Everglades to Reefs: Water Connects South Florida Ecosystems

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ERT, Inc In support of NOAA-Fisheries Service, Southeast Region, Habitat Conservation Division
Everglades-River of Grass: Past and Present

Credit: U.S. Army Corps of Engineers, Jacksonville District.
The Florida Current interacts with wind and tides to create a dynamic coastal ocean environment.
Eddies change the direction and speed of nearshore coastal currents
Water Quality Stressors Affecting Southeast Florida Fish Habitats

- Nutrients (Nitrogen and Phosphorus)
- Salinity changes (especially freshwater pulses)
- Sedimentation
- Turbidity
- Pharmaceuticals and personal care products
- Other pollutants, like biocides, heavy metals and hydrocarbons
Nutrients affecting Southeast Florida coastal waters

Excessive nitrogen and phosphorus can result in adverse changes to estuarine and marine ecosystems.

Increases in nutrients have been shown to promote the growth of macroalgae and cyanobacteria that can smother benthic animals; and phytoplankton blooms that reduce light and dissolved oxygen levels when the phytoplankton die off.

Credit: Dave Gilliam, Nova Southeastern University

Credit: Karl Havens, Florida Sea Grant
The four methods of municipal wastewater disposal in southeast Florida include:

- Surface discharge (after secondary treatment)
- Ocean outfalls (More than 400 MGD after secondary treatment)
- Deep well injection
- Wastewater reuse
Septic Systems

Septic systems can adversely affect ground water quality (i.e. the Biscayne Aquifer) and surface waters with human pathogens (bacteria and viruses) and high nutrient levels.
Changes in salinity can stress or kill important plants (e.g. seagrass) and animals (e.g. oysters and sponges) in southeast Florida estuaries. While the St. Lucie River estuary was in the news over the last few years, other southeast Florida estuaries also faced similar impacts from low salinity.

Credit: Florida Oceanographic Society
**Sedimentation** can kill filter feeding animals like corals, by smothering, burial or inhibiting feeding.

*Right: Montastrea cavernosa with sediment from a dredging project.*

**Turbidity** decreases light penetration and reduces photosynthetic production by seagrass, algae and coral zooxanthellae in coastal waters.

*Right: Turbidity plume extends 2,400m North and 350m south from the spider barge.*
Pharmaceuticals & Personal Care Products

**Pharmaceuticals** (medications and hormones) and **Personal care products**, (e.g., sun screens, lotions, fragrances, and insect repellent), end up in estuarine and marine waters of southeast Florida.

These pollutants are not removed by secondary treatment, but can be removed by advanced treatment of wastewater.

Credit: Alejandro Ramirez, Baylor University
Everglades-River of Grass: Past, Present, and Future

Credit: U.S. Army Corps of Engineers, Jacksonville District.
Rain gardens and rain barrels on the landscape scale

Legend
- Green: Existing STAs (57,000 acres)
- Blue: New FEBs (116,000 ac-ft)
- Yellow: New STAs (6,700 acres)
- Orange: Restoration Strategies Flow Path
- Red: Everglades Protection Area

Credit: South Florida Water Management District
Florida coral reefs evolved in an environment that provided clean, clear water with low nutrient concentrations and slow movement of stormwater to the ocean.

These are not the conditions currently observed in south Florida’s ecosystems.
Florida Coral Reef Tract

Credit: Florida Department of Environmental Protection Coral Reef Conservation Program (DEP, CRCP)
Florida Keys: Wastewater Master Planning Efforts 1997 to 2010

- 137.5 square miles of land area
- ~72,000 Full time residents
- ~18 million Annual Visitors (Person-Days)
- ~7.2 million gallons per day of waste water is generated

Credit: Monroe County Sanitary Wastewater Master Plan
Florida Keys: Wastewater Master Planning Efforts 1997 to 2010

Waste Water Treatment Plant Service Areas for 17 WWTP
Estimated Cost: $438 million
The southeast Florida coral reef tract is approximately 105 miles long and generally varies from half a mile to three miles from shore off Miami-Dade, Broward, Palm Beach and Martin counties.

Over 6 million people live, work and play here, and another 25 million visitors enjoy the beaches, waterways, and reefs of southeast Florida each year.
The nine ICAs total ~2,500 square miles of urban and agricultural development. Extensive watershed modifications have occurred in Florida for flood control, human use and more recently, environmental restoration. To understand how water and pollution loads move in southeast Florida, Inlet Contributing Areas (ICA) were delineated with guidance from the South Florida Water Management District.
PORT EVERGLADES ICA:
• Total Area: 174 square miles
• Urban Land: 149 square miles (86%)
• Water/Wetlands: 19 square miles
• 5th largest of the 9 ICAs in southeast Florida

Much of the stormwater and sanitary sewer infrastructure is at or beyond its design life.
Key Recommendations

• **Reduce nutrient loading** from all human-induced sources and pathways, including stormwater (with fertilizer runoff), septic systems and ocean outfall discharges.

• **Upgrade to advanced wastewater treatment** to reduce effects of pharmaceutical and personal care products on the coral reef ecosystem.

• **Support construction of additional water storage reservoirs, stormwater treatment areas, flow equalization basins, and use of appropriate technologies.**

• **Upgrade stormwater and sanitary sewer systems to** improve water quality in Florida’s estuaries.

• **Modify beach nourishment and port dredging activities to** minimize sedimentation and turbidity impacts.
Questions?

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Credit: NOAA 2012