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Aging Iowa Trees

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AGING IOWA TREES

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Introduction

How old is this tree? Or that one? Unanswerable questions to most people, unless they are there when it started growing, but with proper techniques, equipment, and a bit of skill (or luck), it is not so difficult to determine the age of a tree. Because trees grow in girth by the addition, each year, of a layer of wood just inside the inner bark, these layers can be counted when they are clearly exposed. We usually see the layers exposed as rings on the surface of a stump, hence the study of aging trees is referred to as "tree-ring" analysis, instead of tree-layer analysis.

Procedure

There are two ways to expose tree rings for counting: cut the tree down to look at the cross-section of the stump, or drill out a small core of wood with a special instrument, an increment borer.* There are advantages and disadvantages of both. The first way is very destructive but exposes, in cross-section, the whole pattern of growth rings. The second does little, if any, harm to the tree, but it requires considerable care to operate the borer, and it is often difficult to pinpoint the center of the tree so that all layers are sampled.

One could hardly justify cutting down an old tree just to see how old it *was*. Therefore, it is best to seek out situations where trees have been felled for other reasons. For example, street and park elms which have died, trees being cut for agriculture, construction, or timber harvest. If you are there at the right time you may be able to get cross-sections cut for you. Otherwise, it will take some effort to get a suitable chain saw and operator to obtain a section. Occasionally a tree stump has been cut smoothly enough and has weathered just right to make the tree rings rather easy to count. Rapidly grown elm, oak, and ash tree stumps that have weathered a year may be the most countable; however, in some communities it is a race to count them before they are consumed by stump-eating machines. Cross-sections two inches or so thick can be brought into the shop and sanded to bring out the rings more clearly. Radial cracks usually develop during the drying of the wood no matter what you do, although some materials are suggested which

*Increment borers may be obtained from forestry supply catalogs; however, they are expensive and often scarce. Two companies which usually have them are Ben Meadows, P.O. Box 8377, Station F, 553 Amsterdam Avenue NE, Atlanta, Georgia 30306; Forestry Suppliers, Box 8397, Jackson, Mississippi 39204.

can be used to stabilize large flat pieces of wood (1). Pie-shaped sections may work just as well as the complete cross-section, and they are more convenient to handle and store.

By using an increment borer you can get a good idea of how old a tree *is*. Valuable landscape trees, street trees and timber trees, such as walnut, should not be cored. The pencil-size wound soon heals itself causing little concern except when it is bored through a veneer-grade walnut. Because diseases such as Dutch-elm and oak wilt are carried from an infected to non-infected tree of the same species, stay away from obviously diseased ones. Softwoods such as pine, spruce, and cedar are ideal for coring. Oaks and other ring-porous hardwoods such as elm, ash, hackberry, coffee tree, and honey locust can be cored using great care and sharp increment borers, while hickory, hard maple and ironwood should be avoided not only because they are harder to core, but also because the rings are more indistinct. Once a core is obtained from a tree, it can be placed in a numbered soda straw or plastic tube and the ends closed with tape. Cores should be dried outside the tube at 150-200°F for a few hours then glued to a small strip of wood for support. A groove cut in the strip of wood into which the core sets half way is ideal because cores usually undergo some bending while drying. It is very important to align the core with the wood in the same position it was in the tree so that as you look through a dissecting scope at the core, you see the "rings" in cross-section view. Actually the cores may be upright or upside down, but they cannot be on either side. Cores should be sanded using 100 grit sand paper, progressing through 220, 400, and finally 600. This should provide a surface on which the wood cells are clearly exposed in a cross-section view. Hand sanding with sandpaper wrapped around small blocks of wood is best.

Weather Patterns

With trees such as white pine the cores sometimes can be counted with a hand lens when fresh from the tree, but it is easy to miss a narrow ring. Some stumps can give a good estimate of age without further preparation; however, age is not the only sort of information that can be gained from tree rings. The width of the ring and the extent of early and late wood in each ring give measures of the total environment under which growth occurred. This requires a smooth surface for measurement of each ring so that comparison can be made with environmental measurements such as an annual precipitation. Tree-ring analysis has been successfully used, especially in the Southwest, for identifying a pattern of environmental stresses recorded in the growth rings of trees much further back in time than weather records do (2). The bristlecone pine of the southwestern desert mountain peaks has provided continuous records back thousands of years. This age span cannot be expected for Iowa materials; however, it is realistic to assume that weather

records can be extended back for several centuries. Living trees in excess of 400 years have been located on Iowa bluffs (3). A tree which died in 1890 or thereabouts on the shores of West Lake Okoboji dates back to 1516 (4).

