ANNUAL ASSESSMENT OF FOREST HEALTH ON MOUNT MANSFIELD 1996

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Cooperators

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Abstract

Forest health monitoring plots on Mount Mansfield show denser than usual foliage, especially on sugar maple and other hardwoods. This reflects good growing conditions this year.

Past stress events produced increases in dieback on trees measured at 2200 and 3800 foot elevations. Here, yellow birch (2200 ft.) and balsam fir (3800 ft.) showed trends towards increasing dieback. No new mortality was recorded. Trees at 3800 ft. continue in generally poor condition, exhibiting mechanical injuries typical of ice and wind damage: broken tops, broken branches and boles, and uprooted trees. Yellow birch trees at 2200 ft. continue to be affected by light defoliation by an unknown shot-hole defoliator affecting 74% of trees.

Changes in tree condition over a 5 year period are discussed. A range of changes have occurred, from 13% of healthy trees declining, to 50% of severely declining trees showing signs of improvment.

Introduction

Annual assessments of crown condition, mortality, and damage are conducted on permanent plots located at four elevations. The purpose of these plots is to document changes in tree health over time and will aid in the identification of causes for declines, if they occur.

Two types of plots are used: one plot at low elevations is part of the North American Maple Project (NAMP) plot system, 8 additional plots use the design and measurement variables of the National Forest Health Monitoring Program (NFHM).

NAMP Plot Methods

Plot establishment, site characterization and annual tree evaluations follow standardized

NAMP protocols (Millers et al, 1991). Annual evaluations of tree condition and foliage damage require two - three visits to the plot to determine extent of injury from early-, mid-, and late-season defoliators: one in mid-to-late June, July, and early September. Evaluators are trained and certified with other state and provincial field crews to maintain high Quality Control. Between-crew and between-state remeasurements are done on 12 % of the plot-clusters and with each field crew. Data entry is completed in-state, and statewide data is acquired following quality check by the NAMP data analyst at SUNY in Syracuse, NY. Metric units are used for data collection and analysis.

NAMP Plot Results and Discussion

Sugar maple trees examined as part of the North American Maple Project continue to maintain a generally healthy condition. Over 95% of overstory sugar maples were considered healthy in 1996. Other indicators of health likewise showed signs of good condition: average dieback was 6.9% and average foliage transparency was 9.5. There was no new mortality in 1996.

Table 1. Tree health results for the NAMP plot at 415 m (1360 ft) at the Proctor Maple Research Center, Mount Mansfield, Vermont. Average crown dieback, average foliage transparency (the amount of light coming through the foliated portions of the crown), mortality, and percent of trees healthy are all used to assess the health of dominant and codominant sugar maple trees in this plot.

YEAR	DIEBACK (%)	TRANSPARENCY (%)	MORTALITY (%)	HEALTHY TREES (%)
1988	1 .3	27.3	0	88.6
1989	7.1	23.0	0	91.4
1990	7.6	14.0	0	91.4
1991	3.0	10.9	0	97.1
1992	8.1	14.3	0	94.3
1993	8.2	14.3	0	91.5
1994	7.6	10.4	0	95.8
1995	7.3	11.3	0	95.8
1996	6.9	9.5	0	95.7

Forest Health Plot Methods

Eight permanent plots are used to monitor the health of forests on the west slope of Mount Mansfield, annually. Two plots at each of four elevations (1400, 2200, 3000 and 3800 feet) were established following the design and measurement variables of the NFHM program (Tallent-Halsell 1994). At each elevation, except 3800 ft, paired plots are located in each of the two watersheds: Browns River and Stevensville Brook. In the Stevensville Brook watershed, no canopy trees are present at the 3800 foot elevation, so the paired plots at this elevation are in the Browns River watershed. English units are used for data collection and analysis.

In 1996, annual averages for dieback and healthy trees were reanalyzed. In previous years, subplot averages were used to then calculate elevational averages. This years analysis was conducted strictly on an elevational basis.

Forest Health Plot Results and Discussion

A trend towards increasing dieback was observed on trees surveyed at 2200 and 3800 foot elevations (Table 2a). Yellow birch at 2200 feet and balsam fir at 3800 feet increased average dieback from 1995 to 1996. But when compared to the 4 year baseline, there was no significant difference between dieback in 1996 and the baseline (Figure 1). Other indicators of crown condition, foliage transparency and crown density (Figure 2-3) show good foliage density, reflecting this year's favorable growing conditions. Despite current year growing conditions, trees at 3800 feet remain in poor condition. Percentage of healthy trees is low (57.1%), and average dieback is high (21.7%). The types of damage symptoms include dead terminals (42% of trees), broken branches (16%), indicators of decay (19%) and broken bole or roots (9%), all evidence of harsh winter conditions that feature ice, snow and high winds (Table 3). There was no new mortality on any of the plots in 1996.

