FA127

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Historical and planned changes in the south Florida ecosystem[1]

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The core of the south Florida ecosystem is a unique watershed, the Kissimmee–Okeechobee–Everglades or KOE watershed. This watershed supports and connects freshwater and terrestrial plants and animals to marine waters, mangroves, seagrasses, coral reefs, and marine fish.

What is a watershed? A watershed is an area of land that drains to a common endpoint. High ground separates watersheds, and water falling on different sides of the high ground travels to different endpoints. In the Pacific Northwest, mountain ranges rising several thousand feet separate many watersheds, but in Florida, elevations of only 10–20 feet separate most watersheds.

South Florida ecosystem: the past

The KOE watershed appeared in its current form about 5,000 years ago when sea levels fell. At this time, the Egyptians were building pyramids. The original watershed drained 18,000 square miles of land. By following drops of water flowing through a pristine KOE watershed, we can highlight connections to the Keys.

The journey starts when rain falls near Turkey Lake, just west of Orlando. Water runs into the lake and drifts south through the Kissimmee Chain of Lakes.

At one point, it passes through Lake Tohopekaliga where it may provide oxygen and food to a trophy bass lurking in the shallows.

1. This document is FA127, one of a series of the Fisheries and Aquatic Sciences Department, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida. It is reproduced by permission from its first publication as Score, A. and C. Jacoby. 2004. *Changes in the south Florida ecosystem*. Sounding Line: news of the Florida Keys National Marine Sanctuary. Summer 2004. Original EDIS publication date November 2006. For more information on obtaining other extension publications, contact your county Cooperative Extension service or visit the EDIS Web Site at http://edis.ifas.ufl.edu.

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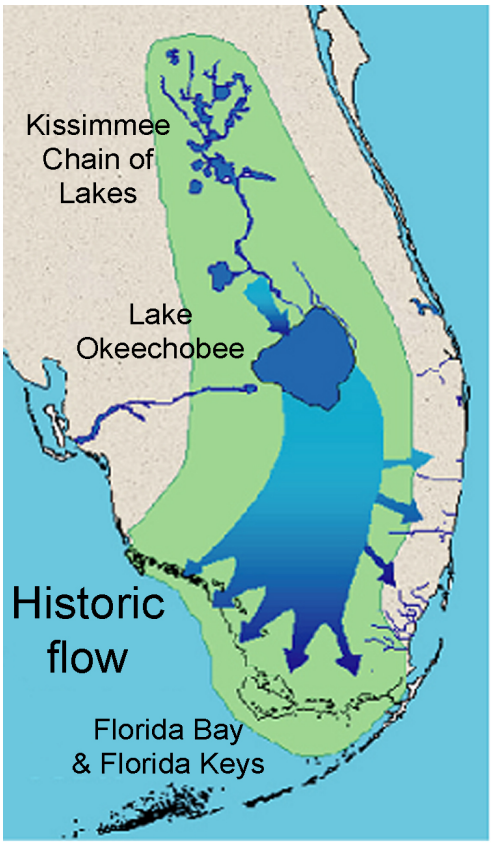
Eventually, the water leaves the last lake in the chain, Lake Kissimmee, and it enters the Kissimmee River. This pristine version of the Kissimmee River meanders south through many long, winding turns.

After a few days, the water reaches Lake Okeechobee, 730 square miles of shallow, highly productive water that supports fish, birds, and other wildlife. If water levels are low, the water stays here until more rain causes the lake to overflow.

Eventually, enough rain falls to push the water over the southern bank of Lake Okeechobee. It passes through acres of custard apple trees growing in thick, mucky soil.



Further down the pristine KOE watershed, the water travels slowly south as it spreads out across the vast sawgrass marshes that make up the “river of grass” or the Everglades. Here, it delivers nutrients, oxygen, and food that support tree islands, cypress domes, fish, alligators, birds, and other wildlife. Eventually, the water enters Shark River Slough where it begins to get salty. In this estuarine environment, mangroves appear and young snook escape predators by hiding among their trunks and roots.

Near the end of the slough, the water pulses in tune with the changing tides in Florida Bay. An outgoing tide pulls it into the bay. As it flows to the Keys, the water passes mangroves, seagrasses, sponges, soft corals, and stony corals.

At the Keys, the water flows from Florida Bay through gaps between the islands into the Florida Straits and the Atlantic Ocean where it encounters the fringing reef that stretches from Key West to Miami. Past the reef, the Florida Current takes the water northeast to merge with the Gulf Stream that sweeps it north along the Atlantic coast.

