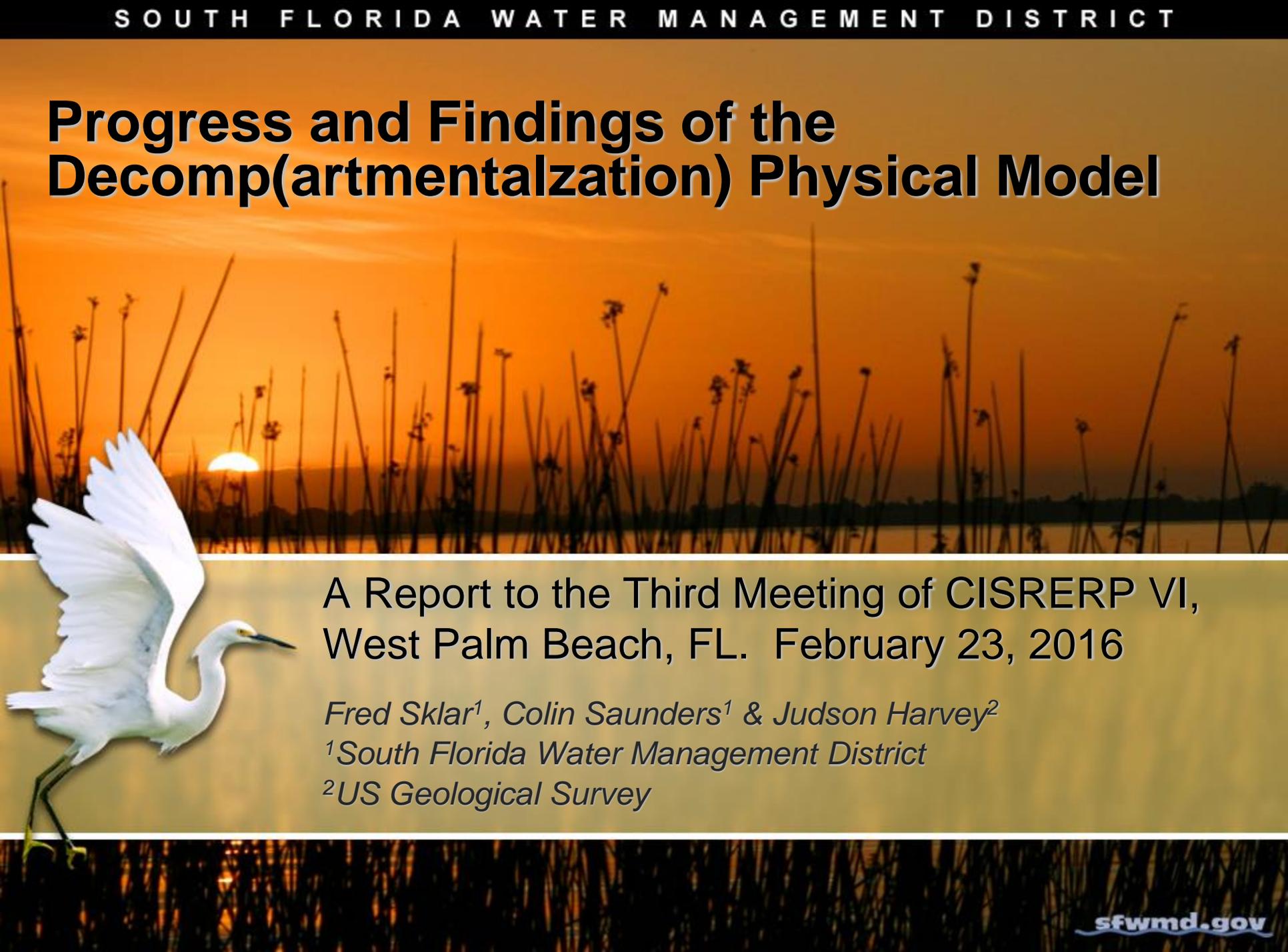


Progress and Findings of the Decomp(artmentalization) Physical Model



A Report to the Third Meeting of CISRERP VI,
West Palm Beach, FL. February 23, 2016

