Mitigation Bank Promotes Research on Restoring Coastal Plain Depression Wetlands (South Carolina)

Christopher D. Barton, University of Kentucky, 203 T.P. Cooper Bldg., Lexington, KY 40546-0073, 859/257-2099, Fax: 859/323-1031, barton@uky.edu; Diane De Steven and John C. Kilgo, USDA Forest Service Southern Research Station, Charleston, SC 29414

Carolina bays and smaller depression wetlands support diverse plant communities and provide critical habitat for semi-aquatic fauna throughout the Coastal Plain region of the southeastern United States. Historically, many depression wetlands were altered or destroyed by surface ditching, drainage, and agricultural or silviculture uses. These important habitats are now at further risk of alteration and loss following a U.S. Supreme Court decision in 2001 restricting federal regulation of isolated wetlands. Thus, there is increased attention towards protecting intact sites and developing methods to restore others.

The U.S. Department of Energy's (DOE) 312-mi^2 (800-km^2) Savannah River Site (SRS) in west-central South Carolina includes about 350 Carolina bays and bay-like wetland depressions, of which about two-thirds were degraded or destroyed prior to federal acquisition of the land. Although some of the altered wetlands have recovered naturally, others still have active drainage ditches and contain successional forests typical of drained sites.

In 1997, DOE established a wetland mitigation bank to compensate for unavoidable wetland impacts on the SRS. This effort provided an opportunity for a systematic research program to investigate wetland restoration techniques and ecological responses. Consequently, research and management staffs from the USDA Forest Service, Westinghouse Savannah River Corporation, the Savannah River Technology Center, the Savannah River Ecology Laboratory (SREL), and several universities developed a collaborative project to restore degraded depression wetlands on the SRS. The mitigation project seeks cost-effective methods to restore the hydrology and vegetation typical of natural depression wetlands, and so enhance habitats for wetland-dependent wildlife. We present a brief summary of this project and the research studies now underway.

The project was designed as a large replicated experiment to test several strategies for restoring wetland vegetation and managing the surrounding upland forest as buffer zones. The mitigation team identified 20 small (1.2 to 5 acres [0.5-2 ha]) depressions with active drainage ditches and a successional forest composition as candidates for restoration. In 2000, we collected pretreatment data on multiple system components, such as hydrology, soils, vegetation, and fauna.

In 2001, we began experimental restoration projects in 16 depressions, with the remaining four left as controls. In the experimental wetlands, we plugged ditch outlets with low-permeability clay in an attempt to reestablish the natural hydrology. The successional forest was completely harvested to open the sites and stimulate plant germination from seedbanks. In addition, we planted seedlings of baldcypress (*Taxodium distichum*) and swamp tupelo (*Nyssa biflora*) at low density in half of the 16 restored wetlands. This will enable us to compare a passive revegetation method to develop emergent wetland with an active planting approach to develop mixed emergent-forested wetland. For the upland management treatments, we delineated 328-ft (100-m) wide upland buffer zones around each wetland. These buffers were either left intact as closed pine-hardwood forest or thinned to an open pine savanna structure to be managed with periodic burning. Treatments were crossed in a factorial design, giving four replicate wetlands in each combination of revegetation method (passive emergent, active emergent-forested) and upland management (unthinned, thinned).

Hydrology and vegetation responses are being monitored annually over a five-year period for mitigation purposes. Our research studies address multiple objectives, including:

1. *The effectiveness of hydrologic restoration and its influence on geochemical processes.* Successful restoration is expected to increase wetland hydroperiods. Christopher Barton is developing models to predict the effect of restoration on hydroperiod change and net wetland improvement. Monitoring studies are assessing how soil physical properties influence the hydrologic response to the restoration treatments and how changes in hydroperiod in turn influence wetland soil and water chemistry. Though early response was complicated by a regional drought, we found detectable enhancements of wetland hydroperiods.
2. *Comparison of vegetation restoration strategies.* Diane De Steven and Rebecca Sharitz (SREL) are conducting research to determine whether seedbanks have sufficient wetland species to support a passive restoration approach, or whether additional planting is needed to establish emergent vegetation. Within the experimental wetland, they also established small plots planted with tillers of two characteristic wetland grasses—maidencane (*Panicum hemitomon*) and southern cutgrass (*Leersia hexandra*)—to test a transplantation method for advancing the development of emergent vegetation. Early results indicated diverse wetland seedbanks and high initial success of both tree and grass plantings.
3. *Evaluation of animal responses to wetland habitat restoration.* Responses of wildlife can provide additional tools for assessing the functional success of wetland restorations. John Kilgo and Michael Menzel (University of West Virginia) are documenting how bird and bat communities respond to the changes in habitat structure created by the restoration treatments and upland buffer management. Similarly, studies led by Karen Kinkead (Clemson University) and Hugh Hanlin (University of South Carolina-Aiken) are examining how wetland changes and the structure of the surrounding landscapes influence herpetiles. Early findings have suggested some positive responses to the restoration and upland management treatments for all

three vertebrate groups. Barbara Taylor (SREL) and Darold Batzer (University of Georgia) found that some depressions already had viable invertebrate communities because sites ponded some water even during the pretreatment phase.

4. *Assessment of restoration success and lessons learned.* All studies will assess how restored sites compare to natural reference wetlands and unrestored control wetlands, and will consider what criteria can best indicate restoration success. Our experiences in conducting this large-scale project will also provide valuable lessons regarding the challenges for such restorations.