FOREST PEST MONITORING ON MOUNT MANSFIELD - 1995

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ABSTRACT

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 of damage to the forests on Mount Mansfield and the LBW from detectable stress agents.

The major stress affecting forests in 1995 was drought conditions in the spring and early summer. At Mount Mansfield, below normal precipitation was recorded from February through June at the Proctor Maple Research Center. At the summit weather station, below normal precipitation occurred only during April and June, suggesting that high elevation forests were less stressed than lower elevation forests.

Population levels of all six major insect pests monitored on Mount Mansfield decreased to or maintained a low population level in 1995. Light defoliation to sugar maple trees from Bruce spanworm was visible but not serious.

On Mount Mansfield, areas of moderate and heavy dieback were mapped from aerial surveys. These correspond to areas defoliated in 1993 by pear thrips. A small area of moderate birch defoliation was also mapped in the Browns River watershed. This same area has been defoliated for the past 3 years.

Four areas of hardwood declines in the Lye Brook Wilderness Area were identified from aerial surveys.

Ground level ozone monitoring at the Underhill and Bennington stations recorded cumulative SUM06 exposures at 21.56 and 19.49 ppb-hr, respectively for 1995. Plants sensitive to ozone were evaluated in August for symptoms of ozone injury. Severity of injury at the Rupert site (southern Vermont) showed light injury. Not injury was found on plants at the Underhill site.

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 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), 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 (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 accordance with that of other statewide surveys for these pests (Teillon et al, 1995).

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 were returned to the Vermont Department of Forests, Parks & Recreation (FPR) 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].

Soil samples are collected annually in the fall of 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

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.

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, and possible cause of injury. Procedures are standardized statewide and remeasurement is conducted on 10% of the area evaluated (Teillon et al, 1995). Information is later digitized into a Geographic Information System.

OZONE BIOINDICATOR PLANTS

Plants sensitive to ground level ozone are monitored throughout the growing season 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 and blackberry. 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 is used as a southern Vermont representative of injury on sensitive plants with maximum ozone exposure.

Mount Mansfield
RESULTS AND DISCUSSION

The major forest stress agent for 1995 was an early season drought. Precipitation was below normal from February through June at the Proctor Maple Research Center weather station (Figure 1a). The summit weather station showed below normal precipitation only for April and June (Figure 1b). So high elevation forests may not have suffered from moisture deficit to the same extent as lower elevations.

Results from insect monitoring showed no detectable populations of forest tent caterpillar or spring hemlock looper. Fall hemlock looper populations were lower than in 1994, and no detectable defoliation was observed. Spruce budworm populations on Mount Mansfield were the highest relative to other survey locations in the state, especially at the high elevation site. These population levels still remain low compared to building and outbreak levels, and no detectable defoliation was observed. Gypsy moth and pear thrips populations remain low, with only slight increases from last year. Overall, all these insect pest populations remained at low levels this year.

Light defoliation was recorded on survey plots at Proctor Maple Research Center (1400') from Bruce spanworm. Lower canopy branches were especially affected. This seemed to be a localized population, since other low elevation areas were unaffected.

Another insect that was active on high elevation spruce and fir trees was the white spotted sawyer beetle (*Monochamus scutellatus*). The noticeable symptom was apical flagging on trees with no apparent pattern. The adults feed on the underside of twigs causing a wound. The twig dies and the foliage from the wound to the tip turns red. Damage to trees was minimal. No previous outbreaks of this insect have been observed, so significant defoliation in the future is not expected.

Mount Mansfield and Lye Brook Wilderness Area
RESULTS AND DISCUSSION

Aerial survey results for Mount Mansfield outline areas of heavy dieback throughout the east slope of the mountain. An area of moderate dieback was mapped on the northwest slope of the Browns River watershed, adjacent to an area of moderate birch defoliation. Both these areas of dieback were mapped in 1993 as defoliated by pear thrips, but recovered in subsequent year. These recovering trees may have been less resistant to drought conditions experienced during the early summer this year.