Fred Sklar¹, Colin Saunders¹ & Judson Harvey²

¹South Florida Water Management District

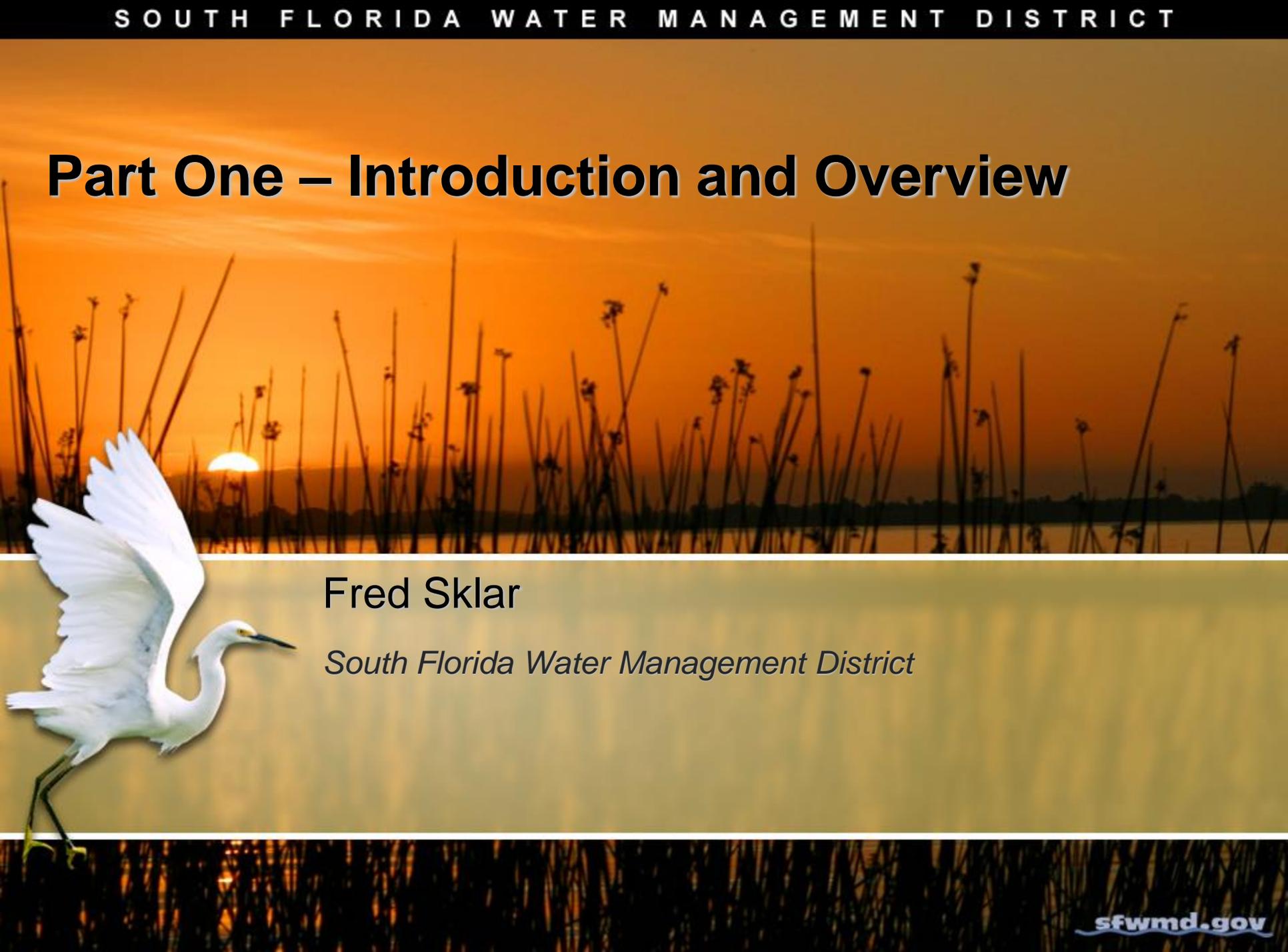
²US Geological Survey



Outline for Today's Discussion

- **Introduction and Overview: Fred Sklar (10 minutes)**
- **Ridge & Slough Results: Jud Harvey (20 minutes)**
- **Canal Results: Colin Saunders (20 minutes)**
- **Summary and Future Directions: Fred Sklar (10 minutes)**
- **Q & A (20-30 minutes)**

Part One – Introduction and Overview



Fred Sklar

South Florida Water Management District



Critical CERP/CEPP Issues

Hydrology: Recreational fishing interests do not want canals to be backfilled. However, there is scientific evidence to suggest that canals that are not backfilled will; short-circuit marsh hydrology, interfere with sediment transport, cause water quality problems, and create habitat for exotic fish.



