A New Look at Some Old Shortleaf Pine Progeny Tests: Lessons for Silvicultural Opportunities Through Partnerships

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ABSTRACT.—Starting in the 1980s, 155 shortleaf pine progeny tests were established by the USDA Forest Service on national forests across the range the species. Originally intended to support the agency's timber management program (post-clearcutting and subsequent reforestation with planting), these progeny tests were largely abandoned as the Forest Service's forest management policies changed. Over the years, some of these shortleaf pine progeny tests were lost to natural disturbances or harvested, but many still remain as more-or-less intact outplantings. Recently, large-scale planting needs to support shortleaf pine restoration on public lands has reignited interest in these established progeny tests, spurring the Southern Region (with the assistance of the Southern Research Station) to take another look at them.

Recently, the Southern Region's Forest Management Unit and the Southern Research Station (SRS) have partnered to reevaluate some shortleaf pine (*Pinus echinata*) progeny tests established in the 1980s and early 1990s in Arkansas and Oklahoma (Hossain et al., in press). Although not established as a research trial, the progeny tests that remain in good condition still retain useful information that can help managers address concerns with this declining species across its natural range. This may be particularly true if new DNA marker technology can shed further light on the genetic nature of these shortleaf pine families, or if sufficient numbers remain to make statistical comparisons of growth and yield performance. If successful, the partnership between the Southern Region and SRS may be expanded regionally to include more progeny tests on other national forests, with emphasis placed on the subregions (e.g., southern Appalachians, Piedmont) that have experienced the most dramatic declines in shortleaf abundance.

To date, staff of the SRS and Ouachita and Ozark–St. Francis National Forests have investigated dozens of these progeny tests and have formally resampled 14 of these tests. Field sampling began in 2018 and will continue into at least the fall of 2019, with limited assessments conducted to date (for example, Hossain et al. 2020; Hossain et al., in press). From this analysis, we can make a few preliminary assessments on the potential of this effort for this paper.

First, although many of these progeny tests were not logged or destroyed by natural disturbances, some had received enough damage from past harvests, fires, ice storms, beetles, and other forest health problems that we chose not to sample them because too few families remained sufficiently intact. For instance, many—if not most—of the pines in these progeny tests had been impacted by multiple glaze events that have struck Arkansas and

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Oklahoma in recent decades, causing physical damage to more than 75 percent of all live trees (Hossain et al., in press). This ice damage was substantial enough to affect the quality (form) of the surviving trees and undoubtedly influenced the height performance of most affected individuals, thereby limiting our ability to use height or forking to assess family performance.

Second, while these progeny tests were established following the tree improvement guidelines available at that time (with establishment records, genetic crosses, and planting maps), there are no subsequent management records from these shortleaf pine progeny tests. Hence, we cannot fully reconstruct the decisions after the closure of the tests, nor have we been able to revisit prior analyses (for example, La Farge 1991; Studyvin and Gwaze 2012). Some of the earliest data collected are available in paper form only, and given the sheer volume of records, they cannot readily be reinterpreted. These limitations further constrain our ability to interpret our present-day results. While we will continue to search for this information and attempt to digitize the data as time and resources permit, we will need to ensure that a similar fate does not befall our work.

Finally, it is clear that there are logistical challenges to re-evaluating these progeny tests so long after the initial effort began, which cannot be corrected. However, we still plan to evaluate this effort, as there are few other options for quick answers to questions about which shortleaf pine families are best suited for deployment on the Ouachita and Ozark–St. Francis National Forests. To avoid such logistical challenges in future efforts, partnerships between national forests and research stations need to be better coordinated from the beginning to ensure that large-scale experiments are properly designed, measured, analyzed, monitored, and archived. After all, some large-scale research must be done on national forests, rather than more controlled locations such as established experimental forests. While experimental forests offer a better degree of treatment control, preservation of ongoing studies, and better certainty for the long-term preservation of documentation and data, and their limited spatial extent mean it is not possible to study family performance in progeny tests across the full range of environmental conditions.

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