Restoration of a Former Marine Wetland in Huntington Beach State Park, Murrells Inlet, SC
Eric Tosso, Joseph Bennett, Susan Libes, Amanda Hall and Azure Bevington Burroughs and Chapin Center for Marine and Wetland Studies, Coastal Carolina University

Abstract
Sandpiper Pond in Murrells Inlet, South Carolina, is the focus of a project that will restore it to its former state as a tidal marine wetland. Located within Huntington Beach State Park, the pond has received seawater on a less frequent basis since the installation of jetties at the mouth of the inlet in the early 1980s. This has ultimately led to closure of the pond’s tidal inlet to the Atlantic Ocean and the pond has been connected to the open ocean since Hurricane Hugo in 1989. The resulting freshwater conditions have supported a change in plant community, leading to almost complete replacement of the native plant species, Pogostemon. Eutrophication has also led to periods of hypoxia resulting in fish kills. It is hoped that re-establishment of the tidal inlet and introduction of seawater will lead to the elimination of Pogostemon and re-establishment of native marine wetland vegetation, such as Spartina alterniflora. The collection of baseline measurements for water quality and biotic status prior to restoration was begun in September 2004, and will continue until April 2006 when the new inlet is slated to be cut. These results will then be compared to post-restoration measurements to evaluate the success of the restoration. Parameters of interest are: temperature, pH, dissolved oxygen, turbidity, salinity, chlorophyll, nutrients, as well as total and volatile suspended solids. Biological assessments include measurements of macrophytes, fish and waterfowl densities.

Introduction
Humans are no more than well intentioned, often carry with them unforeseen and undesirable consequences. This is especially true when these actions influence the fragile balance of a natural ecosystem. Sandpiper Pond (Figure 1) is an excellent example of this: the installation of the jetties at the mouth of Murrells Inlet in the early 1980s has led to the closure of the tidal inlet even though seawater was already entering the pond via a shallow cut that once supplied the pond with seawater. As a result of this impoundment, the pond has become a freshwater wetland.

Although intermittent and relatively short closures of the inlet were a natural phenomenon before the jetty construction, this long-term closure has deprived some native species of birds and other animals of natural habitat for feeding and nesting. It has also had a profound impact on the Macrophyte species of Sandpiper Pond, Pogostemon, which is about to completely overtake native species and choke off most of the open water in the pond. In an event to restore the pond to its former maritime state, a new inlet is slated to be cut in the spring of 2006 which will reconnect the pond to the Atlantic Ocean.

Numerical Eutrophication Criteria
The following water quality criteria were used to assess the level of eutrophication in Sandpiper Pond.

DO criteria for estuaries: Anoxia: 0 mg/l, Hypoxia: >0 mg/l, and <2 mg/l. Biological stress: >2 mg/l, and <5 mg/l.
Rivers: U.S. EPA Office of Water’s Ambient Water Quality Criteria Recommendations

Sampling Design
> Sampling is being conducted on a bi-weekly basis at two sites in Sandpiper Pond.
> Encouraging vegetative growth has essentially divided the pond into two parts: a north pond (figure 2) and a south pond (figure 3). The southern pond is significantly larger than the northern pond.
> Samples from the south pond are collected by wading several feet out and using an extendable sampling pole and bottle to gather water.
> Differences in land use around each sampling site may contribute to variation in sampling parameters: the northern site is adjacent to a parking lot / picnic area while the southern site is near a RV campground.

Results
Error bars represent the ±SE of 2 replicates. Data symbols may be larger than some error bars. Raw data are from nearby Brookgreen Gardens.

Conclusions
> Evidence of nutrient and particulate loading has been found in both ponds. However, this is much more pronounced in the north pond due to it’s smaller volume which allows for less dilution. As a result, the north pond is expected to experience eutrophication events more frequently.
> Fecal matter from animals is a common likely source of loading for both ponds. Bird counts suggest heavier usage of the north pond. This could be a response to predation by alligators seen within Sandpiper Pond as a winter, thus this pond is not utilized as much. Saltwater is also expected to have an impact on vegetation, hopefully reducing or eliminating Pogostemon.

Acknowledgements
> Environmental Quality Laboratory, CCU
> Friends of Huntington Beach State Park
> Huntington Beach State Park (Mike Walker and Steve Ruff)