



Douglas-fir tussock moth (*Orgyia pseudotsugata*)

Outbreak status of a conifer defoliating caterpillar in eastern WA

Importance: The Douglas-fir tussock moth (DFTM) is a defoliating caterpillar that can severely damage Douglas-fir, true fir, and spruce trees in the western United States and Canada (Fig. 1). In eastern Washington, outbreaks are cyclical and may cause top kill, growth loss, and may kill up to 40% of host trees in an infested stand. Hairs from the caterpillars and cocoons can cause an allergic reaction in some people.

Hosts: Douglas-fir, grand fir, Engelmann spruce, and sub-alpine fir in forest environments. Blue spruce in ornamental plantings may also be defoliated. Ponderosa pine and western larch may be damaged, but are not likely to die from DFTM damage.

Effects: In a severe outbreak, as much as 40% of host trees in a stand may be killed. Surviving trees may have top-kill and suffer growth loss. The trees most vulnerable to mortality are those with the least foliage, such as young trees and those growing in dense stands (Fig. 2). Defoliated trees are more susceptible to mortality from bark beetle attacks. The hairs of DFTM caterpillars are skin irritants to many people, which can limit use of and access to forested areas during severe outbreaks. The last outbreak occurred in three areas of Washington from 2008 to 2012, affecting areas of Okanogan County, Spokane County, and the Blue Mountains in southeast Washington. A total of 23,500 acres were defoliated over that period. Over 800,000 acres were affected by a widespread outbreak in Washington, Oregon and Idaho in the early 1970s.



Figure 1. Douglas-fir tussock moth larvae feeding on grand fir.



Figure 2. Top down defoliation damage caused by Douglas-fir tussock moth.

Current Status (as of spring 2020)

Central Washington: A second year of a DFTM outbreak in Kittitas and Chelan counties resulted in an increase of defoliated area from 1,900 acres in 2018 to 5,600 acres in 2019. New areas of defoliation totaling 5,000 acres were primarily an expansion of adjacent areas affected in 2018 along US Highway 97 (Blewett Pass) and small patches south of Interstate 90 west of Ellensburg (Figs. 3 & 4). This area recently experienced a decade-long outbreak of western spruce budworm, meaning stressed host trees may be more vulnerable to damage and DFTM caterpillars have less competition for food from a collapsed budworm population. Egg mass surveys and trap catches in this area indicate the outbreak has likely collapsed.



Figure 4. Defoliation from the air near US Highway 97.

Okanogan County: In northern Okanogan County, a new outbreak resulted in approximately 600 acres with defoliation east of the Okanogan River between Oroville and Chesaw (Fig. 5). New egg masses were difficult to find during surveys near heavily defoliated areas in Okanogan County, so those areas are not likely to expand. New egg masses were located in one Okanogan County area with light defoliation, so some spots of increased defoliation may occur in 2020. These egg masses will be examined for levels of nucleopolyhedrosis virus (NPV) by the USDA Forest Service in Wenatchee. The NPV level in egg masses can be used to determine likelihood of natural population collapse.

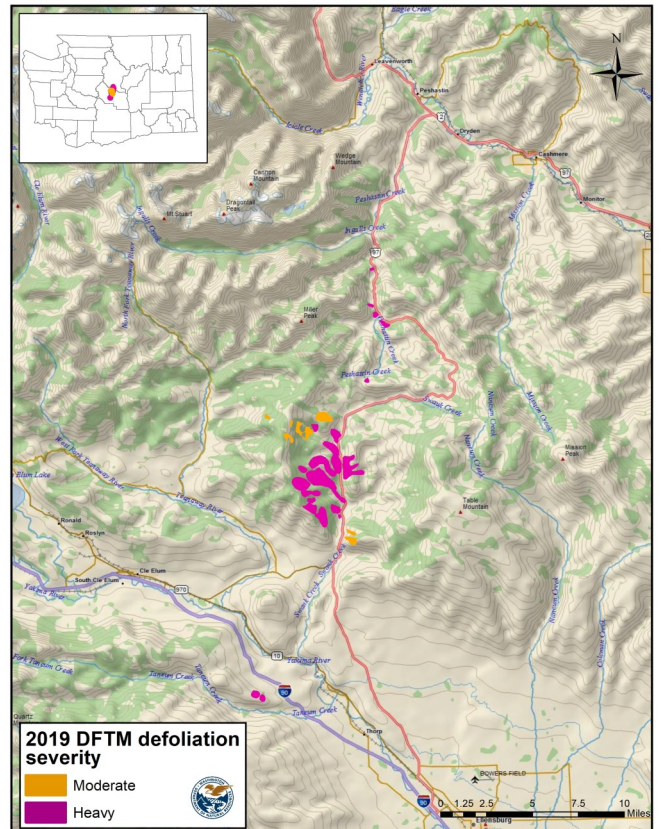


Figure 3. Douglas-fir tussock moth activity on Blewett Pass in Kittitas and Chelan counties.

