

Forest damage assessment at Mt. Mansfield and the Lye Brook Wilderness Area

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Abstract

Annual monitoring of pest population trends and tree damage is conducted on a statewide basis to understand 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 plants sensitive to ground level ozone.

Monitoring efforts on Mount Mansfield include conducting aerial surveys to detect areas of defoliation or decline, ground plot evaluations of tree damages, and monitoring of forest pest population trends. At the Lye Brook Wilderness Area (LBW) aerial surveys and ground plot evaluations are used to detect defoliation and declines.

The objective of this monitoring effort is to detect trends in the populations of major insect pests, and to document the occurrence, location and severity of damage to the forests on Mount Mansfield and the LBW.

At Mount Mansfield, populations of most major forest insect pests remained low. Pear thrips adult populations increased, and light defoliation was observed on scattered regeneration and trees. Spruce budworm populations at the high elevation site remain high, exceeding other sites statewide, but no detectable defoliation has resulted. Aerial survey results revealed persistent birch leaf miner and birch decline on the northwest part of the study area, and birch defoliation in areas in Ranch Valley on the east slope of the mountain. Hardwood decline was mapped in Ranch Valley adjacent to the toll road at high and low elevations.

In the LBW, large areas of birch leaf miner damage and spruce winter injury were mapped from aerial surveys. A small area of hardwood breakage was also recorded, probably associated with heavy winds in July of 1995.

Surveys of ozone sensitive bioindicator plants continue to detect plants with symptoms of ozone injury. Despite lower than usual ozone exposures, especially at Underhill, abundant precipitation favored ozone uptake by plants, resulting in injury symptoms.

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 understand 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 plants sensitive to ground level ozone.

Monitoring efforts on Mount Mansfield include conducting aerial surveys to detect areas of defoliation or decline, ground plot evaluations of tree damages, and monitoring of forest pest population trends. At the Lye Brook Wilderness Area (LBW) aerial surveys and ground plot evaluations are used to detect defoliation and declines.

The objective of this monitoring effort is to detect trends in the populations of major insect pests, and to document the occurrence, location, and severity of damage to the forests on Mount Mansfield and the LBW from detectable stress agents.

Mount Mansfield Monitoring 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), 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 aerial survey.

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 accordance with that of other statewide surveys for these pests (Teillon et al, 1996).

Each trap type is deployed during the adult moth flight period. FTC traps are active between June 10 and August 16. SHL traps are placed out between May 19 and July 29. FHL catches are made from July 10 to October 31. SBW traps are deployed between June 18 and August 16. Trap catches were returned to the Vermont Department of Forests, Parks & Recreation (FPR) Forest Biology Laboratory in Waterbury for identification and counting of target and non-target species.

PEAR THIRPS

Pear thrips 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 Proctor Maple Research Center [1360 ft. (415 m) elevation]. Additional soil sample plots were established in 1995 at 3 elevations in the Stevensville Brook watershed as part of the planned Forest Management Study. Here, the sampling transects are located at 1500, 2000 and 2500' elevations off the Butler Lodge Trail.

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 at each sampling site are used as reference points for soil sampling, using a bulb planter collecting tool, and in the following spring are assessed for defoliation.

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 conducted at the VT FPR Forest Biology Laboratory.

Mount Mansfield and Lye Brook Wilderness Area Methods

AERIAL SURVEY OF FOREST DAMAGE

Aerial surveys conducted by trained FPR staff during the summer months are used 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, severity and possible cause of injury. Procedures are standardized statewide and remeasurement is conducted on 10% of the area evaluated (Teillon et al, 1996). Information is later digitized into a Geographic Information System.

OZONE BIOINDICATOR PLANTS

Plants sensitive to ground level ozone are surveyed as part of the National Forest Health Monitoring Program (NFHM)(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, blackberry, white ash and dogbane. Symptoms are verified by a regional expert in ozone injury identification as part of the NFHM. For Mount Mansfield, plant evaluations are conducted at the Proctor Maple Research Center in the open field where the state ozone monitor is located. The availability of large (>3 acres) opening containing plants sensitive to ozone have not been possible at LBW. A location in Rupert (Bennington County) is used to represent exposure and injury for the southern Vermont site. Ozone exposure data is provided by the Vermont Air Pollution Control Division for the two Vermont sites: Bennington and Underhill.