Pre-drainage ridge & slough landscape

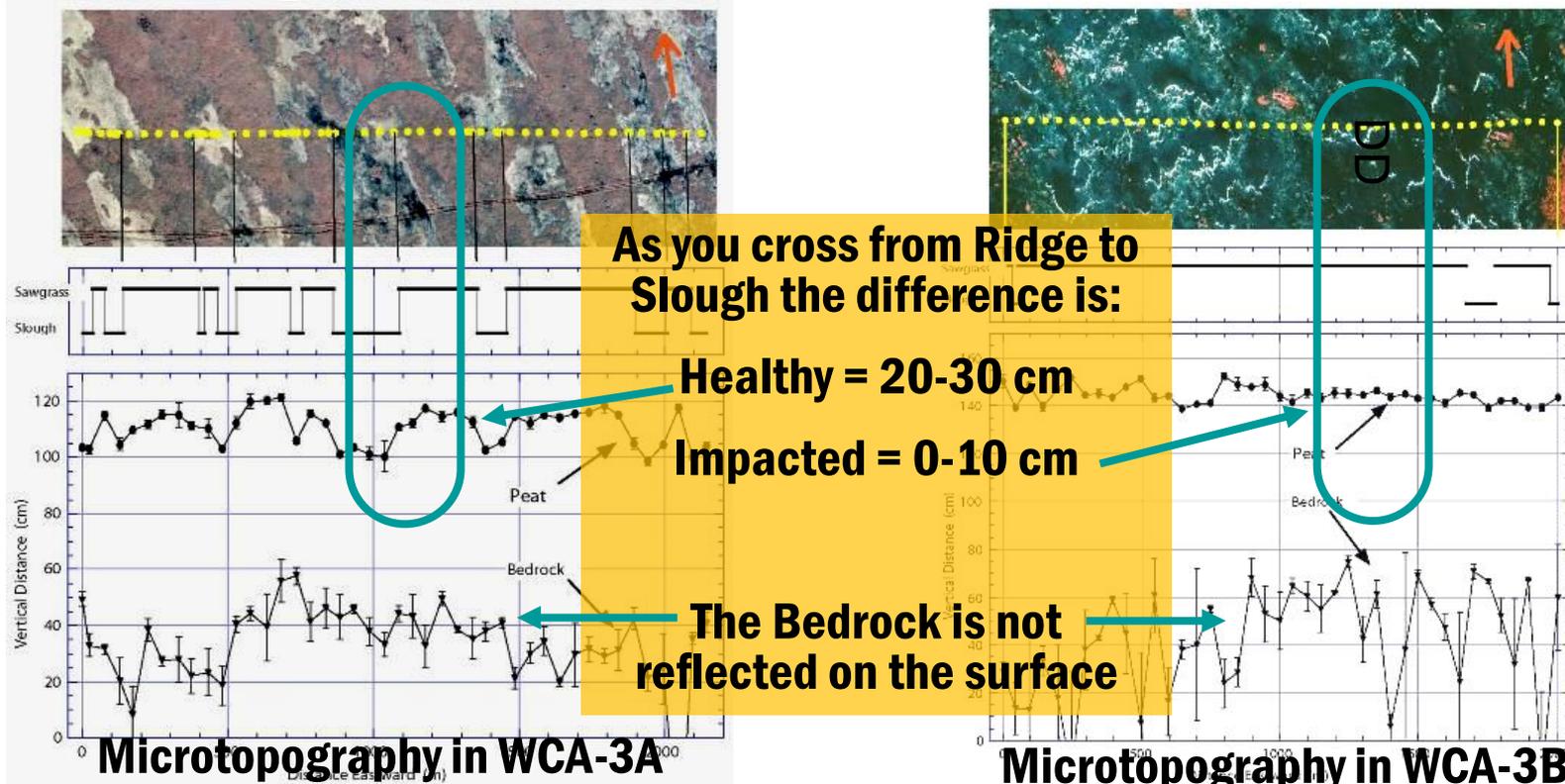


Impacted ridge & slough landscape



Critical CERP/CEPP Issues

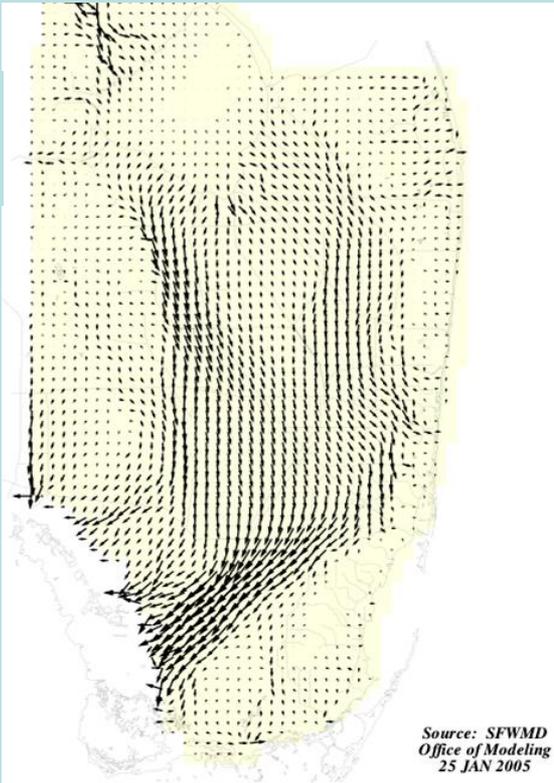
Sediment: Wading birds need slough habitats during the dry season for intensive foraging to support nesting and fledging of young birds. Wading bird populations cannot be restored if the slough habitats of the Everglades continue to be encroached by sediments, cattails and sawgrass. However, there is no scientific understanding of the biology of floc or its distribution & movement across the Everglades.



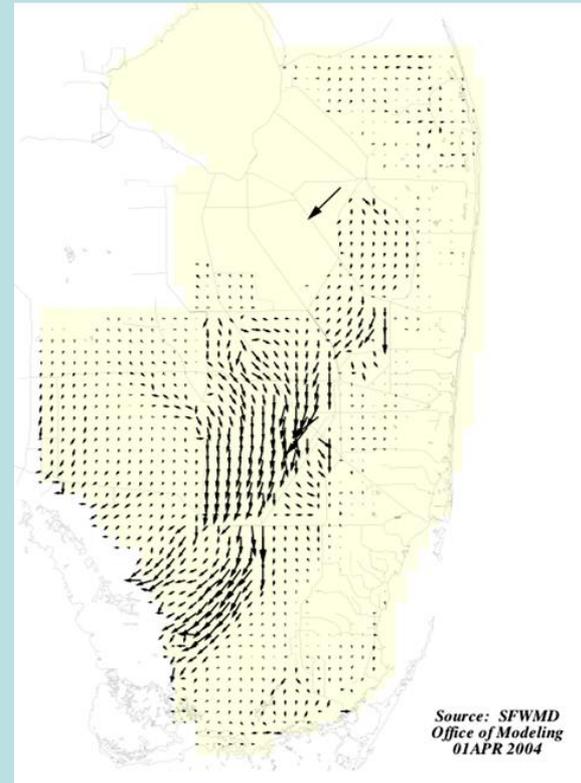
Critical CERP/CEPP Issues

Restoration: Hydrologic performance measures for the restoration of tree islands, ridges, and sloughs do not yet include velocity vectors. The NSM was not calibrated for flow fields and no one knows if current peak flow rates of 1 cm/sec can support the biophysics of restored microtopography in the Everglades.

**Historic
Flows**



**Present-
day Flows**





Critical DPM Questions

Hydrology: Do canals need to be completely backfilled in order to achieve hydrologic restoration?

Sediment: What is the role of floc and sediment movement for restoring and sustaining a stable ridge and slough landscape, and how do canals, levees, and levee modifications affect this movement?.

Restoration: What is the ecological function of sheetflow and what are the hydrologic needs (i.e., flow fields, depths, duration) of the ridge and slough landscape?



What is DPM?

