

## Changing Conditions in Biscayne and Florida Bays--Estuarine or Marine?

*Nancy Diersing, Sanctuary Education Specialist*

Some of Florida's earliest human inhabitants lived along the coast of Biscayne Bay and on the banks of the Miami River, where they sustained themselves by fishing in bay waters and hunting in the Everglades. Later, Europeans and eventually Americans settled on high ground in much of the same area, where they also drew sustenance from the coastal waters and the Everglades.

Today, nearly 2.5 million people live in Miami-Dade County, with many residents living only a few miles from the shoreline of Biscayne Bay. Most people live on land that was drained in the early 1900s by a system of canals to allow for human development. This canal system changed the quantity, quality and timing of fresh water flowing through the Everglades and entering the coastal waters, changing the natural ecosystem.

Without the gradual input of freshwater from the Everglades, the coastal waters of Biscayne Bay would become saltier and less brackish over time, creating a marine and sometimes even a hypersaline (very salty) environment where an estuary once existed.

Why is this change from estuarine to marine conditions detrimental to the health of south Florida's ecosystem? Estuarine habitats support a host of animals that do not survive in higher salinities. Spotted seatrout, silver perch, pink shrimp, eastern oysters, and the endangered American crocodile require either a brackish environment or estuarine salinities at certain stages during their life cycles. Estuarine conditions also keep some marine predators out, protecting marine animals like young pink shrimp from predation during their early stages of life.

Many estuarine animals eventually become part of the marine food chain when they mature and move out to deeper waters.

Pink shrimp (which used to be abundant in these waters) and other marine life might spend time in Biscayne Bay while young, but live in Keys waters as adults. Surface currents move the larvae of fish, conch, crabs, shrimp, lobsters and other marine animals throughout the Caribbean, including the Florida Keys, Florida Bay, Biscayne Bay and the adjacent bodies of water. Tidal flows also help to disperse marine larvae.

In today's system, some fresh water does reach Biscayne Bay, but these are often large amounts of poor-quality water released in pulses through the canal entrances during times of heavy rains to avoid flooding communities on the mainland, instead of flowing in a sheet more gradually across the open Everglades as in the past. The widely fluctuating conditions caused by these pulses of water have negative impacts on many organisms that are not adapted to abrupt salinity and temperature changes associated with the inflowing water.

The water flowing across the open freshwater prairies in the pre-drainage Everglades soaked into the ground, helping to recharge the Biscayne Aquifer, an underground formation of porous limestone that holds water in tiny pores. The restoration of sheet flows in wetlands recharges the Biscayne Aquifer, which prevents saltwater from intruding on the freshwater wetlands along the coastline and helps to maintain both freshwater wetlands and the estuarine zone along the coast. The recharging of the aquifer is also important for residents of south Florida and the Keys since the aquifer is the source of drinking water for these areas.

### Florida Bay's Story

Over the years, Florida Bay has also experienced this general trend toward increasing salinity, especially in its upper basins that typically received fresh surface waters from the adjacent mainland to the north. In the late 1980s and early 1990s, salinities in the northern basins in Florida Bay were, at times, nearly double that of ocean water, creating extremely harsh conditions for most animals and plants. Around the same time, extensive algae blooms, seagrass die-off and sponge mortality were observed in many basins in the bay. These changes helped bring attention to the need to restore freshwater flows to Florida Bay, the Everglades and other coastal areas that had lost their estuarine character.



**The city of Miami overlooks part of central Biscayne Bay. The bay is 434 square miles in size and drains a land area of 938 square miles. Over one-third of the land that drains into Biscayne Bay is freshwater and coastal wetlands in Monroe, Miami-Dade and Broward counties.**

*(continued on next page)*

# Restoration

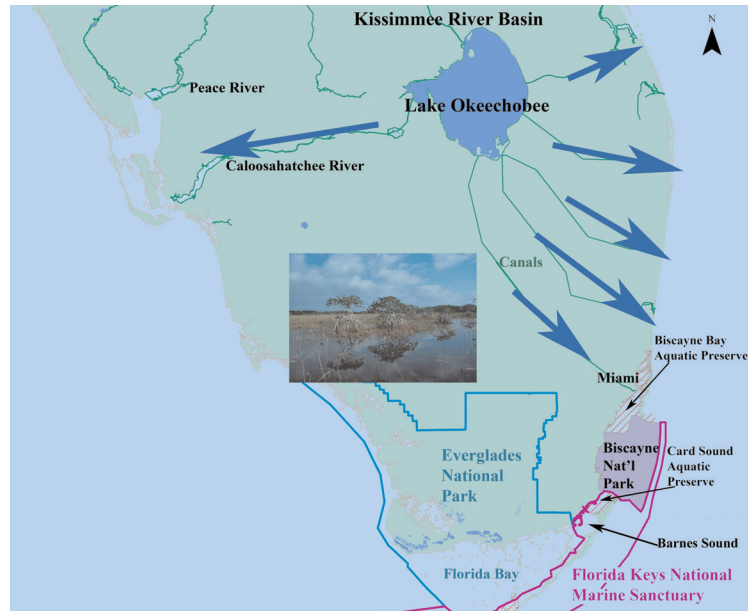
(continued from previous page)