Mount Mansfield Results And Discussion

Insect populations of forest tent caterpillar and spring hemlock looper remained below detection limits, as has been the case in the past 4-5 years (Table 1). Fall hemlock looper populations continue to thrive at the two lower elevation sites, but no noticeable defoliation has been observed. Spruce budworm populations at the 3800' elevation were the highest of all the statewide monitoring sites, but was not associated with noticeable defoliation. Pear thrips populations remained very low in the soil assessment (Table 2), but the adult traps showed an increasing population (Table 1). Light defoliation was observed on scattered regeneration and trees.

Mount Mansfield and Lye Brook Wilderness Area Results And Discussion

Aerial surveys over Mount Mansfield detected persistent areas of birch leaf miner, also associated with birch decline, on the west slope of the mountain (Figure 1). On the east slope in Ranch Valley, hardwood decline areas and patches of birch leaf miner were mapped.

The Lye Brook Wilderness Area aerial survey detected large areas of birch leaf miner defoliation, especially on the west slopes (Figure 2). Spruce winter injury was mapped in areas towards the southwest corner of the site, and one patch of breakage on hardwoods was mapped in the northwest corner, probably associated with localized heavy winds during July 1995.

Plants sensitive to ozone showed symptoms of injury at both the Underhill and Bennington County (Rupert) sites, despite a large difference in ozone exposure, as expressed as the cumulative dose of all hourly ozone greater than 60 ppb over a 24 hour period (Figure 3). The severity of plant injury at the Underhill site averaged 3 (26-50% of leaf area affected) on a scale of 0-5. The Bennington County site bioindicator plant injury was only slightly less severe. Abundant precipitation this year may have favored ozone uptake, despite relatively low exposure levels at Underhill.

Acknowledgments

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Table 1. Survey results on five forest pests monitored on Mount Mansfield from 1991 to 1996. Results are in average population counted unless otherwise indicated.

Target Pest	Survey Type	Elevation	1991	1992	1993	1994	1995	1996
Forest Tent Caterpillar	Pheromone traps	1400'	0	0	0	0	0	0
		2200'		0	0	0	0	0
		3800'		0	0	0	0	0
Spring Hemlock Looper	Pheromone traps	1400'		0	0	0	0	0
		2200'		0	0	0	0	0
		3800'		-	0	0	0	0
Fall Hemlock Looper	Pheromone traps	1400'		325	80	123	111	49
		2200'		521	-	133	28	232
		3800'		41	0	0	0	1
Spruce Budworm	Pheromone traps	1400'	19.7	29.0	16.0	53.0	11.7	30.3
		2200'		5.0	6.3	16.0	5.0	9.7
		3800'		2.3	1.7	18.7	25.7	49.0
Pear Thrips	Adult sticky traps	1400'	8	313	1472	4	37	111

