

FOREST PEST MONITORING ON MOUNT MANSFIELD

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ABSTRACT

The forest on Mount Mansfield is monitored annually to detect changes in populations of major insect pests and to document the incidence of damage from insects, diseases, weather or air pollution. Techniques used include pheromone trapping of adult insects, damage assessments on individual trees, aerial surveys to detect damaged forested areas, and use of plant species sensitive to ozone injury.

Population levels of four of the six major insect pests monitored on Mount Mansfield decreased to or maintained a low population level in 1994. Spruce budworm adults trapped increased from 1993 levels. This trend was seen at other Vermont locations, but is not believed to represent the start of an outbreak since numbers are still relatively low, no defoliation has been observed, and the population cycle is 40 years between outbreaks (last outbreak in the early 1980's). Fall hemlock looper populations at low elevations (1400') rose slightly from 1993, but remained well below levels recorded in 1992. No defoliation was observed.

Light damage to sugar maple from Bruce spanworm and maple leaf cutter was visible but not serious. Ozone injury was detected on one of three bioindicator plant species (milkweed), with the severity of injury recorded as light, 1 on a scale of 0-5.

Areas of moderate and heavy dieback were mapped from aerial surveys. These correspond to areas of recent logging on private lands (northern area in Browns River watershed) and state lands mainly in the Clay Brook watershed south of the Stevensville Brook watershed.

INTRODUCTION

Damage to forest trees from insects, diseases and weather has played a major role in widespread tree declines in the past. Monitoring pest populations and tree damage is conducted annually on a statewide basis to understand trends in the occurrence of stress agents in relation to forest health. More recently, concerns about the role of air pollutants in forest health have prompted monitoring of injury to sensitive plants from ground level ozone.

Our objective, therefore, is to monitor trends in the populations of major insect pests, and to document the occurrence of damage to the forests on Mount Mansfield from any detectable stress agents.

METHODS

There are many different methods for measuring forest pest populations. Some forest pests do not yet have reliable, meaningful survey methods developed. At present, the forest pests monitored on Mount Mansfield include: pear thrips (PT), gypsy moth (GM), forest tent caterpillar (FTC), spring hemlock looper (SHL), fall hemlock looper (FHL) and spruce budworm (SBW). Defoliation is monitored on ground plots and from the air.

FOREST TENT CATERPILLAR, SPRING AND FALL HEMLOCK LOOPER, AND SPRUCE BUDWORM

These pests are monitored using pheromone traps [multiplier traps with a biolure and a vaportape insecticide], which attract male moths during their flight period, indicating relative population levels in the area. FTC trapping is done using a 5 trap cluster in northern hardwood stands. Spring and fall hemlock looper trapping uses 1 trap per site placed in hemlock or balsam fir stands. SBW trapping uses a 3 trap cluster placed in spruce and fir stands. Protocols for these surveys is in accordance with that of other statewide surveys for these pests (Teillon et al, 1994).

Each trap type is deployed during the adult moth flight period. FTC traps are active between June 26 and August 15. SHL traps are placed out between May 19 and July 29. FHL catches are made from August 31 to October 31. SBW traps are deployed between June 22 and August 12. Trap catches are returned to the VT FPR Laboratory in Waterbury for identification and counting of target and non-target species.

PEAR THRIPS

PT are a relatively new pest to Vermont sugar maple trees, and therefore lack the depth of understanding in relating trap catches to population densities and subsequent damage. At present 2 different population assessment methods are in use for monitoring this pest: soil samples for fall and winter population estimates and yellow sticky traps for adult population estimates and flight period. Both methods are used at the PMRC [1360 ft. (415 m) elevation].

Soil samples are collected annually in the fall to estimate the overwintering pear thrips population. Field and laboratory protocols previously established for statewide and regional PT surveys are used (Parker et al, 1990). Basically, 5 sugar maple trees were identified in 1988 as reference points for soil sampling, using a bulb planter collecting tool, and resultant damage assessments.