Four areas of hardwood decline were identified within the Lye Brook Wilderness Area from aerial surveys. Two of these areas are in the far north, and the other two are on the southwest slopes of the wilderness area. On the northeast edge of the wilderness area, outside the boundaries, an area of birch leaf miner defoliation was recorded.

Monitoring of ground level ozone at the Underhill and Bennington stations showed cumulative SUM06 values of 21.56 and 19.49, respectively for 1995 (Figure 4). These ozone values are based on a 24 hour, April through September calculation. Symptoms of ozone injury to sensitive plants was present at the southern Vermont site in Rupert, where light injury was recorded. No injury was observed at the Underhill site. Early season drought conditions probably prevented the uptake of ozone, limiting plant injury.

ACKNOWLEDGEMENTS

Aerial survey data collection was conducted by dedicated Forest Resource Protection staff. GIS maps of aerial survey information 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.

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Table 1. Survey results on six forest pests monitored on Mount Mansfield from 1991 to 1995. 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	Elevation	1991	1992	1993	1994	1995
Forest Tent Caterpillar	Pheromone traps	1400′ 2200′ 3800′	0	0 0 0	0 0 0	0 0 0	0 0 0
Spring Hemlock Looper	Pheromone traps	1400′ 2200′ 3800′		0 0 -	0 0 0	0 0 0	0 0 0
Fall Hemlock Looper	Pheromone traps	1400′ 2200′ 3800′		325 521 41	80 - 0	123 133 0	111 28 0
Spruce Budworm	Pheromone traps	1400′ 2200′ 3800′	19.7	29.0 5.0 2.3	16.0 6.3 1.7	53.0 16.0 18.7	11.7 5.0 25.7
Gypsy Moth	Burlap banded trees	1400′	3 e.m.	4 e.m.	1 e.m.	0 e.m.	2 e.m.
Pear Thrips	Adult sticky traps	1400′	8	313	1472	4	37

e.m. = egg mass

Table 2. Pear thrips soil populations and resulting damage to sugar maple foliage at 1400' on Mount Mansfield from 1989 through 1995. 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
1994	0	NONE	6.0	11.0	NONE	NONE
1995	.1	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 1a. Precipitation at the Proctor Maple Research Center.

