

**2002 DOUGLAS-FIR TUSSOCK MOTH EARLY WARNING SYSTEM
TRAPPING SUMMARY
FOR OREGON AND WASHINGTON**

Katharine A. Sheehan and Iral Ragenovich
Entomologists
Forest Health Protection & Air Management Group/Natural Resources
Pacific Northwest Region
USDA Forest Service
Portland, Oregon

June 2003

Summary

Douglas-fir tussock moth (DFTM) pheromone traps were located on 519 Early Warning System (EWS) plots scattered throughout Washington and Oregon in 2002. In 2002, DFTM trap catches declined sharply throughout Oregon and Washington, dropping to endemic levels. Defoliation also declined in 2002. DFTM populations are expected to continue to decline in 2003, and little or no defoliation is anticipated.

Background

Douglas-fir tussock moth, *Orgyia pseudotsugata* (McCunnough) (Lepidoptera: Lymantriidae), outbreaks in the western United States and Canada tend to be cyclic, occurring about every 9 years (Shepherd et al. 1988). In the Pacific Northwest, a Douglas-fir tussock moth population increase consists of four phases or years. During the first phase the population begins to increase but remains at suboutbreak levels. In phase II populations continue to increase to above the outbreak level threshold and some defoliation is apparent. In phase III, populations are extremely high and result in complete tree defoliation. Populations remain very high during phase IV; however, population pressure and insect pathogens cause the population to collapse during this phase. Additional defoliation will be incurred during this phase, subsequent to the collapse of the population.

Generally, land managers do not recognize the significance of the severity of a DFTM outbreak until phase III when the first year of complete defoliation occurs. Once significant defoliation occurs it is too late to implement any management options.

From 1971-1974, a widespread outbreak of Douglas-fir tussock moth (DFTM) occurred in eastern and central Washington, northeastern Oregon, and in adjacent Idaho. Since that time, populations have fluctuated twice, in Washington and Oregon, without reaching outbreak

status, except in more localized areas near Burns in eastern Oregon in the early 1980's, and near Halfway, in northeastern Oregon, in the early 1990's. In 1991, about 116,000 acres of that outbreak was treated with the biological insecticide, *Bacillus thuringiensis* var. *kurstaki*.

In 1998, traps again signaled increasing population trends. This early warning prompted the preparation of NEPA analysis and Environmental Impact Statement that would be “in place” for areas that would potentially be impacted by DFTM defoliation, should the outbreak occur. In 2000, approximately 39,000 acres within identified areas of concern on the Wallowa-Whitman National Forest in northeastern Oregon, and the Umatilla National Forest in southeastern Washington had suboutbreak and outbreak levels of DFTM and were treated with TM-Biocontrol-1, the natural virus of the DFTM. The 2000 aerial detection survey identified approximately 220,000 acres defoliated by the DFTM in that area. In 2001, an additional 16,690 acres were treated on the Okanogan National Forest in Washington; and 52,840 acres of defoliation were detected. No treatments were applied in 2002, and 16,650 acres of defoliation – 98% on or near the Umatilla and Wallowa-Whitman National Forests -- were mapped during the aerial survey (figure 1).

