

Keeping an Eye on Sugar Maple

Part I

By Douglas C. Allen

In the May issue of "Woodland Steward," Wes Suhr emphasized that *Acer saccharum* is valuable for many economic and aesthetic reasons. Its persistence and dominance on a variety of sites and in many plant communities throughout the northeast reflects on its ecological importance as well. Broadly speaking, the health of this species reflects the overall health of much of New York's forest land.

THE NORTH AMERICAN MAPLE PROJECT (NAMP)

Apprehension about the health of sugar maple arose during the late 1970s and continued throughout the 1980s. As a result, the United States Forest Service and the Canadian Forest Service initiated a long-term project in 1988 to monitor and evaluate the condition of this northern hardwood.

The cooperative effort currently involves ten states and four provinces; a total of 233 different stands and over 14,000 sugar maples. NAMP objectives are i) to detect and monitor annual changes in sugar maple crown and bole condition, ii) to determine if observed change in condition varies with levels of



Figure 1. Evidence of crown dieback.

sulfate and nitrate wet deposition, stand management (active sugarbush vs nonsugarbush) or initial stand condition and iii) to identify possible causes of poor crown condition.

NEW YORK'S PARTICIPATION

The 27 plots in our state are well dispersed and cover a range of geographic locations. Most were selected and established with the much appreciated cooperation of several forest owners (Table 1) and DEC foresters. Additional plots are located on state forests in Lewis, Otsego and Schoharie counties. Each year a field crew reexamines every tree in each of four canopy positions (suppressed, intermediate, codominant, dominant) on each plot. This includes approximately 600 sugar maples in sugarbushes and 1000 sugar maples in stands that are not actively managed for sap production. A plot is visited a minimum of two times each growing season to check for insect defoliation, evidence of late spring frost and other types of stress.

ADVANTAGES OF ANNUAL MONITORING

Repeated observations of permanently marked trees is necessary to reliably attribute changes in tree health (i.e., crown and bole condition) to the occurrence of different disturbances. Further, to assess accurately the impact of events such as insect defoliation or drought, one must account for the prior condition of the tree. It is only through a program such as NAMP where crews are

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Table 1. Name and Location of New York Landowners Associated with the North American Maple Project (NAMP).

Name	Township	County
Harold Moore	Pitcairn	St. Lawrence
Wes Suhr	Fine	
Ted Smith	Croghan	Lewis
Glenn Altmire	Croghan	
Dan Durow	Napoli	Cattaraugus
Boyce McDivitt	Olean	
Van Munson	Allegany	
Richard Frame	Randolph	
Evelyn Root	Conewango	
Bob Adams	Napoli	
David Emery	Victor	Ontario
Jean Gillis	Victor	
John Hicks	Hopewell	
Community College of the Finger Lakes	Hopewell	
Albert Lipman	East Bloomfield	
Arnot Forest	Van Etten	Schuyler
Heiberg Forest	Preble	Cortland

