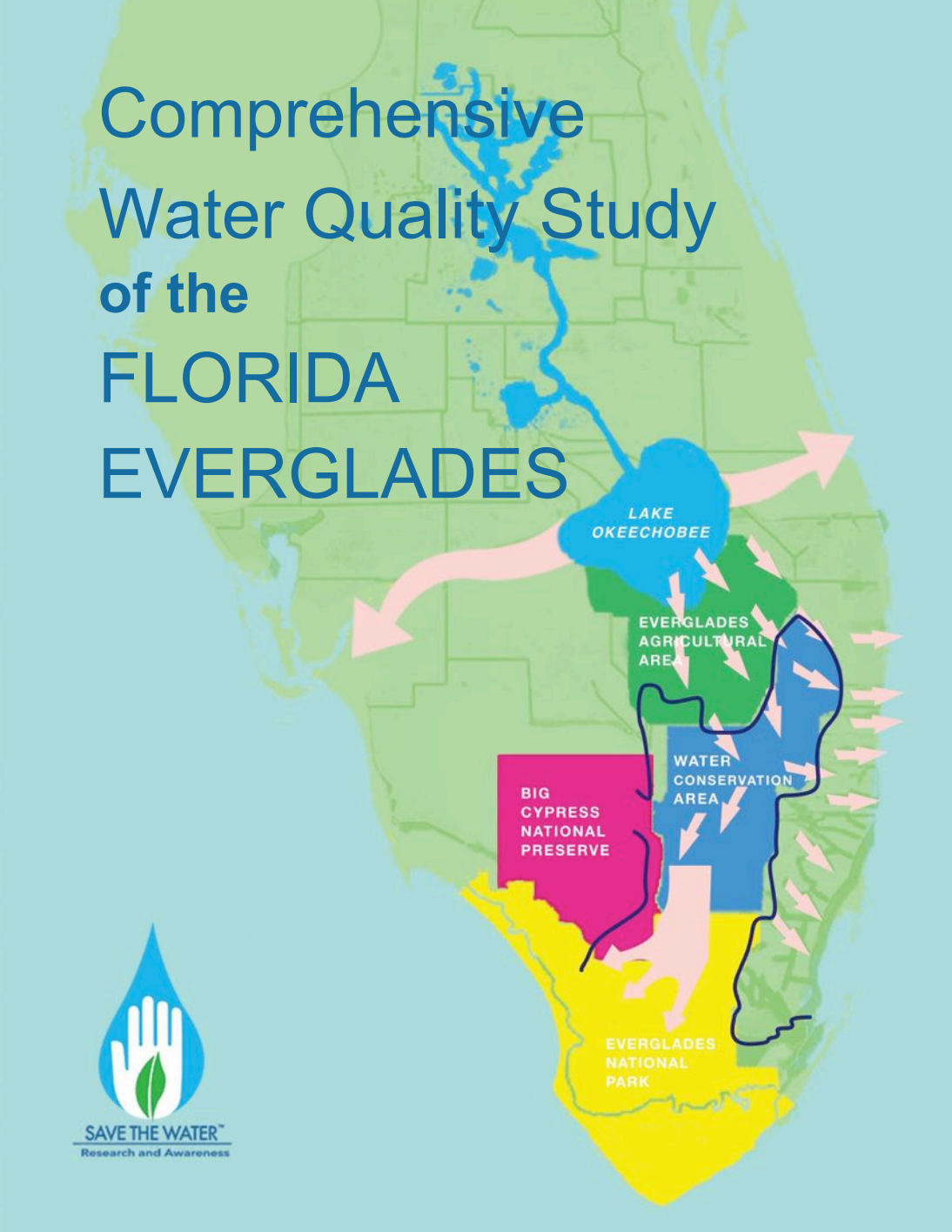
Comprehensive Water Quality Study **of the** FLORIDA EVERGLADES



SAVE THE WATER™
Research and Awareness

Comprehensive Water Quality Study of the Florida Everglades

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Project Overview

Save the Water™ (STW™) proposes to conduct an ongoing comprehensive study of the Everglades that will include water and sediment samples collected from many locations in the Everglades, as well as water discharged into the ecosystem and areas of suspected discharge. Save the Water will provide sample collection and state-of-the-art laboratory analysis of samples for regulated contaminants and for thousands of Contaminants of Emerging Concern (CECs) that are not currently monitored or regulated. These CECs include endocrine disruptors, cancer-causing agents, persistent organic pollutants, pharmaceuticals, pesticides, and many other categories of chemicals that are already contaminating the waters, sediments, and surrounding lands of the Everglades ecosystem. Our greatest concern with these contaminants is the lack of consistent, comprehensive, long-term monitoring, particularly in light of the disruption that new and increased water flow into the Everglades will cause during the current Everglades restoration efforts.

Benefits

The **Everglades and all its inhabitants** will benefit from the scientific water quality data generated by the STW Analytical Laboratory for a greater number of contaminants, tested for at a greater number of sampling points. Between 100 and 400 locations will be sampled per month, as 4 sampling teams are brought online over the course of a year, and some locations may be sampled more frequently where toxicity concerns are greater. This study is of particular importance in light of the 35-year Comprehensive Everglades Restoration Plan (CERP). Ongoing study by STW's Analytical Laboratory can provide data before, during, and after completion of the CERP projects to assess their progress, impact, and success. Openly accessible to the public, the study will provide transparent, accurate, and reliable data to continually monitor the health of the Everglades ecosystem and the people who are a part of it.