Yellow sticky traps are used to monitor the timing and duration of adult PT activity above ground, as well as to monitor trends in adult populations over time. Standard protocols were developed under the CAPS program (Cooperative Agricultural Pest Survey Program) and consisted of placement of 4 yellow sticky traps at a 1-m height off the ground in the vicinity of 8 sugar maple trees to be used for monitoring bud phenology and PT damage. Weekly trap collections are made from April 1 through June 13, with trap catch counts verified by VT FPR Laboratory staff.

GYPSY MOTH

A gypsy moth population monitoring plot is used to monitor trends in GM egg masses counts over time. This plot is located in a small stand of quaking aspen, a preferred host of the GM. Protocols for this survey follow standards used in other Vermont GM focal areas. Burlap bands placed at DBH on live trees within a 1/5th acre plot attract egg bearing females, who tend to lay their egg masses under or near the burlap. Counts of egg masses in the fall are used to estimate the resident population.

AERIAL SURVEY OF FOREST DAMAGE

Aerial surveying of the mountain is conducted by trained FPR staff during the summer months. The purpose is to detect areas of defoliation, discoloration, heavy dieback or mortality, and determine the cause of this injury, if possible. Two observers sketch damaged areas onto topographic maps, indicate possible cause, then later conduct ground surveys to verify location, extent, and possible cause of injury. Procedures are standardized statewide and remeasurement is conducted on 10% of the area evaluated (Teillon et al, 1994).

OZONE BIOINDICATOR PLANTS

Plants sensitive to ground level ozone are monitored throughout the growing season as part of the National Forest Health Monitoring Program (Tallent-Halsell 1994). During the period of maximum exposure, August 7-23, 30 individuals of each sensitive species growing naturally in large openings are examined for symptoms of ozone injury. These include milkweed, black cherry and blackberry. Symptoms are verified by a regional expert in ozone injury identification as part of the NFHM.

RESULTS AND DISCUSSION

Four of the six major insect pest populations monitored on Mount Mansfield decreased to or maintained a low population level in 1994 (Table 1 & 2).

Pheromone traps failed to catch any FTC or SHL adults at any of the elevations, and no gypsy moth egg masses were observed in monitoring plot this year.

FHL populations at the 1400 and 2200' elevations increased in 1994, but were still below levels trapped in 1992. Populations at the top of the mountain remained low. No defoliation was observed on hemlock at any of the elevations.

SBW adults trapped also increased, and were the highest numbers recorded in the four years at these sites, at the population levels recorded at Mount Mansfield are higher than any of the other monitoring sites in the state. No defoliation was observed. These population levels are not believed to represent the start of an outbreak since numbers are still relatively low, no defoliation has been observed, and the population cycle is 40 years between outbreaks (last outbreak in the early 1980's).

PT populations were dramatically lower in 1994, with no insects recovered from soil samples, and only 4 adults trapped during the flight period. No defoliation was observed.

Other pests present and causing light defoliation included Bruce spanworm and maple leaf cutter. Both pests feed on sugar maple. Defoliation in scattered trees was moderate to lower foliage, but overall, only light defoliation occurred.

Ground level ozone caused detectable symptoms on sensitive plants (milkweed) growing in large openings at the Proctor Maple Research Center (Figure 1). Purple stippling rated as severity 1 (on a scale of 0 - 5) occurred on about 30% of the milkweeds observed during August. Drought conditions early in the summer probably reduced plant uptake of ozone, therefore avoiding extensive injury to plants. No damage from ozone was observed to trees at the Mount Mansfield site.

Moderate dieback in the northern part of the Browns River watershed was mapped from the air (Figure 2). This corresponds to previously mapped areas with thin crowns as a result of recent logging on privately owned lands. Also recorded was heavy dieback in the southern part of the Stevensville Brook watershed, adjacent to areas on State Lands logged in the past 5 years. No other damages were recorded from aerial surveys in June and August.

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Table 1. Survey results on six forest pests monitored on Mount Mansfield from 1991 to 1994. Results are in average population counted unless otherwise indicated. Blanks for 1991 indicate pests and elevations not included in the survey for that year.

