Understanding Patterns of Canal-Water Intrusion to Predict the Effects of Everglades Restoration on the A.R.M. Loxahatchee National Wildlife Refuge

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The Arthur R. Marshall Loxahatchee National Wildlife Refuge represents one of the last vestiges of the historic rainfall-driven Everglades. Whereas surface-water chemistry across much of the remnant Everglades is influenced by inflows of high conductivity (i.e., mineral-rich) canal water, the Refuge appears to have largely retained the low conductivity condition indicative of a rainfall-driven hydrology. However, there is concern that changing water management strategies associated with Everglades restoration may be increasing the extent of canal-water intrusion into the Refuge, with consequent effects on water chemistry, ecosystem processes, and native communities.

A synoptic survey of water, soil, and plant chemistry was conducted during February 2004 to better understand patterns of canal-water intrusion into the Refuge and associated environmental effects. Multiple indicators of intrusion were measured at 130 sites throughout the Refuge. Measurements of surface-water conductivity provided a reliable instantaneous measure of the intrusion of canal water (specific conductance > 1000 $\mu S\ cm^{-1}$) across this rainfall-driven wetland (specific conductance < 100 $\mu S\ cm^{-1}$). Conductivity values within the Refuge varied widely (60-1017 $\mu S\ cm^{-1}$) and showed that most intrusion was occurring along the western and northern boundaries. Soil concentrations of uranium, a fertilizer-derived contaminant in canal water, were positively correlated with conductivity, indicating that longer term intrusion patterns were reflected in the conductivity readings. The nutrient content (nitrogen, phosphorus, and sulfur) of plant tissue and soils was also elevated at sites with high conductivity, suggesting that intrusion may affect nutrient biogeochemistry and wetland productivity. Survey findings show that large areas across the western portion of the Refuge are exposed to canal-water intrusion and support the need for routine monitoring to document temporal trends and identify potential hydrologic drivers of this process.

Detailed information on spatiotemporal fluctuations in canal-water intrusion into the Refuge and their relationship to water management activities will be provided from a recently established conductivity monitoring network. Changes in key ecological processes across canal-water gradients within the Refuge will be used to assess the nature and extent of environmental effects.

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