North Central Forest Experiment Station 4.01

CENTRAL HARDWOOD NOTES

The Importance of Site Quality

Yield and quality of central hardwoods depend greatly on the site. So, first off you should determine the site quality of your land for a variety of tree species. This information will allow you to compare yield and value so you can favor the species best suited for each site. Knowing site quality will help you determine what levels of management intensity and investment your land will support.

There are several advantages to intensive management on productive sites:

- Good sites can yield more at a higher quality, especially for high value species such as white and red oak, black walnut, black cherry, and white ash.
- Good sites generally require shorter rotations thus reducing interest costs on long-term forestry investments.
- Good sites may produce a better return on investments in silvicultural practices such as thinning, pruning, fertilization, and drainage.
- Good sites typically are more diverse in woody and herbaceous understory plants and produce more food and habitat for wildlife.

It is also essential to know the capability of poor sites to prescribe the proper kinds and levels of management.

Site quality for central hardwoods is usually expressed as site index-the height of the dominant and codominant trees at an index age, usuatly 50 years. Site index for many central hardwoods can be estimated directly using site index curves or tables and species comparisons. Indirect site index estimates are obtained from soil site relationships, soil surveys, or site classification systems. Methods for direct and indirect site index estimation are discussed in detail in Note 4.02 *Measuring Site Index in the Central Hardwood Region.*

Central hardwoods cover a large geographical area with great differences in climate, topography, and soil. These differences may cause considerable variation in site quality. Most central hardwood species respond similarly to the same favorable site conditions, although the importance of any one site factor or combination of factors may vary among species.

Soil properties most often correlated with site quality are surface soil thickness, total soil depth, and surface and subsoil textures. The surface soil, or “A” horizon, is generally considered the layer most favorable for fine root development and absorption of nutrients and moisture. The relationship between surface soil thickness and site quality is often curvilinear. Where surface soils are thin, small increases in surface soil thickness can cause large increases in site quality.

The best hardwood sites are usually on medium-textured soils. Texture and stone content affect available moisture, nutrient levels, internal drainage, and aeration. Coarse-textured soils generally are of lower site quality because soil moisture holding capacity and nutrient levels are limited. Medium-textured soils are good sites because they have adequate available moisture and nutrients, good structure, internal drainage, and aeration which favor root development. Fine-textured soils generally have adequate soil moisture and nutrients, but are often poorer sites because they commonly have clay subsoils that impede internal drainage, aeration, and root development.

Topographic variables often associated with site quality are: aspect, slope position, slope gradient, slope shape, and elevation. The best hardwood sites are generally north- and east-facing, gently sloping, concave or lower slope positions. The poorest sites are on narrow ridge tops or south- and west-facing, steep, convex upper slopes. Topographic features are often closely associated with soil depth, soil profile development, amounts of available soil moisture and nutrients, and microclimate. In hilly and mountainous terrain, topographic features have the strongest relationships with site quality. On more level terrain, site quality is influenced more by soil properties.

Any estimates of site quality, whether from direct tree measurements or indirect estimates based on soil and topographic features, are only "point" observations of variable conditions in the landscape. Because the land manager deals with large areas, point site quality estimates-to be useful-must be translated into a site classification applicable to larger areas.

A site classification system should be relatively simple, practical, and applicable to all sizes and classes of ownership. The scale and intensity of classification should be appropriate to the management objectives.

Recent physiographic or ecological site classifications have been developed for the Interior Uplands of east-central United States (see Note 4.03 Forest Site Classification *in* the *interior* Uplands) and the Mark Twain and Monongahela National Forests. A multifactor site classification system is presently being developed for the southern Appalachian Region.

These physiographic or ecological site classification systems stratify the landscape in a hierarchy according to physiography, geology, soils, topography, and vegetation. The basic management units, landtypes (or ecological landtypes), are visually identifiable areas that have similar soil and productivity because of similar climatic and geologic processes. Landtypes are described in terms of geographic setting, soils, parent material, soil depth, soil moisture, drainage, and most common or potential climax vegetation. Landtypes are also rated for potential competition, seedling survival, erosion potential, and other site-related factors that may affect forest management operations. Each landtype is evaluated in terms of productivity (site index or volume growth) for selected species and rates species desirability for timber production.

Land units identified in these classification systems have ecological significance for a wide range of forest-related resources and their potential uses. Site classification systems allow you as a resource manager to determine the capability of the site right in the woods and are essential to provide an ecologically based, practical framework for forest management planning and forest practices.

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