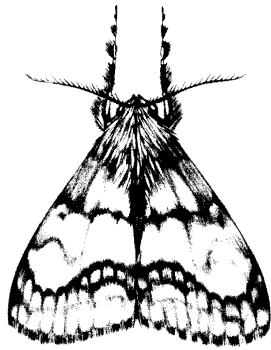


DOUGLAS-FIR TUSSOCK MOTH: A BRIEFING PAPER

You probably heard that the Blue Mountains might experience a Douglas-fir tussock moth outbreak during the next few years. That prediction was based on an early-warning system that utilizes pheromone traps to monitor tussock moth population levels (pheromones are biochemicals whose odor is used to attract insects). The early-warning system was developed during the last major outbreak in the 1970s and was initiated West-wide in 1980 as a way to help predict tussock moth outbreaks. This article is intended to provide some background information about the tussock moth, including its history here on the Umatilla NF, and to speculate about what we could expect if an outbreak occurs in the next year or so.



Douglas-fir tussock moth (DFTM) is a native insect of the Blue Mountains; it was not introduced from somewhere else like larch casebearer or white pine blister rust. Tussock moth defoliates true firs (grand fir primarily) and Douglas-fir from the top down, killing trees outright or setting them up for future attack by bark beetles such as Douglas-fir beetle or fir engraver. Unlike western spruce budworm, another major defoliator that caused widespread tree damage in the Blues between 1980 and 1992, the tussock moth can consume a tree's entire foliage in a hurry – infested trees begin to turn reddish-brown in June and may be entirely defoliated (all of the needles are gone) by mid-July.

Tussock moth populations are cyclic, rising on average about every 9 years in the western United States. Not every population peak results in an outbreak – in northeastern Oregon, it appears that an outbreak happens to coincide with every second or third population peak. Outbreaks were recorded for the Blue Mountains in 1928-1929, 1937-39, 1946-48, 1963-65, 1972-1974, and 1992-93. However, dendrochronology studies showed that tussock moth has been active in the Blues for as long as their mixed-conifer forest habitat has been present (note that dendrochronology is the interpretation of tree cores to infer climatic cycles, fire cycles, insect outbreaks, etc.). For example, dendrochronology analysis indicates that tussock moth may have defoliated mixed-conifer stands in the Drumhill Ridge area (Walla Walla Ranger District) from 1843 to 1845, 1852 to 1854, and in 1875.



Historical Outbreaks. There have been two Douglas-fir tussock moth outbreaks for which we have defoliation or damage maps and written records. The first recorded outbreak was discovered on August 20, 1946 when a pine beetle survey crew was cruising a check plot near Troy, Oregon. After the survey crew reported the outbreak, an entomologist was dispatched from the Forest Insect Laboratory in Portland to review the situation.

When entomologist Walter J. Buckhorn visited the Troy area on September 18 and 19, 1946, he found that 10,000 to 12,000 acres of mixed-conifer had been defoliated by tussock moth, with complete tree mortality occurring on some 500 to 600 acres in patches ranging up to 50 acres. Local residents reported that 1946 was the second year of the outbreak. Heavy egg deposits indicated that tussock moth populations were still increasing and that considerable timber would probably be killed in 1947.

Buckhorn was particularly interested in the Troy-area infestation because it coincided with a much larger tussock moth outbreak in central Idaho and northeastern Washington. Extensive control operations were already being planned for the Washington and Idaho outbreak areas. He decided that the Troy infestation was close enough to the central Idaho outbreak to coordinate a control program. Buckhorn and the Walla Walla District Ranger completed an aerial survey of the Troy outbreak in March of 1947; their sketch map showed that 56,065 acres were infested to some degree with heavy defoliation on 1,265 acres, moderate defoliation on 23,890 acres, and light defoliation on the remainder (30,910 acres).

Between June 24 and July 1 of 1947, 14,000 acres of the tussock moth outbreak near Troy were sprayed with a solution of DDT and fuel oil (one pound of DDT in one gallon of fuel oil per acre). An airplane carrying 1,000 gallons of spray solution per trip was used for the project; it operated from the Moscow, Idaho airport located about 65 miles from the Troy area. Treatment was confined to commercially valuable timber only; unmerchantable and lightly infested stands were excluded because their timber value or defoliation level was too low to economically justify control expenditures.

The next broad-scale tussock moth outbreak affecting the Umatilla National Forest occurred in the early 1970s. The first damage was noticed as 2,400 acres of defoliation in the Okanogan Valley of north-central Washington in 1971. In 1972, over 197,000 acres were defoliated in Oregon and Washington. Perhaps some of the worst damage occurred on the north end of the Umatilla National Forest. By 1974, 44% of the defoliated acreage in the DFTM outbreak area (including state, private, and other federal ownerships) was on the Umatilla – a total of 353,850 acres!