An examination of the fate of trees after five years (1992-1996) shows a combination of recovery and decline (Figure 4). In 1992, the condition of overstory trees in different dieback categories showed 77.3% had 0-10% dieback (healthy), 21.6% had 15-50% dieback (moderate decline) and 1.1% had >50% dieback (severe decline). Of the healthy trees in 1992, 87% were still healthy in 1996, 12% were moderately declining and 1% had died. Conversely, 26% of the moderately declining trees in 1992 had recovered to a healthy condition after 5 years, while 12% were severely declining or dead. Of the 2 trees considered severely declining in 1992, one remained in this category, while the other improved slightly.

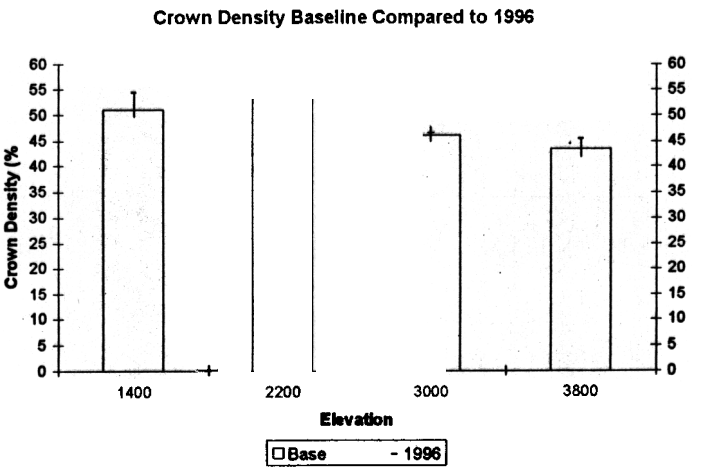
Table 2a. Average dieback for overstory trees of species growing on monitoring plots at different elevations on Mt. Mansfield from 1992 through 1996.

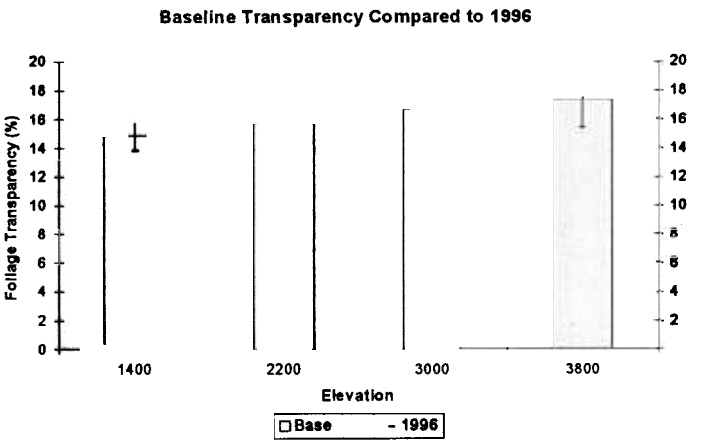
SPECIES	ELEVATION	1992 DIEBACK (%)	1993 DIEBACK (%)	1994 DIEBACK (%)	1995 DIEBACK (%)	1996 DIEBACK (%)
BALSAM FIR	3000	5.6	7.3	10.4	10	10
	3800	18.8	20.5	20.9	16.9	21.9
SUGAR MAPLE	1400	3.9	5.6	5.9	5.0	5.3
YELLOW BIRCH	2200	6.4	6.8	6.4	6.4	7.5
PAPER BIRCH	3000	9.8	8.8	8	7.6	8.2
ALL SPECIES	1400	5.3	6.0	5.4	5.3	5.6
	2200	8.6	9.2	8.2	9.0	10.2
	3000	9.0	8.5	9.3	9.1	9.3
	3800	18.8	20.2	20.7	16.7	21.7

Table 2b. The percentage of overstory trees of different species growing at different elevations on Mt. Mansfield that are considered healthy ($\leq$ 15% dieback) over a 5 year period, 1992 through 1996.

