Natural oak regeneration after clearcutting on the Hoosier National Forest

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Project overview

We examined 32 clearcut sites on the Tell City Ranger District of the Hoosier National Forest (HNF) to examine regeneration of oak (Quercus spp.) in relation to site variables; this study is a follow-up to work done in 1987 by Fischer et al.

Oaks play a very important role in the Central Hardwood Forest Region (CHFR) historically, ecologically and commercially. Even-aged silviculture has replaced many desirable hardwood species with less desirable hardwoods and various other less desirable species, while oak species have better success on more xeric sites.

Methods

Sites examined ranged in age from 23-35 years and were 2.2 to 20.2 hectares (ha) in size, while distributed across a variety of landscapes. A total of 572 permanent plots were established to evaluate species composition change on clearcutover time. Aspects, slope percent, elevation, stoniness, slope position and average canopy height were determined at plot centers.

A 63.7 x 63.7 meter grid was generated over the stand and sample plots were established at grid intersections, for a resultant sampling intensity of 2.5 plots/ha. Regeneration sampling consisted of recording all trees < 2.54 cm diameter at breast height (DBH) by species in a 0.004 ha plot. Individual tree data in a 0.04 ha plot included species, DBH, crown classification (suppressed, intermediate, or dominant), estimates of merchantable volume, and estimation of origin (sprout vs. seed) for all trees with a DBH > 2.54 cm. If a measured tree hosted any grapevines, all were tallied and vine diameter recorded.

Analysis

We considered only dominant-codominant trees of the 1987 and 2004 data sets because they are the best indicators of what species are established on a site. This may provide us with a clearer glimpse of future stand composition.

We used the importance value (IV=RD+RF)/2 to examine nine species groups of interest across slope and aspect positions. Change in the IV of each species group over the 17 year time period allows us to examine how these species compete for resources in this period of stand development.

Results

The concern regarding decline of oaks in the CHFR appears to be valid. Average percent dominant species composition for six species group is shown in Figure 4. It is evident that the composition of sampled stands looks much different today. Pre-harvest stands were dominated by oak species, an average of 66.8 percent, with a relatively small percentage of yellow-poplar, black cherry, ash, and walnut. The post-harvest data shows a considerable shift in average species composition of these stands.

Future directions

We will conduct a more thorough investigation of the influence of site and age on the changes in oak composition over time. From that information we hope to better identify suitable variables to characterize the potential for natural oak regeneration across various sites. We will also examine the potential for oak-dominated sites to naturally regenerate to their pre-harvest Ecological Landtype Phases (ELTP) designations, as defined by Van Kley et al. (1994), within the HNF.