

Assessment of restoration potential of residual stands of mountain (piedmont) longleaf pine at Horseshoe Bend National Military Park

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Introduction

There is strong interest in re-introducing longleaf pine (*Pinus palustris*) to sites where it has been extirpated. The process of ecological restoration is a continuum. One extreme involves extensive site preparation and re-introduction of all species to an area. However when species of interest remain on site, another approach to restoration includes enhancing populations of significant species in an effort to recreate original habitat structure and function. Making use of residual resources is gaining attention for regional restoration efforts (Kush et al. 2004, Varner et al. 2005). Throughout much of the late nineteenth and twentieth centuries many sites in the northern (montane or piedmont) range of longleaf pine suffered extensive cutting and prolonged periods of fire suppression that resulted in alteration of habitat structure and species composition. Today, old-growth stands of montane longleaf are dominant on ridges and most faces of extreme rocky slopes in some areas (Varner et al. 2003) but in areas with more moderate slopes, longleaf originally were predominately found on south and west faces (Reed 1905). A recent search of uplands in Horseshoe Bend National Military Park (HOBE) uncovered stands of suppressed longleaf pine. HOBE is a site with generally moderate slopes in Tallapoosa County, AL. Preliminary observations indicated that there is a substantial number of medium sized longleaf present and so the site warranted further examination to determine if it was reasonable to consider restoration utilizing residual natural resources, including the remaining longleaf.

Methods

In 2005, we assessed three 5 acre plots on south and west facing slopes that currently support longleaf pine. These areas were designated as Plot I (northeast region of HOBE with slopes averaging 7%), Plot II (northwest region of HOBE with slopes averaging 25%) and Plot III (southwest region of HOBE with slopes averaging 20%). Sites were selected for evaluation, in part, because they were deemed to be relatively accessible for possible future restoration activities. On each 5 acre plot, a stand inventory was done and stem map created for all longleaf stems plus all other woody stems ≥ 4 inches in diameter at breast height (DBH). We compared this information to a century-old regional timber evaluation reported by Reed (1905). In addition, we measured the fine fuel accumulation on each plot and collected samples of tree cores for a sub-set of sizes of longleaf plus some of the larger hardwood trees.

Preliminary Results and Discussion

A 100% cruise and stem maps of longleaf pine on three 5 acre plots at HOBE revealed that residual trees were common over much of the sampled areas. The number of longleaf tallied was: 283 on Plot I, 184 on Plot II and 273 on Plot III. Figure 1 illustrates the observed longleaf size distribution estimated on a per acre basis. Almost all of these individuals were of medium size (5-20 inches DBH). There were only three longleaf with diameters less than 4 inches DBH and only 7 trees with diameters greater than 21 inches DBH. Tree cores from a sub-sample of the trees indicated that the oldest extant longleaf on the HOBE plots were approximately 75 years and ranged in size from 8 – 18 inches DBH. The youngest were 45-50 years old and ranged in

size from 5-7 inches DBH. Many individuals > 5 inches DBH were observed to have produced cones the previous season.

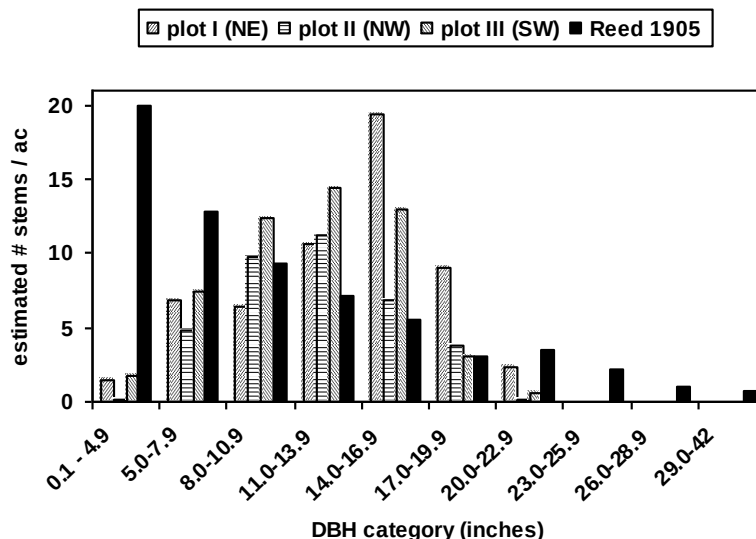


Figure 1: Estimated number per acre of longleaf pine, by size class, for three plots on HOBE and for old-growth longleaf on south and west facing slopes a century earlier in a nearby county (Reed 1905).

Figure 1 also compares observed size distribution of longleaf on HOBE to data reported by Reed (1905) for old-growth longleaf forest on larger tracts of land in nearby Coosa County, AL. A striking feature of the comparison is the lack of longleaf recruits in the modern landscape of HOBE. Visual comparison of larger size classes presents a less obvious pattern, however the total number of longleaf stems ≥ 5 inches DBH in 1905 was 45.1/acre and this is within the range of the number of medium sized longleaf on HOBE in 2005 (36.6 – 61.0/acre). Because HOBE lacks recent longleaf recruits, it is not surprising that current density is also below the 120 stems/ac reported for an old-growth longleaf forest located northwest of HOBE (Varner et al. 2003).

