FOREST PEST MONITORING ON MOUNT MANSFIELD

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ABSTRACT

Damage to forests is monitored annually to detect changes in populations of major insect pests and to document the incidence of damage from insect, disease, weather or air pollution. Techniques used include pheromone trapping of adult insects, damage assessments on individual trees, aerial surveys to detect damaged areas, and use of plant species sensitive to ozone injury. Five of the six major insect pests monitored on Mount Mansfield decreased to or maintained a low population level in 1993. The exception was pear thrips, which increased in number and in damage across the mountain. Other damage detected in 1993 included winter injury to red spruce, moderate to heavy damage to paper and yellow birch from birch leaf miner and birch leaf skeletonizers, light damage to sugar maple from Bruce spanworm and maple leaf cutter, and ozone injury to one of three bioindicator plant species (milkweed).

INTRODUCTION

Damage to forest trees from insects, diseases and weather has played a major role in widespread tree declines in the past. Monitoring pest population trends and tree damage is conducted annually on a statewide basis to understanding trends in stress agent occurrence 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.

The objective 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.

In addition to forest pest monitoring, plants sensitive to ground level ozone are monitored throughout the growing season to detect symptoms of ozone injury to vegetation at the site.

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

These pests are monitored using pheromone traps [multipher 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, 1993).

Each trap type is deployed during the adult moth flight period. FTC traps are activated between June 20 and August 15. SHL traps are placed out between April 7 and July 15. FHL catches are made from August 31 to October 31. SBW traps are deployed between June 14 and September 5. Trap catches were 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. Two soil samples are taken at each tree, for a total of 10 samples per site. Damage assessments are made in June.

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, with trap catch counts verified by VT FPR Laboratory staff. Bud development is monitored weekly, from April to June, and damage ratings are made in June.

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 (Teillon et al., 1993). 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 was conducted by trained FPR staff in April, June and August in 1993. The purpose is to detect areas of defoliation, discoloration, heavy dieback or mortality, and determine the cause of this injury. 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, 1993).

OZONE BIOINDICATOR PLANTS

Plants sensitive to ground level ozone are monitored throughout the growing season as part of the National Forest Health Monitoring Program (Conkling and Byers, 1993). During the period of maximum exposure, August 8-19, 10-30 plants of sensitive species growing naturally in large openings are examined for symptoms of ozone injury.

At this site, the sensitive species available 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

Five of the six major forest insect pests monitored on Mount Mansfield decreased or maintained a low population level in 1993 (Table 1). The exception was pear thrips, which increased in number and in damage across the mountain (Table 2, Figure 1). No FTC or SHL was trapped at any of the elevations in 1993. The FTC trapping may be due to a failure in the effectiveness of the pheromone lure rather than absence of the insect.

PT populations increased, but the timing of adult activity was also early, allowing entry into open maple buds at a vulnerable stage (Figure 2). The timing of adult activity in relation to sugar maple bud development is key to determining whether or not substantial damage occurs to a stand or individual tree. While only light damage was observed on sample trees, other trees within the stand at PMRC and on the mountain had moderate and heavy defoliation.

Other damage detected on the mountain was winter injury on red spruce, birch leaf miner and birch leaf skeletonizer damage to paper and yellow birch, Bruce spanworm defoliation on sugar maple, and maple leaf cutter damage on sugar maple. Ozone injury was detected on one of the sensitive species monitored (milkweed) but not on the others (blackberry and black cherry) (Figure 3). Damage to sensitive species was also detected at a similar site in Bennington County (Merck Forest, Rupert) where milkweed, black cherry and blackberry exhibited symptoms of ozone injury, while white ash did not. No ozone injury was detected on forest trees through aerial and ground surveys.

REFERENCES

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Table 1. Survey results on six forest pests monitored on Mount Mansfield from 1991 to 1993. Results are in total 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.	RESULTS IN 1991	RESULTS IN 1992	RESULTS IN 1993
Forest Tent Caterpillar	Pheromone traps	1400' 2200' 3800'	0	0 0 0	0 0 0
Spring Hemlock Looper	Pheromone traps	1400' 2200' 3800'		0 0 -	0 0 0
Fall Hemlock Looper	Pheromone traps	1400' 2200' 3800'		325 521 41	80 - 0
Spruce Budworm	Pheromone traps	1400' 2200' 3800'	19.7 ave	29.0 ave 5.0 ave 2.3 ave	16.0 ave 6.3 ave 1.7 ave
Gypsy Moth	Burlap banded trees	1400'	3 egg masses	4 egg masses	1 egg mass
Pear Thrips	Adult sticky traps	1400'	8	313	1472

Table 2. Pear thrips soil populations and resulting damage to sugar maple foliage at 1400' on Mount Mansfield from 1989 through 1993. 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	TRANS-PARENCY	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

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 . Areas on Mount Mansfield with damage to trees detected from aerial surveys, 1993.