- **A pilot study to test engineering solutions for ecological restoration.**
- **An on-site, relatively large-scale, controlled manipulation of the environment to evaluate ecosystem response to sheetflow.**
- **A landscape manipulation designed to provide critical information of the hydrologic targets for restoration.**
- **Provides “ecological lift” to a drained system: An Active Adaptive Management approach.**



DPM Science Plan and Design (2004 – 2010)

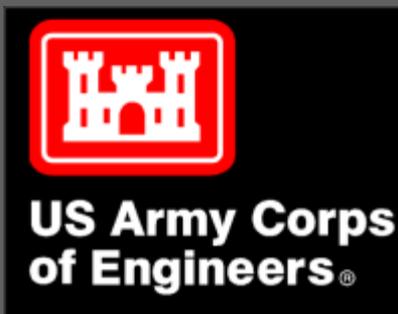
- **10/04-01/05:** Concept development to use large-scale field experiments (Physical Models) to reduce Decompartmentalization uncertainties. The DECOMP Adaptive Management Plan was born (DAMP).
- **02/05:** DAMP, including physical models, approach presented to Quality Review Board (QRB) (Taplin).
- **04/05:** DAMP presented to CISRERP (or was it CROGEE?) (Sklar)
- **06/05-03/06:** DECOMP scientific uncertainty, hypothesis, description of a physical model design (Sklar, Newman, Hagerthey, Engle, Harvey, Childers, and Trexler).
- **04/06-04/07:** Design options are explored; based upon proposed Modified Water Deliveries (MWD) conveyance/seepage feature (C&SF) (S-345). Estimated cost: \$10.3 Million over 5 years (\$3.4M Levee Removal and Canal Backfill; \$6.9M Monitoring and Field Assessment).
- **12/09-04/10:** DPM Science Plan, Environmental Assessment, Hydrologic Field Test Report, and Operational Guidance are completed.



Principle Investigators: 2012 DPM Science Team



F. Sklar
C. Saunders
S. Newman
C. Coronado
S. Hagerthey



S. Baisden
S. Wilcox
N. Garratt
D. Crawford



L. Larsen

J. Trexler



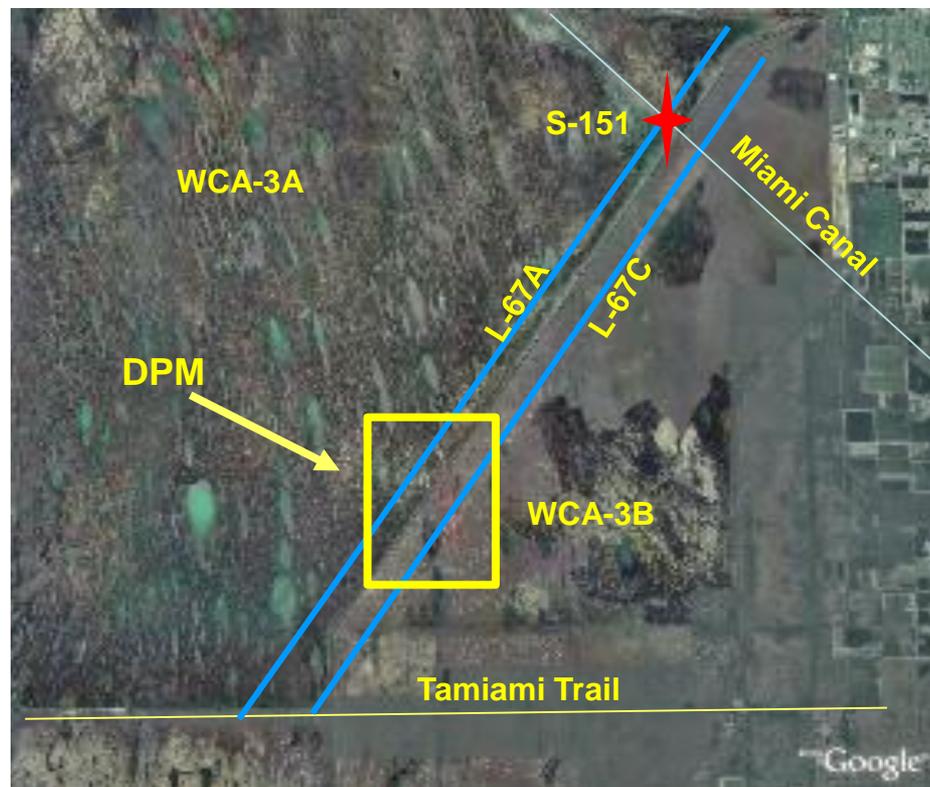
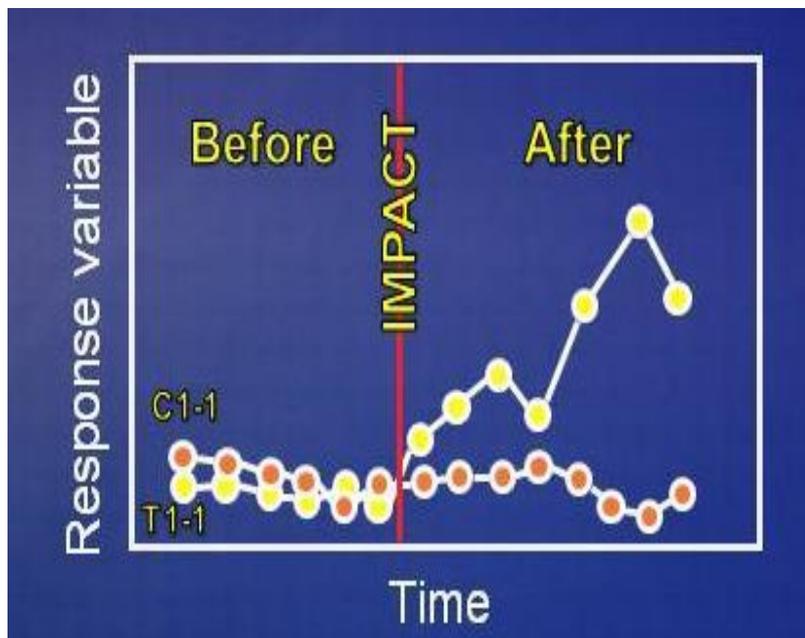
J. Harvey
B. Rosen
M. Dickman
Jay Choi
Katie Skalak