In total, this journey covered over 300 miles. In general, it was a slow drift because the KOE watershed is very flat. In some areas of the Everglades, the water traveled more than 8 football fields (over 800 yards) before it fell the thickness of a penny (3/50 of an inch). It turns out that the duration of the journey is important to the health of the seagrasses, corals, and other habitats in Florida Bay and the Florida Keys. These habitats do best in water with low nutrient levels. The slow journey allowed plants in the watershed to remove most of the nutrients before the water reached Florida Bay.

The journey just described does not fit what we see today between Orlando and the Keys. Over time, we have changed the KOE watershed. Although people have drawn on the watersheds resources for over 10,0000 years, we only started making significant changes about 100 years ago.

South Florida ecosystem: the present

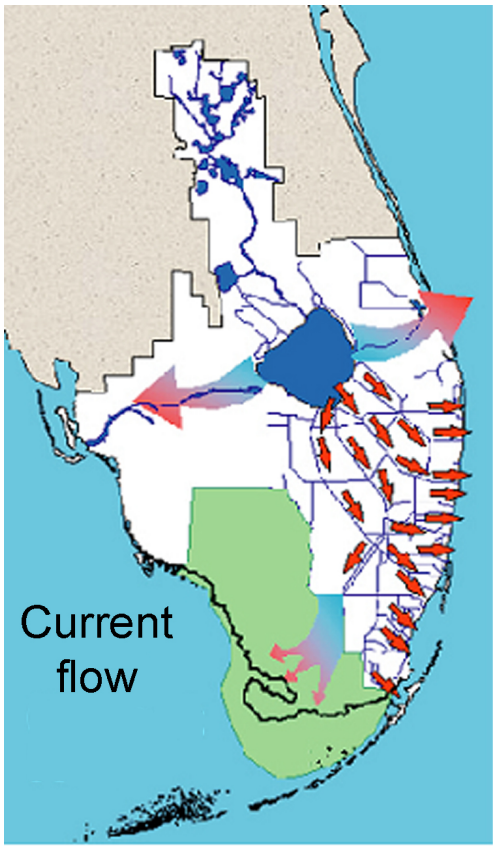
One of the first major changes in the south Florida ecosystem took place in the downstream end of the KOE watershed. In 1905, Henry Flagler decided to extend the Florida East Coast Railway past Key Biscayne to Key West. Construction was completed in 1912. Fill used to provide a base for the railroad reduced tidal exchange between Florida Bay and the Florida Straits. In some places, tidal circulation was cut off completely as an estimated 22 miles of fill was placed between the Keys.

Significant changes to water flow in the upstream section of the KOE watershed began in 1907. In this year, Governor Napoleon Bonaparte Broward formed the Everglades Drainage District (EDD) in response to damage caused by a flood in 1903. Between 1913 and 1927, the EDD spent $18 million on developing and improving 440 miles of canals that drained 7,150 square miles of the KOE watershed.

Another major project began in 1930 as a response to hurricanes in 1926 and 1928. These storms, and the floods they produced, claimed over 2,500 lives and caused $75 million of damage. With support from President Herbert Hoover and funding from Congress, the U.S. Army Corps of Engineers helped construct the 85-mile long Herbert Hoover Dike to control flow from Lake Okeechobee.

In 1947, the flood-control system failed when heavy rains and back-to-back hurricanes dumped nearly 100 inches of rain on the region. Flooding damaged agricultural lands and urban areas, including West Palm Beach, Fort Lauderdale, and Miami. In response, Congress authorized the Central and Southern Florida Project (C&SF Project) in 1948. Many people hailed this massive flood-control project as the best engineering effort in the history of the nation. Along with some recent additions, the C&SF Projects 1,000 miles of canals, 720 miles of levees, and several hundred water-control structures continue to play a critical role in regulating floods and supplying water for agricultural and urban areas in 16 counties.

Our use of the KOE watershed leads to some major challenges if we also want to retain its natural beauty and function. The population in the watershed is currently about triple the prediction of 2 million people used to design the C&SF Project, and it continues to grow rapidly. In fact, current predictions have the population doubling in the next 50 years. More people will create greater demands for the 1.7 billion gallons of fresh water that currently flow through canals to the coast each day. We are challenged to meet these demands while restoring a more natural flow to the freshwater marshes, rivers, sloughs, pine flatwoods, prairies, hardwood hammocks, mangrove swamps, seagrass meadows,



estuaries, and bays that support corals, fish, birds, and wildlife. We have already decreased the flow through these systems to 70 percent less than pre-1900 levels.