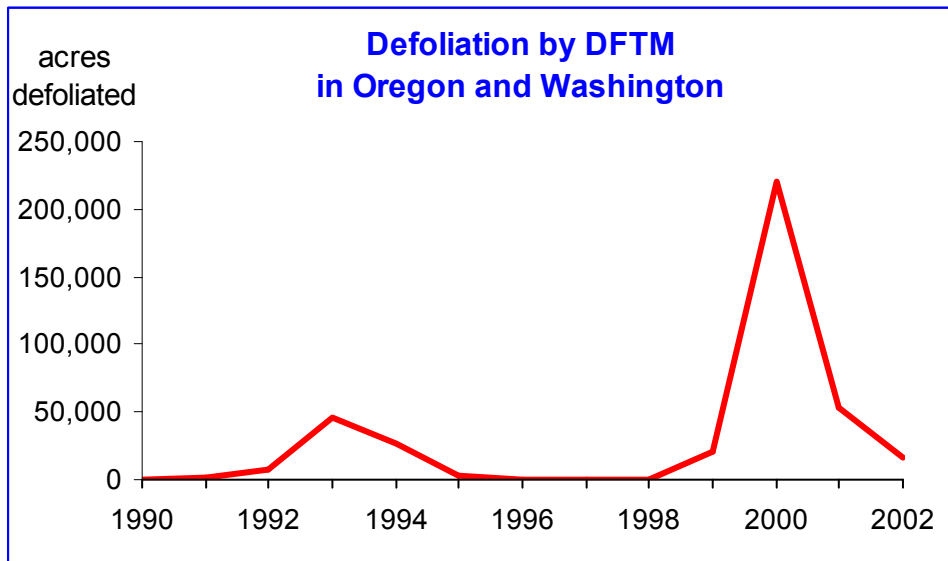


Figure 1: Acres of defoliation by Douglas-fir tussock moth as detected during annual aerial surveys.

The DFTM Early Warning System

DFTM population level trends are monitored annually throughout Oregon and Washington using pheromone traps. This on-going Douglas-fir Tussock Moth Early Warning System is a cooperative effort by the USDA Forest Service, USDI Bureau of Land Management, USDI Bureau of Indian Affairs, Oregon Department of Forestry and the Washington Department of Natural Resources. Other western Regions and States also participate in this west wide survey. The objective of the Early Warning System is to detect incipient DFTM outbreaks. When trap catches increase to predetermined levels, additional sampling activities are initiated to further quantify population levels (Sheehan et al. 1993). The DFTM Early Warning System

is intended to provide an advance warning of population changes that would indicate a potential outbreak one to two years prior to the outbreak occurring. This would allow land managers an opportunity to evaluate and implement management options before high levels of defoliation occur.

The pheromone traps are deployed according to standardized procedures (Daterman et al. 1979) in specified trap sites in July and retrieved following moth flight in the fall. The pheromone lures contain a very low pheromone dose and are calibrated specifically to detect low populations. There are five traps per plot. The average number of moths per trap is calculated for each plot. Male DFTM are sampled annually on these permanent locations throughout eastern Oregon and Washington. This report summarizes the sampling results for 2002.

Population Monitoring Process

Plot trap catch averages, trends in trap catches on plots from year to year, and trap catch density patterns over larger geographic areas, are the factors considered when determining future sampling intensity and methodology. When plot averages exceed predetermined threshold levels and the trend of trap catches is increasing in areas where defoliation would concern land managers, ground sampling is initiated.

Cocoon, egg mass, and/or larval surveys using methods described by Fettig et al. (2001) are conducted in the fall of the same year or spring and summer of the following year in the vicinity of plots with trap catch averages exceeding 40 moths per trap within areas of concern. Cocoon and larval survey data provide estimates of population densities and give more accurate indications of outbreak potential and population trends than the pheromone trap data, which indicate population changes over large geographic areas.

The DFTM Early Warning System is **not designed or intended** to predict exactly where the defoliation will occur; areas to be sampled on the ground should be selected on the basis of the impact of potential DFTM defoliation on management objectives. DFTM Early Warning system traps are **not** calibrated for use during the actual DFTM outbreak and as populations increase, a decline in trap catches will typically be noted. Once the traps have signaled a population increase, larval and cocoon/egg mass surveys are used to determine what the populations are doing in a particular area,

Results and General Trend

Figure 2 shows the annual number of moths caught in DFTM pheromone traps distributed throughout the host range in Oregon and Washington. For the current outbreak, trap catches peaked in 1998. As has been observed in other outbreaks (Daterman, Wenz, and Sheehan, manuscript in preparation), trap catches generally declined during the course of the outbreak.