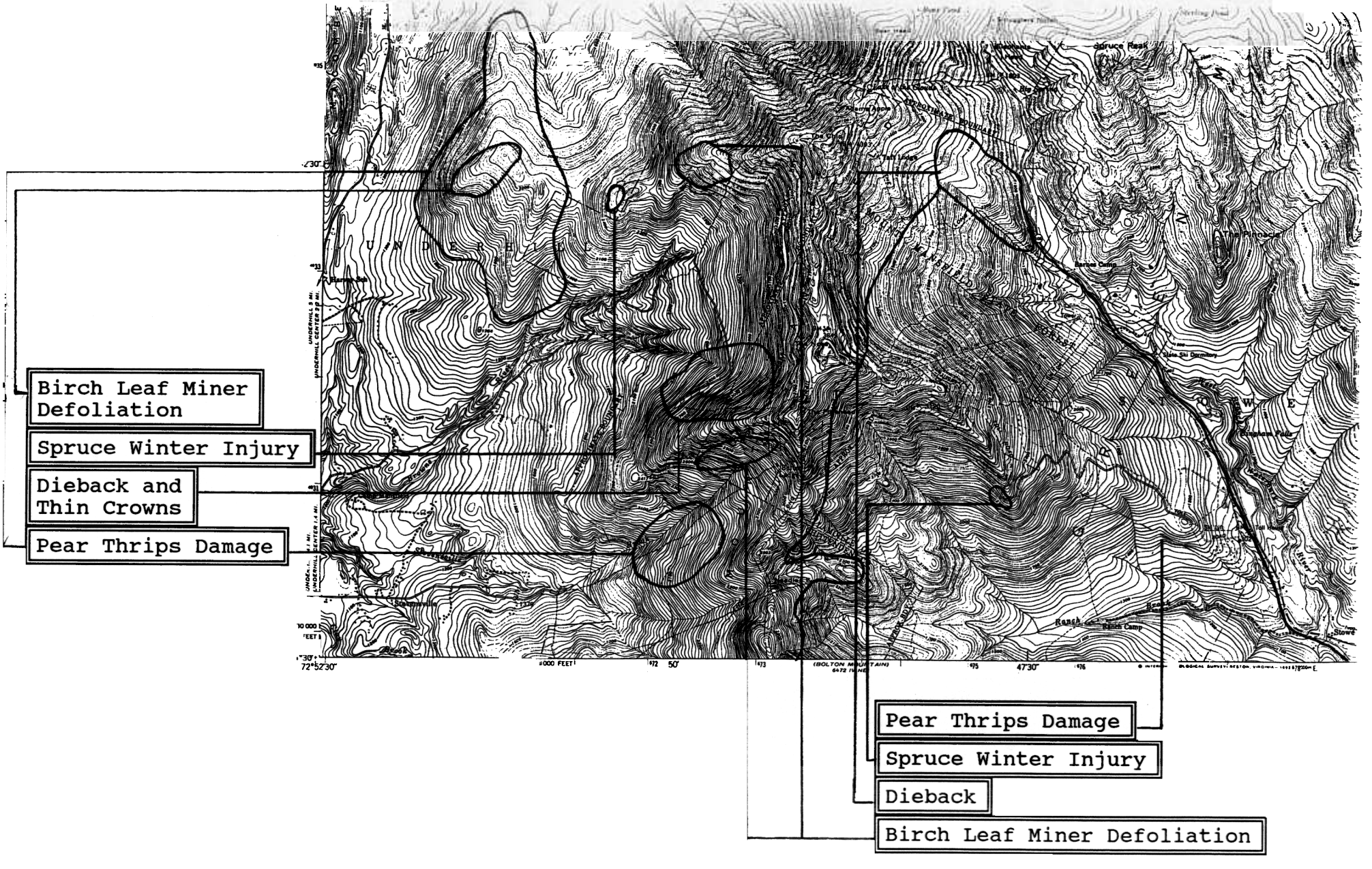

Figure 2. Pear thrips adult activity in 1992 and 1993 compared to sugar maple bud development at the Proctor Maple Research Center, Underhill, VT.

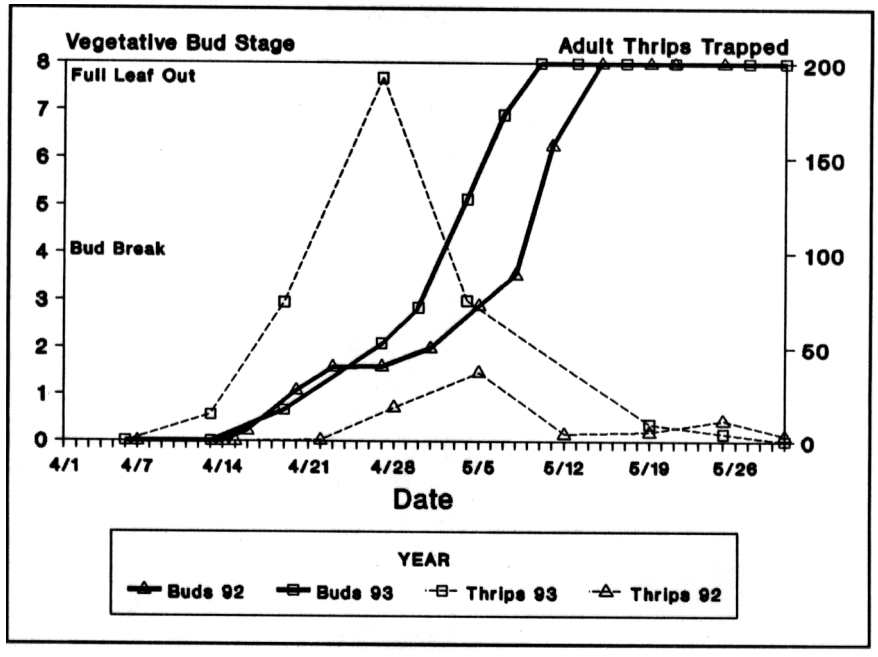

Figure 3. Cumulative weekly ozone levels above 60 ppb from April through September compared with injury observed on sensitive plant species. Underhill and Bennington, Vermont, 1993.