USGS
science for a changing world

Prepared as part of the U.S. Geological Survey Greater Everglades Priority Ecosystem Science

Using the Everglades Depth Estimation Network (EDEN) for Real-Time Evaluation of the Everglades Restoration Transition Plan (ERTP) and Its Impacts on Tree Islands in the Florida Everglades

Bryan McCloskey[1], Paul Conrads[2], and Pamela Telis[3]

[1]Cherokee Nation Technology Solutions, Contractor to the U.S. Geological Survey, St. Petersburg Coastal & Marine Science Center, St. Petersburg, FL
[2]U.S. Geological Survey, South Atlantic Water Science Center
[3]U.S. Geological Survey, Caribbean-Florida Water Science Center, Jacksonville, FL (retired)

Contact Information: Bryan McCloskey, St. Petersburg Coastal & Marine Science Center, 600 Fourth Street South, St. Petersburg, FL, 33701 USA, Phone: 727-502-8017, Email: bmccloskey@usgs.gov

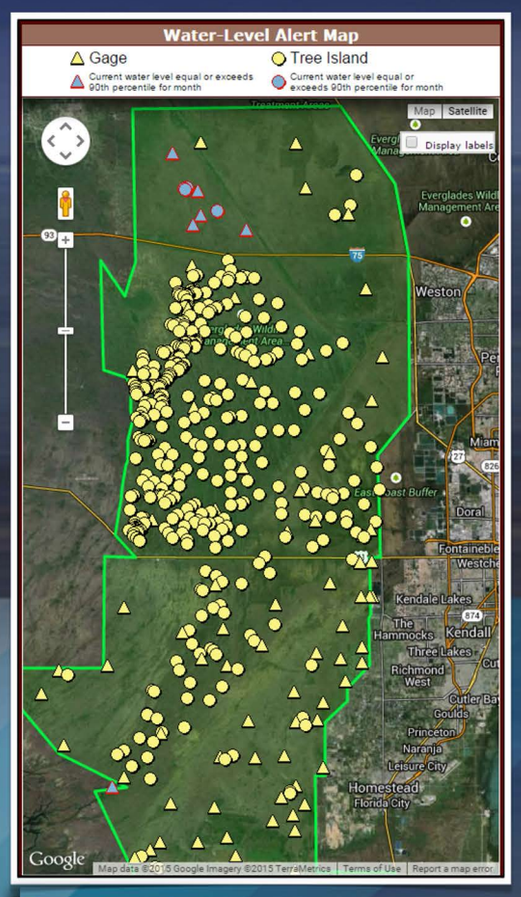

Figure 1. Screenshot showing tree islands (circles) and EDEN real-time water-level gages (triangles) in Water Conservation Area 3A and 3B and Everglades National Park. Gages and tree islands with water levels exceeding historic 90th percentile for the month are shown in blue.

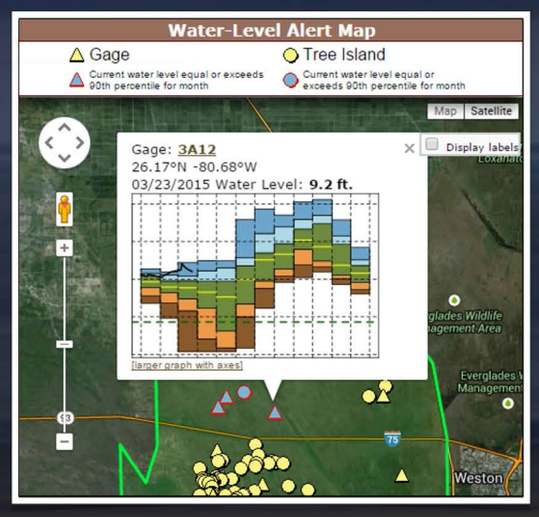

Figure 2. Screenshot showing thumbnail of real-time water levels, historic water-level percentiles, and hyperlinks to more detailed data for each gage and tree island. Tree island water levels are extracted from interpolated EDEN water-level surfaces.

