Forest Research Note

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UNINJURED TREES--A MEANINGFUL GUIDE TO WHITE-PINE WEEVIL CONTROL DECISIONS

The white-pine weevil, Pissodes strobi, is a particularly insidious forest pest that can render a stand of host trees virtually worthless. It rarely, if ever, kills a tree; but the crooks, forks, and internal defects that develop in attacked trees over a period of years may reduce the merchantable volume and value of the tree at harvest age to zero. Dollar losses are especially high in plantations where costs of planting and care have been incurred.

After establishment of the weevil in a forest stand or plantation, an increasing number of trees are attacked two or more times. Conversely, the number and proportion of trees remaining free of weevil damage declines. As the recoverable volume and value of the tree crop is reduced in successive years, the owner or manager is confronted with the question, "Shall I apply control now?" For his decision, he must have sound and meaningful criteria or standards.

The recent adoption of a white-pine weevil control program by the New York State Conservation Department on selected State reforestation areas brings the problem of developing proper criteria for decisions on control sharply before us. As with most other insect pests, the weevil problem is confounded by the interplay of biological and purely economic considerations. Essentially, both boil down to this: the plantations selected for control must be at or

approaching the limit of tolerable injury by the weevil, and each must justify by its present or potential value the added cost of protection against the weevil. The primary entomological factor is the insect population level and the corollary damage; sound decision requires a practicable and meaningful measure or index of one or both. What follows is concerned with such an index.

For the New York program, which presently involves only white pine plantations, standards have been proposed that specify the desired results in terms of number of crop trees per acre at maturity or harvest age. General guidelines for white pine management similarly point to production of a given number of high-quality trees per acre. Variation in site quality is recognized, and the stocking specifications change with site class accordingly. Yet the allowable limits of weevil damage are expressed in the form of percentage of trees weeviled in the current (or previous) year. This is the generally accepted measure of weevil populations for both decision-making and after-control evaluations. But for the forester responsible for deciding when and where to apply control, considerable omniscience is needed to convert this measure into terms of his objectives, which deal with the number of trees remaining undamaged rather than the percentage weeviled in a given year.

Weevil surveys and population studies in the Northeast have shown that a cumulative damage index based on the number of trees remaining free of weevil injury is both a logical and biologically significant criterion for control decisions. It puts the factor of allowable damage directly in terms that can be interpreted and used by the forest or plantation manager. The field data are obtained just as easily; and, because no conversion to percentages is involved, there is a statistical advantage too. From the biological standpoint the cumulative number of unweeviled trees is a far more stable variable than percentage of trees weeviled in successive years. Plotted graphically, this becomes a smooth curve, while current percentage of weeviling generally becomes a broken line, in which only a general trend is apparent at best.

To illustrate the number-of-undamaged-trees index and to compare it with percentage current weeviling, the data from six weevil-survey plots in New York for the years 1952-57 are shown in Figure 1. The trees in these plots were 1 to 2 feet tall in 1952 and showed no evidence of weevil damage--although some weevils may have been present. In the

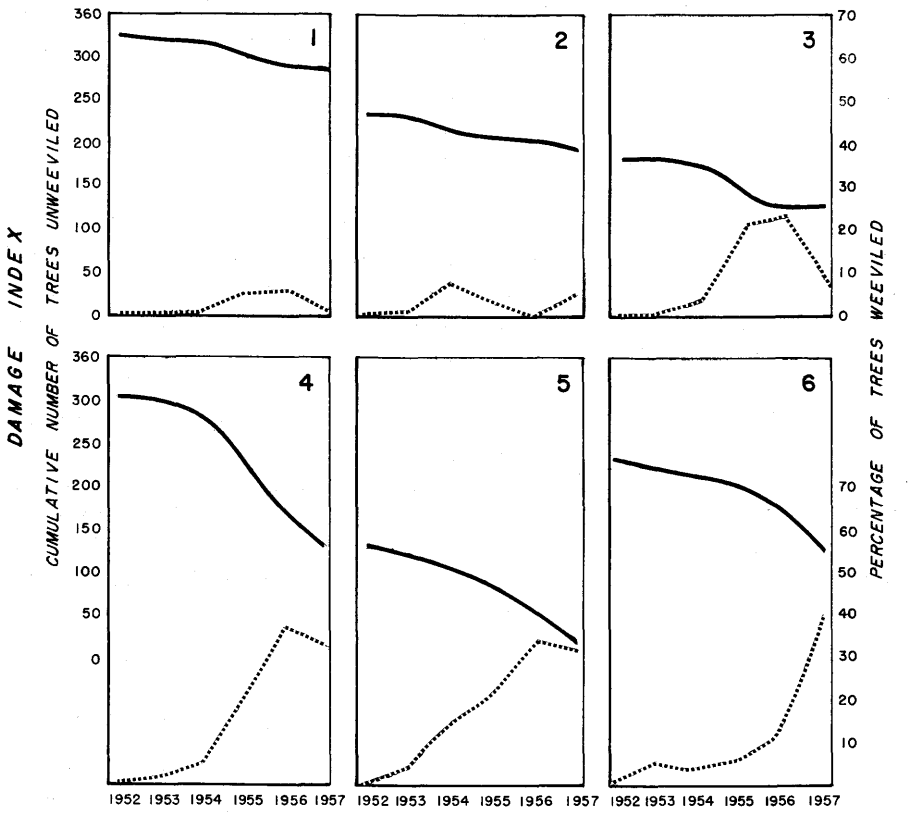

Figure 1.--The number-of-undamaged-trees index (solid line) compared with percentage of current weeviling (broken line) as a criterion for control decisions.

figure, the plots are numbered simply 1 to 6. The scale for cumulative number of trees unweeviled is on the left side and that for percentage of trees weeviled is on the right.

The upper set--Plots 1, 2, and 3--represent light, or at least slowly developing, infestations. Plot 3 gave evidence of a sharply rising weevil population in 1955, but it returned to a low level in 1957. In these plots, the downward curve of unweeviled trees is shallow, or rather flat; and the annual percentage values fluctuate at a low level.

The lower set--Plots 4, 5, and 6--are indicative of fast-developing infestations. The curve of unweeviled trees is more sharp and steep; the upward trend in percentage of current weeviling is more pronounced and longer sustained.

Even in such cases, however, the degree of change is usually impossible to predict. In Plot 6, for example, there was a more or less regular increase in weeviling each year till 1956--then it jumped from 13 percent to 41 percent in 1957. The percentage of weeviling that might occur in 1958 would have been anyone's guess at that time.

In contrast, the smoother lines of the plotted cumulative number of unweeviled trees permit reasonably accurate projection and thus prediction of the situation at least 1 year in advance. And these data are in terms most meaningful to the practicing forester.

Of added ecological interest is the variation in form and shape of the proposed damage-index curves. Analysis of these data in conjunction with those of physical and biotic factors known or guessed to affect weevil behavior and survival should provide further insight into this complex and, possibly, provide a workable basis for characterizing high and low hazard areas or stands.

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