RING-SHADOWS

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SELOSTUS:

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Ring-shadows

To manage a forest economically, the yield must be related to the forest's annual increment. This may be assessed by comparing the results of two or more enumerations, by the inspection of cores bored from selected trees, or from the study of existing tables. Enumerations show the composition of the growing stock and its growth over the period of study, but are expensive and involve a time lag before their conclusions may be applied; cores, while showing the increment at the height bored, still require some form of enumeration before the appropriate sample trees can be selected, while tables available may not be applicable.

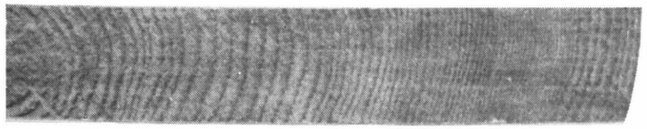
The present article aims at introducing another approach to one further source of information, namely, the stumps.

DOBBS (1952) considered that data based only on the single factor of ring width, are insufficient for reliable results unless carried out on a massive scale such as that on which HUBER (1943) and his associates at Munich have worked. DOBBS (1951) points out that the correct identification of the annual increment is an essential preliminary to any valid work on tree rings, and that this may require the identification of the ring by such qualitative features as the occurrence of 'lines' of denser wood, or the relationship between spring and summer wood, see also HARRIS (1955).

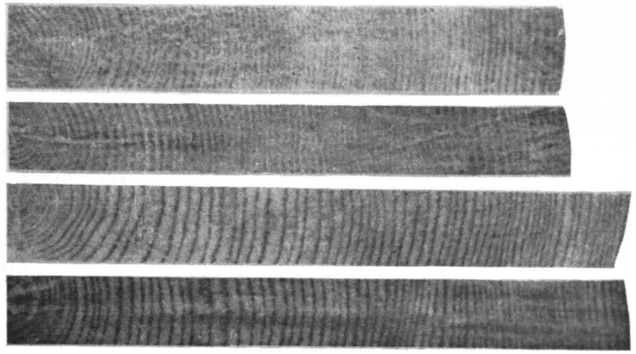
Discs or sections of trunks and stumps, while furnishing the material for detailed study, are expensive, tedious to obtain and cumbersome to transport, but it is possible to obtain an exact replica of the growth ring configuration by 'shadowing' (Fig. 1). This is simply the representation obtained on paper by placing it over a differentiated surface and rubbing it with a pencil. With stumps, the denser summer wood appears as darker bands when compared with the spring wood, the difference increasing with weathering, giving readable results until an advanced stage of decay.

By applying this idea to any ground survey of the forest, an unqualified staff may collect a large amount of data, cheaply, easily, and quickly; the actual samples may then be mailed at little expense to some convenient point where their data may be studied at leisure.

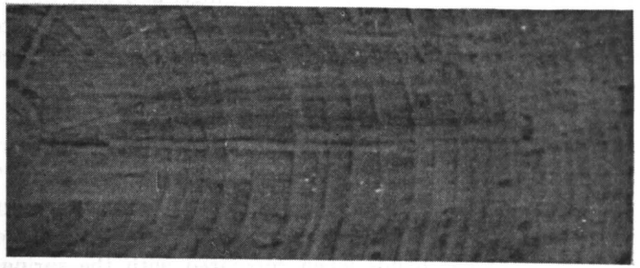
The only equipment required consists of a knife for clearing stump débris and a pencil and paper: cheap note paper gives satisfactory results as do most types of pencil, but as a general rule, the longer a stump has weathered, the softer is the pencil which gives the optimum result.



Pine



Spruce



Larix sibirica

Fig. 1. Stump shadows from the same MT site of Sulkava and *Larix sibirica* shadow from Punkaharju showing »lines», as well as annual rings.

These 'shadows', while not yielding the complex data obtainable from the actual wood, do show the proportion of the growth ring composed of narrower tracheids; this can show the position of compression wood, may also be sufficient to differentiate between rings and 'lines', and gives an accurate record of the periodic, basal, horizontal increment.

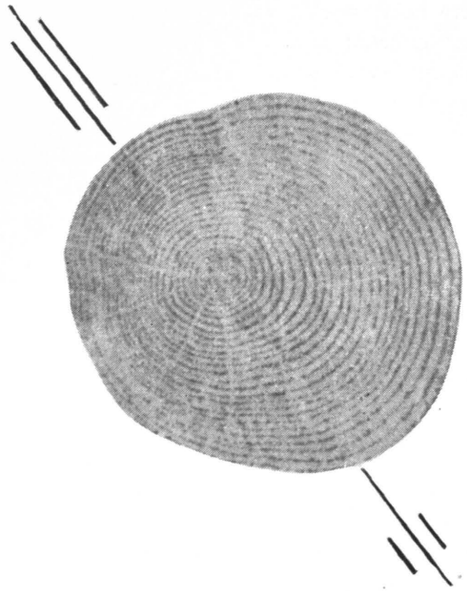


Fig. 2. Slow grown spruce on MT at Evo.

Material was collected over the southern part of Karelia, East Finland, where young pine and spruce sample plots on VT and MT sites showed the same number of growth rings as the anticipated number of annual rings, (as with HUSTICH's results in North Finland,) while plots of European and Siberian larch up to 30 years of age, were found to have from four to ten 'lines' in excess of their age.

These larch plots were all in the Punkaharju district and showed a marked similarity in their ring configuration, both within a specific plot and between local plots of the same age group.

As a precaution it is advised that the ring pattern should be studied in a few cross-sections of the complete stumps, so that any 'lines' or partial, missing and additional rings, may also be identified in the ring-shadows.