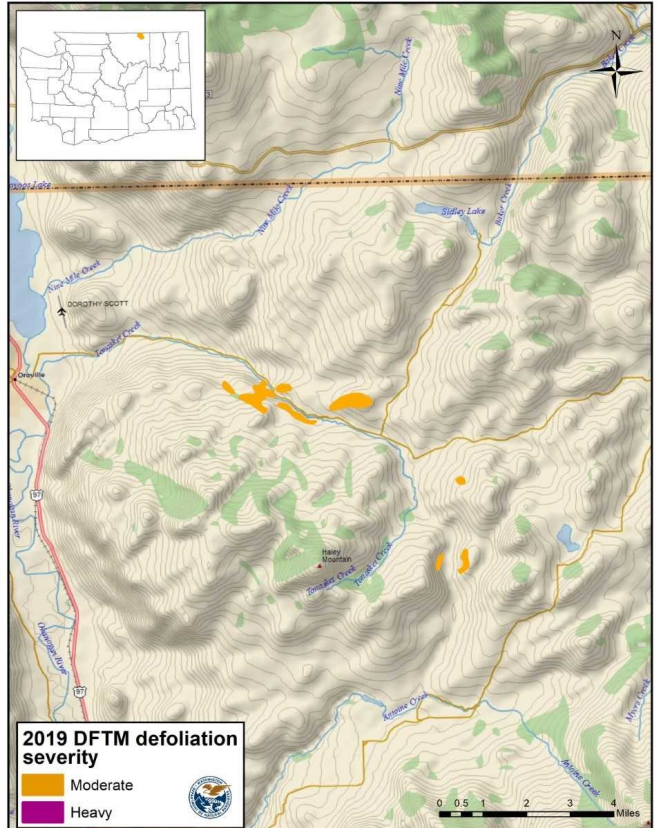


Figure 5. Douglas-fir tussock moth activity in northern Okanogan County.

Monitoring: The USDA Forest Service (USFS) and Washington Department of Natural Resources (DNR) conduct annual monitoring of DFTM activity using a combination of aerial survey, ground surveys and a network of around 250 “Early Warning System” pheromone-baited trap locations on federal, state and private land (Fig. 6). When the number of moths caught in traps increases significantly, DNR conducts ground surveys near trap locations to identify specific areas at risk of defoliation. The annual insect and disease aerial detection survey also records acres and severity of defoliation seen from the air.

In 2019, trap catches increased in areas of Okanogan County, south of Spokane, and in the Blue Mountains, which may indicate higher likelihood of DFTM defoliation developing in those areas in 2020. High trap catches do not always correlate with location of future defoliation.

Signs and symptoms to look for: DFTM egg masses can be found on the underside of branches and on structures through the winter. Egg masses are about 1 inch across, round, gray, hairy, with white eggs (Fig. 7). Mature caterpillars with distinctive tight tufts of hair, called “tussocks,” can be seen from June through early August (Fig. 1). The cocoons are about 1 inch long, tan, and felt-like (Fig. 7). They can be seen throughout the year on branches and structures, but only contain live pupae in July and August.

Adult male DFTM are brownish gray with feathery antennae and a wingspan of about 1 ¼ inches. Female adults are gray to brown, about ¾ inch long with a wide abdomen, and are flightless, so wings are not noticeable.

Caterpillars feed on both new and old foliage and defoliation can be most severe in the top crown (Fig. 2). Sometimes webbing can be seen in the tops of tussock moth infested trees. Feeding by DFTM in June and July may completely remove needles from branches or may cause new foliage to turn brown. This damage can be confused with defoliation caused by the western spruce budworm. Defoliated ornamental spruce trees in non-forested areas are known as “sentinel trees” because their damage often precedes forest defoliation. There is no direct, predictable relationship between the location of sentinel trees and locations where forest areas will be defoliated.

