

**Forest damage assessment at
Mt. Mansfield and the Lye Brook Wilderness Area
1998**

Sandra Wilmot, Thomas Simmons and Trish Hanson
Vermont Department of Forests, Parks & Recreation

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.

Weather played an important role in forest ecosystems in 1998. It was the 5th warmest winter, the second wettest summer, and experienced heavy rains causing localized flooding. But of major importance was the January ice storm, which coated trees causing significant ice loads on Mount Mansfield from elevations beginning at about 1800'. Weather effects at Lye Brook resulted in anthracnose leaf diseases at various locations.

At Mount Mansfield, populations of most major forest insect pests were at low levels. Of the major forest insect pests monitored, forest tent caterpillar was below detection limits, spruce budworm populations remained low with no visible defoliation, and pear thrips populations as measured in the soil and emerging in the spring were lower than in 1997. A total of 491 thrips were caught on sticky traps, a decrease from 618 in 1997. Light defoliation was observed on scattered regeneration.

Surveys of ozone sensitive bioindicator plants in both northern and southern Vermont continue to detect plants with symptoms of ozone injury. In 1998, symptoms were more severe at the northern Vermont site. Both sites had cumulative SUM60 ozone exposures greater than 200 ppb-hrs when symptoms were evaluated.

Introduction

Damage to forest trees from insects, diseases and weather has played a major role in widespread tree declines in the past. Monitoring of 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. In 1998, the forest insects monitored on Mount Mansfield included: pear thrips (PT), forest tent caterpillar (FTC), and spruce budworm (SBW). Defoliation and declines are monitored on ground plots and from the aerial survey. Ground level ozone injury to sensitive plants is monitored at both study sites.

FOREST TENT CATERPILLAR 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. SBW trapping uses a 3 trap cluster placed in spruce and fir stands. Protocols for these surveys are consistent with those of other statewide surveys for these pests making results comparable across the state (Teillon et al, 1998).

Each trap type is deployed during the adult moth flight period. FTC traps are active between June 10 and August 16. SBW traps are deployed between June 18 and August 16. Trap catches are 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 THRIPS

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 10 soil samples, using a bulb planter collecting tool, and in the following spring these trees 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 a 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, 1998). 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 2 week period of maximum ozone accumulation, mid-August, 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, pin cherry 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 an open field where the state ozone monitor is located. The availability of a large (>3 acres) forest opening containing plants sensitive to ozone has 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 are 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 remain below detection limits, as has been the case for the past 7 years, with no moths trapped. Spruce budworm populations continue at low levels, with no visible defoliation detected (Figure 1). The statewide average was 6.6 moths per trap. Pear thrips populations remained higher in 1998 than in the period from 1994-1996, but are still relatively low (Figure 2). A total of 491 thrips were caught on sticky traps, a decrease from 618 in 1997. Light defoliation was observed on scattered regeneration and trees. Southern Vermont experienced significant pear thrips defoliation, affecting over 36,000 acres.

Mount Mansfield and Lye Brook Wilderness Area

Results And Discussion

Ozone injury symptoms were confirmed at both northern and southern Vermont sites. Although southern Vermont received higher cumulative ozone levels, injury symptoms at the northern Vermont site were heavy (Figure 3). Severity of injury to sensitive plants was light to moderate at the southern Vermont site, and ranged from light (on black cherry and milkweed) to heavy (on blackberry).

Results from aerial surveys to map areas of defoliation and decline at the Lye Brook Site detected damage from anthracnose fungus at various locations in and surrounding the wilderness area (Figure 4). This summer was unusually wet, resulting in fungal diseases on many species. Sugar maple, paper birch and yellow birch showed the heaviest damage from fungal attacks. Statewide, nearly 250,000 acres of anthracnose damage was detected.

