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Management Challenge

South Carolina's Botany Bay Plantation serves as important nesting habitat for least terns (*Sterna antillarum*) and loggerhead turtles (*Caretta caretta*). The site first opened to the public in July 2008, and its beach has become a popular destination for locals and vacationers alike. This surge in human presence represents a major disturbance to all wildlife that uses the undeveloped beach and marsh.

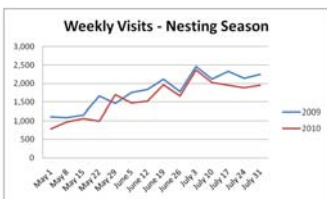
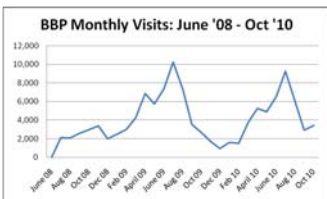
No reliable baseline data were collected prior to allowing public access to the site.

How can public access be managed in a way that protects nesting habitat while maintaining publicly acceptable levels of use?

A proposed solution

A basic simulation model is being developed to represent the interactions among people, terns, turtles and predators. The model is meant to be used as a tool for exploring various scenarios and management options in an iterative process that allows for further refinement as more data and knowledge become available.

The model is also intended to make use of Botany Bay's extensive network of volunteers as a resource for monitoring select indicators and for providing the public with a greater understanding of system functions and relationships.



Botany Bay Plantation



A crowd on the beach at Botany Bay Plantation on Labor Day weekend, 2009.



The ACE Basin, one of the largest unspoiled estuaries on the U.S. east coast, is an integral part of "lowcountry" culture. Upper left: The "boneyard" on Botany Bay Plantation at sunrise.

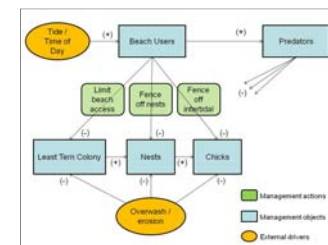
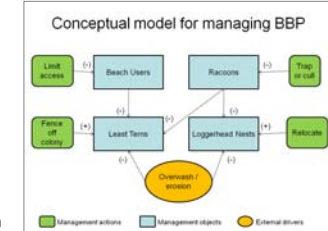
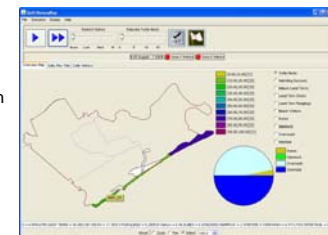
Model Development Process

The initial version of the QnD model for Botany Bay Plantation (see top figure on right) was based on observations of ecological and social processes on the beach during the 2009 and 2010 nesting seasons. This version:

- Records daily overwash events
- Reduces habitat from overwash
- Distributes turtle nests
- Records overwash damage to turtle eggs
- Tracks incubation, counts hatchlings
- Builds least tern colonies
- Records overwash damage to eggs, chicks
- Tracks incubation and time to fledge
- Adds people to beach
- Calculates damage from humans

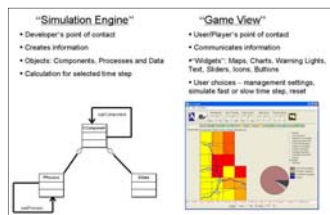
In subsequent discussions with ACE Basin managers, it became clear that a simpler version of the model was desired. Less emphasis is being given to changes to beach morphology from overwash and more to the potential consequences of management actions. The conceptual models at right resulted from those discussions

This is part of an ongoing process to develop a model that serves as a management tool first and foremost and avoids burdening management with intensive data collection requirements.



About the model

The Questions and Decisions™ (QnD™) system integrates ecological, managerial, and social factors into a user-friendly game/model framework. The system uses object-oriented Java as its base and is developed for customization using Extensible Markup Language (XML). QnD links spatial components from geographic information system (GIS) files to selected abiotic and biotic interactions in the system being modeled.



Why simulation modeling?

- Deals with uncertainty in complex social-ecological systems
- Provides a tool for making adaptive management decisions
- Provides a mechanism for monitoring and learning
- Provides a way to develop a common vision of the system
- Emphasizes adaptive learning
- Considers system surprises to be inevitable
- Helps to increase knowledge, modify management actions

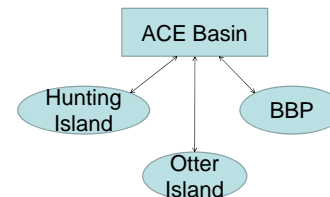
The study area

Botany Bay Plantation is located on the northeast edge of Edisto Island. It comprises 4,687 acres (1,897 hectares) of beach, tidal marsh, agricultural fields, maritime and upland forest, and brackish and freshwater ponds.

Prior to 2008, the property was privately owned as a working plantation and hunting reserve. It provides one of the few sandy barrier-island beaches from Charleston to Beaufort that has escaped coastal development.

The site's 2.3-kilometer stretch of ocean-facing beach holds one of the state's four least tern colonies located at natural sites (about 70% of the state's least tern population nests on pebbled rooftops). The beach also provides important nesting habitat for loggerhead turtles. The plantation serves as important habitat for numerous sea birds, wading birds and Neotropical songbirds.

In 2008, the S.C. Department of Natural Resources designated the site as a wildlife management area and heritage preserve. Edisto Beach is a 10-minute drive from the entrance gate, making Botany Bay a popular side trip for summer tourists. Getting to the beach, which attracts the majority of visitors, requires a half-mile walk through marsh and hammock islands. The site offers no permanent structures or facilities.



A Vision for the Future

The QnD model for Botany Bay Plantation is being developed in a way that could be replicated across the ACE Basin, allowing for simultaneous use as a local management tool and as a method for centralized data collection and coordinated management decisions.

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