FOREST HEALTH PROTECTION
Pacific Southwest Region
South Sierra Shared Service Area

FHP Report No. C06-3 3420
March 15, 2006

Douglas-fir Tussock Moth in Sierra National Forest, Spring/Summer 2006

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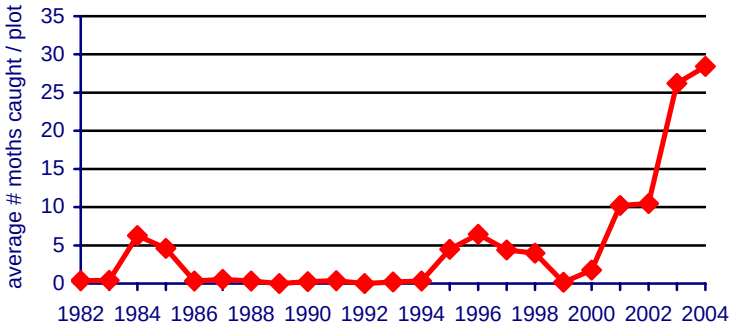
Background

The Douglas-fir Tussock Moth (DFTM), *Orgyia pseudotsugata* (Lepidoptera: Lymantriidae), is a native defoliator of Douglas-fir and true firs in western North American coniferous forests. White fir is the primary host in California. Outbreaks of this insect tend to occur within its range somewhere between seven to thirteen years. Under outbreak conditions, defoliation by larval feeding can result in top-kill, severe growth loss over large expanses where hosts have been affected, or increased vulnerability to other damaging agents. Populations of DFTM can be so high in some areas that host trees can be quickly stripped of foliage within a short period of time, directly resulting in tree mortality. Public health also becomes a concern because larval hairs have been shown to have an urticating effect that can cause skin lesions, eye irritations, or respiratory reactions ("tussockosis").

Population monitoring/Observations

A graph of annual collections from the Early Warning System (pheromone trapping) that monitors DFTM populations of adult males, show that the past few years has been the highest activity ever recorded in the Sierra National Forest (see Figure 1). While trap counts were up in 2002, it was not until 2003 that counts passed low-level thresholds. By 2004, DFTM trap results were still indicating that populations were building, possibly to peak in 2005 or 2006. Trap results for 2005 of central California were recently sent out (DFTM Survey Report NE06-01); detailed Sierra monitoring results are presented in Table 3.

Figure 1. Yosemite National Park and Sierra National Forest (*combined*) DFTM Pheromone Trap Catch Summary (1982-2005).
Note: 2005 information was not included.



Based on aerial detection surveys conducted in the summer of 2005, a grand total of 8,369 acres in the forest were observed with moderate to heavy defoliation (see Appendix A). Aerial and ground surveys observed where DFTM had severely defoliated crown tops on mature hosts and were stripping foliage of smaller understory trees by 50% or more. Forest Health Protection conducted larval sampling in 2005 (Table 1) around monitoring traps with high counts as well as areas of special concern designated by district personnel (FHP Report NE05-07). Additional egg mass sampling was performed at four specific locations due to their proximity to defoliated areas on the ADS map (see Table 2).

Discussion and Recommendations

Summations of the data indicate that Summit Campground could anticipate moderate defoliation in 2006. Over and along the ridge north of the campground towards Devil's Peak may experience additional defoliation and possible mortality in all size classes due to its south-facing aspect and drier conditions. Benedict Meadows may also experience complete defoliation and possibly some mortality based on larval and egg mass survey results. Infested areas that are in or very close to campgrounds could pose public health hazards. Loggers working in the vicinity of Benedict Meadows also complained of skin irritations and annoyance of falling caterpillars during the summer. Yosemite National Park, also experiencing a severe outbreak in two of its main campgrounds, several cases had been reported of symptoms of tussockosis.

Vertebrate predators, insect parasitoids, and naturally occurring viruses effectively regulate tussock moth populations. Consequently, a DFTM outbreak typically last three to four years and is characterized in four separate phases: pre-outbreak, release, peak, and decline. If the current populations in the affect areas progress as anticipated based on activity and surveys from previous years, they may be expected to peak in 2006 and decline by 2007 from natural factors. However, additional defoliation will continue to occur in 2006 and 2007 due to high population densities.

Concurrent analysis of egg mass samples by a Canadian laboratory is underway to determine present levels of naturally occurring nuclear polyhedrosis virus (NPV) in the population. Early warning trap monitoring, larval, defoliation, and egg mass surveys will be conducted as needed in 2006.

At this probable stage of the outbreak, realistic and feasible mitigation actions would involve the use of insecticides or foliage protection for hosts. Chemically formulated NPV is the most commonly recommended insecticide – it is species specific and has been shown to effectively reduce populations with one application. There is a five-to-eight week incubation period after treatment applications before larvae cease feeding. Chemical or biological insecticides may be necessary at this stage if further defoliation cannot be tolerated. Visitors and employees would likely be impacted by tussockosis if allowed to enter into infested areas. Seasonal closures would ensure limited contact with insects, and posted warnings would promote hazard awareness.

If management actions are to be implemented in a timely manner for 2006, preparation should be initiated as soon as possible. A letter was sent to Forest Supervisors of the Stanislaus, Sierra, and Sequoia National Forests (dated May 9, 2005) outlining the additional steps required to initiate NEPA processes if Forests intend to implement control projects by spring 2006.

Please contact me if you have questions or would like more information.

