

THE EFFECTS OF FLOODING REGIMES AND GREEN-TREE RESERVOIR MANAGEMENT ON SUCCESSION OF BOTTOMLAND HARDWOODS

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I examined the effects of flooding regimes on bottomland hardwood (BLHW) succession by determining the effects of flooding on BLHW seed germinated, seedling growth and survival, and mature tree stress and survival in a series of greenhouse, field, and simulations modelling studies. In a greenhouse study, germination of stratified and non-stratified willow oak (*Quercus phellos*) acorns decreased following submergence for 90 d, whereas germination of the more water-tolerant overcup oak (*Q. lyrata*) peaked during this treatment.

Experimental studies on the effects of timing and duration of flooding on BLHW seedling growth and survival were conducted on Texas Utilities' Big Brown Mine in Fairfield, Texas. The order of survival within each of the three treatments was from the most to least water-tolerant species and was as follows: baldcypress (*Taxodium distichum*), overcup oak, Nuttall oak (*Q. texana*), willow oak, and Shumard oak (*Q. shumardii*). Baldcypress exhibited significantly ($P < .05$) greater growth than hardwoods in all three treatments.

Field studies conducted within two green-tree reservoirs (GTR) in east Texas indicated that overcup oak seedling establishment and survival was related negatively to duration of flooding. Stress and mortality of overstory trees differed inter- and intra-specifically. Temporal and spatial patterns of overstory mortality suggested mortality was a result of cumulative flooding events over a series of years rather than the amount of flooding in any single year. Stand-structure analyses indicated regeneration had been limited in both impoundments period.

A simulation model, GTREE, was constructed to evaluate the effects on seedling growth and survival of overcup oak, water elm (*Planera aquatica*), and willow oak. The number of seedlings reaching sapling height and the time needed to reach sapling height were dependent upon duration of time flooded during the growing season, the dormant-season flood depth, and light availability. Regeneration was limited as light availability or the duration of time flooded during the growing season approached an extreme for that species.

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