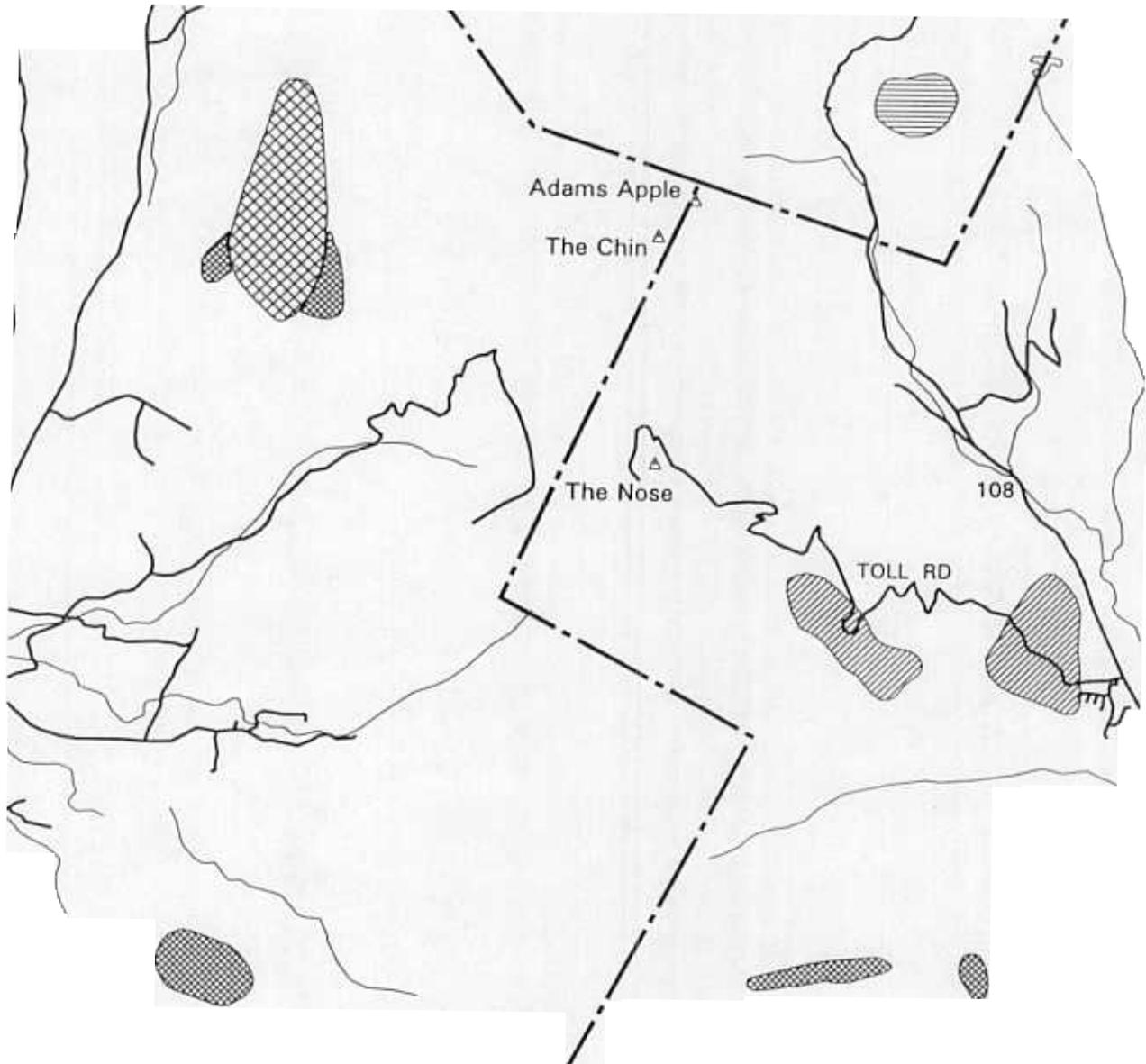
Table 2. Pear thrips soil populations and resulting damage to sugar maple foliage at the Proctor Maple Research Center at 1400' on Mount Mansfield from 1989 through 1996. Soil populations are recorded in units of pear thrips per bulb planter of soil to allow comparison between other Vermont sites.

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
1995	.1	NONE	6.0	11.0	NONE	NONE
1996	.1	LIGHT	10.0	11.25	LIGHT	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 Forest damage mapped on Mt. Mansfield, 1996.



LEGEND

-  birch leaf miner
-  hdwd decline
-  birch decline
-  spruce/fir decline

Figure 2. Forest damage mapped in Lye Brook Wilderness Area, 1996.