Where pine and spruce stumps showed concentric growth rings and radial ring-shadows some few cm wide were considered representative, some twenty stumps could be recorded in as many minutes, but with the larches, 'lines' occasionally faded out in part of the ring, so a replica of the whole surface was taken, its bearing being noted (Fig. 2). The time lapse since felling could be roughly assessed by relating the stump's condition with the normal sequence of decay (NYYSSÖNEN 1955).

These woods were being worked on a three to five year thinning cycle and related stumps generally could be associated. More accurate determination of the year of previous thinning was made by comparing the ring-shadows of related stumps with borings in the bases of the standing crop. Normally, narrow rings caused by cold or dry summers, heavy seed years, or defoliation by climate or insects, and wider rings resulting from release cutting, drainage etc., followed a pattern which could be found in both the standing crop and the stumps, and hence their relative ages ascertained. Individual trees gave variations to the standard for the plot, but the overall compliance was marked. Where necessary, qualitative ring characteristics can be used to ensure accuracy in dating.

The ring-shadow of each tree provides the stump height diameter of that tree for all but the first one or two years of its life. Hence if it be possible to assume that each ring represents one year's growth, or if false or missing rings can be identified, then by inspection of a clear felled area or of trees thinned from a standing crop, the basal areas of specific stems can be found accurately for any date in their past. Further, by relating the present condition of the crop with its past management, it may prove possible to decide on the most suitable thinning policy, the economic rotation and the future yield.

One point that arises when conclusions are drawn from the stumps of thinnings, is that they may have been the weaker members of the forest and results will probably reflect an underestimate of the remaining crop.

Most of the current data from enumerations and general sample plot work is based on the diameter or girth at breast height. NYYSSÖNEN (1955) derived a relationship between breast height diameter, dbh, and the diameter at the 'lowest possible cutting point', do

$$dbh = 0.75\ do - 0.5\ cm$$

This relationship was applied to pine, spruce and birch in the southern part of Finland and the standard deviation found to be 5 %. No doubt if the height of the trees when felled, the forest site type and the density of stocking are taken into consideration, the probable error could be even further reduced, thus allowing data from ring-shadows and breast height measurements to become freely interchangeable.

The ring-shadows may be obtained from any trees having conspicuous growth rings, some, e.g. English oak and Sitka spruce, immediately after cutting, while with others, such as the larches, the differentiation is only distinct after a period of weathering.

The same method may also be applied to obtain replicas of barkbeetle tunnels, or plant leaves, and they be preserved without loss of detail by applying a coat of clear varnish (Fig. 3).

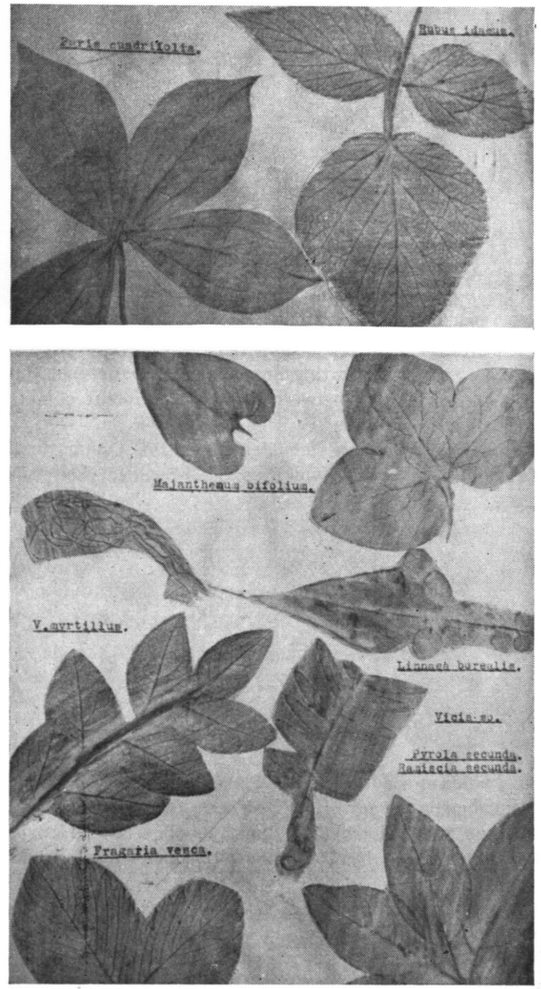


Fig. 3. Shadows of various plant leaves.

The use of ring-shadows would appear to have particular application to the study of selection forests, especially those being brought into intensive management for the first time (SARVAS 1944).

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SELOSTUS:

VUOSILUSTOJEN VARJOSTUS

Puun vuosilustoista voidaan saada tarkka jäljennös asettamalla ohut paperi sileälle poikkileikkauspinnalle ja hankaamalla kevyesti lyijykynällä. Näin syntyneessä kuvassa kesäpuu esiintyy tummina ja kevätpuu vaaleina renkaina (kuvat 1—2). Tällaisia kuvia saadaan mm. pitkällekin lahonneista kannoista; on hyvä käyttää sitä pehmeämpää kynää, mitä pitemmälle kanto on lahonnut.

Vaikkakaan tällaisista varjostuskuvista ei saada kaikkea sitä selville mitä itse leikkauspinnasta, voidaan menetelmää suositella etenkin sellaisissa tapauksissa, että ei ole mahdollista sahata puista tai kannoista kiekkoja ja kuljettaa niitä mukana. Varjostusmenetelmä on nopea ja halpa, ja kerätty aineisto vie vähän tilaa ja on helppo lähetellä ja säilyttää.

Varjostusmenetelmää voidaan käyttää mm. tutkittaessa metsän aikaisempia vaiheita kantojen perusteella. Samanlaisella menetelmällä voidaan ottaa paperille tarkkoja jäljennöksiä myös lehdistä, kaarnakuoriaisten käytävistä tms. (kuva 3).