FIXING THE EVERGLADES AND THE ESTUARIES

A Road Map

It has been more than six years since President Clinton signed the bill enacting the Comprehensive Everglades Restoration Plan—the program for recovery of the watershed whose health is essential to the southern end of the Florida peninsula. During those six years, hundreds of millions of dollars have been appropriated by the State of Florida and the Federal Government to buy land, build stormwater treatment areas, and begin construction of authorized projects.

But the Everglades remain unrestored.

While the general public assumes that the patient is on the road to recovery, this unrestored natural system has actually been wheeled into ICU. In addition to the "critical condition" of Greater Everglades Ecosystem, its diseased hydrology has spread—infecting the estuaries on the east and west coast with excessive flows of polluted water from the system's heart—Lake Okeechobee. Beyond endangering billions of dollars in coastal properties, the marine ecosystems along the peninsula's Atlantic and Gulf of Mexico coastlines are now plagued with many of the same symptoms that have infected the Everglades.

There are still more species in danger of extinction in the Everglades than any other place in the United States—and the problems caused by pollution and unnatural water flows are also now affecting the estuaries from the Indian River Lagoon, to Biscayne and Florida Bays, to the 10,000 islands and Estero Bay, to the mouth of the Caloosahatchee and San Carlos Bay.

How did we get where we are today, and what can be done about it? In one way, the answer is simple: The South Florida ecosystem is disastrously short of water storage, and much of the water it currently receives is laden with nutrients and other pollutants. The semi-tropical region receives between 50 to 60 inches of rain annually—rain water that both the urban and natural communities need. And when the heavy summer rains fall (especially tropical storms and hurricanes) there is no place to put the water. Instead it is sent down chutes—the Caloosahatchee and St. Lucie Rivers, in addition to numerous canals through the Everglades themselves—into salt water estuaries whose life cannot survive these gigantic polluted pulses.

While scientists differ on the exact amount of storage needed north, south, west, and east of Lake Okeechobee, there is general agreement that the storage required is at least three million acre feet—about the amount equivalent to another Lake Okeechobee. And there is no place to put that water, which will not require the acquisition of tens of thousands of acres of land for reservoirs, or acquiring flowage (flooding) easements on much, much more land, to store the water in shallow wetlands seasonally.

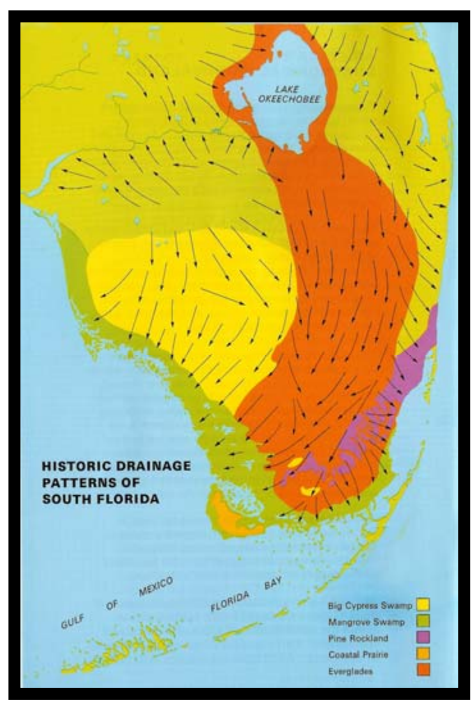
Just storing the water will not be enough. Most of the system's water is polluted by excessive nutrients from fertilizer, animal and human wastes. This pollution must be stopped at the source or removed, or it will continue to pollute the water that is stored and is eventually moved east and west to the estuaries, or south into the core Everglades.

Fixing this badly broken system will take many billions of dollars; but not fixing it is _not_ an option. Not fixing it now will only postpone the inevitable and increase restoration costs manifold. And in the meantime, assaults on the Greater Everglades Ecosystem will continue to damage the lives and property values of millions of people in South Florida.

The choice is ours.

To make wise decisions requires first of all an understanding of how the Greater Everglades Ecosystem-–on which the health and values of all of south Florida depend—actually functions. How did it function historically, what have we changed in the system with the vast land-altering engineering we launched in the last century? And what do we now know needs to be done to resuscitate it? That is what this paper, produced by the Everglades Foundation and its environmental partners, aims to do.

There are four main points which are essential to an understanding of the Greater Everglades Ecosystem—the system is vast, the terrain of the ecosystem is extraordinarily flat, it is subject to extraordinary extremes of wet and dry weather, and it historically was based on extraordinarily low nutrient input.