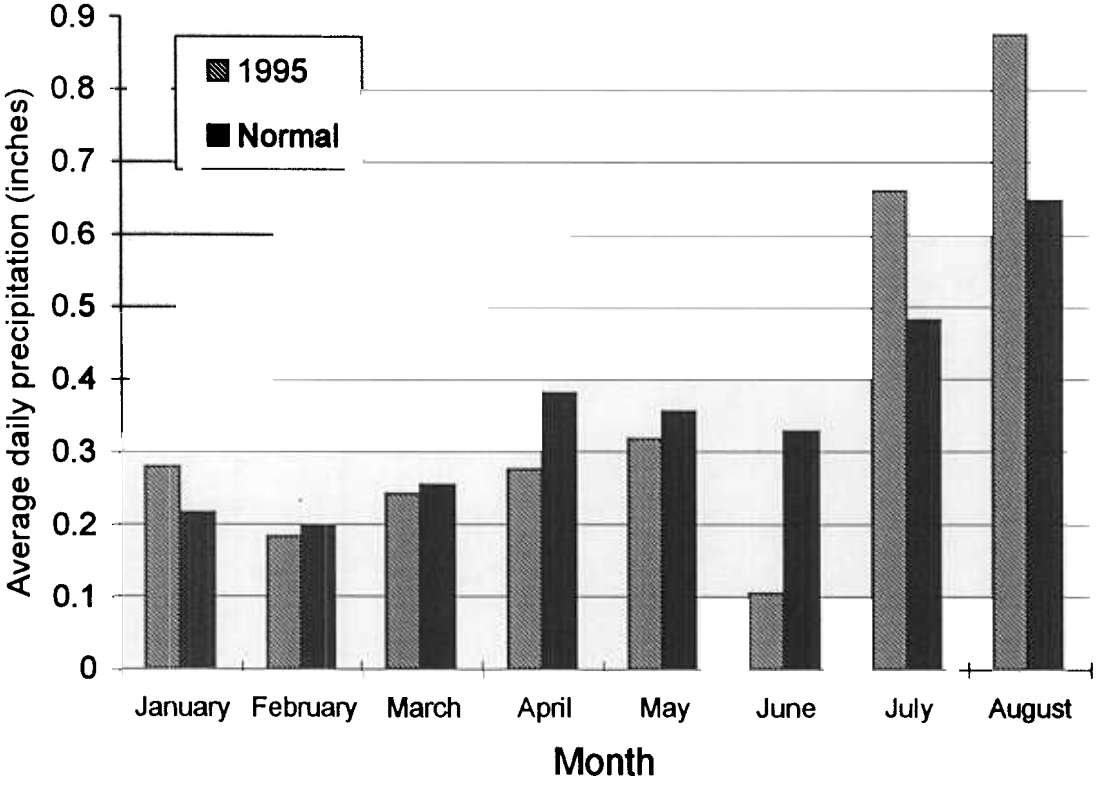
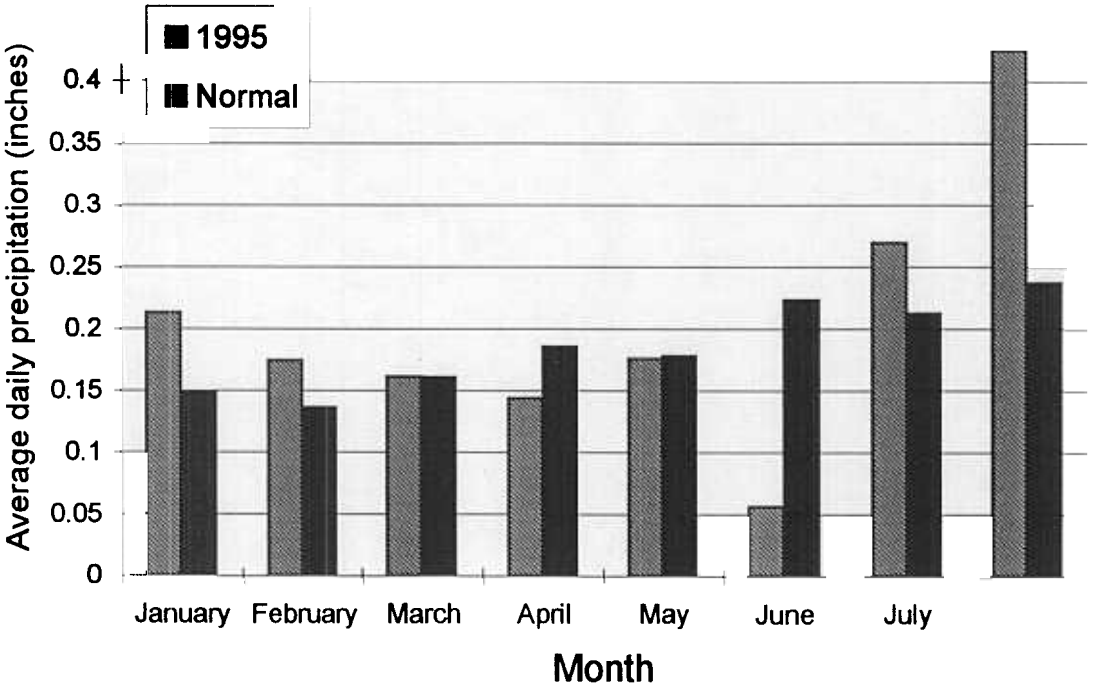


Figure 1b. Precipitation on the summit of Mt. Mansfield.