D. Ho



DPM Experimental Design





DPM Experimental Design

Construction

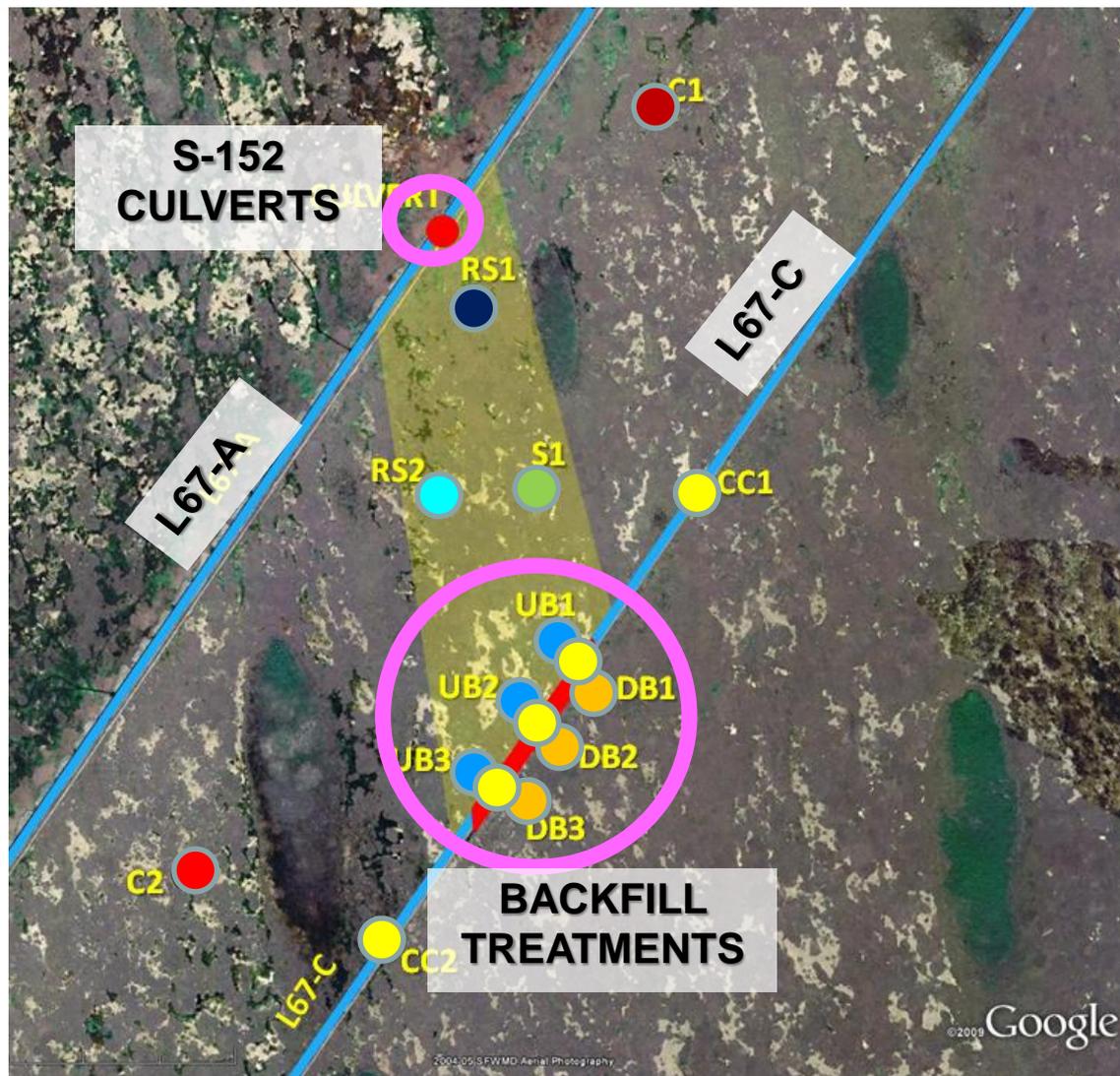
- L67A: ten 6-ft gated culverts
- L67C: 3000-ft gap and 3 canal-backfill treatments

