



Top kill in western larch caused by wood-boring moth



Erika Eidson & Tom Eckberg, Idaho Department of Lands
Gina Davis, U.S. Forest Service Forest Health Protection

In 2018, forest health professionals across northern Idaho began receiving reports of unusual top kill and mortality in western larch (*Larix occidentalis*). Damage is believed to be caused by a species of small, wood-boring moth known as *Cydia laricana* complex (see *Insect Identification* on page 2 for naming explanation). Although this species is believed to be native, it has not previously been documented as a mortality agent and very little is currently known about its biology.

Host

In Idaho, *Cydia laricana* complex has only been seen in western larch. In Montana, *Cydia laricana* has been documented affecting both western larch and Douglas-fir (*Pseudotsuga menziesii*).

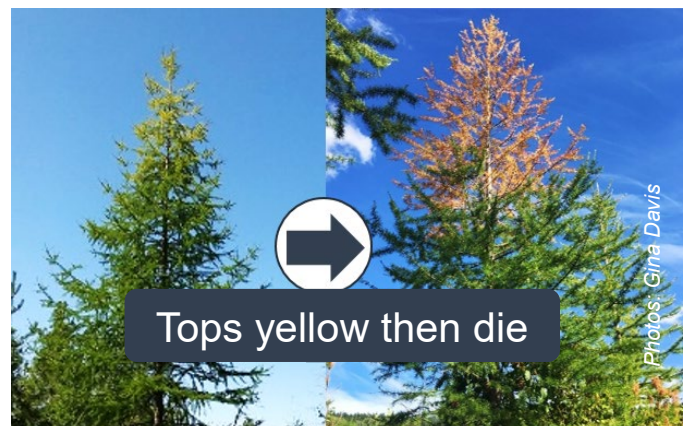
In recent reports, affected trees ranged from 3 – 14 inches in diameter in stands no more than 30 years old. Damage typically occurs scattered throughout the stand or in small patches, and western larch mortality has been recorded in both pure and mixed-species stands.



At least twelve reports have occurred throughout the Idaho panhandle from June 2018 – November 2019.

Damage

The first noticeable symptom on trees attacked by *Cydia laricana* complex is yellowing from the top down. In most reports, top kill progresses down the stem over several years, sometimes killing the entire tree.



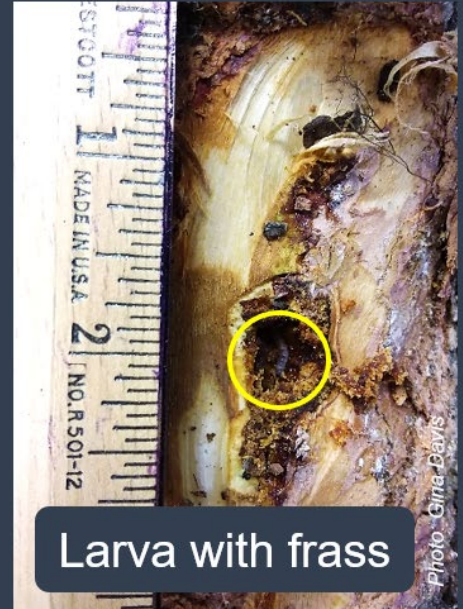
Damage



Canker-like area



Excavated feeding site



Larva with frass

Less conspicuous signs of attack include small, canker-like areas on the main trunk and branches. These areas appear to be flattened or sunken, often with loose, cracking bark and viscous sap. Granular frass (sawdust-like insect refuse) may also be visible in cracks or beneath loosened bark. In some cases, trees may survive attacks and form scar tissue around old attack sites.

Initial testing of the canker-like areas found no fungal fruiting bodies present on symptomatic wood tissue, which suggests that pathogenic fungi do not play a major role in causing this damage. Excavating the symptomatic areas revealed evidence of insect feeding, including coarse, shaving-like frass, finer frass, and round ≤ 0.25 inch-diameter holes.

Insect Identification

Larvae extracted from feeding sites on western larch were sent in to the USDA Animal and Plant Health Inspection Service and identified using molecular-based species confirmation based on comparative entries in the Barcode of Life Database (BOLD). The closest match in BOLD was a species of moth in the family *Tortricidae* called *Cydia rana*, which occurs in the eastern United States.

A closely-related western species, *Cydia laricana*, was first described infesting western larch near Missoula, Montana over 100 years ago. However, no specimens of *Cydia laricana* were listed in BOLD for comparison. Due to field observations of feeding on western larch, as well as the need for taxonomic revision in the *Cydia* group, the species of concern has thus been deemed *Cydia laricana* complex. Previously, *Cydia laricana* was known as *Laspeyresia laricana*, and references to this insect in older literature can be found under the former name.

Larvae were identified using DNA analysis



Insect Biology

At this time, information regarding *Cydia laricana* complex biology is speculative and monitoring is needed to understand its life history. Generally, wood-boring moths lay their eggs on the bark of host trees, eggs hatch, and larvae chew their way into the tree. It appears that *Cydia laricana* complex larvae tunnel into the wood of host trees to feed, develop, and possibly pupate, but pupation may occur elsewhere, such as in the soil beneath the tree. Following pupation, adult moths emerge, mate, and lay eggs, thus completing a generation.