Mount Mansfield forests were affected by the January ice storm that coated branches and twigs with thick ice, 1-5 inches of ice accumulation (Figure 5). Statewide, 940,000 acres of forest land were affected by ice. While ice on the west slope of the mountain began melting within a few days, trees on the east slope remained laden with ice for several weeks. Extensive ice loads to trees were mapped on both the east and west slopes of the mountain. Most of the injury occurred above 2300 feet on the west slope, and above 1800 feet on the east slope of the mountain. Ground surveys showed that most of the injury was due to crown breakage, especially to hardwood trees.

Acknowledgments

Aerial survey and ground plot data collection was conducted by dedicated Forest Resource Protection staff. GIS maps of aerial survey data was provided by Tom Luther of the USDA Forest Service, Northeastern Area State & Private Forestry in Durham, NH. Ozone data has been generously provided by the Vermont Air Pollution Control Division. Financial support has been provided in part by the USDA Forest Service, Northeastern Area State & Private Forestry, the National Forest Health Monitoring Program and through the State of Vermont.

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Figure 1. Spruce budworm population trends on Mount Mansfield at 3 elevations.

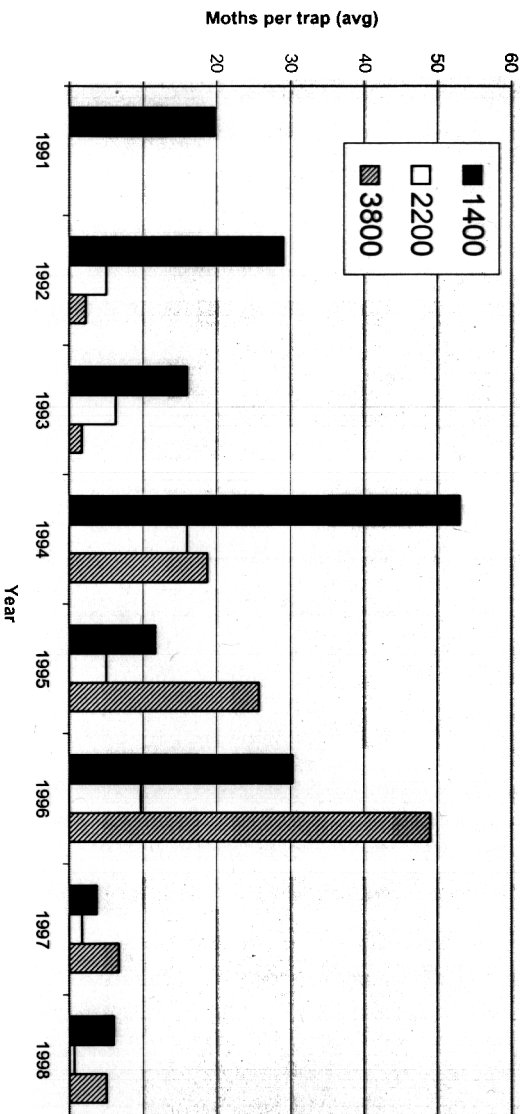


Figure 2. Pear thrips population monitoring on Mount Mansfield at 1400 feet. Comparison of overwintering soil population and emerging adult population.

