

## Management Guide for **Douglas-fir Tussock Moth**

*Orgyia pseudotsugata* McDonald

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**Epidemics occur about every 8 to 10 years in conifer forests of Idaho.**

### Hosts

- Douglas-fir
- All true firs
- Spruce
- When favorite foliage is gone, they will eat most other conifers and many shrubs.

### *Periodic outbreaks in predictable locations*

Mature, densely stocked stands of grand fir or Douglas-fir in certain locations in Idaho and Montana experience cyclical outbreaks of this insect; about every 8 to 10 years. Outbreaks occur on ridgetops and upper slopes with shallow volcanic ash soils in northern Idaho. In eastern Montana, outbreaks can occur in dry, Douglas-fir stands in the transition between forest and grassland.

Montana, and average 3 years in northern Idaho.

Young larvae feed on new needles. Later instars can completely strip all needles from trees. Because of this, trees can be top killed or killed in 1 year. Entire stands of grand fir and Douglas-fir have been killed after 1 or 2 years of heavy defoliation. Continued defoliation also causes marked radial growth loss.

Outbreaks last about 2 years in

### Key Points

- Locations of outbreaks are highly predictable
- Outbreaks are somewhat cyclical.
- Stand hazard can be reduced through silviculture.
- Chemical pesticides are temporarily effective.

### Management

A monitoring system using pheromone-baited sticky traps is used to watch for increasing populations. When outbreaks seem imminent, ground-based egg mass and pupal evaluation surveys are utilized to measure population levels and to help in making management decisions.

Management decisions involve; predicting damage, weighing effects of different management practices, estimating costs of various treatments, and translating socioeconomic impacts (Campbell and Stark 1980).

## *Life History*



The female Douglas-fir tussock moth is wingless. Photo by Ladd Livingston

Tussock moth overwinters as eggs in a mass of female body hairs stuck together with a frothy, gelatinous substance. These egg masses are laid on top of cocoons which can be attached to foliated twigs, trunk, under large limbs, or other objects surrounding the tree.

Eggs begin hatching when buds burst on hosts. First instars feed on the tender new foliage. Larvae do not web needles together at any period, but they produce loose webbing from branch to branch while crawling.

Pupation occurs from late July to end of August inside a thin cocoon of silken webbing mixed with larval hairs. Moths emerge 10-18 days later.

The female moth does not have wings and crawls onto the top of her cocoon and produces a sex attractant pheromone to draw winged males for mating. After mating, she lays her egg mass on the cocoon.

**Stands in areas of repeated outbreaks should be hazard rated to better predict their vulnerability to defoliation.**

### Hazard Rating for Douglas-fir Tussock Moth in northern Idaho

Some stands are more susceptible to outbreaks. Using these and other variables, stands can be risk rated for defoliation from aerial photographs.

This method has been demonstrated on the Palouse Ranger District, Idaho Panhandle National Forests.

Parameters	Trend
<b>Physiographic Location</b>	Defoliation is heavier on ridgetops and upper slopes
<b>Depth of Volcanic Ash</b>	Defoliation decreases as depth of volcanic ash increases
<b>Site Occupancy</b>	Defoliation increases as the ratio of total biomass at site productivity increases
<b>Age of Host Trees</b>	Little or no defoliation in stands with average host age less than 50 years
<b>Proportion of Grand Fir in Stand</b>	Rate of defoliation of grand fir increases as the proportion of grand fir the stand increases

## *Silvicultural Management*

### Preventing Tussock Moth Outbreaks on high-hazard sites in Idaho

- **Mature stands composed mostly of grand fir and Douglas-fir:** Harvest and establish seral species in stands .
- **Young pine or larch stands:** Thin one or more times to encourage their growth.
- **Multistoried stands with a diverse mixture of tree species, age classes, and sizes:** Improve growth of trees in the intermediate and lower stand levels by felling diseased and decadent trees in the overstory, followed by thinning to favor pines or larch.
- **Pole-sized, dense, even- aged stands composed predominately of grand fir:** Use a multiple thinning approach. Remove intermediate, suppressed, and a few codominant trees during the first thinning. Followup treatments should be made at 3- to 5-year intervals to open up the stand gradually. Favor species other than grand fir or Douglas-fir as leave trees.
- **Mature stands composed of predominantly pines or larch with a distinct understory of grand fir or Douglas-fir seedlings or saplings:** Prescribed burning may destroy the unwanted understory which would develop into a high-hazard stand .