The timing and duration of flow also pose challenges because flood-control structures alter the naturally slow, sheet-flow of water. Changes to the variation or pulsing of freshwater flow can affect the natural system in many ways. For example, it can alter the spawning behavior of sportfish. In addition, water that flows to the coast rapidly often will contain higher levels of nutrients and other chemicals. In combination, these factors have caused:

- damage to habitats;
- 90–95 percent reductions in wading bird populations;
- health advisories across 1 million acres in the Everglades due to mercury contamination of fish;
- declining numbers of commercial and recreational fish in Biscayne Bay and Florida Bay;

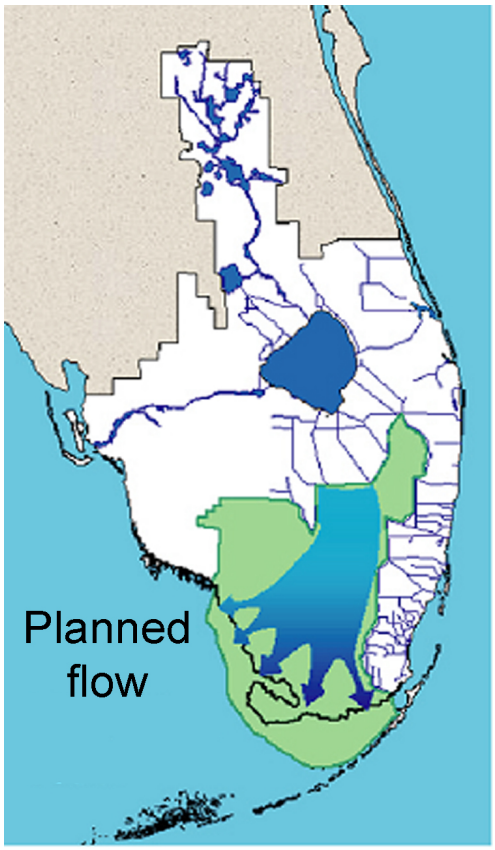
- saltwater intrusion into our drinking water supplies; and
- other detrimental impacts on the KOE watershed and south Florida ecosystem.

South Florida ecosystem: the future

In an effort to address these challenges, the South Florida Ecosystem Restoration Task Force was created in 1993. Initially, the task force consisted of federal agencies, with local governments and tribal representatives added as formal members in 1996. The task force reviews work to restore the south Florida ecosystem and KOE watershed. It coordinates and develops consistent policies, strategies, plans, programs, and priorities for South Florida Ecosystem Restoration (SFER), including the Comprehensive Everglades Restoration Plan (CERP).

SFER involves cleaning up the environment and restoring more natural water flow, habitats, and plants and animals throughout the KOE watershed and south Florida ecosystem, including Biscayne Bay, Florida Bay and the coral reef tract off the Florida Keys. Restoration of the south Florida ecosystem will involve hundreds of projects, supported by extensive research. Representatives from federal, state, tribal, and local government, along with representatives from agriculture and other industries, will make decisions as restoration unfolds. Estimates put the cost of this 30-year effort at between 10 and 15 billion dollars, which will be shared between federal and state government. In total, SFER is the largest ecosystem restoration project in history.

CERP is a major component of the restoration effort. It resulted from the C&SF Project Comprehensive Restudy, which Congress authorized in December 2000. CERP is the framework that will guide restoration, protection, and preservation of water resources in central and southern Florida. CERP is the cornerstone of getting the “water right.” The projects in CERP will restore a more natural quantity, timing, and distribution of high-quality water through the KOE watershed, while retaining or enhancing flood control and water supply for a growing population. Successful management of all these factors in combination is critical to



restoration and preservation of healthy coastal environments.

In an effort to consider all key factors and their interactions, SFER and CERP rely on the best available science to produce ecological forecasts of the downstream effects from alternative restoration scenarios. Efforts to improve our understanding and these forecasts continue through research funded by the National Oceanic and Atmospheric Administration, the South Florida Water Management District, the National Science Foundation and other state and federal organizations. Although the best available science will underpin predictions and plans, the ultimate changes resulting from restoration will remain uncertain. A key to the success of SFER and CERP is the explicit recognition that these uncertainties exist and the application of adaptive management to deal with them. Adaptive management will rely on monitoring of performance measures to detect unforeseen and undesirable changes, and it will use these results to formulate changes in management designed to get restoration “back on track.”

For more information see:
http://www.evergladesplan.org