Title: Bottomland Hardwood Restoration and Enhancement in River Basins within the Post Oak Savannah and Blackland Prairie Ecoregions.

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Introduction:

Throughout the major river basins in eastern Texas, bottomland hardwood systems have been degraded or lost due to many factors. Much of the alteration in bottomland hardwood hydrologic regimes is associated with dredging and drainage activities and flood control levees coupled with clearing for agricultural and timber harvesting purposes. It is estimated that 95% of the bottomland hardwoods in eastern Texas have been lost due to degradation or outright conversion to another use, such as reservoirs or agriculture. In the Trinity Basin alone, there are 25 reservoirs, including 14 major reservoirs with a combined storage of 6.9 million acre-feet (TWDB 2002). Additionally, much of the best remaining hardwood forests are threatened by future reservoir construction and altered hydrological conditions which threaten species diversity of future stands. Because of the immensity of habitat loss and the number of threatened/sensitive species that occur in this habitat type, there is an ongoing push for habitat restoration in these bottomland systems. Many governmental programs, both State and Federal, have cost-share practices to restore and improve diversity in these habitats. However to date, there has been little to no research examining restoration methods across the varied basins and soil types of Eastern Texas. There has been extensive research in the Mississippi Alluvial Valley, but the methods and techniques that work there have proven to be ineffective in our area.

The reforestation of bottomland hardwood sites with mast producing species, including oaks and hickories, is the most important step in achieving the goal of ecological restoration in bottomland hardwood systems (Stanturf et al. 1998). Numerous attempts at bottomland hardwood restoration throughout eastern Texas have been largely unsuccessful. Understanding environmental limitations and finding the site preparation methods resulting in the highest survival among sites, and among species, will greatly increase our ability as natural resource managers to restore this vital resource at a significant scale across eastern Texas. Study site locations will include state owned, federally owned, and private lands in both open field sites and forested sites. They will be selected from the Brazos, Navasota, Trinity, Sabine, Sulphur, and Red River Basins, where these rivers intersect the Blackland Prairie and Post Oak Savannah Ecoregions. They will also include a broad array of soil types present in all of these systems. By broadening our study area we will be minimizing the effect of local environmental factors on treatments. Forested sites targeted will be low-diversity stands, comprised mostly of green ash, cedar elm, sugarberry and other early successional species, and will include thinning to varying densities with both mechanical and chemical methods followed by underplanting. Site preparation methods in the open areas will include, but are not limited to: ripping, deep ripping $\geq$ 24", and flat planting. It is also speculated that herbivory and seedling depredation is a potential contributor to seedling mortality, so varying types of seedling protection will be evaluated including tree shelters, fencing, and stacking cut trees on top of the planted seedlings. Tree species of interest include: shumard oak, water oak, willow oak, nuttall oak, bur oak, overcup oak, native pecan, red mulberry, and water hickory, among others, and will be determined on a site-by-site basis. Planting should include containerized trees, bareroot seedlings, and direct seeding of hand-collected seeds.

Several studies have been conducted at the Richland Creek Wildlife Management Area (RCWMA) to test methods for the establishment of oaks and hickories. The poor survival observed during these studies was attributed to drought, as is similar to many other plantings across the study area. The river basins of interest are all located on the western edge of the deciduous forest biome, where dry soil conditions during the growing season will always be a major stress affecting planted seedling survival. Also, backwater flooding from the river systems causes anaerobic stress in the root zone of the planted seedlings during the winter and early spring.

This project couples perfectly with a currently funded project at Old Sabine Bottom WMA wherein they are evaluating methodology to improve stand dynamics on existing stands of desirable hardwood species. This proposed project will examine establishing stands of desirable species and increasing diversity in low-diversity stands.

Justification Related to Division Priorities:

Across the state the most important wildlife habitats, containing the highest number of rare species and the most threatened, are native prairie and riparian habitats. Bottomland hardwoods are listed as high priority habitat statewide (TWAP 2005). The study sites within the Trinity, Upper Sabine, Sulphur, and Red River Basins would be located in the Blackland Prairie Ecosystem, which is classified as a Tier 1 priority by the Texas Wildlife Action Plan (TWAP).