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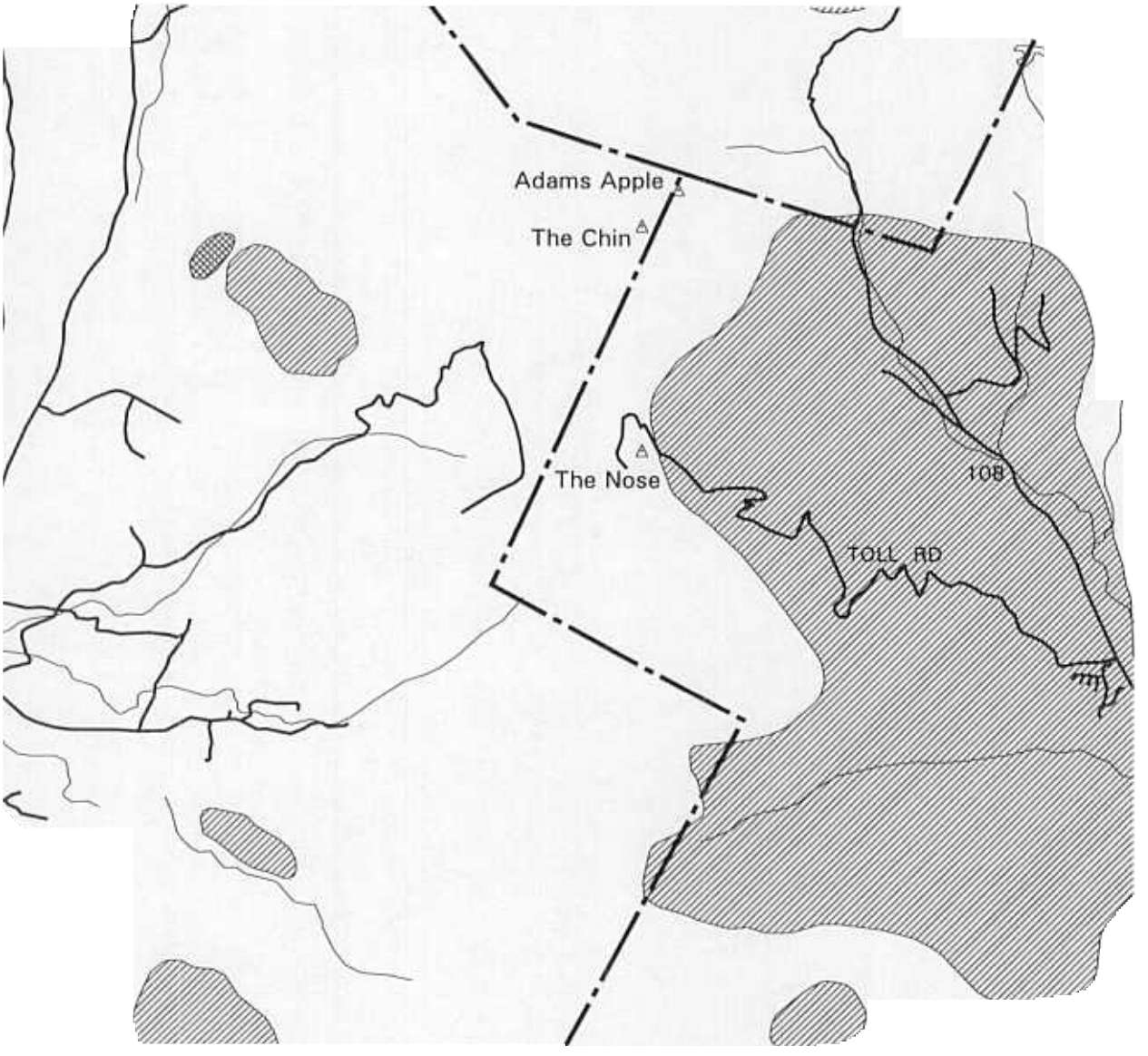

LEGEND

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Figure 3. Forest damage mapped in Lye Brook Wilderness Area, 1995.