The number of woody stems ≥ 4 inches DBH for all species on each 5 acre plot is illustrated in Figure 2. It is expected that many of these individuals invaded south and west slopes as the result of lack of fire. Many of these species were not recorded by Reed (1905) to be associated with south or west facing longleaf stands. It is likely that there was expansion of species commonly associated with infrequently burned habitats such as *Liquidambar* (sweetgum), *Cornus* (Florida dogwood), *Oxydendron* (sourwood), and *Liriodendron* (yellow poplar). However some individuals of other species may have been components of old-growth longleaf forest on the slopes of HOBE. Tree cores of larger hardwood individuals revealed that some *Quercus stellata* (post oak) and *Q. falcata* (southern red oak) are older than residual longleaf trees. Cores of some of the larger oak stems indicated ages of 125 – 175 years. A century ago Reed (1905) noted that post and southern red oak intermingled with longleaf pine on west and south facing slopes and so the old oaks at HOBE are relicts of the original old-growth forest.

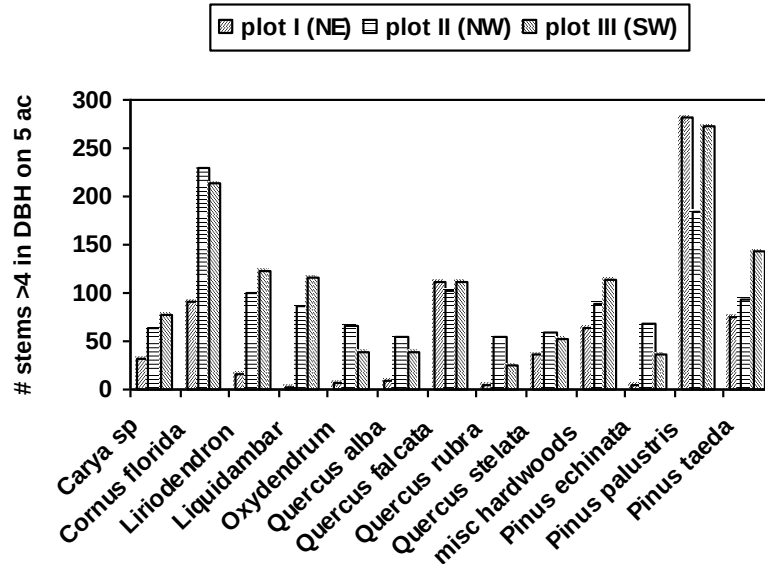


Figure 2: Number of woody stems ≥ 4 inches DBH on three 5 acre plots at HOBE. The taxa are species with more than 50 stems on at least one plot. Species of *Carya* (hickory) were lumped. All other woody species are in the category of “misc hardwoods”.

No fire has been reported on HOBE since the site became federal property in 1959. Currently, there is an excessive accumulation of fine fuel. Average litter depth across all three plots is 6-8 inches. At the base of some longleaf, litter depth is as great as 10-14 inches. The lowest layers of pine needles are in an advance state of decomposition and many trees, including longleaf, have roots growing in this duff layer. Excessive duff creates a challenge for the reintroduction of fire (Kush et al. 1998). Trees, including longleaf, are often stressed and/or killed due to destruction of roots. Duff at the base of longleaf may smolder, unnoticed, and eventually burn down to mineral soil (Kush et al. 1998); this prolonged exposure to high temperature usually damages the cambium and kills the tree.

Restoration and Management Recommendations

The residual longleaf trees and the older oaks on the south and west facing slopes at HOBE are valuable resources for future habitat restoration efforts. Although all plots have been invaded by off-site tree species, intrusion of these stems is not the most immediate management challenge to restoring native forest structure and species composition. The most significant task is to develop ways to reduce and eventually eliminate excessive fine fuel that has accumulated over decades of fire suppression and, at the same time, maintain many extant, cone-producing longleaf and the old-growth oak trees. Because longleaf requires mineral soil for successful establishment, reintroduction of fire is necessary but the process will be difficult. Kush et al. (1998) recommended burning to remove excess fuel in small amounts over a series of low-severity head fires under cool and relatively moist conditions. Even with great care, some longleaf are likely to be killed in the process. Although mechanical and/or chemical treatment of off-site trees and shrubs may eventually be necessary, we suggest that these actions wait until much of the litter accumulation has been removed. Some and perhaps many off-site stems are likely to be killed

by fire and, in the worst case where longleaf mortality is high, residual woody stems, regardless of species, may be important to serve as cover on a short-term basis.

Because small longleaf are absent at HOBE, it may be useful to focus attention on ways to establish new recruits as soon as possible. In addition to eventually creating bare mineral soil with the tempered re-introduction of fire, it may be productive to establish trial plots of planted, container longleaf juveniles. This effort could include creation of patches for planting using manual and/or mechanical removal of litter coupled with local removal of nearby off-site woody stems. Such activity may be one way to shorten the time required to restore a natural stand structure.

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