Trees in Iowa are not consistent in showing extreme narrow rings for every drought year because the severity of the drought varies from place to place. Preliminary observations of tree rings indicate that on a majority of sites there were narrow rings in 1956, 1936, 1934, 1926, 1910, 1901, 1895, 1894, 1887, and 1886. On some sites other years resulted in very narrow growth, 1931 in western Iowa, 1916 in eastern Iowa and many more local examples. Because trees do most of their growing in spring and early summer, the effects of rain in late summer and fall are mainly carried over into the next growing season. This lag in response may help explain why ring width and precipitation do not correspond exactly in most situations.

The dry summer of 1976 did not result in extremely narrow rings because the subsoil moisture in most areas of the state was exceptionally good early in the year. However, with subsoil moisture exhausted by the continued drought in late 1976, it would seem probable that 1977 will be a severe year for tree growth unless moisture is overly abundant early in the 1977 growing season.

Despite the lack of precise correspondence between annual precipitation and tree-ring width, the narrow tree-rings are a good approximation of severe weather. Weather records seldom go back further than 100 years for Iowa locations and often trees much older than this can be found. Thus, the tree-ring pattern can be useful in extending the approximate weather history of an area back as far as the tree can be successfully dated and measured. With this additional extension of weather data, it may be feasible to figure out if there are cycles to our weather and of what length.

Narrow rings do not always signify a shortage of moisture. They may have resulted from extreme temperatures or damage to the tree from ice, wind or fire. For example, a sharp change from wide rings to a series of very narrow rings would suggest the tree was recovering from a loss of several large crown branches, returning to wide rings when sufficient additional crown growth has occurred. Also, competition from neighboring trees may cause growth rings to gradually become narrower and narrower until the tree dies, or as in some cases, the neighboring trees are thinned out, and the growth rings immediately become wider. Trees that lean or bend have an effect on the ring widths.

Conservation of Old Trees

Old age imparts a value to a thing much greater than one would obtain from the simple use of it. One only has to observe the rising value of antique

furniture and paintings to see this. It also applies to old trees, but most of us have not thought much about it. Generally speaking, the older the tree, the more valuable it is (and the more tree-ring information it contains). Therefore, it is a worthwhile goal to protect our remnant forest areas because this is where the old trees are. The oldest trees may be smaller ones growing on steep, rocky slopes along the river. Before coring or collecting samples of cross-sections, be certain that you have permission from the owner or manager of the land. Trees older than 250 years are rare, but you may find them. If you find trees older than 300, please let me know where you found them. The information they contain in their growth rings belongs to all the people of Iowa.

Literature Cited

1. Mitchell, H. L. 1972 *How PEG helps the hobbyist who works with wood.* Forest Products Laboratory, Forest Service. U.S. Department of Agriculture. P.O. Box 5130, Madison, Wisconsin 53705.

2. Fritts, Harold C. 1972. Tree rings and climate. *Scientific American*. 226(5):92-100.

3. Landers, Roger Q. and Dolores Graf. 1975. The oldest Iowa tree, II: Eastern Red Cedar on Cedar River Bluffs. *Proc. Iowa Acad. Sci.* 81:123.

4. Anderson, W. A. 1938. The oldest Iowa tree. *Proc. Iowa Acad. Science* 45:73-74.

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Iowa Landforms

A new publication, *A Regional Guide to Iowa Landforms*, is now available as the *Iowa Geoglogical Survey Educational Series 3*. This non-technical account of the appearance and geologic history of Iowa's terrain was written by Jean C. Prior, a Research Geologist on the Iowa Geological Survey staff. Copies may be obtained from the Survey offices at 123 North Capitol Street, Iowa City, Iowa 52242. Over-the-counter cost is $1.50 per copy; add $.50 postage and handling for orders placed by mail.

This publication is intended to meet a long-expressed need by educators, environmental scientists and the general public for a well-illustrated, popular summary of Iowa's landscape features and the geologic events and processes that shaped them. The book deals first with the different perspectives from which Iowa's terrain has been examined--from pencil sketches by 19th century naturalists to space-age views by the Skylab astronauts. The events and deposits of the Great Ice Age are examined in a chapter on the geologic history and materials of Iowa landforms. A series of maps follows, illustrating the landform regions of Iowa, rivers and lakes, elevations, glacial history and topographic relief. Finally, each of the state's seven principal landform regions is discussed individually with respect to its appearance, geologic history, and earth materials found beneath the land surface.