

IS SEEDLING GRADING BENEFICIAL TO ARTIFICIAL REGENERATION OF NORTHERN RED OAKS?

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Effective and consistent success with artificial regeneration of northern red oak (*Quercus rubra* L.) has been achieved on many sites using 1-0 graded seedlings produced with the nursery protocol developed by the USDA Forest Service at the Institute of Tree Root Biology in cooperation with the Georgia Forestry Commission. Small northern red oak (NRO) plantings of one or two acres have demonstrated that artificial regeneration can play a vital role in restoring this species in stands where it has been difficult to establish NRO naturally for different reasons.

In preliminary testing, the minimum standards normally used for evaluating NRO for outplanting in our regeneration protocol have included first-order lateral roots (FOLR), heights, and root collar diameters of 6, 70 cm, and 8 mm, respectively. For over a decade, research with over a hundred different half-sib oak seedlots have indicated that 20 to 30 percent of the seedlings from any given seedlot do not meet these minimum standards and thus are subsequently culled upon lifting. Some questions have been raised as to the culling standards used since it is not unusual to cull a third of the seedlings from each seedlot. Although they did not meet height and root collar diameter standards, we have tested some seedlings with higher FOLR numbers than the minimum FOLR standard. In addition, several studies have shown seedlings under shade can rapidly shed lateral roots and lose benefits of FOLR grading.

It has been difficult to test the range of grading standards because herbicide usage has been so restrictive on National Forest lands and mechanical release is difficult and costly to implement. In 2000 a small area became available for grading standard testing on the Tusquitee Ranger District on the Nantahala National Forest in North Carolina. Acorns from five NRO half-sib seedlots obtained from the Watuga seed orchard in Tennessee were used in this study. Seedlings were grown according to our nursery protocol and root pruned to a standard length of 15 cm for the FOLR and 30 cm for the taproot. The 1-0 seedlings were classified as small, medium, and large based primarily on number of FOLR. The range in FOLRs for each group was 0 to 6, 7 to 13, and 14 to 22, respectively. The fourth year mean survival for small, medium, and large seedlings was 22, 67, and 77 percent, respectively. Mean fourth year height and diameter at breast height for small, medium, and large seedlings were 138 cm and 4 mm, 190 cm and 9 mm, and 199 cm and 10 mm, respectively. Whether seedling grading is beneficial depends highly on what the nursery does and planting conditions.