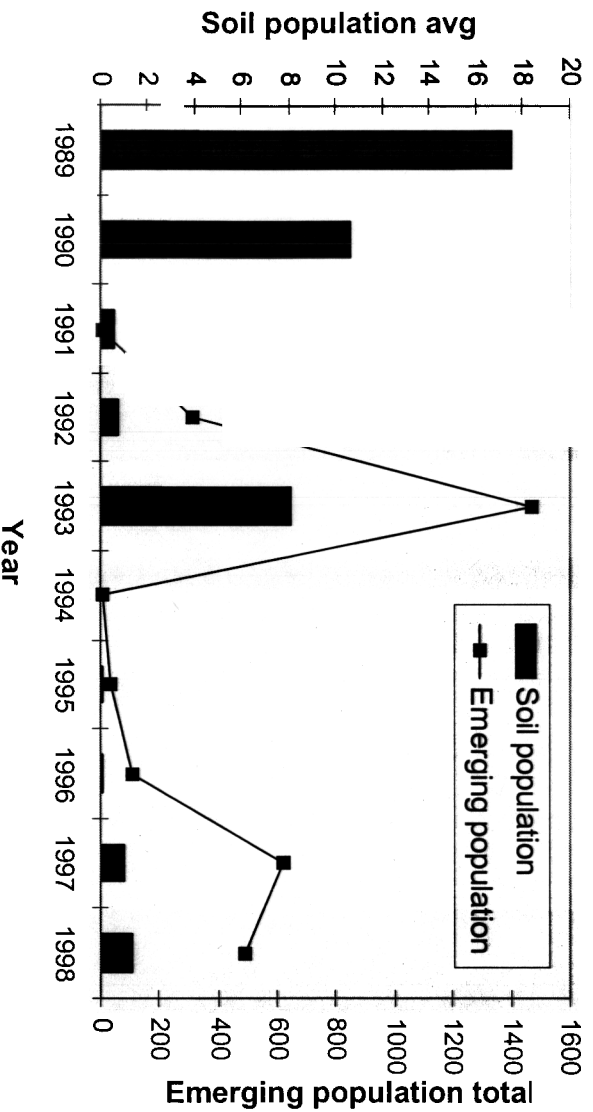


Figure 3. Weekly cumulative ozone exposures (expressed as cumulative sum60 ozone based on 24 hour period) representing the Mount Mansfield (Underhill) and Lye Brook (Bennington) study sites compared with injury to ozone sensitive bioindicator plants surveyed at Underhill and Rupert (Bennington County). 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%. Plant injury symptoms were present at both sites. Injury symptoms at the southern Vermont site were moderate, while heavy at the northern Vermont site.

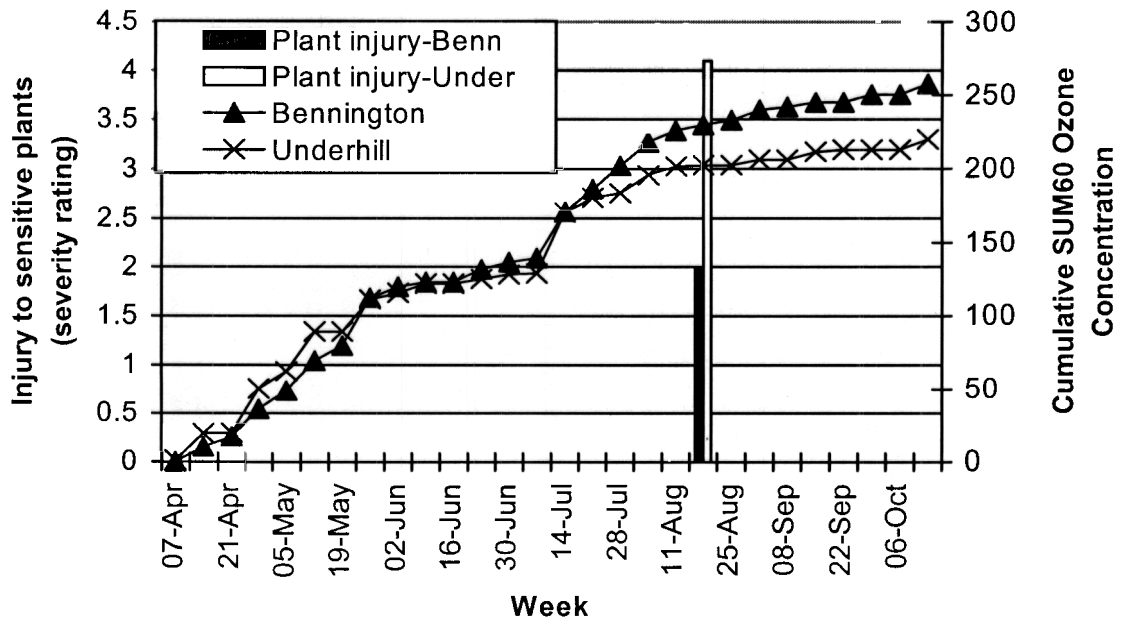


Figure 4. Forest damage mapped in Lye Brook Wilderness Area, 1998.

