

Regional Forester's Natural Resource Stewardship Award Nomination (2006)

“USDA Forest Service-Savannah River (USFS-SR) nominates the Carolina Bay Restoration and Banking Project Team for its accomplishments, including sufficient wetland banking credits to implement two critical environmental restoration projects at the Savannah River Site (SRS). This nomination is based upon the successful implementation and completion of an innovative design that provided practical alternatives for landowners; gained regional, national and international recognition for the work and public acceptance; demonstrated the value of close cooperation between management, and research groups; and established sound scientific, technical, and operation standards for future restorations in the region that will sustain watershed health. As of September 2006, the project has completed all major monitoring and reporting milestones in the large scale restoration and research project in 16 drained Carolina Bays.

Varying in size from less than an acre to several hundred acres, Carolina bays are a unique group of isolated wetlands characteristic of the upper and lower coastal plain in the Southeastern United States (U.S.). The Carolina Bays are critical habitats in upland landscapes because they support numerous threatened, endangered and sensitive plants, including pondberry and bog spicebush, and provide critical ephemeral breeding habitat for amphibian and reptile species (e.g. gopher frogs, tiger salamander), nesting habitat for avian species (e.g. wood stork, bald eagle,) and foraging for bats, as well as numerous specialized invertebrates. According to research studies and conservation organizations, historical land use has destroyed or degraded 90 percent of the many thousand bays found in the Southeast through farming, drainage, and other development activities. Because these wetlands are isolated from navigable streams and other waterways and are largely ephemeral, they are not legally protected as other wetlands, thus making efforts by public land management agencies to restore and conserve these wetlands critical to natural resource stewardship.

The Team effectively integrated research and cooperation among USFS-SR, the United States Department of Energy-Savannah River Operations Office (DOE-SR), the USFS Southern Research Station, Washington Savannah River Company (WSRC), Savannah River Ecology Lab (SREL), the South Carolina Department of Natural Resources, the Corps of Engineers (Corps), and the US Fish and Wildlife Service (USFWS) to develop the Carolina Bays Restoration and Mitigation Bank that could be used to offset in-kind and out-of-kind wetland impacts at the SRS. The design for a large scale restoration-research project for 16 previously drained Carolina Bays was submitted to the Corps. Recognizing the uniqueness of the project and non-traditional approach (research objectives) of restoration activities, the Corps then issued a permit for Carolina Bay restoration and mitigation banking in 2000.

The USFS-SR, the Southern Research Station and partnering organizations developed an experimental design for the restoration that facilitated the assessment of practical alternatives for the DOE-SR and other landowners that are relatively simple and cost-effective. The soils and vegetation of the bays were mapped and surveyed. The pre-settlement wetland interiors of 16 bays were logged operationally based upon previous

ecological studies at SRS demonstrating the benefit of disturbance in stimulating the obligate wetland species in the soil seed bank. The ditches previously installed by farmers were then plugged with local soil to re-establish the hydrology. Since these isolated wetlands are components of both longleaf pine fire savanna landscapes and mixed hardwood forests, the upland buffered in eight bays were partially cut (heavy seed tree) and burned, and the remaining eight were left intact with small gaps created for hardwood planting. Within each group of eight bays, four of the interior wetlands were planted with native cypress and tupelo seedlings and four others with *Panicum spp.* and *Leersia spp.* sprigs to test whether native Carolina bay tree or grass/herbaceous communities could be successfully re-established.

Not only was the project able to assess the benefits of planting various species, but unplanted areas were also assessed to evaluate natural re-colonization. Because of the importance of these wetlands in both fire and non-fire regimes, we were able to provide data on the impacts of managing these systems with fire. The latter is particularly significant because of the importance of the upland-wetland fire ecotone for savanna plants and because of the controversy concerning the impacts to fire on amphibians using these systems for breeding.

The project has gained regional, national and international recognition and public acceptance, as well as strong support from stakeholders. It established the USFS-SR in a regional leadership role for natural resources stewardship and watershed health. By bringing together stakeholders at the beginning in both the concept and design, particularly experimentation with alternatives, the approach received broad acceptance and allows the project team to evaluate controversial alternatives, such as harvesting and fire, and planting. In the process of implementation, the entire SRS was surveyed for potential candidates, thus clearly identifying both previous impacts and potential opportunities in the new Natural Resource Management Plan. Multiple presentations were made to members of the SRS Citizens Advisory Board, and numerous field trips were given to various public and environmental organizations. The Corps has stated that this project will establish the regional standards for similar work in the region. In addition to multiple scientific presentations at professional meetings, such as the Ecological Society of America and the Society of Wetland Scientists, the project team has arranged for a major national journal (Wetland Ecology and Management) to publish the results of the physical and biological monitoring as a single issue. Finally, the project has been highlighted at several International Symposiums on Wetlands for innovation in experimental restoration.

This project is an outstanding example of management-research cooperation in the nation. The USFS-SR staff worked closely in the design, monitoring and implementation of the project with scientists from the Southern Research Station, and they brought together numerous other individuals from at least three universities (Georgia, Clemson, South Carolina-Aiken), two agencies (USFWS, NRCS) and WSRC to participate in the design, surveys, monitoring, research and reporting to regulators. USFS-SR and Southern Research Station personnel worked together on every aspect of the project including treatments, data collection, and reporting. The project team conducted pre and

post-treatment monitoring of avian species, amphibians and reptiles, invertebrates, bats, wetland and upland vegetation, bay hydrology, and bay water quality parameters.

The innovative experimental approach adopted by the project team, the involvement of a diversity of individuals, and the publication of results in national and international journals established sound scientific, technical, and operation standards for future restorations in the region that will sustain watershed health. In particular, the rapid recovery of these isolated wetlands and demonstration of how biodiversity is enhanced by these systems in upland landscapes was clearly documented. Richness and diversity of wetland birds, amphibians, obligate plants and invertebrates increased in response to an elevated flooding duration that resulted from restoration activities. Survival of planted species was acceptable, and colonization of native Carolina bay species from dormant seed banks was substantial. While fire altered community structure in upland buffers, no significant negative impacts to bay soil and water resources were observed. Restoration success criteria have been met and the sites are moving toward that of the undisturbed reference condition. To date, 18 publications have been completed (accepted, in press, or submitted) and many others are pending. The Corps has released 58 of 142 restoration credits to the Mitigation Bank thus far. These credits will be used, in part to off-set impacts to wetlands associated with the clean-up and closure of the Mixed Waste Management Facility Tritium Phytoremediation Project, and the D-Area Acid Coal Drainage Cap. The availability of these credits is facilitating low-cost, low-impact environmental technologies that will remove tritium and acid coal drainage discharges, e.g. arsenic. The operational scale coupled with the rigorous scientific assessment will support flexible alternatives and methods for future restorations in the region.



**Bay 5128, *after restoration*
before restoration**



Bay 5128,



**Mixed Pine/Hardwood post-harvest, #5071
Savanna post-harvest, #126**



Open Canopy Pine