

MASTING DYNAMICS OF BOTTOMLAND OAKS IN THE MISSISSIPPI ALLUVIAL VALLEY, USA

Emile S. Gardiner

PURPOSE AND SCOPE

The biological process of mast seeding is foundational to the ecology and silviculture of oaks (*Quercus* spp.) and oak-dominated forests. Limited knowledge on the mast seeding dynamics of the bottomland oaks impedes informed decisionmaking for rehabilitation of degraded oak stands and sustainable management of healthy, oak-dominated stands in floodplains across the Southern United States. A 5-year study on acorn production by two key species, Nuttall oak (*Q. texana*) and willow oak (*Q. phellos*), was conducted in the Mississippi Alluvial Valley to assess mast seeding dynamics of mature, bottomland oaks at four different locations.

METHODS AND APPROACH

In 2012, mature bottomland oak stands with strong Nuttall and willow oak canopy components were selected for study in the Delta National Forest in Sharkey County, MS, Dahomey National Wildlife Refuge in Bolivar County, MS; Cut-Off Creek Wildlife Management Area in Drew County, AR; and Sheffield Nelson Dagmar Wildlife Management Area in Monroe County, AR. At each location, 35 trees per species were chosen as sample trees and assigned seed traps relative to total ground area covered by the canopy. All acorns were collected from seed traps over the course of each collection year and processed into categories of maturation and viability. After 5 years of observation (2013 to 2018), repeated measures analysis of variance was used to test for fixed effects and interaction on variables of acorn count and condition to assess interannual acorn production and acorn fate among locations and for individual trees.

FINDINGS AND IMPLICATIONS

Mean annual total acorn production in both species was affected by year at all locations ($P \leq 0.012$), but synchronous acorn production among locations and species within locations was not consistently observed. In other words, the level of acorn production observed each year for either Nuttall oak or willow oak was specific to the location.

Immature acorns shed in various stages of underdevelopment comprised the greatest proportion of mean annual total acorn production. For all sites, Nuttall oak shed a greater percentage of immature acorns than willow oak ($P \leq 0.00154$). Percentages of shed immature acorns averaged across year for each location ranged between 61 ± 2 percent (mean $\pm$ standard error) and 85 ± 2 percent for Nuttall oak, and 47 ± 6 percent and 80 ± 3 percent for willow oak.

Emile S. Gardiner, U.S. Department of Agriculture, Forest Service, Southern Research Station, Center for Bottomland Hardwoods Research, Stoneville, MS 38776, USA

In each collection year, 7 to 10 of the 35 sample trees for each species produced ≥ 50 percent of the mature acorns at a location. Fewer than half of these trees typically showed an annual acorn production sufficient to remain in this subset for all 5 collection years.

Results illustrate the temporal and geographic complexities of bottomland oak masting at species, tree, and stand levels. These observations highlight the unpredictable nature of oak masting and imply that managers aiming to promote natural regeneration of bottomland oak stands will need to monitor mast development in target stands and incorporate flexibility into scheduling stand entry activities that are used to encourage germination and seedling establishment.

ACKNOWLEDGMENTS

This work was conceived and initiated by Tracy Hawkins. Shelley Griffin, Rory Thornton, and Justin Williams worked tirelessly to establish and maintain the sampling grid and process acorn collections.