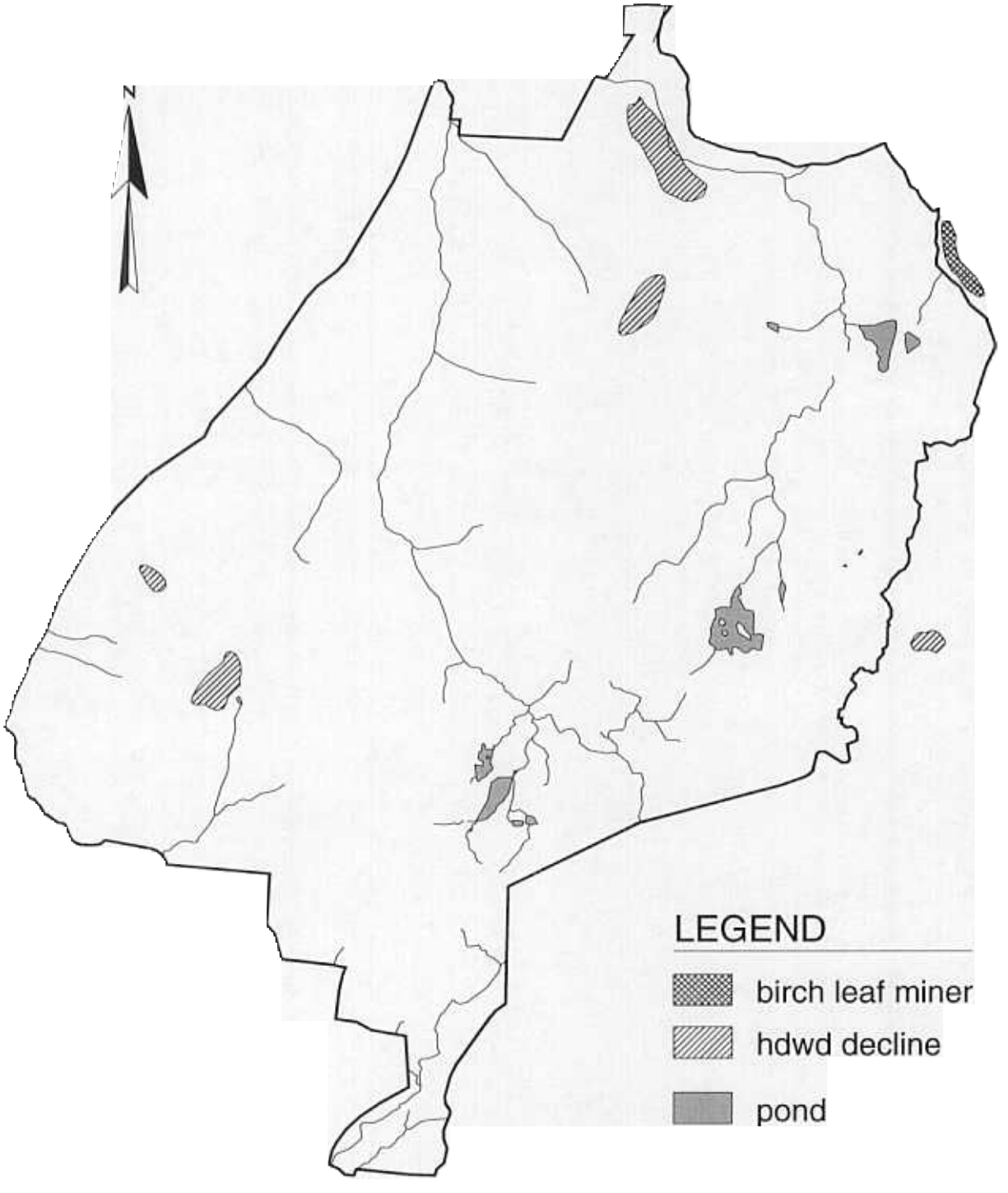

Figure 4. Cumulative weekly SUM06 ozone exposure for 1995.