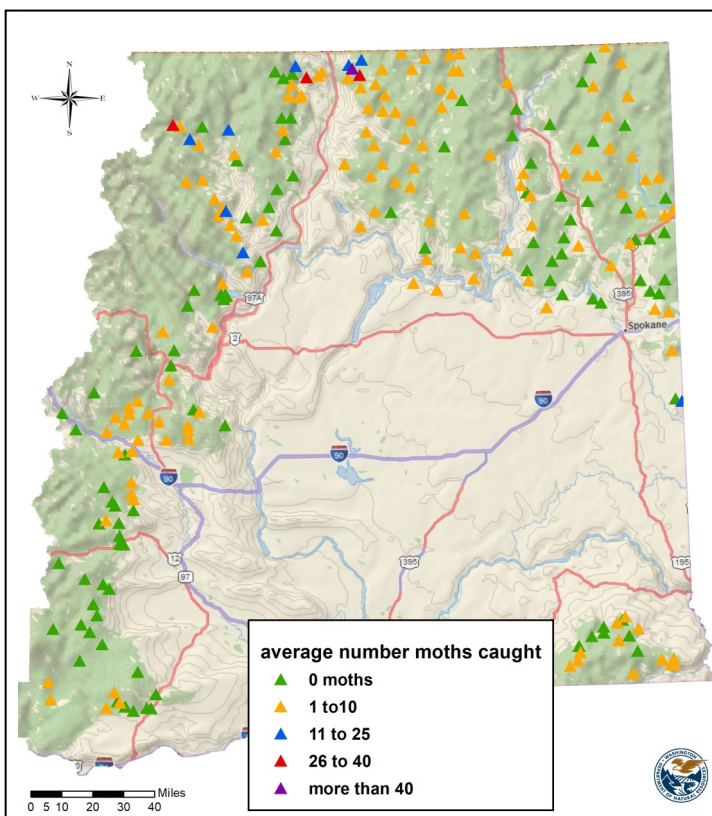


Figure 6. Douglas-fir tussock moth pheromone trap catch results for Washington in 2019.



Figure 7. Douglas-fir tussock moth cocoon (top) and egg mass (bottom).

Life cycle: The DFTM completes one generation per year. In late May or early June, eggs hatch shortly after host trees flush new needles in spring. New caterpillars spin silk webbing and can disperse by wind. This webbing can sometimes be seen in the tops of trees. Caterpillars begin by feeding on new needles, turning them brown, then later feed on older needles. In late July or early August, caterpillars spin a tan cocoon of silk mixed with body hairs attached to the underside of branches or on nearby structures. In late July through November, adults emerge and mate. The females are flightless and cling to their cocoons where they deposit pearly-white eggs in a gray mass of body hairs bonded together with saliva. The eggs overwinter attached to the cocoon.

Infestation cycle: DFTM populations are normally kept low by natural controls that include disease, predators, food supply, and weather. Periodically, DFTM populations are able to escape these controls and outbreaks occur. Outbreaks typically collapse within two to four years due to a combination of build-up in natural enemies or starvation (Fig. 8). Early in the outbreak, egg masses can be analyzed to determine the level of virus and parasitism. This information can be used to predict the duration and possibly predict severity of the outbreak.

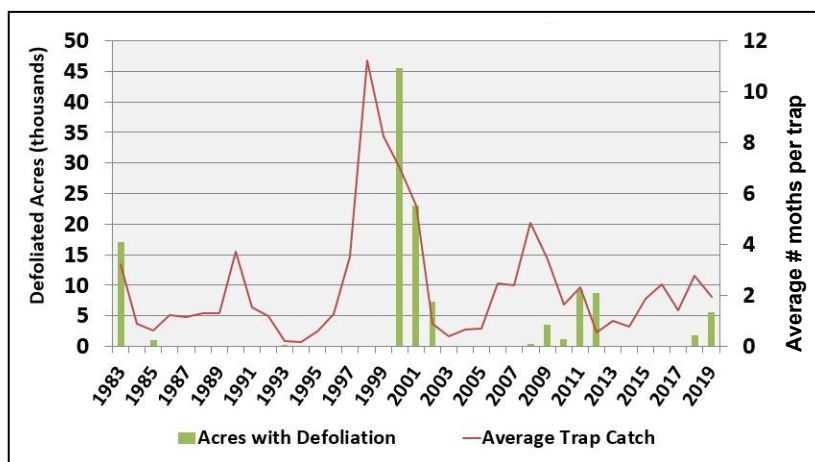


Figure 8. Historical Douglas-fir tussock moth trap catches and defoliation in Washington.

Management Options

If no actions are taken to manage or prevent DFTM damage, the outbreak will subside in two to four years due to a build-up of natural controls.

Stand Treatments: DFTM may damage ponderosa pines and western larch, but is unlikely to kill them. If timed before an outbreak, thinning the forest to reduce the proportion of Douglas-fir and true fir can reduce DFTM damage. Dense understory trees are more vulnerable to damage because they have fewer needles and DFTM caterpillars drop on them from taller trees. In an even-aged stand with widely spaced trees, caterpillars are less likely to land on host trees. After an outbreak, killed trees can be salvaged as timber or left standing. Selection of trees for removal should be done in spring following bud break because some trees that appear dead may produce new growth. High numbers of standing dead trees may create wildfire or falling hazards. Some dead trees can provide value as wildlife habitat.

Insecticides: For immediate reduction of defoliation, insecticides can be sprayed on host trees soon after most caterpillars have emerged and begun feeding. Conventional insecticides and the bacterial insecticide, Foray or 'Bt' (*Bacillus thuringiensis* var. *kurstaki*), are effective against DFTM. Please contact the Washington State Department of Agriculture for current pesticide information. When using pesticides, always read and follow the label. It is a violation of state and federal law to apply a pesticide in a manner not described on the label.

For more information:

If you have questions about this information or want to report Douglas-fir tussock moth activity, please contact Glenn Kohler, Forest Entomologist with DNR (360-902-1342; glenn.kohler@dnr.wa.gov).

The USDA Forest Service's Forest Health Protection website has detailed information on DFTM biology, management, and monitoring at: <http://www.fs.fed.us/r6/nr/fid/dftmweb/index.shtml>.