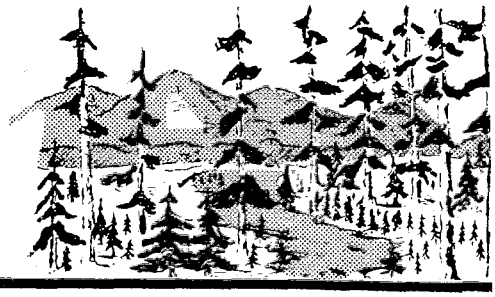
Timber Talks



Prepared by V. H. Phelps, Forest Research Laboratory, 506 W. Burnside Road, Victoria, B.C.

HOW LARGE IS A LEAF?

No. 40

Valid explanations of plant growth in relation to environment often require an accurate determination of the surface area of leaves. This is a simple process for leaves from hardwoods but, due to the size and shape of the needles, is much more difficult for coniferous leaves. The surface area of needles from different conifers has been obtained by a variety of methods, including the measurement of light intercepted by the leaves, measurement of leaf dimensions and by correlation with leaf weight and volume. A laboratory study compared the surface area of needles from five species of conifers obtained by a photo-electric method to that calculated from the measurement of leaf dimensions.

A photometer with a light sensing probe and a scale graduated in foot-candles was used in the photo-electric method. Scale readings, when the probe was fully exposed and when covered with a needle, were used to calculate the surface area of the leaf. Correction was made for light transmitted through the translucent needle. Light transmitted was determined by comparing the amount of a fixed light intensity that passed through a small aperture to the amount that passed through after the aperture was covered with a layer of needles, or by comparing the surface area of needles coated with black ink to the apparent surface area of untreated needles. Differences in light transmitted through leaves of different age and thickness could not be determined by the former method but, when the latter method was used, transmittance varied with species, growing conditions and age of leaves.

The plane and total surface area of leaves was obtained by measurement of leaf length and width. Correction was made for longitudinal curvature in computing plane surface and a further correction for cross-sectional curvature in the calculation of total surface area. A Bausch and Lomb micro-slide projector and a K & E polar planimeter were used for measurement. Plane surface and cross-sections of needles were projected at different magnifications and their outlines traced on graph paper. Area of the outline of the plane surface was measured with a planimeter and the correction factor determined by dividing the area by that calculated from measurement of the projected leaf length and width at mid-point; correction factor for cross-sectional curvature was obtained by dividing the perimeter of the projected outline by its width. Generally, an inverse relationship prevailed between the correction factor for longitudinal curvature and for cross-sectional curvature. The product of the two tended to be a constant for the species.

Plane surface area of needles as determined from photometer readings and modified for light transmittance by the method of coating the leaves with black ink, was within $\pm 1\%$ of the area as calculated from measurements of length and width that had been corrected for leaf curvature.

REPORT: Methods of Measuring Leaf Surface Area of Some Conifers. H. Barker, Forest Research Laboratory, Victoria, B. C.