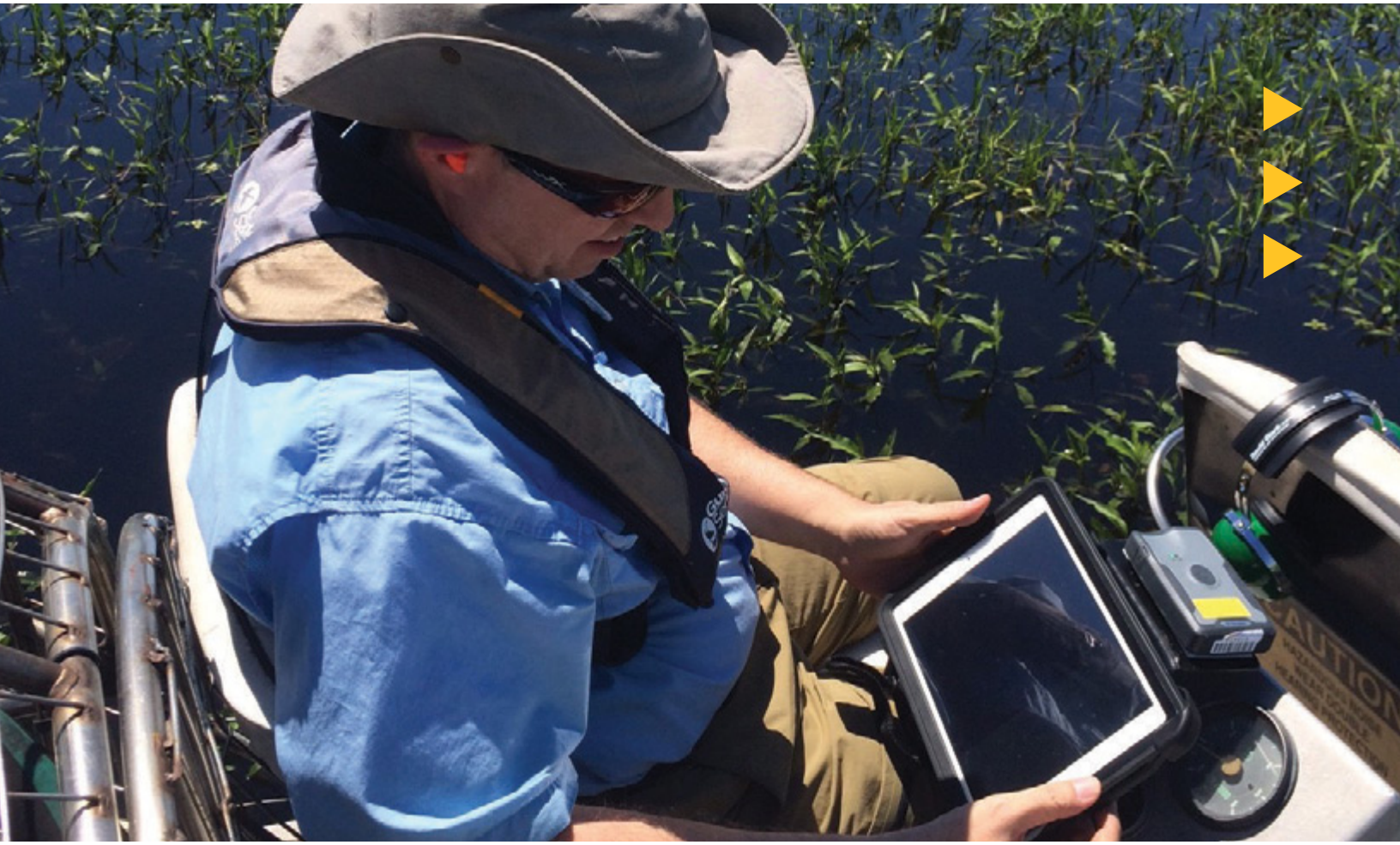
A New Data Stream



The Trimble R1 creates a stream of precise data for the South Florida Water Management District

Pairing GNSS with iPads provides spatial data precision, seamless data flows and reduced field time for environmental scientists managing complete wetlands.

