HARVEST SURVIVABILITY OF OAK ADVANCED REGENERATION

Jeff Stringer
Department of Forestry, University of Kentucky
Lexington, KY 40546-0073

Natural regeneration of oak requires the occurrence of advance regeneration and/or stems capable of stump sprouting. These stems must be present before harvest and adequate numbers must survive harvest for oaks to successfully regenerate. Regeneration predictions are based on pre-harvest advance regeneration inventories. However, the use of these inventories does not account for losses that can occur to the advance regeneration pool during harvest operations. This research was designed to determine the survivability of oak advance regeneration subjected to a ground skidding harvest associated with commercial clearcutting.

This study assessed the harvest survivability of advance regeneration of a number of species in four mixed species upland oak stands in Kentucky. Seven regeneration plots were established using a systematic random grid on each of four 8-acre harvest areas. One regeneration plot was centrally located in each of the seven sections. The regeneration plots included one 0.01-acre fixed area plot (28 total) and three 0.001-acre plots (84 total). All trees > 4.5 ft tall to 10 inches diameter-at-breast-height in the larger plot and all stems 0.5 to 4.5 ft tall in the mil acre plots were permanently located with a combination tag composed of a heavy aluminum number tag and a whisker tag pinned to the ground with #9 galvanized wire. Species, height, and groundline diameter were measured prior to harvest. Directly after harvest each tag was located and the stem was coded as either present or absent. Each tree was placed into a height class and a groundline diameter class for analysis. Regression was used to determine relationships between survival (dependent variable) and groundline diameter and height (independent variables).

Each area was subjected to a fall harvest, completed with manual felling and ground skidding. All merchantable stems greater than 8 inches in diameter were removed. Slopes averaged approximately 20 percent and wheeled skidders were able to run unimpeded throughout the tracts. Percent survival varied by height, groundline diameter, and species. Analysis by height classes across all species found that survival was different between stems taller than and shorter than 3.0 ft in height. Oaks < 3 ft in height averaged 55.3 percent survival while those > 3 ft in height averaged 90.2 percent survival. The relationship between total height and survival for all species yielded the best fit simple linear regression ($y=0.7187+0.0924*x$, $r^2 = 0.66$) and the best fit linear regression ($1/y=0.0167+(-0.0032)*\ln(x)$, $r^2 = 0.87$). As would be expected analysis of survival by groundline diameter classes mirrored the results of the analysis by height. The relationship between survival and groundline diameter yielded the best fit regression ($\ln y=0.1613+(-0.2534)/x^{0.5}$, $r^2=0.80$).

The outcomes of this study allow regeneration models to be adjusted for harvest mortality. Further analysis of data from this study will provide logistic regressions for individual oak species as well as other important competing species (ex. red maple (*Acer rubrum* L.)) on medium quality sites.

INDEX TO OAK (*QUERCUS*) SPECIES INCLUDED IN ONE OR MORE ABSTRACTS

Sub genus and species[1]	Common Name	Pages
RED OR BLACK OAK GROUP (SECTION *LOBATAE*)		
Q. agrifolia Nee	Coast live oak	13
Q. kelloggii Newb.	California black oak	13
Q. nigra L.	Water oak	1, 11
Q. nuttalli Palmer	Nuttall oak	11
Q. pagoda Raf.	Cherrybark oak	1, 10
Q. palustris Muenchh.	Pin oak	3, 9, 22
Q. parvula v. shrevei	Shreve oak	13
Q. phellos L.	Willow oak	1, 11
Q. rubra L.	Northern red oak	2, 5, 6, 8, 15, 16, 19, 20, 23, 24
Q. shumardii Buckl.	Shumard oak	22
Q. veluntina Lam.	Black oak	4
WHITE OAK GROUP (SECTION *QUERCUS*)		
Q. alba L.	White oak	4, 14, 20
Q. bicolor Willd.	Swamp white oak	3, 22
Q. macrocarpa Michx.	Bur oak	22
INTERMEDIATE OAK GROUP (SECTION *PROTOBALANUS*)		
Q. chrysolepis Liebm.	Canyon live oak	13

[1]Fralish, James S; Franklin, Scott B. 2002. Taxonomy and Ecology of Woody Plants in North American Forests. New York, NY: John Wiley & Sons, Inc. 612 p.