Private landowners, state agencies, federal agencies and NGO's are spending millions of dollars to re-forest floodplain sites throughout these river basins, thus it is critical for natural resource managers to have the information to make recommendations for successful re-forestation efforts.

Potential partners on the project include NRCS for funding and study sites, USFWS for funding and study sites, TPWD for funding, study sites and project implementation, The Trinity Basin Conservation Foundation (TBCF) for funding and study sites, and Stephen F. Austin State University for funding, graduate students and publications.

Programs and initiatives that have bottomlands listed as important, if not critically important, include the East Texas Black Bear Task Force 10-year plan, TPWD waterfowl Strategic plan, North American Waterfowl Management Plan, North American Land Bird Conservation Plan, North American Bird Conservation Initiative, North American Waterbird Conservation Plan, Wetland Reserve Program, Lower Mississippi Valley Joint Venture, Oaks and Prairies Joint Venture, etc……

Species of Greatest Conservation Need (Texas Wildlife Action Plan 2005)
Bottomland Hardwoods:
High Priority SOC: *Breeding birds* Swainson's warbler (*Limnothlypis swainsonii* G4), Kentucky warbler (*Oporornis formosus* G5),
Mammals Rafinesque's big-eared bat (*Corynorhinus rafinesquii* G5 Threatened)
Medium Priority SOC: *Breeding birds* Red-headed woodpecker (*Melanerpes erythrocephalus* G5), Prothonotary warbler (*Protonotaria citrea* G5), Chuck-will's-widow (*Caprimulgus carolinensis* G5). Wood stork (*Mycteria americana* G4 Threatened).
Wintering birds Rusty blackbird (*Euphagus carolinus* G5) 11% decline mature bottoms.
Reptiles Timber rattlesnake (*Crotalus horridus* G4 Threatened)
Mammals American black bear (*Ursus Americanus* G5 Threatened), Louisiana black bear (*Ursus americanus luteolus* State & Federal Threatened)

Low Priority SOC: *Breeding birds* Yellow-billed cuckoo (*Coccyzus americanus* G5), Wood thrush (*Hylocichla mustelina* G5), Eastern wood-pewee (*Contopus virens* G5)
- FWS focal species: wintering species Yellow-bellied sapsucker (*Sphyrapicus varius*).
- Furthermore, migratory waterfowl, including Wood duck (*Aix sponsa*) and Mallard (*Anas platyrhynchos*) will utilize hard mast during winter floods.

Objectives:
1. Conduct experiments to test methods for the restoration of native hardwood species in open-field environments throughout river basins within the Post Oak Savannah and Blackland Prairie ecoregions.

2. Implement underplanting experiments within river basins throughout the Post Oak Savannah and Blackland Prairie ecoregions in order to observe if native hardwood species can be successfully established under a thinned forest canopy.

3. Determine tree species survival rates on a variety of bottomland soils planted using different site preparation techniques.

4. Determine tree survival among containerized trees, bare root seedlings, and direct seeding.

5. Develop a demonstration area on Richland Creek, Cooper, and Tawakani WMA's to show interested public how to restore native hardwood species.

6. Examine seedling predator exclusion devices and their effects on seedling survival.

7. Evaluate past plantings within the study area (WRP and East Texas Wetland Project sites) to determine percentage of success based on practices used.

Expected Management Implications:

The studies will test applied techniques for the establishment of bottomland hardwood seedlings. The information from the experiments will be used to guide natural resource restoration on the best methods to restore desirable hardwood species in the major river basins throughout the Post Oak Savannah and Blackland Prairie ecoregions. The techniques and research results can be demonstrated to interested landowners through technical notes and workshops. The workshops can be held at associated WMAs and private lands where some of the research sites can serve as demonstration areas. The economics of implementing the reforestation techniques will be communicated to the landowners and cooperating agencies as necessary.

Literature Cited:

Stanturf, J. A., C. J. Schweitzer, S. H. Schoenholtz, J. P. Barnett, C. K. McMahon, and D. J. Tomczak. 1998. Ecosystem Restoration: Fact or Fancy. In: Trans. 63rd North American Wildl. and Natur. Resource Conference. 376-383.

TWDB. 2002. State water plan. Austin, Texas.