**Silvicultural control offers the only long-term solution for high-hazard sites.**

**Chemical and biological pesticides can reduce the severity and longevity of an outbreak.**

#### **Chemical Control**

Past epidemics were aerially sprayed with chemical insecticides.

Carbaryl (Sevin-4-Oi1® ), Dimlan® (diflubenzuron), *Bacillus thuringiensis* (a bacterium), and a nucleopolyhedrosis virus are registered for aerial application; In addition, carbaryl is registered for ground sprays.

### Reducing Douglas-fir Tussock Moth hazard in Montana forests

No hazard rating system has been developed for this state, but it seems the purer stands of Douglas-fir are more susceptible. High-hazard stands can be altered through silviculture. Brookes and others (1978) recommended the following practices.

- ⇒ **In mature and overmature stands,** regeneration cuts should be designed to establish seral species to develop new stands dominated by species other than Douglas-fir at maturity.
- ⇒ **In all stands with host species;** maintain vigorous trees.

## Natural Control

Mortality from starvation, weather, parasites, predators, and mainly virus, terminate epidemics.

- Lack of new foliage can cause high mortality in young larva populations and lack of any foliage causes older larvae to migrate which makes them vulnerable to predation and starvation.
- Frost damage to current year's foliage can starve high numbers of early instars.
- Excessive heat and associated dehydration cause mortality and may cause latent virus to become virulent.

## Recognizing Douglas-fir Tussock Moth

Douglas-fir tussock moth is one of the easiest forest pests to identify because some obvious signs of its presence are apparent the entire year. Look for cocoons and egg masses from August until May. Look for hairy larvae from late May until August on foliage. First instars are gray with long hairs. Later instars develop four dense tussocks

(brushes) of yellowish-brown hairs on their "backs". Mature larvae are up to 30 mm long, have two long, dark tufts or pencils (horns) of hair just back of the head, a similar but longer pencil on the posterior end, four tussocks on their backs, and the rest of the body is covered with short hairs radiating from red, button-like centers.

## Other Reading

- Brookes, M. R., R. W. Stark, and R.W. Campbell.1978. The Douglas-fir tussock moth: A synthesis. USDA For. Servo Sci. and Education Agency, Wash. D.C., Tech. Bull. 1585,331 pp.
- Campbell, R. W. and L. C. Youngs.1978. Douglas-fir tussock moth -and annotated bibliography. USDA For. Servo Pacific Northwest For. and Range Expt. Sta., Portland, OR. Gen. Tech. Rept. PNW-68 , 168 pp.
- Campbell, R. W. and R. W. Stark.1980. The Douglas-fir tussock moth management system. USDA Wash. D.C. Douglas-fir tussock moth handbook, Ag. Handbook No.568, 19 pp.
- Wickman, B. E., R. R. Mason, and Galen C. Trostle.1981. Douglas-fir tussock moth. For. Insect and Disease Leaflet 86, 10 pp.

### Forest Health Protection and State Forestry Organizations

#### Assistance on State And Private Lands

Montana: (406) 542-4300

Idaho: (208) 769-1525

Utah: (801) 538-5211

Nevada: (775) 684-2513

Wyoming: (307) 777-5659

#### Assistance on Federal Lands

US Forest Service  
Region One

Missoula: (406) 329-3605

Coeur d'Alene: (208) 765-7342

US Forest Service  
Region Four

Ogden (801) 476-9720  
Boise (208) 373-4227

