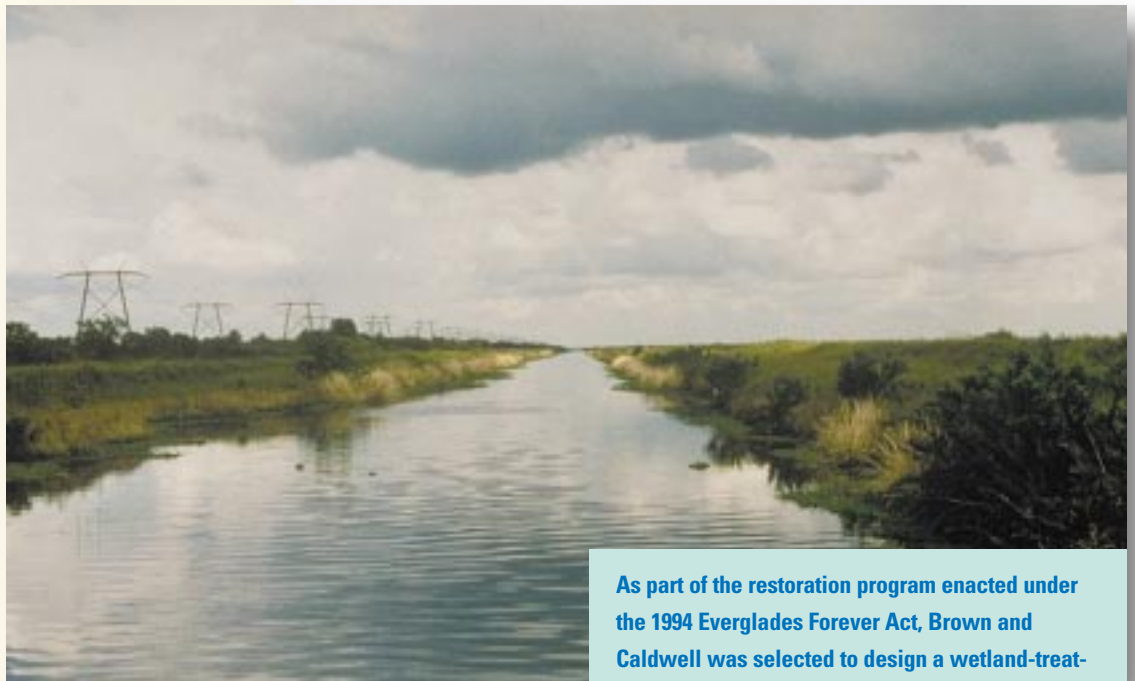


Wetland Treatment of Stormwater for the Everglades

Brown and Caldwell designed a wetland “filter” for nutrient-rich agricultural runoff, tailored to the flat topography and stormy weather of the Everglades.



**B R O W N A N D
C A L D W E L L**

As part of the restoration program enacted under the 1994 Everglades Forever Act, Brown and Caldwell was selected to design a wetland-treatment area because of our in-depth knowledge of the ecological, political, and regulatory issues affecting design and implementation.

B A C K G R O U N D

A restoration program enacted by the Florida Legislature under the 1994 Everglades Forever Act called for completion of approximately 40,000 acres of constructed wetlands, supporting canals, and pumping stations by February 1999. Brown and Caldwell was selected to design a 6,400-acre constructed-wetland treatment area for the purpose of cleansing agricultural runoff of excessive nutrients.

The wetland consists of three filtration cells that treat agricultural runoff by biological uptake of phosphorous and other nutrients that would oth-

erwise cause excessive plant growth in adjacent natural areas. As water slowly courses through the cells, nutrients are incorporated into plant biomass.

The South Florida Water Management District also commissioned Brown and Caldwell, in a joint venture with Prescott Follett & Associates Inc., to design two hurricane-proof outflow pumping stations, each rated at more than 3,000 cfps. To meet legislative deadlines, the District required that all related design work be completed in 18 months.

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Methods and Results

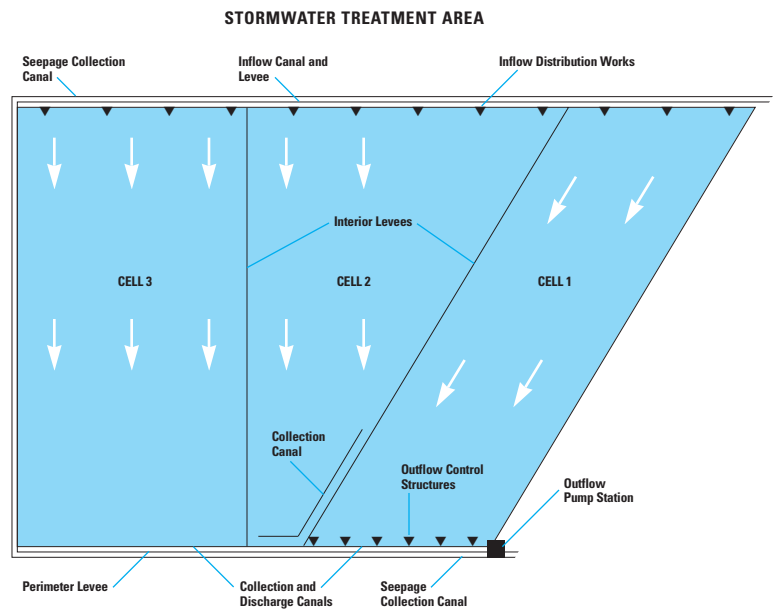
The Brown and Caldwell design team implemented several timesaving strategies to meet the District's tight deadline:

Stormwater Treatment Area

- Used global positioning to expedite surveys. Approximately 20,000 elevations were recorded within a single month to define the hydraulic characteristics of the site.
- Proposed fine grading and vegetation planting during levee construction, rather than after, to avoid redressing the levees later.
- Reduced excavation time and avoided importing additional material by constructing levees from on-site soils.
- Performed extensive geotechnical investigations and soil analyses to evaluate variable subsurface conditions and determine engineering properties of the foundation soil and proposed levee fills. Settling and slope stability also were modeled, and computerized algorithms estimated water seepage under levee perimeters.
- Used two-dimensional hydraulic/hydrodynamic modeling to address problems of short-circuiting and variations in land elevation.

Outflow Pumping Stations

- Reduced construction costs by designing a compact "inlet-shaped" configuration that reduced size requirements for the foundation, pump inlets, and structural size. The design also improved pump performance with efficient channeling of water to the intakes.
- Designed pump stations with three different pump sizes to accommodate varying discharge volumes from the treatment area, as well as to limit starts and stops.
- Issued pre-purchase pump specifications early in the design process to allow manufacturers to perform model tests and build the pumps concurrently with station design.
- Reduced operational costs by selecting diesel engines over electric power to drive the pumps, making the choice based on the economy and practicality of diesel engines in remote locations.



The wetland treatment area was designed with an elevation of 10.6 feet. The treatment area, which is sized to treat 3,370 cfs of stormwater runoff, consists of three cells that naturally assimilate phosphorous and other nutrients into an emergent macrophyte community. It is designed to reduce phosphorus concentrations from 100-200 ppb to less than 50 ppb.

Future Challenges

Brown and Caldwell, with its joint venture partner PEER Consultants, is working on identifying treatment processes that will aid implementation of the second phase of the Everglades restoration. Phase II implementation is legislated to occur in 2006. In Phase II phosphorous concentrations are mandated to be much lower, possibly as low as 10 ppb.

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Environmental Engineers & Consultants