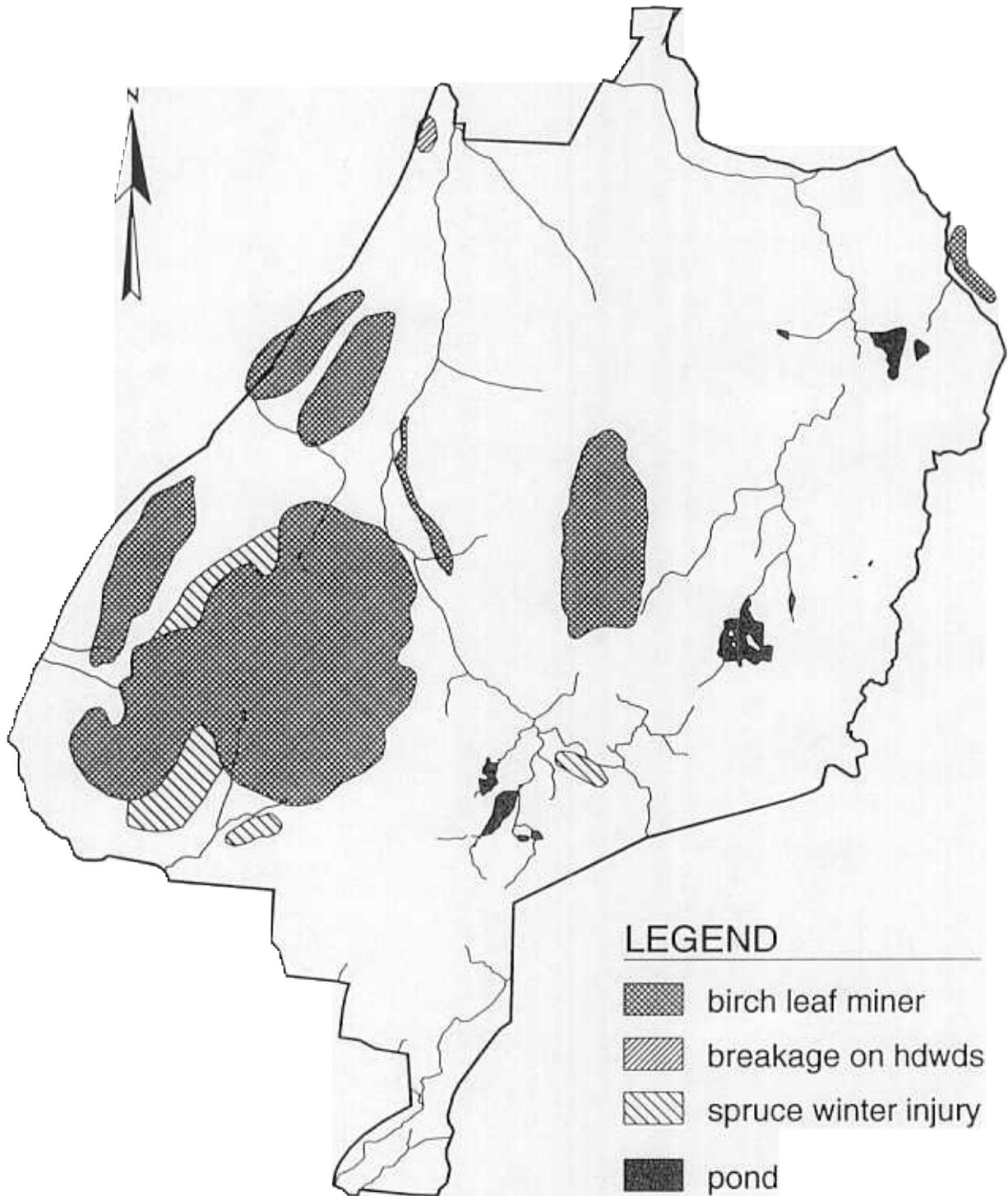


Figure 3. Weekly cumulative ozone exposures (expressed as cumulative sum60 ozone based on 24 hour period) representing the Underhill (Mount Mansfield) and Bennington (Lye Brook) study sites compared with injury to ozone sensitive bioindicator plants surveyed at Underhill and Rupert (Bennington County). Plant injury severity is based on a 0 - 5 rating system where 0=no injury, 1=1-6% of leaf area affected, 2=7-25%, 3=26-50%, 4=51-75%, and 5=>75%. Despite lower exposures at Underhill, both sites show moderate plant injury.