TARGET PEST	SURVEY TYPE	ELEV.	1991	1992	1993	1994
Forest Tent Caterpillar	Pheromone traps	1400'	0	0	0	0
		2200'		0	0	0
		3800'		0	0	0
Spring Hemlock Looper	Pheromone traps	1400'		0	0	0
		2200'		0	0	0
		3800'		-	0	0
Fall Hemlock Looper	Pheromone traps	1400'		325	80	123
		2200'		521	-	133
		3800'		41	0	0
Spruce Budworm	Pheromone traps	1400'	19.7	29.0	16.0	53.0
		2200'		5.0	6.3	16.0
		3800'		2.3	1.7	18.7
Gypsy Moth	Burlap banded trees	1400'	3 e.m.	4 e.m.	1 e.m.	0 e.m.
Pear Thrips	Adult sticky traps	1400'	8	313	1472	4

e.m. egg masses

Table 2. Pear thrips soil populations and resulting damage to sugar maple foliage at 1400' on Mount Mansfield from 1989 through 1994. Soil populations are recorded in units of pear thrips per bulb planter of soil to allow comparison between other Vermont sites.

YEAR	SOIL POPULATION	RESULTING DAMAGE AFFECTING:				
		TREES			SAPLINGS	SEEDLING
		GENERAL DAMAGE RATING	DIEBACK	TRANSPARENCY	GENERAL DAMAGE RATING	GENERAL DAMAGE RATING
1989	17.5	LIGHT			MOD.	---
1990	10.6	LIGHT			LIGHT	LIGHT
1991	0.6	LIGHT	15.0	17.0	LIGHT	LIGHT
1992	0.8	LIGHT	12.0	9.0	LIGHT	LIGHT
1993	8.1	LIGHT	22.0	19.0	MOD.	LIGHT
1994	0	NONE	6.0	11.0	NONE	NONE

Soil Population based on average number of thrips in 10 bulb planter sized samples
 Light Damage = 1-30 % of leaves affected; Moderate Damage = 31-60 % of leaves affected
 Dieback = average % of recently dead branches; Transparency = average % of light coming through the foliage

Figure 1. Cumulative weekly ozone levels above 60 ppb from April through September compared with injury observed on sensitive plant species. Northern Vermont site = Underhill, southern Vermont site = Bennington & Rupert, Vermont, 1994.

