

Douglas-fir Tussock Moth (*Orgyia pseudotsugata*)

Hosts

Douglas-fir tussock moth (DFTM) is a defoliating insect that feeds on true firs (grand fir, white fir, subalpine fir), Douglas-fir and spruce (Engelmann and blue spruce). In Idaho forests, most damage is to grand fir and Douglas-fir, and Engelmann spruce is not often seriously damaged. Colorado blue spruce is a common host in ornamental plantings. Western larch and pines are uncommon hosts, and damage is usually minor.

Distribution

DFTM occurs throughout the West, wherever the hosts grow. In Idaho, most outbreaks recur in the same general areas. Historic outbreak areas are: the Coeur d'Alene Indian Reservation, south to Moscow Mountain, the Nez Perce National Forest east of Kooskia, the Boise, Payette, and Weiser River drainages and Owyhee Mountains in southern Idaho (**Figure 4**).

Life Cycle

DFTM has one generation per year. Females are flightless and lay eggs on host tree branches in late summer (**Figure 1A**). Egg masses overwinter and hatch in late spring when new needles begin to emerge. Caterpillars go through 5-7 molts feeding on new, then older needles. Caterpillars spin cocoons and enter the pupal (resting) stage in late summer, and adults usually emerge starting in August. Females alight on their cocoon after emergence and call males to mate by producing attractive pheromones. Male moths are good fliers, but are nocturnal and are rarely seen (**Figure 1B**).

The first two caterpillar stages (1st and 2nd instars **Figure 2A**) must feed on the new growth (**Figure 3**). Older caterpillars (**Figure 2B**) can feed on older needles, but younger foliage is still preferred. Damage is usually noticed first at the tops of trees and the outer branches, and it moves down the tree as the summer progresses. Needles with partial feeding often turn brown during the heat of the summer and fall off, or are eventually knocked off by snow the following winter. Trees defoliated <50% often fully recover. Needle loss of >90 percent can kill trees, as well as repeated defoliation of over 50% or from subsequent bark beetle attack.

Older caterpillars are striking insects (**Figure 2B**) and are the most common life stage to be observed by landowners. They are covered with hairs that can cause a rash on many people.

Recognition



Figure 1. Female moth on cocoon (A), male moth on grand fir foliage (B).



Figure 2. DFTM 1st instar (A) and mature caterpillars (B)



Figure 3. Light defoliation of grand fir new growth caused by 1st and 2nd instar caterpillars.



Forest Pest Fact Sheet

Douglas-fir Tussock Moth Management

Predisposing Factors DFTM outbreaks typically occur in predictable locations. Female moths cannot fly, so most dispersal occurs by wind blowing young caterpillars short distances. Most outbreaks in Idaho have occurred between Moscow and Plummer in northern Idaho, the Nez Perce-Clearwater National Forests in northcentral Idaho, and on the Boise, Payette, and Sawtooth National Forests in southern Idaho. Periodic outbreaks have also occurred in the Owyhee Mountains in southwestern Idaho (**Figure 4**). Damage tends to be worse in forests that have a high proportion of grand fir, stands on ridges, and drier aspects. Multistoried stands of grand fir and Douglas-fir allow caterpillars in infested trees to drop onto susceptible understory trees. Dense forests also aid movement of caterpillars and can suffer heavier damage.

Population Monitoring Populations are present at low levels in most years, but outbreaks occur approximately once per decade (8-12 years) and cause defoliation for 3-4 years before collapsing on their own due to natural enemies. The pheromone used by female moths to call mates has been synthesized and is used by forest managers to monitor adult populations through trapping. Prior to an outbreak, male moth captures increase dramatically, giving entomologists advanced warning of an impending outbreak in the general area. Sites with high trap captures are identified for follow-up surveys for caterpillars and egg masses. When egg masses are observed at survey sites in the fall, this indicates that defoliation is very likely the following spring. See the latest DFTM monitoring report: <https://www.idl.idaho.gov/forestry/insects-and-disease/>

Long-term Management Through Silviculture DFTM causes the most damage on grand fir and Douglas-fir in Idaho. Past management and fire suppression have allowed these shade tolerant species to increase in areas better suited to pines, larch or other species. Pines (ponderosa, western white, and lodgepole), western larch, and Engelmann spruce are not often damaged in forest situations. Harvest that retains these species over Douglas-fir and grand fir will minimize damage by DFTM (**Figure 5**). Where landowner objectives dictate retention of susceptible hosts, thinning dense stands may decrease damage and allow for better recovery after an outbreak. Caution is urged when root disease is present in a stand because increased mortality can occur. See Root Disease Fact Sheet on IDL Forest Health web page for more information: <https://www.idl.idaho.gov/forestry/insects-and-disease/>. Two storied stands with susceptible understory should be avoided.

Short-term Insect Management Currently there are several insecticides labeled for control of DFTM. *Bacillus thuringiensis* (Bt) is a selective biological insecticide that is effective against DFTM and other moths, but it will also kill butterfly caterpillar. One growth regulator (tebufenozide) and one conventional insecticide (carbaryl) are currently registered (as of 2020). Aerial spray programs have been used in the past, but recent regulations and expense make administering them challenging. It is important to remember that spraying will not reduce susceptibility to DFTM and populations collapse on their own due to starvation, parasites and disease after a few years. Please contact IDL entomologists for recommendations before considering spraying.

Figure 5. Photo A shows a stand with defoliated grand fir and Douglas-fir in October 2011 near Post Falls. Photo B shows the same stand in July 2012 after most of the firs have been removed. The remaining ponderosa pine and western larch are resistant to defoliation from DFTM.

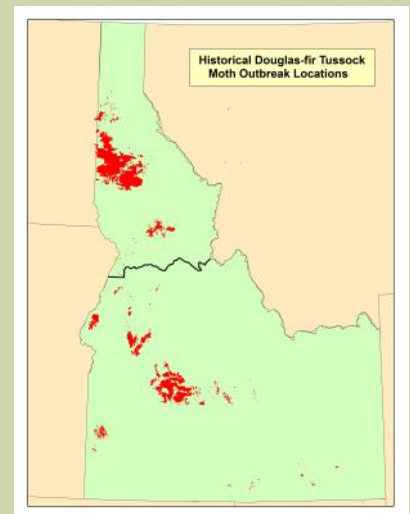


Figure 4. Historical DFTM outbreak areas.