The goal of restoring the Everglades ecosystem, which begins north of Lake Okeechobee with the Kissimmee River system and ends downstream at the reef in the Florida Keys, involves getting the right amount of good-quality water in the right places at the right time. This restored sheet flow will help recharge the aquifer and sustain the wetlands. To accomplish this restoration, Congress passed the Water Resources Development Act (WRDA) of 1992, authorizing the U.S. Army Corps of Engineers to work in partnership with the South Florida Water Management District and other local, state and federal agencies and tribal entities to develop a restoration plan for the entire Everglades ecosystem.

## CERP and the Sanctuary

The Comprehensive Everglades Restoration Plan (CERP) provides the framework for restoring the system and was adopted by Congress in the reauthorization of WRDA 2000. A main feature of CERP involves re-engineering the extensive canal drainage system managed by South Florida Water Management District to restore sheet flow through wetlands, creating more natural water delivery and fostering estuarine conditions along the coast. It also mandates that flood control be maintained to protect South Florida communities. Congress recently passed WRDA 2007, which authorizes new projects under the 30 year CERP and includes language to fund previously authorized projects at today's costs.

CERP includes projects designed to help restore central and southern Biscayne Bay, which is part of Biscayne National Park. The restoration will affect nearby Barnes and Card Sounds at the southern end of the Bay. Card Sound is part of the Biscayne Bay Aquatic Preserve under Florida's Department of Environmental Protection, and both Barnes and Card Sounds are within the boundaries of Florida Keys National Marine Sanctuary.



**The watershed begins north of Lake Okeechobee and ends in the Keys. The canal system drains much of the surface waters before they reach the Everglades wetlands in the south or Biscayne Bay. Most of Biscayne Bay is within the boundaries of Biscayne National Park and the Biscayne Bay Aquatic Preserve. Map: Alicia Farrer**

The proximity of the proposed restored areas to Florida Keys National Marine Sanctuary is one reason why National Marine Sanctuary Program Regional Director Billy D. Causey is a member of the working group that advises the South Florida Ecosystem Restoration Task Force, an interagency body with tribal and government representatives charged with overseeing restoration activities. Sanctuary Superintendent Dave Score sits as Causey's alternate on the working group. Sanctuary representatives also participate in the Biscayne Bay Regional Restoration Coordination Team, a stakeholders group established to advise the working group about CERP projects that affect Biscayne Bay and related waters, including Card Sound and Barnes Sound.

The Florida Keys Sanctuary Advisory Council (SAC) has played a role in the mainland restoration process since the beginning. After the onset of algal blooms in Florida Bay in the late 1980s and early 1990s, the council took a leadership role in urging state and federal authorities to investigate the bloom's effects on marine life and to restore the ecosystem. Today, the council's Ecosystem Restoration Working Group, chaired by Dr. Jerry Lorenz, director of Audubon of Florida's Tavernier Science Center, keeps the SAC informed about restoration activities on a regular basis.



**The American crocodile depends upon estuarine conditions for its young. Photo: Everglades National Park**

## Biological Monitoring of Key Species

Biological monitoring of key estuarine species is planned to determine how well CERP is accomplishing its goals. Pink shrimp, American oysters, silver perch and the American crocodile have been selected as indicator organisms to see if conditions are returning to the more natural state as CERP projects are put into place.

To read the resolutions and actions of the SAC, visit the SAC link on the sanctuary's home page, <http://floridakeys.noaa.gov>. To find out more about the South Florida Task Force, working group, restoration plans and public meetings, visit [www.sfrestore.org](http://www.sfrestore.org) or [www.evergladesplan.org](http://www.evergladesplan.org).

*Note:* This article appeared in the Winter 2007-Spring 2008 edition of *Sounding Line*, the newsletter of the Florida Keys National Marine Sanctuary. For more information, please visit: <http://floridakeys.noaa.gov/>.