Competitive Research Grant Program

Evaluating the use of enhanced oak seedlings for increased survival and growth

Investigators: Andrew W. Ezell, John D. Hodges, Andrew Londo, Forestry; Dave Godwin, Ron Seiss, Mississippi Department of Wildlife, Fisheries, and Parks

Project Objectives:

1. To evaluate the survival and initial growth response of oak seedlings produced under special nursery protocols
2. To compare these "enhanced" seedlings to regular "nursery run" oak seedlings of the same species
3. To evaluate the influence of various cultural practices including competition control, planting method, and fertilization on initial seedling performance
4. To establish areas that can be monitored and evaluated for any differential in acorn production as relates to initial seedling condition or cultural practice. The areas will be monumented and available for continued monitoring and measurement for decades.

Synopsis of research activities per objective:

1. A total of 6,480 oak seedlings were planted in the study which included two nursery stocks of two species. The planting was completed with half the total seedlings planted at each of the two sites. All cultural treatments have been completed for the duration of the study. Survival, height growth, and diameter growth have been measured as appropriate for three growing seasons on the 3,240 enhanced seedlings that were planted.
2. All seedlings were evaluated at each measurement timing, and the data have provided the basis for comparing the nursery stocks through statistical analysis.
3. Data were separated by cultural practice which has allowed the statistical evaluation of the influence of each of the practices on the survival and growth of the seedlings.
4. The seedlings are planted using operational spacing on two Mississippi Department of Wildlife, Fisheries, and Parks wildlife management areas. These areas are well monumented and protected from factors that could potentially interfere with continued monitoring of the project. Barring unforeseen circumstances, the trees will be available for continued evaluation as long as desired.

Significant findings/results per objective to date:

1. Survival and growth of the enhanced seedlings has been excellent for Nuttall oak and very good to excellent for white oak. Survival is greater than 90% for Nuttall oak at both sites, greater than 90% at Copiah County wildlife management area for white oak, and more than 70% for white oak at Malmaison wildlife management area. Growth is outstanding with some Nuttall oaks reaching heights of 9-10 feet and diameter breast height (dbh) of 0.9-1.0 inch after only three growing seasons. As expected, white oak seedlings are smaller, with heights of only 3-5 feet and dbh

Fund Leveraging	
Mississippi Department of Wildlife, Fisheries, and Parks; National Wild Turkey Foundation; Mississippi Forestry Commission, E.I. DuPont Chemical Company, and Timberland Enterprises	$18,270

of 0.2-0.3 inch.

2. The enhanced seedlings do not survive or grow better than the high quality nursery-run seedlings used in this study. Survival was statistically the same for all direct comparisons of nursery stock. Total height or diameter may be greater (not always) for the enhanced seedlings at this time, but they were significantly larger at planting, and the growth rate has been greater for the nursery run seedlings in most comparisons. If the growth trends do not change, the nursery run seedlings will surpass the enhanced seedlings in the immediate future.
3. The experimental matrix created in this study has allowed scientists to carefully partition the effect of the cultural practices, and it is now documented that the cultural practices are equal to or of greater importance than nursery stock in determining survival and early growth (given the use of high quality nursery run seedlings). Thus, requiring an "enhanced" seedling is not necessary for superior initial performance. Hand planting in subsoiled trenches is the optimal planting method. Pre-emergent herbaceous weed control the first growing season only is the optimal competition control regime (no total control

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for repeated growing seasons). Use of directed sprays of glyphosate during the growing season is credited with the lower survival of white oak seedlings at Malmaison wildlife management area, and this study disapproves all directed sprays of glyphosate around oak seedlings during the active growing season. Fertilization has no effect on survival and no statistical impact on growth during the first three growing seasons.

4. Two very successful plantings have been established. Each of these areas covers more than seven acres that will provide substantial amounts of mast for wildlife in the future. The plantings also have sufficient stems to provide growth and mast production data for many years in the future.

Unrealized or unsuccessful endeavors of project:

All objectives have been satisfied.

Applications or broader impacts of significant findings, including economic impacts or projected impacts:

This project has identified the practices that are essential to successfully establish oak trees for future wildlife habitat enhancement. It has also identified the practices that are not necessary and those that may be detrimental to the same process. This has the potential for application across the entire South and could result in saving land managers millions of dollars annually. By using the optimal establishment practices as defined in this study as opposed to the more intensive and rigorous regime originally proposed for use with these enhanced seedlings, land managers may also be able to afford planting more areas and create/enhance more wildlife habitat. By the year 2040, it is projected that 34 million acres of retired agricultural land in the South will be planted with trees – many of those acres will be planted with oak seedlings. The potential impact of the findings from this study on those acres is enormous.

Project success relative to original objectives:

This project has been very successful in every aspect of each objective.

List post-docs and graduate students with title of thesis or dissertation, if completed, and estimated graduation date:

Moree, J.L. 2007. Influence of nursery stock, planting practices, fertilization, and competition control on initial survival and growth of nuttall and white oak seedlings. Thesis, Department of Forestry, Mississippi State University.