References

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Table 1. 2005 Douglas-fir Tussock Moth early stage larval densities in Sierra National Forest.

Ranger District	Location Name	*M <2 larvae	*M = 2-19 larvae	*M >20 larvae
Bass Lake	Kelty Meadows		2.03	
Bass Lake	Whiskey Falls		6.08	
Bass Lake	DFTM trap #605		6.16	
Bass Lake	Gaggs Campground		11.4	
Bass Lake	Summit Campground		13.8	
Bass Lake	DFTM trap #611		18.7	
Bass Lake	DFTM trap #613			**121.6**
Bass Lake	DFTM trap #610	0.1		
Bass Lake	Fish Creek	0.19		
Bass Lake	Soquel Campground	0.36		
Bass Lake	Whiskers Campground	0.56		
Bass Lake	Grey Mtn. Campground	1.52		
Bass Lake	Texas Flat Campground	1.53		

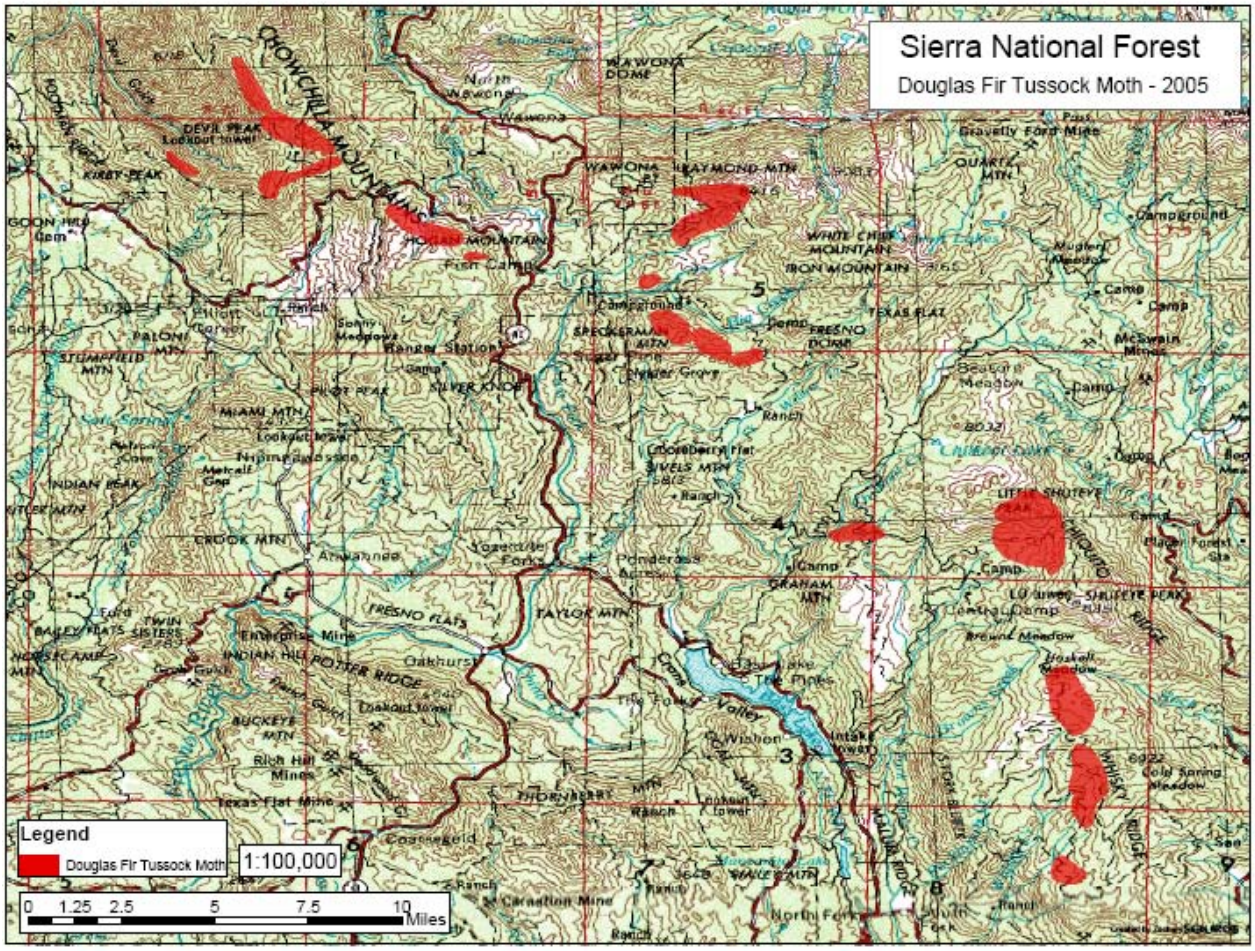
*M is average larvae midcrown density: <2 is two or more years away from outbreak, 2-19 larvae is typically one year away, and >20 is outbreak.

Table 2. 2005 Average egg mass survey results of four high priority locations, Sierra National Forest.

Location	Average egg mass/branch*
Chilkoot Campground	0.0
Summit Campground	0.88
Whiskey Falls Campground	0.0
Benedict Meadows	1.619

*Less than 0.7: light to no defoliation; 0.7-1.9 expect moderate but variable defoliation; >2.0 expect severe defoliation, top-kill and mortality

Appendix A. 2005 Aerial Detection Survey of Sierra National Forest (Bass Lake Ranger District) showing Douglas-fir Tussock Moth damage.



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Number of Pages: 6
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