Introduction and Background

NAMP Objectives

The Vermont objectives of the project are to:

1. Determine the rate of change in sugar maple tree-condition ratings from 1988 through 2 !

2. Determine if the rate of change in sugar maple tree-condition ratings is different among sugarbush and non-sugarbushes.

". Determine the possible causes of sugar maple decline and the geographical relationship bet#een causes and e$tent of decline.

General Approach

The %& ' (project began in the summer of 198) #ith the development and testing of field methods. *n 1988+ 1!, plots #ere established across eastern %orth &merica+ from -ntario and . isconsin in the #est and to ' aine and %ova /cotia in the east. The %orth &merican /ugar ' aple Decline (roject: -rgani0ation and ' ethods 11991 2 provides bac3ground on the start of the project. The original field methods used for plot establishment are in the 4ooperative 5ield ' anual dated 5ebruar6 1 + 1988 as revised 7ul6)+ 1988 subse9uent clarifications and changes #ere made during the (roject :evie# at ' ontreal in 1989. & fe# minor clarifications #ere added in 199 and 1991. *n 2 "+

#ith sugarbushes+ such as logging or gra0ing+ #ere accepted. 14ode 12

%on-sugarbushes - & hard#ood stand #ith sugar maple+ 1 cm d.b.h. and larger comprising more than half of the upper canop6. The stand could not have evidence of disturbance in the previous , 6ears before establishment+

d. /oil series--Docal soils scientists or recentl6 published soil surve6s #ere consulted to obtain the soil series.

The terminolog6 used b6 the %orth &merican /ugar ' aple Decline (roject is the same as that used b6 the other %&(&(5orest :esponse (rogram projects 1Eeda3er and %icholas 199 2. %ine categories are used 15igure ,2:

a. Dandform 15ig. "a28 coded into 8 descriptions:
  1- ridgetop 1primar6 ridge of a mountain s6stem2
  2- spur ridge 1secondar6 or lateral ridge from primar6 ridge2
  "- noseslope 1diverging drainage at end of ridge2
  ;- headslope 1convergent drainage above cove2
  ,- sideslope 1parallel drainage along side of ridge2
  !- cove 1deep+ narro# depression in the slope or bo#l #ith one end open2
)- dra# 1depression open on both ends but bounded b6 steep sideslopes or noseslopes.
  8- flat 1the entire area t6picall6 is flat2

b. /lope position 15ig. "b28 coded into) t6pes of slopes+ as follo#s:
  1- summit 1highest point of landform2
  2- shoulder 1transitional 0one bet#een summit and bac3slope8 the slope is al#a6s conve$ and has the greatest erosion loss on a mountain2
  "- bac3slope 1middle portion of landform+ conve$ or 2

concaeshou 1 aae8

6 0 @• 0 6 •Ø@± • ²xT }òS 2 6 •Ø@± • ò 6 1 ` •Ø@ 5#¾ €° 0 + S 26 •Ø@± • ò 6 1 ` •Ø@

d. Tapping is rated in four classes:

1 - currentl6 active

2

"ecanium %cale Population %urve*

Starting in 2005, visual estimates are made of scale populations on understory and lower branches of sugar maple using the abundance rating system listed below. Ten

2. 4enter the cro#n outline on the grid so that the entire middle s9uare is #ithin the cro#n perimeter+ but none of the cro#n is outside the margins of the grid. This is done b6 moving the grid closer or farther from the e6e. &fter the cro#n is centered+ do not change the distance #hile the cro#n and damage are being outlined.

". Dra# the outline of the entire tree cro#n b6 connecting the tips of major branches and branch clusters+ that is+ dra# a curve of the lines from branch tip to branch tip to avoid creating large open spaces bet#een branches on the peripher6 of the cro#n. . hen outer portions of branches are dead+ dra# a line bet#een terminals of dead t#igs in order to obtain the cro#n outline. & ver6 large hole in the cro#n+ such as that caused b6 bro3en branches+ should be e$cluded.

;. Trace the outline of the damaged portion of the cro#n #ithin the outline produced in step ".

,. Determine the number of dots or s9uares encompassed b6 the #hole cro#n and the damaged portion separatel6.

!. Divide the smaller number 1damaged area2 b6 the larger number 1entire cro#n2 and multipl6 b6 1 to get the percentage of cro#n damaged. : ecord the damage in one

1 - less than " percent of cro#n defoliated.
2 - "1 to ! percent defoliation.
" - more than ! percent defoliation.

The causal agent+ if identifiable+ is recorded in the %otes section. %o other tree condition ratings are made during the spring defoliation visit.

- ccasionall6+ late season defoliation ma6 occur 1for e$ample+ saddled prominent2. . hen the potential for this is

provided for an6 measurement not ta3en b6 leaving blan3 the space in the record. That portion is deleted in the anal6sis and does not appear as or 1.

%tandards and (ritical Measurements

*n 1988+ the five cro#n-rating measurements #ere: branch diebac3+ foliage transparenc6+ foliage discoloration+ d#arfed foliage+ and presence of epicormic shoots. ?ecause of poor remeasurement precision for epicormic shoots and d#arfed foliage+ these measurements #ere deleted from subse9uent annual measurements. 5oliage discoloration measurements #ere do#n-graded to non-critical measurements and their 9ualit6 is not chec3ed for compliance #ith minimum standards. *n 1989+ a ne# measurement #as added to assess the degree of insect defoliation. *t is not considered a critical measurement and is not chec3ed for repeatabilit6 precision. &lso in 1989+ cro#n ratings of hard#oods other than sugar maple #ere added+ but these are not chec3ed for compliance #ith minimum standards. *n 199"+ vigor ratings #ere added to the critical measurements.

Data 9ualit6 re9uirements for the critical measurements #ere outlinedirements for the critical measurements

&emeasurements

%o remeasurement plots #ill be conducted in 2 !. The precision of critical cro#n-

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?urlington+ VT: Bniversit6 of Vermont+ &gricultural <$periment /tation+ ?otan6 Department+ 4ollege of &griculture and Dife /ciences. Vol."+ ") p.

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/&/ *nstitute *nc. 198,b. /&/ Bser?s Cuide: statistics+ version , edition. 4ar6+ %4: /&/ *nstitute+ *nc. 9,! p.

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B./. Department of &griculture. 1982. 5orest insect and disease conditions in the Bnited /tates 1981. . ashington+ D4: B./. Department of &griculture+5orest /ervice. ,1 p.

B./. Department of &griculture. 198". 5orest insect and disease conditions in the Bnited /tates 1982. . ashington+ D4: B./. Department of &griculture+ 5orest /ervice. ,1 p.

B./. Department of &griculture. 198;. 5ield instructions for /outhern %e# <ngland. ?roomall+ (&: B./. Department of &griculture+ 5orest /ervice+ %ortheastern 5orest <$periment /tation+ 5orest *nventor6 and &nal6sis Bnit. 129 p.

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