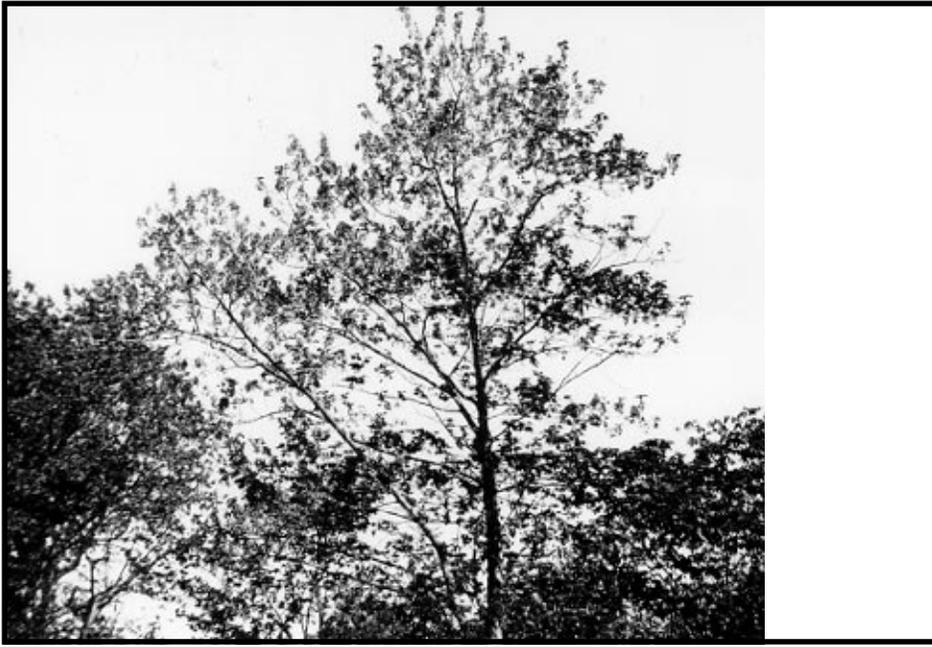


Figure 2. Example of high crown transparency. This is a red maple with a heavy seed crop.

trained and are required to follow standard evaluation procedures that we can obtain reliable background information on individual trees. The type of monitoring and evaluation done by NAMP also allows us to determine both the short and long-term effects of a stress or combination of stresses.

INDICATORS OF TREE HEALTH

The Program examines a variety of tree and site features in each plot. The observations that reflect tree condition most meaningfully, however, are extent of crown dieback, crown transparency, bole condition, and a general evaluation of tree vigor that factors in these three variables plus overall crown size and appearance.

DIEBACK refers to the occurrence of

branch mortality that begins at the ends of branches and, over the course of a few years, may progress towards the base of the branch. Dieback usually begins in the upper crown (Fig. 1) and is estimated as a percentage of the whole crown.

TRANSPARENCY estimates the percentage of light passing through foliated portions of the crown (Fig. 2) and reflects changes in leaf size and foliage abundance. High transparency indicates a “thin” crown.

For our intents and purposes, we consider levels of crown dieback greater than 15% and crown transparencies greater than 25% as high. That is, they may be indicative of a tree under serious stress.

BOLE DAMAGE can be caused by a number of insects, micro-organisms and hu-

man activities.

INTERPRETATION

Both dieback and high transparency are symptoms of stress. Whether or not a crown recovers depends on the extent, duration and nature of the stresses to which the tree is exposed. Dieback and increasing transparency represent the normal response of a tree to stressful conditions. The latter may result from a variety of biological (e.g., defoliation), physical (e.g., drought) or human imposed (e.g., skidder damage) events. A vivid example of a biological event that makes crowns look “thin” and generally unhealthy was the heavy seeding that occurred on red maple this summer throughout much of the northeast. Crowns of this species looked very sparse (that is, they were very transparent), offcolor and generally of low vigor (Fig. 2). This is a condition that typically occurs when this species produces abundant seed. Most of these trees will look fine next summer, assuming that they do not produce another bumper crop. Heavy seed production by sugar maple results in similar changes in crown appearance. Careful examination and monitoring of tree condition allows us to attribute changes such as those observed on red maple this summer to the correct cause and avoids speculation. (*Continued for Part II...*) ▲

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Results from New York's Plots — Part II

By Douglas C. Allen

In the Sept./Oct. issue, readers were introduced to the North American Maple Project (NAMP) and the New York landowners who cooperate in this endeavor. The current article highlights results from the 27 woodlots and sugarbushes that comprise New York's portion of the program.

Crown Condition

One of the most meaningful ways to view results is to look at yearly changes in the proportion of overstory sugar maples (trees in dominant and codominant canopy positions) that have what NAMP considers to be high levels of crown dieback (greater than 15%) or high crown transparency (greater than 25%).