SPECIES	ELEVATION	1992 HEALTHY (%)	1993 HEALTHY (%)	1994 HEALTHY (%)	1995 HEALTHY (%)	1996 HEALTHY (%)
BALSAM FIR	3000	100	91.3	88	88	95.6
	3800	54.0	60.6	56.5	64.2	56.7
SUGAR MAPLE	1400	100	100	100	100	100
YELLOW BIRCH	2200	94.7	94.7	100	100	100
PAPER BIRCH	3000	88	91.7	96	92	96
ALL SPECIES	1400	97.0	100	100	100	100
	2200	90.6	90.6	96.9	93.8	87.5
	3000	89.8	88.1	91.7	90	94.8
	3800	54.0	61.6	57.7	64.7	57.1

Figures 1-3. Overstory tree health in 1996 compared to 4 year averages (baseline) for survey plots at 4 elevations on Mount Mansfield. Tree health indicators used are crown dieback, foliage transparency and crown density.





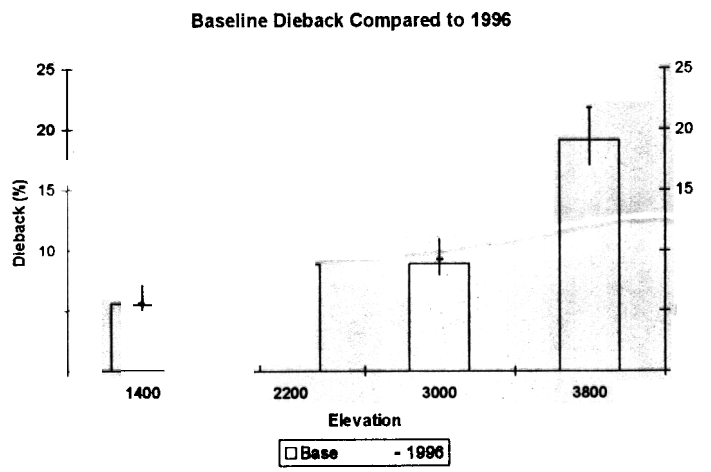


Figure 4. Condition of live overstory trees on Mount Mansfield after five years (1992 to 1996. Trees are grouped into 3 condition classes: healthy trees (0-10% dieback), moderately declining trees (15-50% dieback) and severely declining trees (>50% dieback).

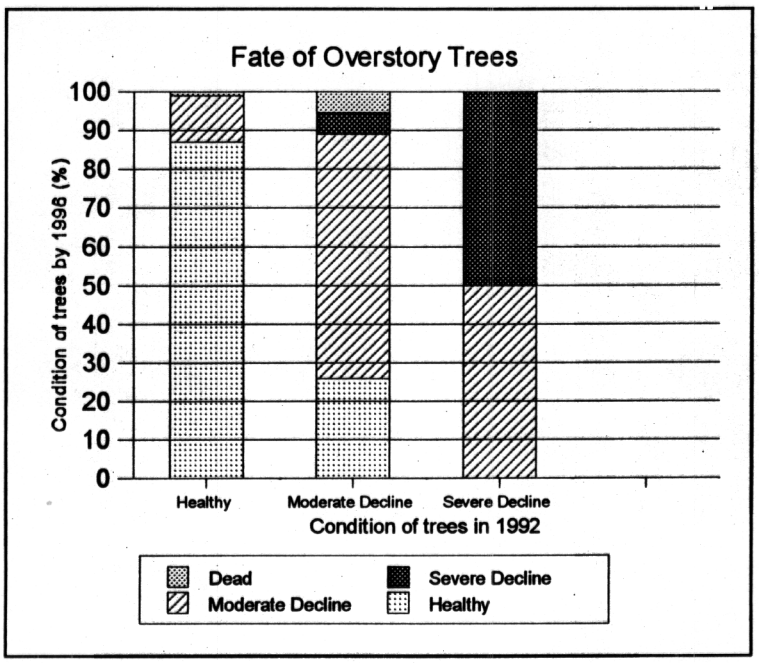


Table 3. Percent of trees affected by significant damages. Minimum thresholds for each type of damage are those considered significant for tree growth and vigor. Protocols follow those of the National Forest Health Monitoring Program.

Species (elevation)	Percent of trees and type of damage
Balsam Fir (3000 ft.)	5 % with dead terminal 5 % with discolored foliage (30% of foliage)
Balsam Fir (3800 ft.)	19 % with indicator of decay 42 % with dead terminal 16 % with broken branches 9 % with broken bole or roots
Sugar Maple (1400 ft.)	15 % with indicator of decay
Yellow Birch (2200 ft.)	42 % with indicator of decay 5 % with open wound (size > 20% of circumference) 74 % with light defoliation by unknown shot hole defoliator (<30% defoliation)
Paper Birch (3000 ft.)	43 % with indicator of decay 22 % with cankers

References

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