In fall 2012, the Everglades Restoration Transition Plan (ERTP), a new water-control plan for the Central and South Florida Project, replaced the Interim Operational Plan (IOP). These water-control plans primarily regulate water levels in the Everglades for wildlife-resource management and the surrounding urban areas for flood control. Local Native Americans use the tree islands in the Water Conservation Areas and the Everglades National Park as cultural and sacred burial sites and have expressed strong objection to unnatural inundation of trees islands under the ERTP. An internet webpage application was developed that allows real-time evaluation of ERTP water levels at and near tree islands in the impact area using the Everglades Depth Estimation Network (EDEN).

The EDEN project, initiated in 2006, is an integrated network of real-time water-level gages, interpolation models, and web-accessible applications that generates daily water-level and water-depth maps and derived hydrologic data for the freshwater part of the greater Everglades. The EDEN measured and modeled data are used to monitor water levels and the ERTP water levels are statistically compared to the water levels that occurred during the IOP period (2002 through 2012) in Water Conservation Areas 3A and 3B and Everglades National Park (figs. 1 and 2).

Two approaches are used to compare water levels in the Everglades from the ERTP and IOP periods, one for measured water levels at marsh gages and the other for modeled water levels at tree islands. For each month, non-exceedance probabilities (water-level duration curves) for specified percentiles are plotted for daily water levels when the IOP was in operation (fig. 3). For example, the 90th percentile water level for May indicates that 90 percent of all days in May during the IOP were that value or less. When the current water level during ERTP is plotted over the percentile plot, the user can compare the current water level with the statistical probabilities during IOP. For tree islands, the current water level also can be compared with the maximum ground elevation to monitor when overtopping conditions occur.

A

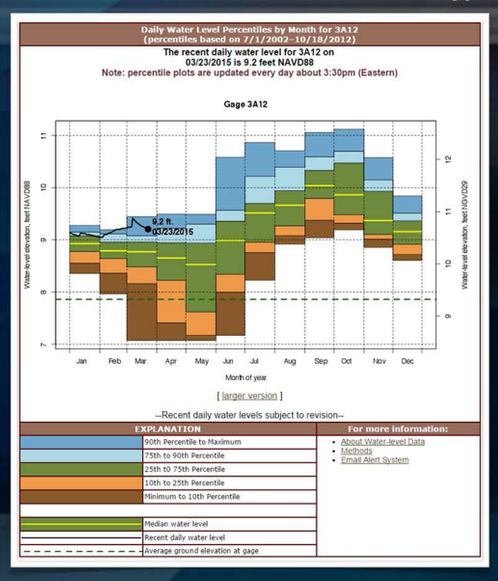

Figure 3. Screenshot showing A) monthly duration hydrographs of water-level percentiles and current conditions, which are created for each gage and tree island and B) Table of Daily Water Level Percentiles indicating the historic context of the current conditions (shaded in peach)

B

Table of Daily Water Level Percentiles by Month for 3A12
(percentiles based on 7/1/2002–10/18/2012)

The recent daily water level for 3A12 on 03/23/2015 is 9.2 feet NAVD88

	Minimum	10th percentile	25th percentile	Median	75th percentile	90th percentile	Maximum
January	8.36	8.55	8.78	8.93	9.07	9.15	9.27
February	7.96	8.36	8.64	8.79	8.96	9.12	9.19
March	7.07	8.16	8.48	8.77	8.96	9.08	9.44
April	7.07	7.41	8.23	8.65	8.94	9.22	9.49
May	7.07	7.17	7.62	8.53	8.94	9.3	9.49
June	7.17	8	8.34	8.99	9.36	9.57	10.58
July	8.23	8.76	8.96	9.52	9.7	10.21	10.86
August	8.92	9.08	9.27	9.66	9.94	10.39	10.7
September	9.04	9.38	9.79	10.04	10.33	10.59	11.06
October	9.19	9.32	9.48	9.86	10.47	10.7	11.12
November	8.86	9.01	9.11	9.37	9.93	10.15	10.58
December	8.61	8.72	8.91	9.16	9.36	9.51	9.84