Except for sugarbush maples in 1992 and 1993, 6% or less of the overstory trees that we monitor in New York exhibited high levels of dieback during each of the past six years (Fig. 1). This figure increased to approximately 9% in 1992 and 1993 for maples in active sugarbushes. The 361 overstory sugar maples monitored in sugarbushes consistently have had slightly higher levels of dieback compared to the 612 overstory maples in nonsugarbush stands.

For the past two years, the proportion of overstory maples in the high dieback categories in NY's sugarbush plots (9%, Fig. 2) has exceeded the average for NAMP sugarbushes as a whole, but it has been less than the NAMP average for nonsugarbushes.

Thirty-four percent of the overstory maples in both sugarbushes and nonsugarbushes exhibited high crown transparency in 1988, but transparency decreased substantially thereafter (i.e., crown density improved), until the last two years when a modest increase occurred.

The proportion of NY maples with high levels of transparency in 1993 was greater than the NAMP average for sugarbushes, but the NY average in the nonsugarbush stands was lower than average crown transparency for the overall project.

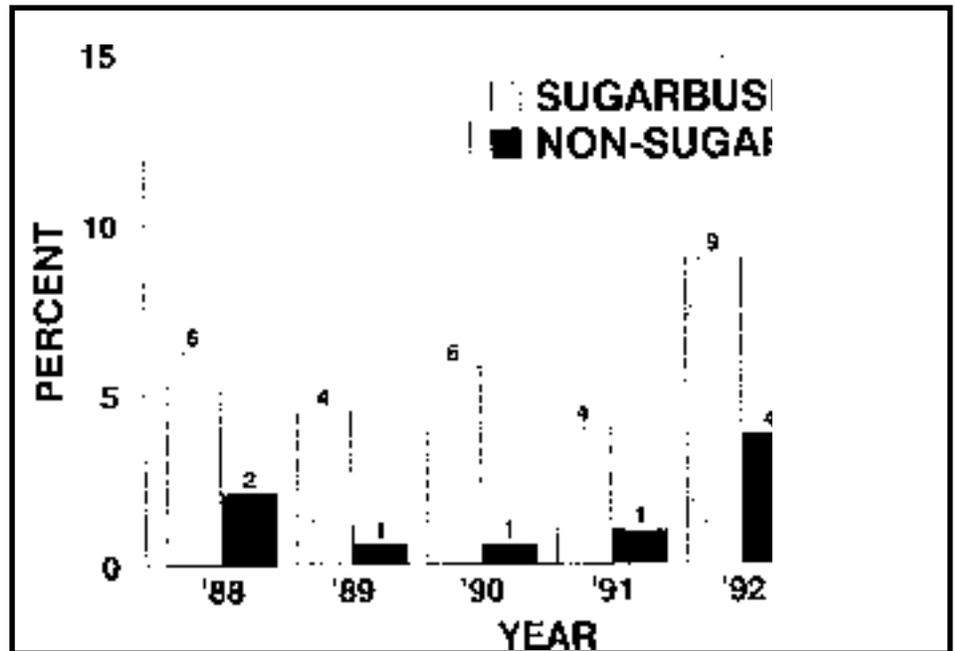


Figure 1. Annual percentage of the overstory sugar maples in NY's NAMP plots rated in high (i.e., > 15%) crown dieback classes.

Factors Associated With Crown Condition Changes

High crown transparency in 1988 was caused by extensive pear thrips damage. Very little dieback was associated with this outbreak and within two years (Fig. 2; 1988 through 1990) crown density improved markedly.

The slight increase in the proportion of NY's overstory sugar maples with high levels of both dieback and transparency during 1992 and 1993 can be attributed to forest tent caterpillar defoliation at a few sites and bole damage resulting from forest management (thinning) activities in two stands. In general, the condition of sugar maple crowns in New York's NAMP plots indicates that the trees we monitor are healthy.