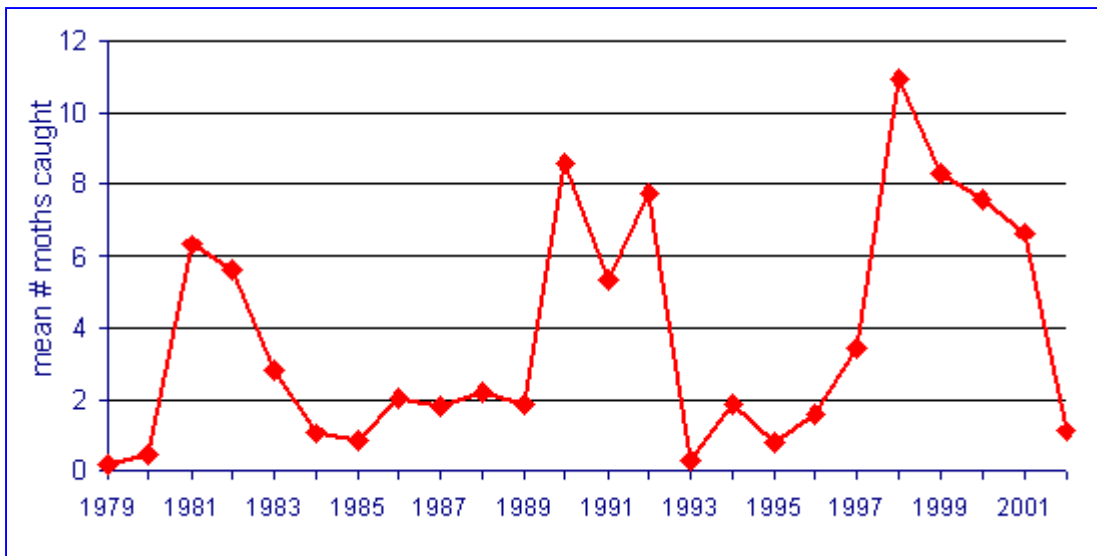


Figure 2 – Average DFTM pheromone trap catch for Oregon and Washington.

Figure 3 shows the percent of plots by trap catch categories for the last 7 years. The average trap catches from 2000 to 2001 did not change significantly. Maps 1 and 2 show plot locations and trap catch categories for each state in 2002.

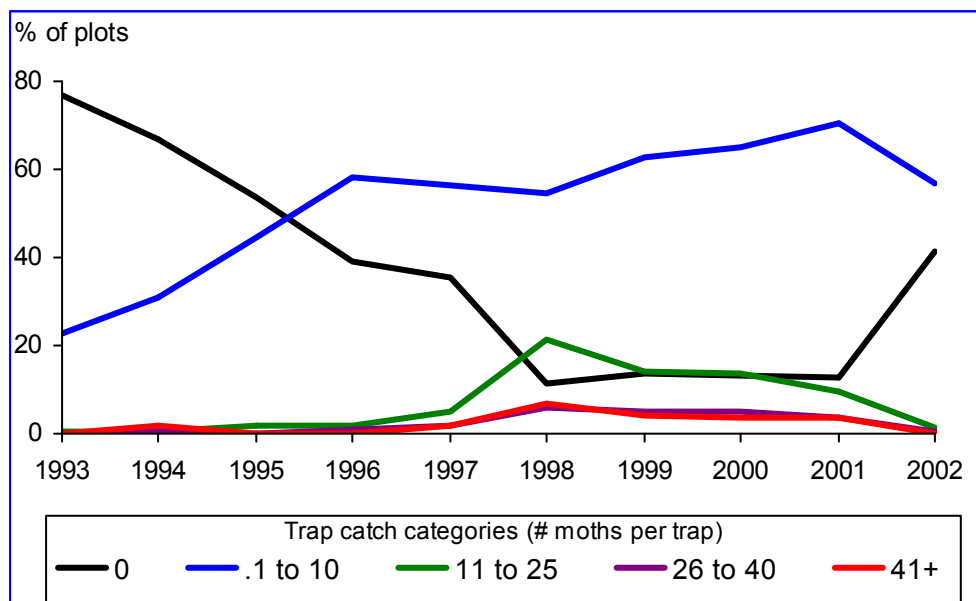


Figure 3 – Percent of plots by trap catch category in Oregon and Washington.

In 2002, relatively few plots caught ten or more moths per trap (table 1), and average trap catches on those plots declined by 55% from 2001. Among all plots, only 12% caught more moths in 2002 than in 2001, and for those plots the average increase was 1.0 moths per trap (maximum increase = 5.2 moths per trap).

All of the local areas where trap catches had increased in 2001 showed a decline in 2002. In southeast Washington and northeast Oregon (on or near the Umatilla NF), trap catches declined from 19.2 to 0.3 moths per trap on or near the Pomeroy RD and from 73.9 to 3.1 moths per trap on or near the Heppner RD. In south central Oregon, trap catches on or near the Fremont NF declined from 14.1 to 5.0 moths per trap. In scattered forested areas near the

Washington-Idaho border – and near a concurrent DFTM outbreak in the vicinity of Potlatch, ID – trap catches declined from 55.9 to 4.7 moths per trap.

