Management Options

Microbial and chemical insecticides, and mating disruption pheromones can be effective at reducing DFTM populations and subsequent damage. State or Federal Forest Health Specialists should be consulted for treatment options and the most current Information on registered insecticides. In addition, State and Federal Forest Health Specialists can provide information on silvicultural management practices to help minimize the impacts of DFTM.

Microbial Insecticides:
- *Bacillus thuringiensis* (Bt), an environmentally safe bacterium specific to Lepidoptera larvae. It is used in sensitive areas such as campgrounds or along riparian areas where chemical use is restricted or prohibited.
- *TM Biocontrol-1*, a virus specific to DFTM larvae. The virus is currently not available for public use.

Chemical Insecticides:
- Carbaryl, a broad spectrum, general purpose carbamate.
- Dimilin®, a growth regulator that affects insect larvae mainly in the Lepidoptera and Diptera orders.

Mating disruption:
- Dimpyl® DFTM, a pheromone that interferes with male-female mating communication.

Silviculture:
- Thin Douglas-fir and true fir overstory and understory to help reduce susceptibility to DFTM and favor non-host leaves such as pine, larch, or spruce.
- In post-fire or post-management restoration planning, consider planting non-host species.
- Prescribed fire can be used to reduce DFTM susceptible fir understory and reduce competition and improve stand vigor.

Natural Controls

Populations of DFTM are usually kept in check by a combination of predators, parasites, pathogenic microbes, adverse weather conditions, and food that is either scarce or of poor quality. Major factors in ending outbreaks in forested settings appear to be starvation or viral infection. In urban settings, cultural practices such as thinning, watering, and fertilizing will help promote tree vigor, which may help trees survive repeated DFTM attacks.

Maintaining a diverse habitat for insectivorous birds, mammals, and predatory insects can also help keep DFTM populations at lower levels. This may be achieved through proper snag management and leaving adequate woody residues on managed site.

Conclusion

Forest management of true fir and Douglas-fir should include the ongoing process of assessing the potential impacts of DFTM by evaluating forest and site conditions. The greatest potential for preventing or reducing the severity of DFTM outbreaks is to maintain tree vigor and healthy and diverse forests.

For additional information, contact any USDA Forest Service or State Forestry Office in your area.

USDA Forest Service
Forest Health Protection:

- Ogden Field Office
  801-476-9720
- Missoula Field Office
  406-329-3308
- Coeur d’Alene Field Office
  208-765-7342
- Boise Field Office
  208-373-4227

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Douglas-Fir Tussock Moth in the Interior West

Extensive mortality caused by a Douglas-fir tussock moth outbreak
Introduction
The Douglas-fir tussock moth (DFTM) is a native defoliator that reaches outbreak levels every 7 to 14 years in the western United States and Canada. The larval (caterpillar) stage of DFTM feeds on both new and old needles and can completely defoliate trees in one season.

Douglas-fir tussock moth defoliates Douglas-fir, true firs, and spruce in rural forested and urban environments. Defoliation from DFTM can result in top and branch kill, reduced vigor, growth loss, increased susceptibility to attack by other insects and diseases, increased short-term fire risk, impacts to other resources such as water and visuals, and tree death. Fortunately, DFTM outbreaks typically last only 3-5 years before natural enemies or starvation cause populations to collapse. Several management options including thinning and insecticide treatments may reduce damage and potential mortality from DFTM.

Description
A young larva is about 1/4" long, light tan to dark gray, with long body hairs. The 1" mature larva is gray to brown, with a shiny black head. Two long, horn-like dark tufts project forward from its head and a similar but longer tuft projects from its posterior end. Four dense, buff-colored "tusocks" with red tips are located on its back. The rest of the body is covered with short white hairs that protrude from red tubercles (knoblike bumps), and an orange stripe on each of its sides.

Life History and Habits
Douglas-fir tussock moths produce one generation per year. About 350 overwintering eggs hatch in late May or early June. These newly hatched larvae feed on the current year's foliage, turning it tan or reddish brown. As they mature, and if populations are high, larvae may feed on old foliage after consuming new foliage. They typically feed in the upper tree crown foliage, then disperse and feed on lower foliage on a silken thread. Larvae may totally defoliate trees in one season.

Evidence of Infestation
Douglas-fir tussock moth can be found year round by looking for the following signs on host trees:
- May-August: Hairy larvae; silk webbing on tree tops and outermost tips of upper branches; defoliation.
- July-November: Grayish-brown cocoons on foliage, branches, tree trunks, understory, or nearby objects when defoliation is severe; appearance of adult moths; defoliation.
- July-May: Empty cocoons with hardened egg masses; defoliation.

Monitoring
An early detection system using pheromone-baited sticky traps can be placed in susceptible forest settings to trap male moths. Forested areas with a higher proportion of Douglas-fir, grand fir, or white fir would likely be more prone to higher incidence of defoliation. Trend data from traps can be used to help land managers make informed decisions regarding DFTM potential impacts on forest resources.