--Recent daily water levels subject to revision--

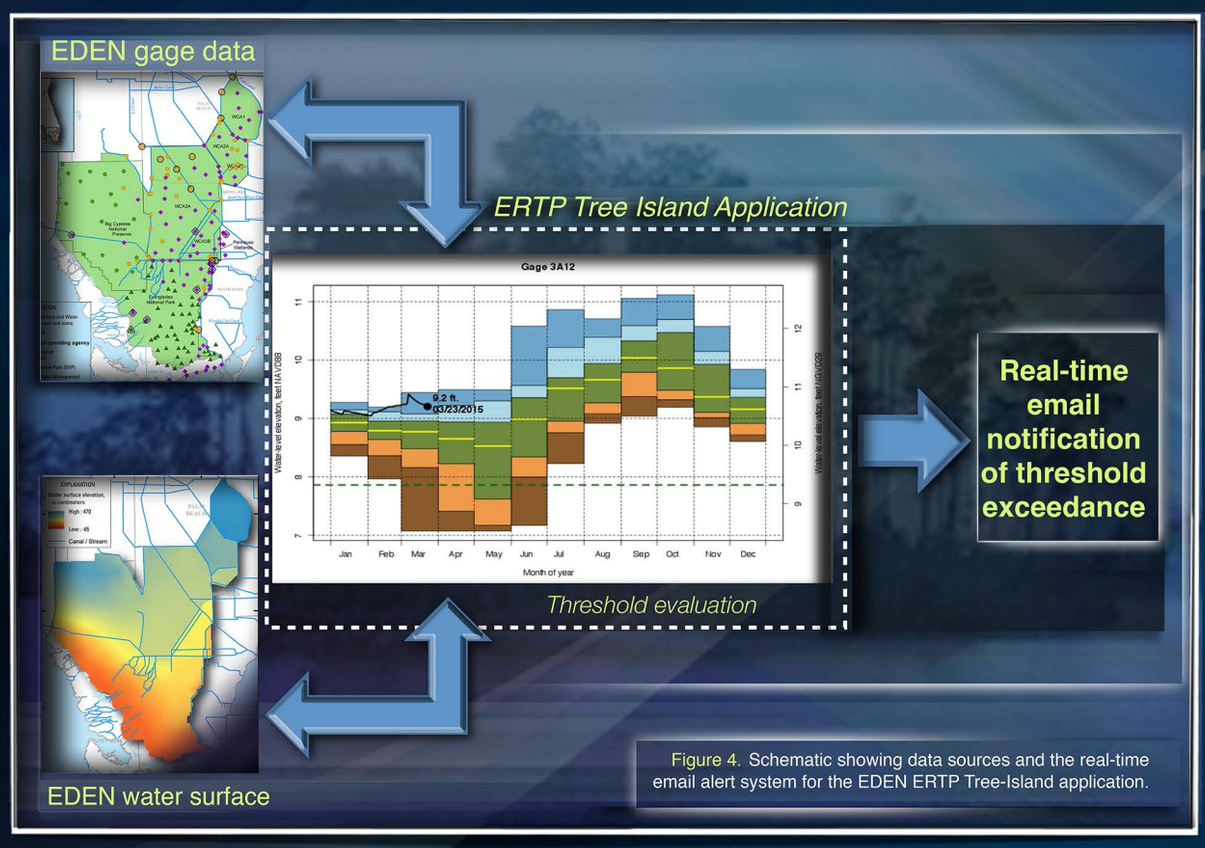

Figure 4. Schematic showing data sources and the real-time email alert system for the EDEN ERTP Tree-Island application.

A daily email notification informs stakeholders when current water levels reach specified elevations at gages or tree islands (fig. 4). An alert is triggered for a gage or tree island when the water-level elevation equals or exceeds the 90th percentile water level or is less than the 25th percentile water level for the IOP period. An additional alert is triggered for tree islands when the water level equals or exceeds the maximum tree-island ground elevation. Water managers can use these plots to document the anticipated changes in water levels under ERTP and make operational changes when necessary.

U.S. Department of the Interior
U.S. Geological Survey

Everglades Depth Estimation Network
EDEN