Trimble Solutions

- R1 GNSS receiver: Pocket-sized solution that delivers precise positioning data to Bluetooth-enabled devices like smart phones or tablets
- eCognition: Out-of-the-box solution for precise vegetation and land-cover mapping

overview

Based in West Palm Beach, the South Florida Water Management District (SFWMD) covers 16 counties stretching from Orlando to the Florida Keys, including the unique and intricate Everglades freshwater wetland. The oldest and largest of the state's five water management districts, the 67-year-old SFWMD strives to maintain a delicate balance between safeguarding the water needs of the natural environment and the competing water-supply demands of 8.1 million residents.

Location
FLORIDA, USA

As part of its extensive responsibilities for south Florida's rich environment, the District has been at the helm of significant natural resource initiatives. One of the most ambitious ones is the Kissimmee River Restoration Project (KRRP), which aims to repair detrimental damages from past overly aggressive flood control measures.

With the scope of the KRRP and the extent of its monitoring area—about 17,000 hectares (44,200 acres)—the SFWMD created the lakes and river ecosystems section (LRES) in 2006 to act as a dedicated team to evaluate environmental changes and ensure the ecology of the region is thriving throughout the restoration phases.

Measuring the environmental successes, however, was a significant challenge for LRES personnel because they were trying to monitor and map a very fluid environment with static, labor-intensive tools—paper notebooks and maps, hard copy geospatial imagery and consumer-grade GPS technology.

Recognizing the need for data-collection efficiency, versatility and accuracy, the LRES embarked on a ten-year technological transformation to find the right solution. In 2015, they found a winning technological triad: a Trimble® R1 GNSS receiver connected via Bluetooth® to an iPad running the Esri® Collector for ArcGIS® app.

The new combination of iPads paired with R1 handheld receivers has not only shred the paper trail for the LRES, it's giving staff the smart tools they need to more efficiently and accurately monitor and map diverse vegetation species in the KRRP and produce deliverables with higher confidence.

CHALLENGE

Given the size of the KRRP monitoring area, the LRES uses both airboats and helicopters to survey and map the vegetation—field work that is coordinated with aerial surveys flown every three years for large area coverage. The focus is on studying and mapping the predominant emergent vegetation—plants above the soil or water surface—which is a key indicator of the ecosystems' overall health.

Despite the efficiency of airboats and helicopters, the early reliance on paper-based systems for data collection not only produced stacks of saturated field data, they made the fieldwork quite laborious and the data vulnerable to errors. Although the department did supersede some paper methods with digital alternatives, they were still plagued with location data inaccuracies, technical failures in the field, cumbersome data inputs and interoperability issues.

LRES field crews routinely use helicopters to capture vegetation data as part of the KRRP success evaluations.

Photo: Brent Anderson – SFWMD

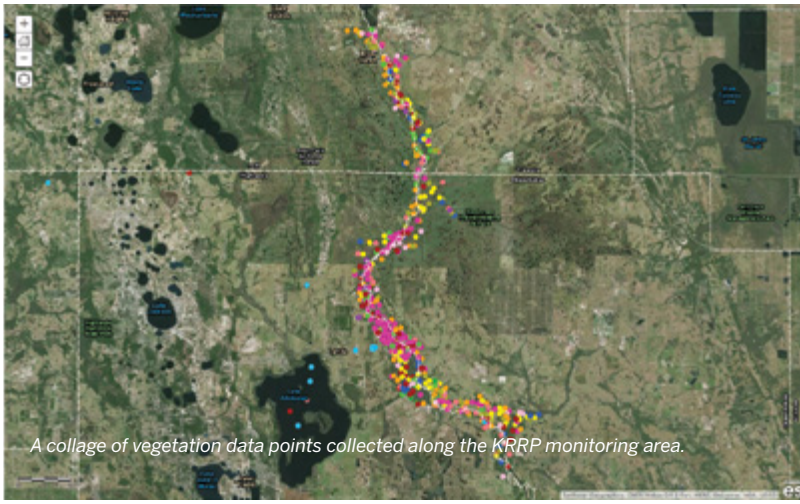
To enable their environmental scientists to more efficiently and effectively assess the vitality of the region's vegetation, the LRES needed a fully interoperable system that would provide sub-meter accurate GPS data, drop-down menus for quick data entry and real-time data integration and sharing. They coordinate field activities for audits, repairs and data collection, then leverage the resulting data to help optimize their advanced metering systems