BACI design

- 11 marsh sites
- 5 canal sites
- Before-, Impact- sampling

S-152 Operational constraints

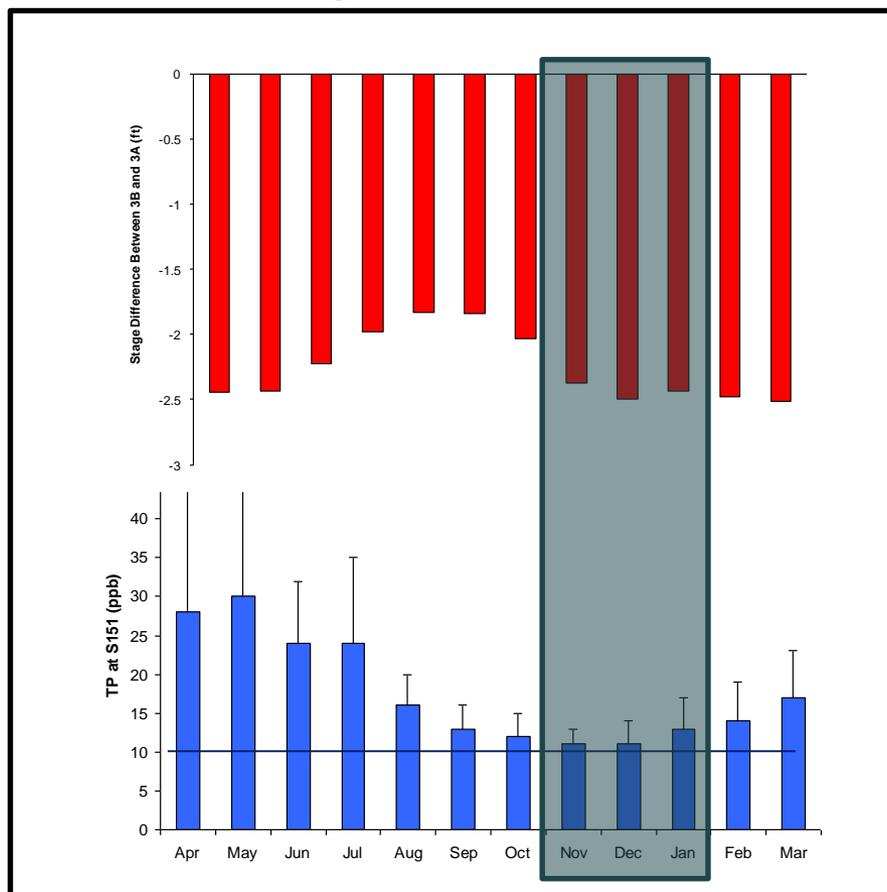
- Flooding in WCA3B
- Water quality in L67A
- Operational window is November-January