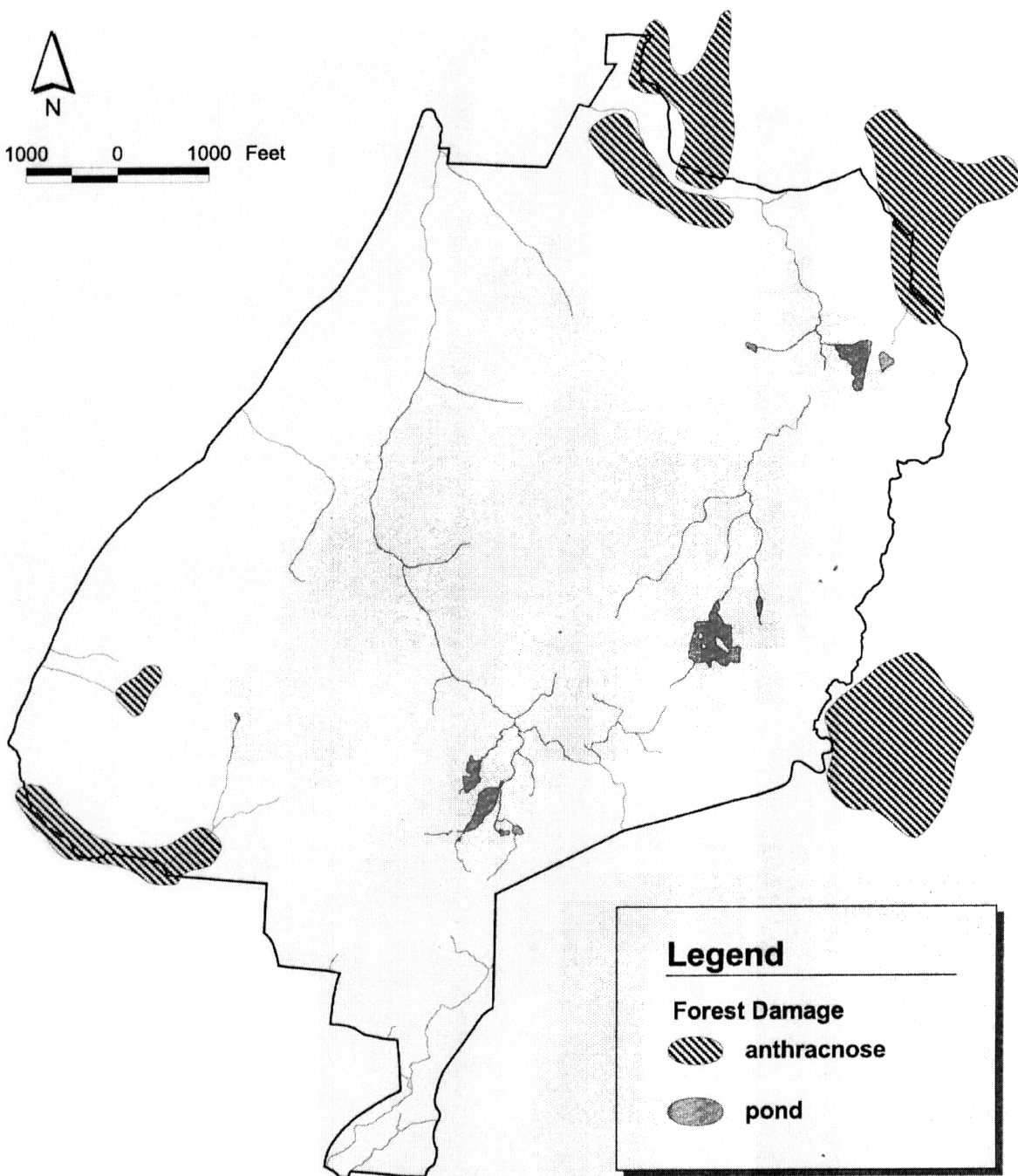


Figure 5 Forest damage mapped on Mt. Mansfield, 1998.