First, the Greater Everglades Ecosystem is vast.
In length, it is more than half the distance from Florida's northern border to its outlets in Florida Bay and the Gulf of Mexico. It stretches from near Orlando in the North to Biscayne and Florida Bays and the Gulf of Mexico in the South, to Indian River Lagoon on the east coast and San Carlos Bay on the west.

Historically, the Kissimmee-Okeechobee-Everglades watershed—the core Everglades system—covered about 9,000 square miles in a single hydrologic unit. Rain water in the northern half of the watershed followed the Kissimmee River and its tributaries and drained slowly through large areas of wetlands into Lake Okeechobee, a shallow water body of about 730 square miles.

During the wet season when water levels were high, this northern drainage spilled over the south bank of Lake Okeechobee into the Everglades—once a vast, pristine wetland of about 4,500 square miles that included what is now the 700 square mile Everglades Agricultural Area

The Caloosahatchee River watershed to the West drained an area of about 1,400 square miles. Originally its headwaters were west of Lake Okeechobee, and did not include the Lake itself.

To provide navigation between the Lake and the Gulf of Mexico, a cut between the Lake and River was constructed early in the last century. Since then the Caloosahatchee watershed has become a connected segment of the Greater Everglades Ecosystem.

As with the Caloosahatchee, the St. Lucie River also was reengineered into a canal, in this case to connect the east side of Lake Okeechobee to the Atlantic Ocean. This completed the integration of these three watersheds into a single hydrologic unit.

The Big Cypress watershed is south of the Caloosahatchee on the western side of the peninsula. It encompasses about 2,500 square miles from the Immokalee Rise—a sandy ridge 25-42 feet above sea level which forms the southern boundary of the Caloosahatchee segment— south and west to Big Cypress Swamp and Estero Bay.

Altogether this Greater Everglades Ecosystem contains about 13,000 square miles, and when one includes coastal waters from Charlotte Harbor on the Gulf of Mexico and the St. Lucie River on the Atlantic, and the bays and inshore coastal waters in between—all affected by what happens in the interior watershed—the system covers about 19,500 square miles. For comparison, the interior watershed is about the size of Connecticut and New Jersey combined; when you include the affected coastal waters, you can add Rhode Island and Delaware.

Second, the vast terrain of the Everglades Ecosystem is extraordinarily flat.
At its highest point near Orlando, it is less than 150 feet above sea level, and most of the Kissimmee Valley north of Lake Okeechobee is less than 50 feet above sea level. The Lake itself rarely reaches 20 feet above sea level. South of the Lake the maximum elevation is less than this, and in many places the gradient measures only about two inches per mile. This means that under historic conditions water flow in the region was extraordinarily slow and wide—giving rise to the terms “sheet flow” and “river of grass.”

Third, the ecosystem is located in the sub tropics and is subject to extraordinary extremes of wet and dry weather—flood and drought—both within an annual cycle and over the years. In a typical January in South Florida there will be fewer than four days with more than one-tenth inch of rain. But from May to October, as seas warm and evaporate, the skies open up, so that by year end annual rainfall may reach about 60 inches on the southeast coast, and about 50 inches in the southwest. *Along with these wet season rains, tropical storms and hurricanes can drop 18 to 24 inches of rain in a single 24-hour period over thousands of square miles.*

Historically these extremes did not create a problem. Water fell in heavy amounts in most summers and was allowed to pond throughout the watershed, recharging the underground aquifer and flowing ever so slowly south during the rest of the year. The whole natural ecosystem was adapted to this pattern, with a burst of plant and animal growth in the summer, gradually drying up during the winter, thereby concentrating food resources in smaller areas. Birds and animals at or near the top of the food chain took advantage of the concentrated abundance to reproduce and raise their offspring. The natural system adapted to the extremes, even including periodic fires and floods.

Fourth, the Everglades is a nutrient-poor Ecosystem and was based on extraordinarily low nutrient input. For the most part, the ecosystem’s substrate was limestone, or former ocean bottom. The only net additions to the system’s nutrition came in very modest amounts from rainfall and plant decay, which over eons created a stratum of peat in depressed areas.