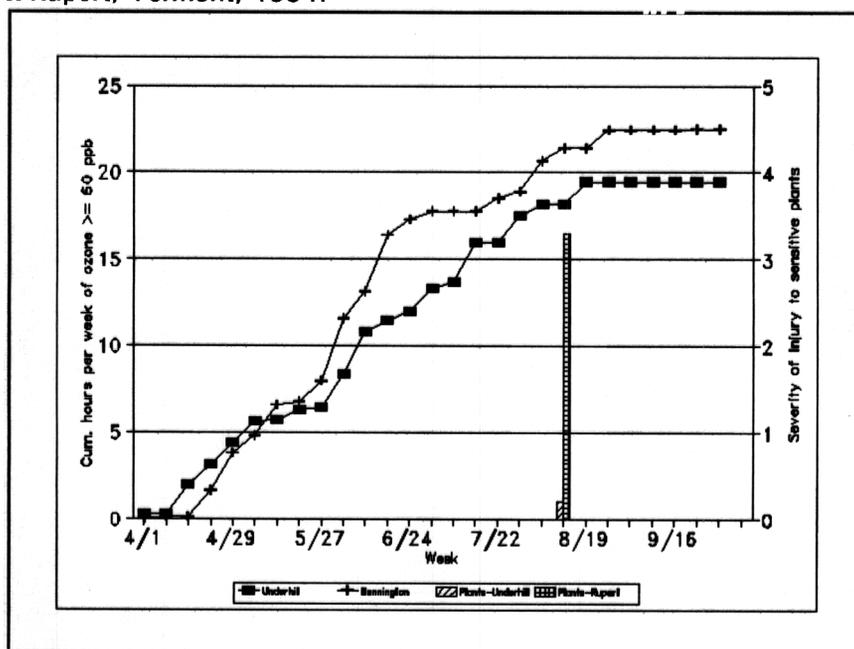
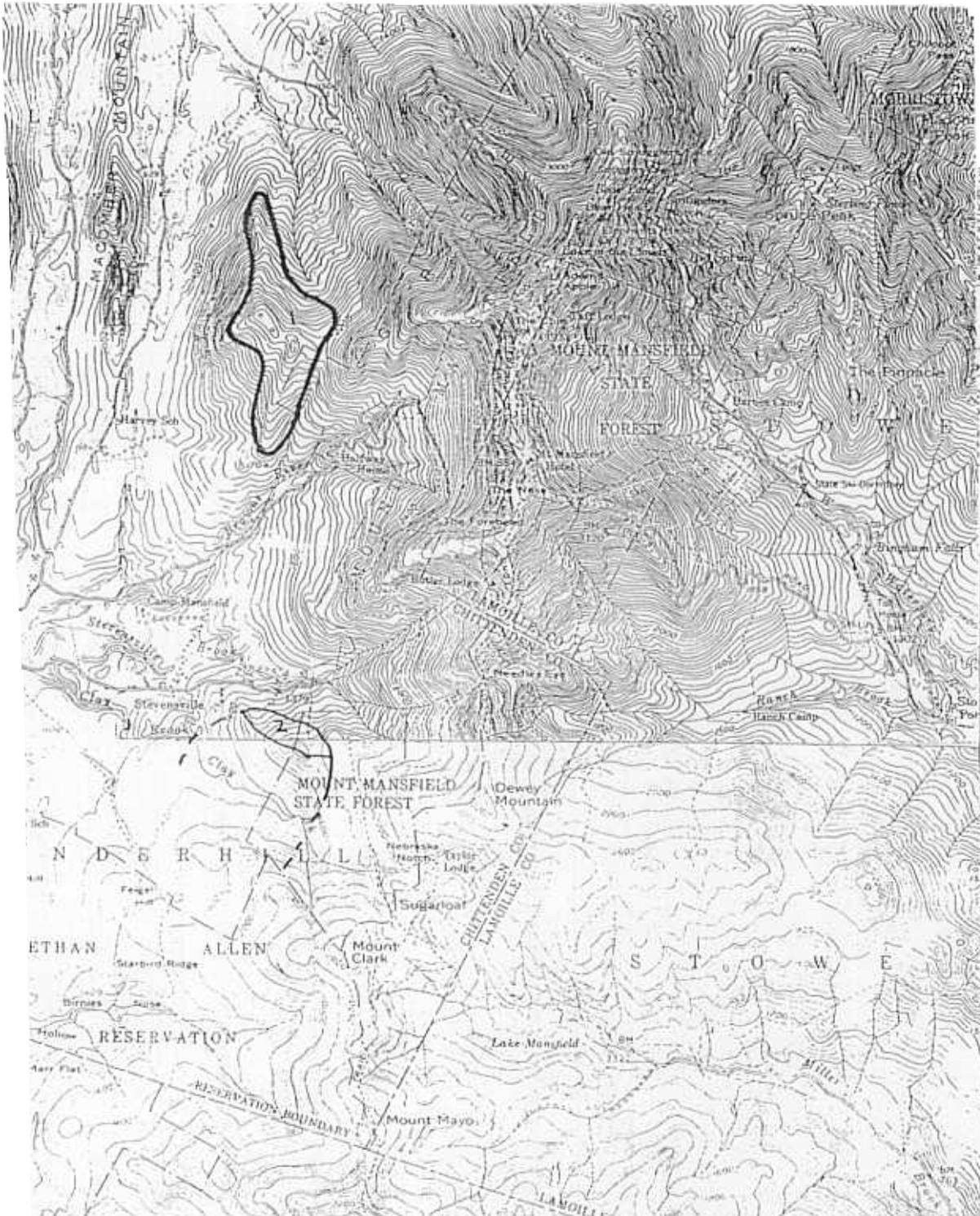


Figure 2. Forest Damage Mapped on Mt. Mansfield, 1994.



Damage 1 = Moderate dieback Damage 2 = Heavy dieback
Dotted line indicates that damage extends to adjacent watershed.