DFTM Early Warning System data and summaries for the Oregon and Washington can be found on <http://www.fs.fed.us/r6/nr/fid/data.shtml#dftm>.

Discussion and Recommendations

DFTM Early Warning System trapping results indicate that DFTM populations have decreased to endemic levels. Defoliation has also declined for the past two years, and the outbreak which first caused defoliation in 1999 appears to have ended. Little or no defoliation is expected in 2003. Annual monitoring of the DFTM Early Warning System plots should continue.

References Cited

Daterman, G.E.; R.L. Livingston; J.M.Wenz; and L.L.Sower. 1979. How to use pheromone traps to determine outbreak potential. US Dept. Agric. Hdbk 546. 11p.

Daterman, Gary E.; Wenz, John M.; Sheehan, Katharine A. (in preparation). Early Warning System for Douglas-fir Tussock Moth Outbreaks in the Western United States. 28 p.

Fettig, Christopher J.; Fidgen, Jeffrey; McClellan, Quintin C.; Salom, Scott M. 2001. Sampling methods for forest and shade tree insects of North America. US Dept. Agric., Forest Service, Forest Health Technology Enterprise Team, FHTET-2001-01. 273 p.

Sheehan, K.A.; E.A. Willhite; A. Eglitis; P.T.Flanagan; T.F. Gregg; and B.B. Hostetler. 1993. Regional guidelines for sampling Douglas-fir tussock moth and western spruce budworm. US Dept. Agric., Forest Service, Pacific Northwest Region, For. Pest Mgmt. R6-93-03. 18p.

Shepherd, R.F.; D.D. Bennett; J.W. Dale; S. Tunnock; R.E. Dolph; and R.W. Their. 1988. Evidence of synchronized cycles in outbreak patterns of Douglas-fir tussock moth, *Orgyia pseudotsugata*, (McCunnough) (Lepidoptera:Lymantriidae). In Paths From a Viewpoint: The Wellington Festschrift on Insect Ecology. Mem. Ent. Soc. Can. 146:107-121.

Table 1: DFTM Pheromone Trap Catch Summary
Locations with Average Trap Catch >= 10 Moths per Trap in 2002

Nearest Forest	Nearest District	Plot Name	Agency*	Average # moths per trap							
				1995	1996	1997	1998	1999	2000	2001	2002
Fremont_NF	Bly	Goodlow	usfs		7.6	0.8	12.6	18.6	6.4	47.0	20.6
Fremont_NF	Bly	Riverbed	usfs		1.4	0.8	1.4	6.0	1.2	11.4	11.6
Fremont_NF	Lakeview	Deep_Creek	usfs	0.4	7.0	1.4	0.8	0.2	0.8	20.2	17.4
Fremont_NF	Lakeview	Horseshoe	usfs	21.8	13.2	0.2	1.8	2.4	3.2	28.4	17.4
Malheur_NF	Emigrant_Cr	2850_Road	usfs	2.6	6.4	1.8	14.6	15.8	8.2	9.2	9.8
Malheur_NF	Emigrant_Cr	Thompson_Spring	usfs	1.0	7.2	1.2	5.0	11.4	3.8	7.4	10.0
Okanogan&Wenatchee_NF	Tonasket	Dusty_Mtn_Meadow	dnr					55.0	52.6	40.0	26.6
Okanogan&Wenatchee_NF	Tonasket	Palmer_Lake	dnr	3.2	15.2	43.8	43.2	58.6	34.4	9.4	13.0
Spokane_St	South	Gilbert_Mtn	dnr								39.8
Spokane_St	South	Tekoa_Mt_North	dnr							85.2	12.4
Umatilla_NF	Heppner	Happy_Jack	usfs	0.2	0.0	4.8	42.4	17.4	47.8	116.8	10.8
Warm_Springs_IR	Warm_Springs_IR	Badger_Cr_2	bia					38.8	23.4	59.2	22.8
									<i>average:</i>	38.7	17.4