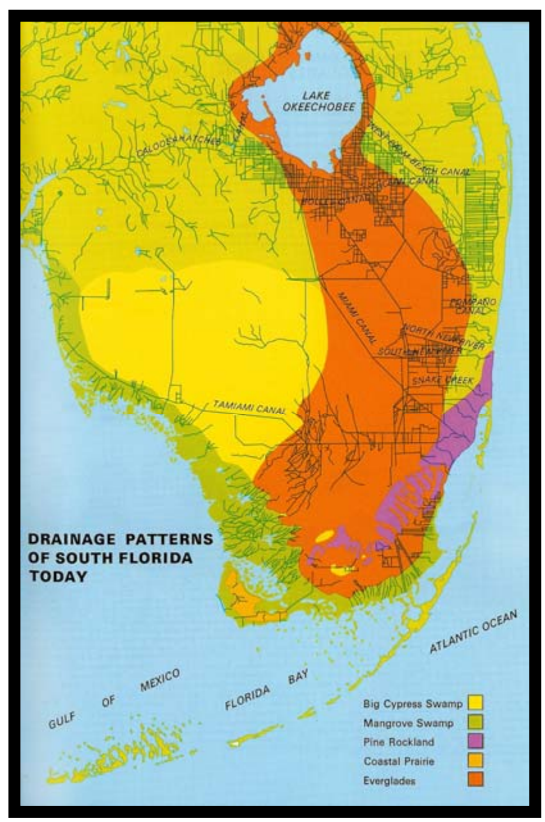
For thousands of years, from the time when seawaters receded about 5,500 years ago, until large-scale in-migration began, these four points described the system—a lush, subtropical wilderness of pine forest, hardwood hammocks, unpolluted swamps, marshes, estuaries and bays, with enormous populations of terrestrial and water-dwelling wildlife.

About one hundred years ago, the migration of new residents to South Florida began, first as a trickle, then as a stream, then a torrent, until today approximately 7 million people (roughly half of the population of Florida) inhabit the Greater Everglades Ecosystem. More come every day.

These immigrants— in other words, all of us—settled mostly along the coasts, but to a limited extent on higher ground within the wetlands themselves. They introduced new demands on the system—a demand for flood control, as protection against the periodic high rainfall, and a demand for predictable and certain water supply, to protect against periodic drought. They also introduced a large nutrient load— initially from farm fertilizer and animal wastes and later from human activities, including human waste.

Government, mainly the state of Florida through the South Florida Water Management District, and the nation through Congress and the Corps of Engineers, responded to these demands with huge civil works projects—primarily levees, canals and pumps, aimed at carrying away the excess water from summer rains, especially hurricanes, as rapidly as possible. In addition to the Caloosahatchee and St. Lucie Rivers already widened and deepened east and west to estuaries on the Atlantic and Gulf of Mexico, a dozen canals were dug through the Everglades to provide outlets to the Atlantic Ocean, Florida Bay and the Gulf of Mexico.

For most of the 20th century, the amount of water that came into the system greatly exceeded the demands for it. As a result, relatively little thought was given to water storage, particularly in the Southwest; although portions of the northern part of the original core Everglades were dammed to help provide back-up water supplies for the lower East Coast.



Managing nutrient load was ignored, or left to municipalities.

For many years this re-engineering of the natural system seemed to work well enough. Agriculture flourished, north and south of the Lake and along the Caloosahatchee and St. Lucie Rivers, and development flourished along the coastal ridges. But, largely unnoticed, signs of stress were beginning to appear in the system.

The first place to show signs of this stress was Lake Okeechobee. The Kissimmee Valley, north of the Lake, became a cattle raising area, first in large ranches, then later in dairy farms as well, with much denser cattle populations per acre. Truck gardening and row crops, using large applications of fertilizer, also flourished in the northern watershed. These uses, particularly the latter two, introduced huge quantities of nutrients to the system, and the effects of this addition were multiplied by the ditching of the Kissimmee River, which removed large areas of wetlands and accelerated the flow of nutrients into the Lake (and in times of high water, into the St. Lucie and Caloosahatchee Rivers and their estuaries.) The Lake began to die. More recently, similar signs of stress and decay have occurred in the estuaries as well.

South of the Lake, heavy use of agricultural nutrients in the EAA, mainly phosphorous, began causing deterioration of the northern Everglades, changing the nature of plant growth, and affecting the composition and distribution of aquatic life. Back-pumping from the Everglades Agricultural Area into Lake Okeechobee also contributed to the Lake's woes.

In periods of heavy rains the nutrients which all these activities supplied were shipped to estuaries east and west from the Lake through the St. Lucie and Caloosahatchee Rivers, and south through the myriad canals in the Everglades themselves into the Atlantic Ocean, Biscayne and Florida Bays.

Near the end of the last century, it became clear that the system was broken, unable to sustain either its natural life, or over time, the developed areas which depended on the system for clean, fresh water.

