AFFORESTING OAKS IN BOTTOMLANDS

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Several factors are critical when regenerating oak in agricultural bottomlands: species selection, site ydrology, soil characteristics, nursery stock types, competing vegetation, and animal damage. First, species selected must be adapted to site environment, and in particular, hydrology and soil. Flood regime (frequency, duration, season, depth, flow) in combination with soil character and topography determine the influence of water on trees. The flood tolerance of a species and other silvical characteristics are valuable for determining the suitability of a species. Flood lab studies help to better quantify the flood tolerance of seedlings and cuttings for given flood regimes; and to determine the genetic variability in flood tolerance for a species.

Disking, ripping, and bedding are used to improve structure, drainage and increase the rooting zone on clayey and silty soils, and soils with traffic pans. Soil bedding did not improve oak (*Quercus* spp.) survival and growth on well drained silt loam soils that flooded for up to a month in May-June. Decades of crop production can deplete nitrogen and organic matter that limits tree physiological function. Tree nutrition is further limited by high soil pH (e.g., 7.8 to 8.0). Bur oak (*Q. macrocarpa* Michx.) and Shumard oak (*Q. shumardii* Buckl.) can tolerate high soil pH; Nuttall oak (*Q. nuttallii* Palm.), cherrybark oak (*Q. pagoda* Raf.), pin oak (*Q. palustris* Muenchh.), and water oak (*Q. nigra* L.) are very sensitive to alkaline soils. Fertilizing with ammonium nitrate or urea slow release fertilizer has not been sufficient to overcome low foliar nitrogen and chlorosis in pin oak and swamp white oak (*Q. bicolor* Willd.) on high pH soils. Studies are under way to evaluate the usefulness of ammonium sulfate to acidify soils, improving nitrogen, and micronutrient uptake in oak.

High quality, large oak seedlings grown as bareroot or container seedlings have performed well in bottomland plantings. Seedlings that are greater than 1.5 m (5 ft) tall at planting are less susceptible to browsing by large mammals and are more likely to maintain their live crowns above growing season floods. These seedlings have a substantially larger root structure and mass than traditional bareroot. They are also capable of early acorn production. Regardless of stock type, competing vegetation must be controlled. Disking, herbicides and cover crops have improved oak regeneration success. Managing competing vegetation also provides indirect benefits to planted trees by reducing the habitat of small mammals, and their herbivory on planted trees. Plantations can be fenced or individual trees can be protected from herbivores. We have sufficient knowledge and guidance to successfully afforest bottomlands. Research continues to work on the unknown and discover more effective and efficient methods for establishing oaks in floodplains.