NORTHERN HARDWOOD NOTES

Determining Site Index Accurately In Even-aged Stands

Good site index estimates are necessary for intensive forest management. To get tree age used in determining site index, increment cores are commonly used. The diffuse-porous rings of northern hardwoods, though, are difficult to count in cores, so many site index estimates are imprecise. Also, measuring the height of standing trees is more difficult and less accurate than measuring the height of felled ones.

A more precise way for foresters to determine site index is to fell, measure heights, and take a section for counting rings from representative trees. Site index can then be obtained from polymorphic curves.

Method for Counting Rings

1. Select a stand to measure that is:
   - Even-aged with less than a lo-year age difference among the overstory trees, excluding residuals.
   - Fully stocked with a closed canopy.
   - Mostly free of trees killed by wind, insects, or disease.
   - Not disturbed by fire, grazing, or heavy thinning from above since establishment.
   - At least 20 years old and preferably more than 50 years old at ground line. (Site index estimates in younger stands are not as valid because tree heights and growth rates vary so much).
   - Composed of sugar or red maple, or other hardwoods. (The maples are widely distributed and therefore can be used for comparisons among hardwood species. When suitable maples are not present, reliable estimates can be obtained with other species.)
   - Representative of a large area.
2. Select at least 5 sample trees if they are from stands more than 30 years old; at least 10 if the stand is less than 30 years old. Sample trees must be:
   - Dominants or strong codominants.
   - Above the average diameter for the stand (considering all trees over 5 inches d.b.h.).
   - Single-stemmed, not from a sprout clump.
   - Without serious insect, disease, or fire injuries; (don't use trees with rotten cores unless all rings are evident).
   - At least a stand height away from residual trees.
   - Straight and without pronounced lean.
   - Free of most surface defects, epicormics, bumps, and dead branch stubs.
   - Full-crowned, without dead tops and large forks. Small (l-inch diameter) correcting forks are permissible.
3. Fell each sample tree carefully to avoid breaking or loosing the tip.
4. Measure the total height to the nearest foot.
5. Cut a l-to 2-inch-thick cross sectional disk from the tree at breast height and label it.

6. Count the number of rings on each disk taken at d.b.h. and add 4 years to get the tree's total age at ground line.

- Smooth the disk with an electric planer or belt sander to help distinguish annual rings. Usually rings can be more readily distinguished a few days after planing; magnification, ample lighting, and staining (phloroglucinol in hydrochloric acid and Bismark brown stains) can be used to bring out growth rings on difficult disks.

- Be careful to count every ring in periods of slow growth where rings are closer together and avoid counting false (incomplete) rings.

- Use Carmean's (1978) polymorphic site index curves to determine site index for each tree. Then calculate an average site index for the stand.

- Use Carmean's (1979) site index comparisons for estimating site indices of other species. (See also Note 4.02).

- Developing growth curves and relating them to soil and site characteristics which can be used on a variety of sites would make the felling and measurement of a number of trees more worthwhile.

References

Carmean, W. H. Site index curves for northern hardwoods in northern Wisconsin and Upper Michigan. Res. Pap. NC-160. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station; 1978. 16 p.

Carmean, W. H. Site index comparisons among northern hardwoods in northern Wisconsin and Upper Michigan. Res Pap. NC-169. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station; 1979. 17 p.

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