Similar moths usually have a one or a two year life cycle per generation. Adult specimens of *Cydia laricana* have been collected in Montana in May, suggesting that emergence from infested trees and subsequent attacks on new trees may occur in spring.



Larva in excavated feeding site

Developing Management Recommendations

In landscaped settings, the most effective treatment to protect trees from wood-boring moths is typically an insecticide. High concentrations of permethrin or other chemicals that are appropriately labeled for treatment would be sprayed on the bark during the attack period (egg laying through egg hatch). However, due to the current lack of information on the *Cydia laricana* complex lifecycle, appropriate application timing has not been identified and therefore insecticides cannot be recommended at this time. Notably, imidacloprid, a popular soil-drench systemic insecticide, is generally *not* an effective treatment against the larvae of most wood-boring moths. In forest settings, bark-spray insecticides are often impractical and not labeled for widespread use. It is always important to read and follow the label when applying any pesticide.

Sanitation by removing and destroying (chipping or burning) infested trees may help reduce populations of *Cydia laricana* complex within a stand, but population drivers of this insect are not well understood. Some evidence suggests that thinning may not be an effective means for increasing stand resistance to *Cydia laricana* complex. A number of reports originated from young stands that had recently been thinned, but this was not a consistent relationship and other factors should be investigated. The species composition of a stand does not appear to be a major factor for tree susceptibility, as damage has been reported in stands even where larch is only a minor component. So far, damage has not been reported in mature trees in stands >30 years of age. Overall, only small and sporadic areas of larch have been affected and we do not discourage planting of western larch at this time.

Possible contributing factors to attack are not well understood and should be investigated. These may include climatic factors, drought stress, soil type, and seed source. Biotic stressors, such as larch needle cast (*Rhabdocline laricis*), larch needle blight (*Hypodermella laricis*), and larch casebearer (*Coleophora laricella*) have increased in affected acreage over the past several years, but in many cases these issues were not present in stands affected by *Cydia laricana* complex. Multiple stressors often interact and affect overall tree health and productivity.

Next Steps

Additional information is needed to confirm the species identification of *Cydia laricana* complex and to develop strategies to protect western larch from attack. Specimens of the adult moths of *Cydia laricana* complex are needed for morphological-based species confirmation, and life cycle monitoring is needed to prescribe appropriately-timed management actions.

Several logs from infested western larch have been collected by USFS Forest Health Protection (FHP) and the Idaho Department of Lands (IDL) and placed in screened-in rearing cages in an effort to capture adult moths as they emerge from the logs. These logs have been placed outdoors to reflect the field conditions of infested stands, such that information on emergence timing will be relevant to management. Additional plans include applying screen cages to standing infested trees in the field and testing the effectiveness of pheromone traps to capture adult moths, which would provide important information on emergence and flight timing. More intensive studies are likely to develop in collaboration among FHP, IDL, and the University of Idaho.



References to pesticides appear in this publication. Publication of these statements does not constitute endorsement or recommendation of them by the U. S. Department of Agriculture, nor does it imply that uses discussed have been registered. Use of most pesticides is regulated by state and federal laws. Applicable regulations must be obtained from the appropriate regulatory agency prior to their use.

CAUTION: Pesticides can be injurious to humans, domestic animals, desirable plants, and fish and other wildlife if they are not handled and applied properly. Use all pesticides selectively and carefully. Follow recommended practices given on the label for use and disposal of pesticides and pesticide containers.

Additional forest health resources for northern Idaho:

Idaho Department of Lands
[Forest Health Program](#)
Coeur d'Alene office: (208) 769-1525

USDA Forest Service
[Forest Health Protection, Region 1](#)
Coeur d'Alene office: (208) 765-7233

In accordance with Federal civil rights law and U.S. Department of Agriculture (USDA) civil rights regulations and policies, the USDA, its Agencies, offices, and employees, and institutions participating in or administering USDA programs are prohibited from discriminating based on race, color, national origin, religion, sex, gender identity (including gender expression), sexual orientation, disability, age, marital status, family/parental status, income derived from a public assistance program, political beliefs, or reprisal or retaliation for prior civil rights activity, in any program or activity conducted or funded by USDA (not all bases apply to all programs). Remedies and complaint filing deadlines vary by program or incident.

Persons with disabilities who require alternative means of communication for program information (e.g., Braille, large print, audiotape, American Sign Language, etc.) should contact the responsible Agency or USDA's TARGET Center at (202) 720-2600 (voice and TTY) or contact USDA through the Federal Relay Service at (800) 877-8339. Additionally, program information may be made available in languages other than English.

To file a program discrimination complaint, complete the [USDA Program Discrimination Complaint Form, AD-3027](#), found online at [USDA Complaint Form](#) and at any USDA office or write a letter addressed to USDA and provide in the letter all of the information requested in the form. To request a copy of the complaint form, call (866) 632-9992. Submit your completed form or letter to USDA by: (1) mail: U.S. Department of Agriculture, Office of the Assistant Secretary for Civil Rights, 1400 Independence Avenue, SW, Washington, D.C. 20250-9410; (2) fax: (202) 690-7442; or (3) email: program.intake@usda.gov.

USDA is an equal opportunity provider, employer, and lender.