A SIMPLE TECHNIQUE FOR AGE DETERMINATION IN TREMBLING ASPEN¹

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Difficulties were encountered in counting annual rings of *Populus tremuloides* Michx. (trembling aspen) during recent studies in the forest-grassland ecotone in the northern Great Plains of Canada (Maini 1960). These were not merely associated with the semi-diffuse porous character of the wood, but were complicated due to the presence of false rings (Fig. 1) and of stain caused by fungal infection. The purpose of the present note is to record the efforts which were made to overcome the difficulties and to suggest methods of making ring counts in such circumstances.

Diller (1935) reported that counting of annual rings in increment cores was facilitated by gluing in grooves of rabbeted wood and buffing them with a power sander. The work of Kirby (1953) has shown that in *P. tremuloides* 87 per cent of the field counts were unreliable. Accordingly, he and Ghent (1952) have resorted to the use of discs (cross-sections at the base of the bole). Impregnating of decayed wood with paraffin has also been useful (Ghent 1954). The use of stains and incident-light fluorescence microscopy has been suggested by Marts (1950), but this method involves extensive preparation and the use of special equipment. Rose (1957) has developed a technique for differentiating annual rings in *P. tremuloides* by replacing the air in the increment core with light oil and examining these translucent cores microscopically under low power while immersed in oil.

The present authors were unable to differentiate between annual and false rings by using Diller's technique. It was necessary to cut a thin freehand section from the core with a razor blade and to view this microscopically under low power (x110) and occasionally under high power (x475). Glock (1937) has suggested criteria which can be used in distinguishing between false rings and annual rings. In an annual ring there is a gradient from large xylem elements of spring to the smaller, thick-walled summer elements. The latter are followed by an abrupt transition to early wood. False rings are usually less sharply defined (Fig. 2). During the present study with *P. tremuloides* as many as eight rings were found between the sharp margins presumed to demarcate an annual ring. This frequency of false rings is to be expected where groves exist in prairie climate, since Glock (1937) has found that they are associated with intervals when growth is interrupted during the growing season and are most common towards forest borders.

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Oils of various viscosities were used to impregnate increment cores, but the latter always became brittle. Sections were easier to cut from cores which were soaked in water over night, but the presence of air bubbles prevented critical examination. Although most air bubbles could be removed by boiling the cores in water, the resulting agitation caused breaking and crumbling of fungus-infected wood. Increment cores from different trees were placed in marked test tubes containing water and subjected to low pressure (10-20 mm. Hg.) by placing the test tubes in a desiccator connected with a suction pump. This procedure not only reduced the treatment period to about 30 minutes, but a large number of cores could be treated simultaneously. After little experience, the annual rings could usually be counted under low power of a microscope using transmitted light. In some instances it was necessary to cut thin, free-hand cross-sections of doubtful portions of cores for further microscopic examination under high power. These laboratory methods apparently provide an accurate means of determining the age of fungus-stained wood of this species. They have been used successfully also on *P. tacamahacca* Mill. and *Betula papyrifera* Marsh. and may be presumably employed on other troublesome species. A satisfactory field method has not yet been devised.

SUMMARY

For accurate age determination of living trees of *Populus tremuloides*, a simple, rapid technique involves water infiltration of increment cores under low pressure and microscopic examination of treated cores under low power using transmitted light. Free-hand cross-section are examined to distinguish between annual and false rings and to appraise rings in fungus-stained wood.

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FIGURE 1. Cross-section of stem of *P. tremuloides* showing the presence of 3 false rings (F) within the xylem of one growing season (X240).

FIGURE 2. Cross-section of stem of *P. tremuloides* showing false (F) and annual (A) rings (X73).