The first attempt to remedy this was called the Comprehensive Everglades Restoration Plan, (CERP). This Everglades Restoration plan, developed by the Governor Lawton Chiles' "Commission for a Sustainable South Florida," and codified in documents prepared by The U.S. Army Corps of Engineers with input from the South Florida Water Management District and the U.S. Department of Interior, among many others, was passed by Congress in 2000, and signed into law by President Clinton just before he left office.

The Comprehensive Everglades Restoration Plan (CERP) called for an $8 billion restoration plan—the cost to be divided 50-50 between the state and the federal government—concentrating on developing more storage and removing impediments to flow within the core Everglades and into Florida Bay.

This plan focused primarily on the core Everglades—the Kissimmee-Okeechobee-Everglades watershed. It provided for minimal surface storage to protect the Lake and estuaries. About 90% of proposed storage for the entire system was to be provided by Aquifer Storage and Recovery (ASR) a system by which surface water would be pumped to deep aquifers and then later retrieved as needed.

Many proponents of restoration questioned the feasibility of these ASRs. They were unproven on the scale proposed; incapable of responding rapidly to large quantities of water such as those delivered by tropical storms; and, of questionable utility in the non-uniform Floridan aquifer composed of a hodge-podge of former sea bottom, sand, shell and mud. While the ASRs may prove to be useful to utilities on a smaller scale along the coast, of particular concern is the plan to use large-scale ASRs around Lake Okeechobee where scientists have confirmed "the rocks are wrong."

Because of doubts about ASR real-world feasibility, there have been repeated calls for an alternate contingency plan based on surface storage within the Comprehensive Everglades Restoration Plan (CERP). Neither the Corps of Engineers nor the South Florida Water Management District has yet provided such a contingency plan.

Even the relatively limited plan, with its heavy and questionable dependence on unproven ASRs, has moved much more slowly than Congress or the State of Florida promised, as various interests wrestle for advantage in planning and use of the plan's dozens of projects. (There *has* been progress on the de-ditching of a segment of the Kissimmee River, a previously authorized project, but it is far too small in scale to address the problems of storage and clean-up needed north of the Lake.)

Meanwhile, the tropical storms and hurricanes of 2004-05 exposed a great hole in CERP. Because little attention had been paid to the top half of the watershed—where at least half of the water came from—the heavy rains of those summers caused tremendous ecological damage. The Lake was overwhelmed with inflows of water, the dike protecting communities to its south put in danger of failure, and billions of gallons of nutrient-loaded fresh water were discharged into the estuaries, greatly damaging the sea life there.

Now, public opinion along the East and West Coast of the peninsula has begun to call for a ***more comprehensive*** **Greater Everglades Restoration plan**—a plan that also would directly address the problem of polluted estuaries. Such a plan can only work if it provides vastly more storage north of the Lake; institutes regulatory reform to clean up the water stored there; restores the connection between the Lake and the Everglades Agricultural Area; and, provides more storage in the EAA *while continuing to implement the core Everglades restoration programs called for in CERP*.

Adaptive Management

Roadmap to Restoration Essentials

Fortunately, Congress recognized in passing the original bill that the 30-year plan for this large-scale restoration would almost certainly call for scientists, engineers and policy leaders to employ "adaptive management" to meet their original goals.

Because Adaptive Management allows us to revise strategies with new technologies—or, to rethink original objectives like rising land or construction costs. In other words, Adaptive Management provides an avenue to make changes without compromising the original intent of the restoration.

And we must adapt. It's a different world since 2000 when the state and federal governments agreed to the 50-50 partnership.

The first step is to agree, in broad concept, on what those needs are. Congress approved the Comprehensive Everglades Restoration Plan (CERP) six years ago; however, key elements of the plan have not been implemented. Wildlife habitat and the spatial extent of the Everglades continue to disappear as development, invasive species, and poor water management decisions further threaten the sustainability of the remaining ecosystem.

BOTH THE EVERGLADES FOUNDATION'S ENVIRONMENTAL ADVISORY COUNCIL (EAC)
AND THE EVERGLADES COALITION
HAVE IDENTIFIED NINE RESTORATION ESSENTIALS AND BENCHMARKS
THAT MUST BE ACHIEVED
IF CERP IS GOING TO DELIVER BENEFITS AS IT ORIGINALLY PROMISED….

Essential #1 **Protect Water Quality**

Essential #2 **Restore the Kissimmee River**

Essential #3 **Provide Drought Storage**

Essential #4 **Provide Additional Wet-Year Storage**

Essential #5 **Reconnect Lake Okeechobee to the Everglades**

Essential #6 **Restore Sheetflow in the Everglades**

Essential #7 **Restore Florida Bay**

Essential #8 **Impose Sustainable Development**

Essential #9 **Improve the State and Federal Partnership**