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 1predo0portion of landform2 conve$ or
concaeshou 1 aae

6 0 @• 0 6 •Ø@±• ²xT ìòS 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

8,	81-8,	)1-9,
9	8!-9	)!-1
9,	91-9,	81-1
99	9!-1	8!-1

dead branch tip+ at least 1 cm 1; in2 long+ in the upper portion of the tree cro#n+ is rated as the lo#est class #ith diebac3 in the ,-percent class. . hen dead t#igs are scattered throughout the cro#n+ an estimate is made of the appro$imate proportion of foliage lost from the dead t#igs+ #hich is then recorded as the diebac3 percentage.

*n addition to normal diebac3+ e$tensive branch mortalit6+ including snag branches+ that might be affecting tree gro#th #ill be recorded in the notes The e$tent of the cro#n lost #ill be recorded in the same ,-percent classes.

!oliage #ransparenc* 1&ll hard#oods2

5oliage transparenc6 is determined b6 estimating the amount of s36light visible through the foliated portions of branches and averaged for the cro#n as a #hole. *t includes normal tree characteristics of foliage densit6 as #ell as reduced foliage densit6 resulting from insect damage+ disease+ or environmental stresses. &reas included in diebac3 are not rated for foliage transparenc6. *t is assumed that an increase of foliage transparenc6 over time indicates reduced tree vigor that eventuall6 ma6 lead to branch diebac3. :ecover6 is e$pected from short periods of defoliation events. T#o certified raters are re9uired to ma3e the transparenc6 estimates from opposite sides of the tree. The 21-class rating s6stem #ill be used to estimate foliage transparenc6 1Table 12. 5oliage transparenc6 is a
!39sie critical measurement that re9uires e$tensive training to achieve standardi0ation among observers and consistenc6 among 6ears.

!oliage transparenc* grid

The 5oliage Transparenc6 Crid 15ig. ,b2 is a visual presentation of var6ing proportions of blac3 and #hite s9uares. The blac3 areas represent the foliated portion of the cro#n+ #hile the #hite areas represent the s36light visible through the cro#n. The percentage class is sho#n beneath the s9uare. The 5oliage Transparenc6 Crid is used as a training aid. 4omparisons are made bet#een the grid and foliated portions of the branches on the peripher6 of the cro#n as #ell as in the midcro#n areas.

!oliage transparenc* standards &n@OdtrP clg s!&D0rOdtrP csj&u)&DiAIsdOP #}#h

The 5oliage Transparenc6 /tandards 15ig. !2 are used to standardi0e foliage transparenc6 estimates among observers and to provide a reference guide for subse9uent 6ears. These are photographs of actual sugar maple cro#ns sho#ing the amount of s36light visible through the cro#n.

!39#igsbi.gl(CB@e;H1In gro# 6 bps#igsbi.gl(CB@e;H1In grg!39sV, !33hesV · 0 are p oli te

0&s!&ot#AdrgA&0rOdtrP clg t

" - 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 detected during the scheduled cro#n rating visit+ a return visit to more accuratel6 rate the degree of defoliation is encouraged.

%eed Production 1/ugar maple onl62

<$cessive seed production is believed to #ea3en a tree and result in increased diebac3 the follo#ing 6ear. Therefore+ it #as agreed b6 cooperators in 199" to have seed abundance recorded as follo#s:

1. %one 1no seed is visible #ith binoculars2

2. Dight to moderate seed present+ ?BT %-T abundant enough to cause noticeable discoloration in the upper cro#n

". =eav6 1branches in the upper cro#n #ith reddish-bro#n cast in mid- to late summer as a result of color change of samara from green to reddish-bro#n2

A#A MANAGEMEN# AN -)A"I#*1*

A%%EMB"*1*

ata (ollection and #ransmission

/tandard field forms are used to record data 15igs. ;+ !2 in the field. (revious 6ears data are carried for#ard for the first , items on the form. *ndelible ball point pens are used to permit photo cop6ing and prevent erasures. 4hanges are initialed and dated b6 the person ma3ing the change. . hen data must be transcribed because of damage to the original data sheets+ another person chec3s the transcript+ initials+ and dates each page. The original data sheet is attached to the transcript. *n the field+ the recommended practice for the recorder is to repeat measurements audibl6 before data are recorded. &bsence of an item is recorded as K K to indicate that a measurement or an observation #as made. &bsence T0l data sheet is attached to t is considered as missing data

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 outlined at the beginning of the project. &cceptable variabilit6 bet#een raters+ for e$ample+ tolerance limits+

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