Save the Water benefits by engaging with local partners in Florida while showcasing its state-of-the-art accredited water laboratory as an authority in water quality. The STW Analytical Laboratory's physical proximity to the Everglades makes it an ideal partner for the full range of stakeholder consultation, sample collection, chemical analysis, and results reporting. The Everglades study aligns very well with Save the Water's own mandate to identify 7,500 CECs and the means for others to do so; to conduct toxicity studies, particularly with endocrine disruptors; and to partner with universities and other research organizations to establish toxicity criteria for aquatic species.

Background

The Everglades is one of the largest remaining subtropical wild spaces in the United States, and supports a very broad spectrum of wildlife. Historically, it spanned an area of over 18,000 square miles in southern Florida (NPS, 2016a).

In the 1900s, however, portions of the Everglades were drained, and a massive network of water management systems (e.g. canals and levees) was constructed to support rapid urban development. As a result, this sub-tropical forest has been reduced to half its size today. Furthermore, urbanization and agricultural advancements have led to nutrient pollution and over-drainage in the Everglades.

In 2000, Congress passed The Comprehensive Everglades Restoration Plan (CERP) as a plan to "restore, preserve, and protect the south Florida ecosystem while providing for other water-related needs of the region, including water supply and flood protection" (Congressional Record, 2000: 23040). The CERP is a multibillion-dollar project with a 35+ year time-line, and is the largest hydrologic restoration project ever undertaken in the United States (NPS, 2016a).

Challenges to Water Quality

The biggest challenge this project faces is that of the quality of water being restored to the Everglades. Urban and agricultural development has contaminated its waters with phosphorus, nitrogen, sulfur, mercury, pesticides and many CECs that have caused serious problems in the Everglades (NPS, 2016b) and in other major watersheds (e.g. IJC, 2016), and are not currently monitored or studied.

Scientific evidence suggests that the CERP, which is intended to restore the ecosystem, would in fact have negative impacts on both wildlife and human populations due to its deteriorated water quality (NRC, 2012). Environmentalists and State officials believe that the restoration will not benefit the ecosystem until higher water quality standards have been met (NRC, 2012). It is, therefore, essential to collect and monitor ongoing water quality data to determine the impact and adequacy of the restoration projects and to understand the needs of the changing environment. The proposed research will provide important information and tools for wise decision-making and for investment of the CERP's resources.

Currently, the scope of water quality monitoring in the Everglades is limited to monitoring nutrients that influence algal blooms and excessive plant growth. Parameters routinely tested are: *pH, alkalinity, calcium, chloride, potassium, magnesium, nitrogen, ammonium, nitrite, phosphate, sulfate, total nitrogen, total phosphorus, total suspended solids, and turbidity*. No tests, however, are routinely conducted on EPA-designated CECs unless specifically requested, or on contaminants regulated under the Safe Drinking Water Act. Our rationale for testing chemicals regulated under the Safe Drinking Water Act in the waters of the Everglades is that, if these chemicals are being

found in the drinking water, they also must be in the source water. If the contamination can be stopped in the Everglades (source water), it will also not appear in our drinking water.

Contaminants of Concern

It is obvious that the current parameters being studied do not include the many dangerous chemicals we expect to find in the water and sediments of the Everglades. We know that pesticides from agricultural runoff, pharmaceuticals from municipal water treatment discharges, endocrine disruptors, persistent organic pollutants, and industrial chemicals have previously been found in the ecosystem (McPherson et al., 2000).

Causes of endocrine disruption in alligators in the Saint Johns Water Management District have been studied in the past (Guillette et al., 2000; ACOEM, n.d.). The study came to no conclusive answer, however, yet no follow up monitoring or study has ever been performed or proposed.

Polychlorinated biphenyls (PCBs) are also of substantial concern in the Everglades (Requejo et al., 1979), and further complicated in the current context by climate change-based sea-level rise (cf. NAS, 2014). Banned by the EPA in 1979, PCBs are toxic, potentially cancer-causing, and have been linked to poor fetal development and to endocrine disruption in fish and other animals (including humans) that consume fish (Eisler, 1986; Colburn and Clement, 1992; Jacobson and Jacobson, 1993).

PCBs remained present in the waters of the Upper Mississippi River Basin, however, even 20 years after their ban (Lee and Anderson, 1998), and have been detected in Everglades fish in the last decade (Hussam et al., 2005). In spite of the multiple toxicity concerns that this highly dangerous substance poses to humans and the environment, no current study is being performed in the Everglades. Because of the potential effects of PCBs on environmental and human health, an understanding of PCB spatial and temporal trends is necessary to develop effective management strategies in Florida's Everglades waters return to former agricultural and industrial areas.

These contaminants have not magically gone away, and not testing for them does not mean we do not have to worry about them. These dangerous chemicals should be monitored in and around the Everglades on a continual basis to keep track of chemicals that are in the water and continue to be added daily. The restoration project is essential, but can only succeed if we ensure that the water allowed to flow south into the Everglades is as clean as the existing water in the south. There is no room for taking chances; any gross miscalculation or mistake will be irreparable.

In consideration of the sources and effects of these contaminants, the proposed study

must include a complete water quality evaluation of the sending (north) and receiving (south) areas of the ecosystem on a continuing basis. The current quality of water of the sending area, when discharged to the ocean and gulf through the east and west canals, has caused marine species kills (e.g. Rojas, 2015; Waymer, 2016) which are also not acceptable. When comparing the size of the Everglades with the Atlantic ocean or the Gulf of Mexico, the Everglades is a relatively small body of shallow water. If fish kills occur when contaminated water is discharged into the Atlantic and Gulf, the destruction will be much greater when discharging the same contaminated water to the Everglades, a much smaller, shallow, and slow moving ecosystem.

Comprehensive, and continuous analysis of the contaminants in the water and sediment of the Everglades is of the utmost importance to a successful restoration project and to the continued protection of the ecosystem while protecting drinking water sources and human health.

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