SOLUTION

LRES staff needed technology that could acquire sub-meter spatial accuracy and allow them to seamlessly integrate that data with their iPads and the Collector app. After testing a number of advanced GPS technologies, the department chose the Trimble R1 GNSS receiver for their location-data component.

With the 2015 field assessments approaching, it was an opportune time for LRES environmental scientist Lawrence Spencer to test the viability of using the R1 Bluetooth-enabled GNSS unit in combination with an iPad and the Collector app.

Unlike in the past, when Spencer would print out reams of paper before entering the field, this time he only had a Trimble R1 and an iPad loaded with all the relevant apps and maps he needed. Traveling by airboat, he used the R1 in combination with the iPad to navigate to prede-termined sample areas. Once at a location, he located the center of the vegetation cluster and captured a precise GPS ground-control point (GCP) of that population, which was stored into the Collector app to provide an accurate position for mapping



A collage of vegetation data points collected along the KRRP monitoring area.

that vegetation class. Using templates, he recorded an array of attributes such as the plant type, its areal extent, and its health; he also attached photos of the area. Data collection complete, he navigated to the next location and recorded the vegetation there, a process he repeated every week for about six hours a day from April to June.

Using the R1 receiver, Spencer collected around 475 sub-meter-accuracy GCPs—about three times the number of GCPs he could acquire previously. The GCPs are used both to generate signatures for air-photo-based vegetation classifications and to assess the accuracy of the final vegetation maps produced.

In between airboat trips, Spencer also carried out vegetation surveys with a helicopter. Once he reached each predetermined location, the pilot hovered over the

wetland and Spencer collected several GCPs with the R1, recorded plant attributes and took pictures of the vegetation below—acquiring all necessary data by himself in less than 90 seconds. In all, Spencer collected another 450 GCPs from the helicopter, giving him about 900 data points for the final maps.

In addition to the new field system, Spencer is also developing a more automated and accurate map production system using Trimble's eCognition® image analysis and land classification software. Historically, Spencer manually drew polygons around vegetation populations on the digital infrared air photos, named each one by its signature and then used those specific poly-gons to map the wetland vegetation. This time, he is ingesting all of the data points he collected in the field—along with the 2015 aerial imagery—into eCognition to automatically classify and map the vegetation.

"With significantly more sub-meter accuracy data points, I can classify the vegetation much more accurately and quickly," said Spencer. "And I can repeat and customize this process to produce any type of map. This flexibility and detail will help to better measure how well the vegetation and wildlife is responding to the KRRP."

RESULTS

Based on the success of the 2015 field work, the LRES' new technological triad seems to be a winning combination.

Previously, field teams used GPS technology just for navigation, leaving them to make best guesses when mapping the locations of vegetation. The new system enables them to collect sub-meter accurate GPS points that feed directly into the iPad and Collector software in real time. It's much more efficient, it's more accurate, it's easier to use and they can monitor and as-sess the health of the vegetation in the KRRP with more confidence.

Data sharing now means an exercise in keystrokes rather than several trips to the printer.

The new combination also enables users to acquire more information in flight in less time—with less crew. Prior to the R1 and iPad, surveying the whole KRRP area required a two-person team equipped with a laptop, Esri's ArcPad, an old backpack GPS unit and paper maps. It would take four hours to complete the aerial survey. With the new system, they've reduced flight times by nearly 50 percent and one person can capture all the data.

"With the Trimble R1 and iPad, we've reduced flight times by nearly 50 percent and I can acquire all the data, including photos, myself."

LAWRENCE SPENCER
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