Sugar Maple Mortality

Now that we are six years into the NAMP project, it is possible to determine the extent of sugar maple mortality since 1988. The figures given below are conservative estimates, because they include live trees that were cut for management purposes (salvage cuts from unusually severe storm damage, thinning, etc.) as well as those lost to natural mortality.

Eventually, we will distinguish between the two sources of "mortality," but at this early stage of the analysis they remain combined.

For NAMP as a whole, the average annual mortality of upper canopy sugar maple for all sites was approximately equal for both sugarbush (0.8%) and nonsugarbush (0.7%) stands. Average annual mortality in New York sugarbushes (1.8%) was a little more than twice that of the NAMP average for sugarbushes. This difference is explained largely by the fact that during the past six years one entire plot in NY was clearcut because of excessive ice damage and two plots were thinned heavily. Basically, the natural mortality of overstory trees that we have observed in NAMP (including NY) has been low and well within the range of what one would expect in a healthy forest.

Sugar Maple Health Confirmed

At any point in time throughout the range of sugar maple, one can find forests where maple crowns appear to be deteriorating and (or) where abnormally high mortality occurs. The agent or agents

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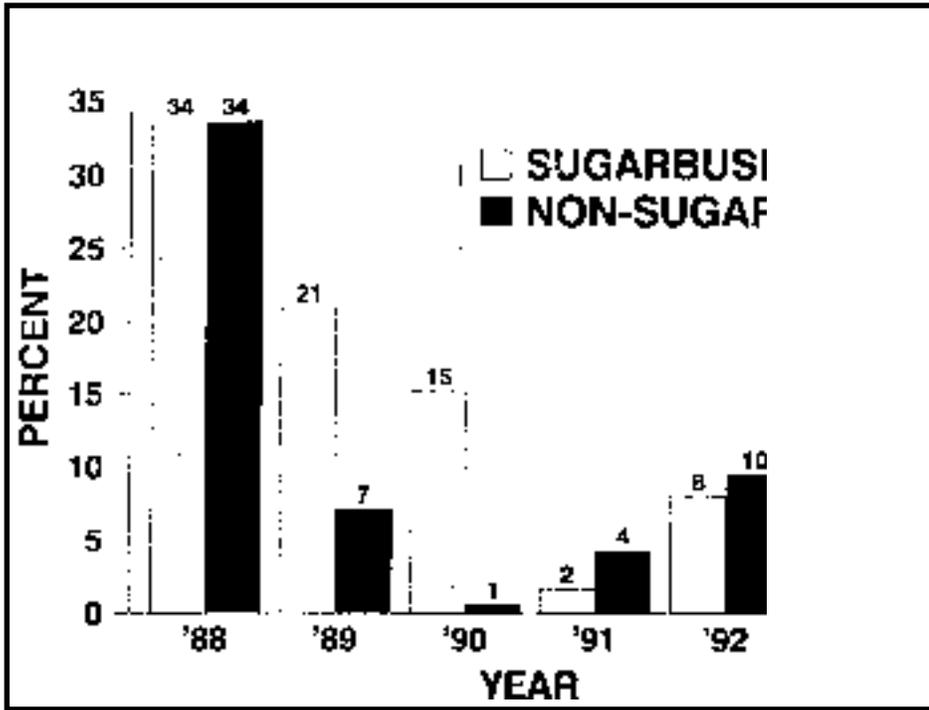


Figure 2. Annual percentage of the overstory sugar maples in NY's NAMP plots rated in high (i.e. > 25%) crown transparency classes.

involved frequently can be identified, but in some instances the cause is unknown. Results from NAMP indicating that the sugar maples observed by this project generally are in good condition and have been corroborated to one degree or another by independent surveys in Ontario, Vermont, Wisconsin, the Canadian Forest Service Acid Rain National Early Warning System, and the U.S. Forest Service Forest Health Monitoring Program. ▲

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