which attracts both males and females to the breeding site. One to ten (typically four to six) females enter each nuptial chamber to

construct egg galleries which approximately parallel the grain. Larvae mine for about 3 mm entirely in the phloem, often crossing over an adjacent egg gallery. They then continue the mine against the xylem and pupate about 5 cm from the egg gallery. Teneral adults feed in the brood material through the summer, often reducing the inner bark to a powder. If the host material becomes very dry, beetles will emerge to overwinter in the forest litter (mountain and coastal populations) or possibly to initiate new attacks (coastal only). Otherwise, the beetles will overwinter *in situ*. There are typically two to three generations per year (Bright and Stark 1973, Furniss and Carolin 1977, Wood 1982, Wood and Bright 1992).

Management of spruce engraver beetles is typically not necessary in general forest settings, although prudent and timely slash management directed at spruce beetle prevention might also serve to reduce spruce engraver beetle populations. In the Russian Wilderness, spruce engraver beetle has been detected in the past and is currently active, but control is not recommended due to the restrictions on designated wilderness areas and other stress factors at play (drought and root disease).

References:

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