How did the Forest respond to the 1970s outbreak? The Forest Service acted quickly and decisively to the tussock-moth damage, and the political aspects of that story are fascinating. DDT, the powerful chemical insecticide used in the 1947 spray project near Troy, was found to affect many other organisms besides insect defoliators (it was also used against the spruce budworm during the late 1940s and the 1950s). Due to its environmental persistence and the broad spectrum of organisms affected by it, William Ruckelshaus, director of the Environmental Protection Agency, banned DDT on June 14, 1972.

From the perspective of the 1970s tussock moth outbreak, the EPA's ban couldn't have come at a worse time. Banning DDT removed the most effective weapon against tussock moth during the first year of what would turn out to be the largest and most severe outbreak ever recorded for the interior Pacific Northwest. In response to the ban, the Forest Service immediately began testing other potential insecticides. Testing included Zectran, carbaryl (Sevin), Pyrethroid, and Dylox, all of which were chemical compounds, and *Bacillus thuringiensis* (a bacteria) and a natural virus, two possible biological control agents. After a Forest Service petition to use DDT was denied by the EPA in June of 1973, 32,000 acres of the Walla Walla watershed was immediately sprayed with Zectran during a test project.

On Thursday, August 16, 1973, when United States Senator Bob Packwood was reviewing tussock moth damage near La Grande, Oregon, a forest fire broke out near Perry and burned nearly 6,000 acres in a short period of time, including an area damaged by tussock moth. This Rooster Peak fire directly threatened La Grande, burning several homes at its edge and coming within yards of others. Over 1,500 people fought the fire from the ground, many of which were local residents of La Grande. The National Guard was activated to help evacuate homeowners

from foothill areas. Shortly after this fire event, an area-wide fire closure was instituted due to tussock moth damage and high fire danger from an on-going drought.

Originally, Senator Packwood had no official position regarding EPA's ban on the use of DDT. Following the Rooster Peak fire and his review of thousands of acres of tussock-moth damage from both the air and the ground, Senator Packwood eventually expressed this opinion regarding the DDT ban: "But, now I'm convinced their decision was wrong" (in reference to EPA's decision to not authorize use of DDT for tussock moth control). Following Packwood's visit and the Rooster Peak fire, petitions began circulating in northeastern Oregon requesting that the EPA's ban on DDT be lifted so that it could be used against tussock moth. On August 31st, Secretary of Agriculture Earl Butz visited the Blues to review tussock moth damage.

In January of 1974, the EPA held hearings in Portland to consider possible use of DDT against tussock moth. On January 30, 1974, the Tussock Moth Control Association of La Grande, Oregon presented petitions with 57,000 signatures to Vice President Gerald Ford; the petitions requested that DDT be allowed for use against tussock moth. On February 26, 1974, EPA director Russell Train granted authorization for emergency use of DDT against tussock moth only.

After a Johnny Appleseed clean-up weekend in early June of 1974, when 2,000 four-wheel drive club volunteers performed clean-up work in tussock moth damaged areas, a tri-Region, tri-State DDT spray project began on June 9, 1974 on the Colville Indian Reservation. By June 22, DDT spraying was underway in the Blue Mountains, eventually concluding on July 25, 1974. A total of 426,559 acres was sprayed, including 32,706 acres on the Umatilla NF and 72,717 acres on the Wallowa-Whitman NF.

Although application of an insecticide was the main Forest Service response to tussock moth defoliation, salvage sales to harvest damaged and dead timber were also completed on the Forest. The first Umatilla sale was sold on November 28, 1972. The last of 40 tussock-moth salvage sales was sold on September 3, 1974. Some of the old harvest units in places like Ruckel Ridge, Phillips Creek, and upper Tiger Canyon date from the tussock-moth salvage program of the middle 1970s.

Treatment Options. Now, how would the Forest respond to an outbreak in the near future? The answer to that question is that it all depends. Our response could involve application of an insecticide but, if it did, the area treated would be much smaller and more focused than was done in the 1970s. The impetus for the 1970s spray projects was protection of high-value timber; the impetus for an early 2000s project would be protection of values related to fisheries, visual quality, recreation, and so forth. Unlike the 1970s, it is unlikely that chemical insecticides would be considered; a polyhedrosis virus has been produced and stockpiled at a Forest Service lab in Corvallis, Oregon and would be available for application, in addition to *Bacillus thuringiensis* and other registered insecticides.

If no direct action was taken to suppress tussock-moth populations and mixed-conifer stands then suffered partial or complete tree mortality, it is possible that salvage sales would be completed to remove some of the dead trees. Once again, salvage would only be considered for situations where tree removal was compatible with other values. Since tussock moth can kill entire stands of susceptible host type, and do it quickly, the future risk of forest fires would also need to be considered. Damaged areas in the urban-wildland interface zone might pose a particularly high fire risk, so any salvage operations would probably be considered there first.

Note: David C. Powell, Forest Silviculturist for the Umatilla National Forest, compiled this summary. It was based on historical references in the archives of the Forest's silviculture library.