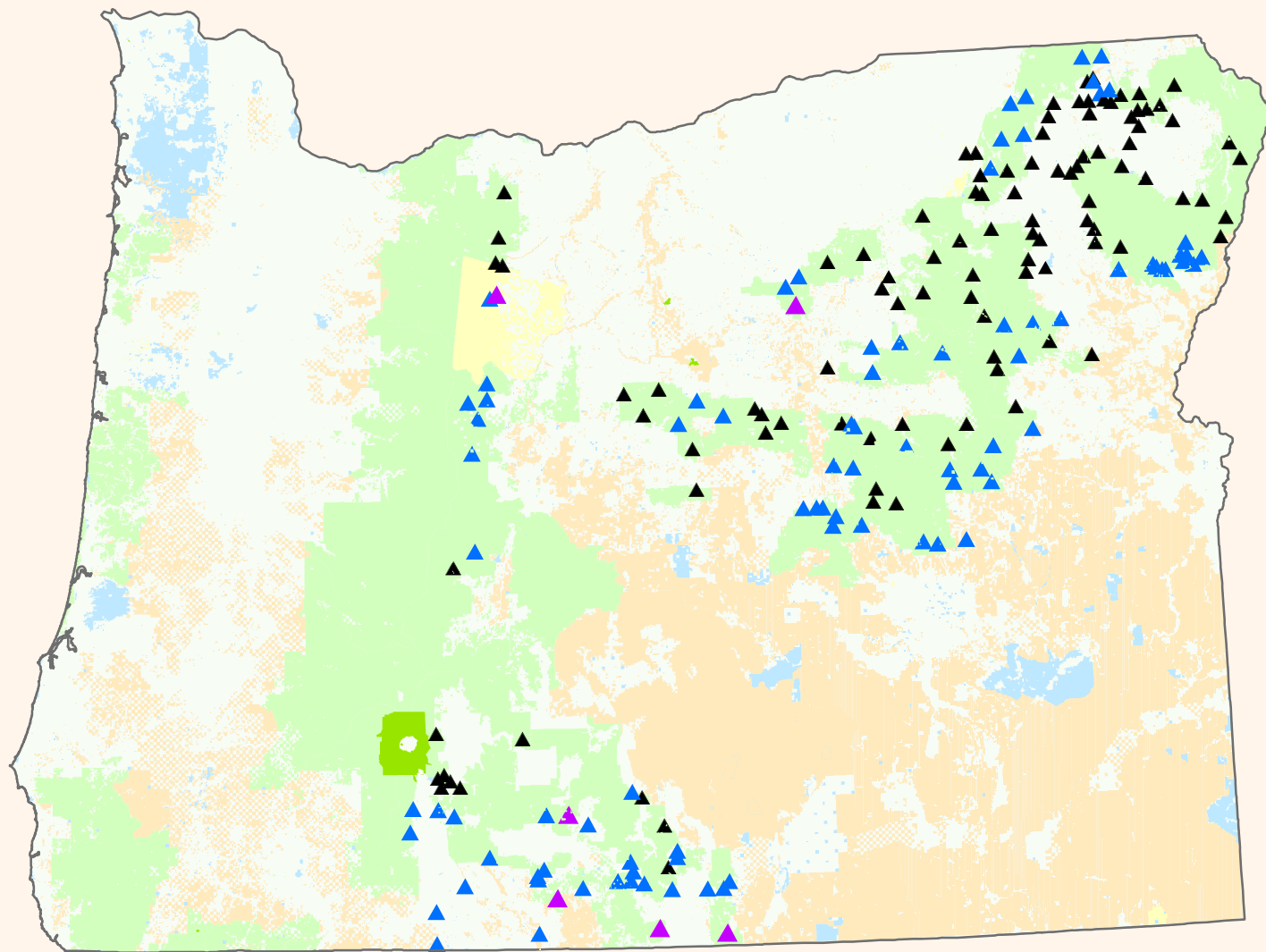
* usfs = USDA Forest Service
 dnr = Washington Department of Natural Resources
 bia = USDI Bureau of Indian Affairs

green = trap catches >=25 and <40 moths per trap

red = trap catches >= 40 moths per trap

note: the 12 plots shown in this table represent 2.3% of the 519 plots reported in 2002

Douglas-fir Tussock Moth: 2002 Average Trap Catch/Plot in Oregon



Average # of Moths Caught/Trap/Plot

▲ 0 Moths

▲ 11-25 Moths

▲ 1-10 Moths

US Forest Service

National Park Service

Tribal Land

Bureau of Land Management

Oregon State Land

Douglas-fir Tussock Moth: 2002 Average Trap Catch/Plot in Washington