DPM Operational Design

Monthly Mean Stage Difference WCA-3B-WCA-3A

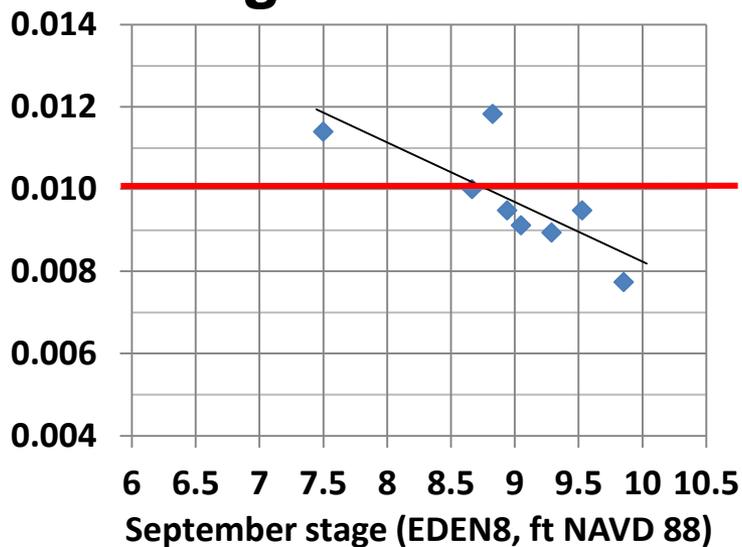


Monthly Mean TP Concentration at S-151



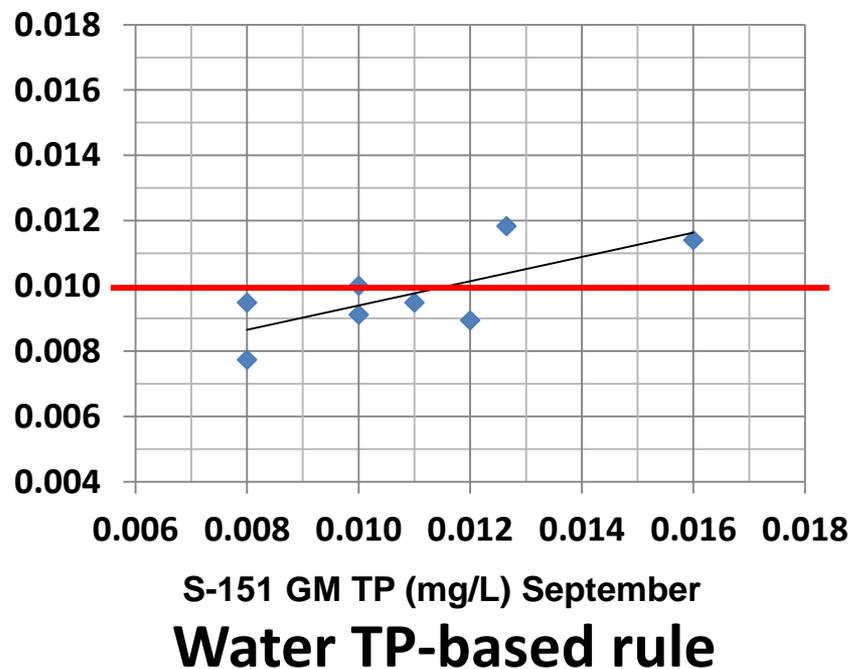
DPM Operational Design

Stage-based rule



- If stage ≥ 9 ft., then **“Yes, operate S-152”**
- If stage < 9 ft., then go to water TP-based rule

- If TP ≤ 12 , then **“Yes, operate S-152”**
- If TP > 12 , then **“NO, do not operate.”**





S-152



USACOE Construction Contract Awarded to Leno Dredging: May 3, 2012

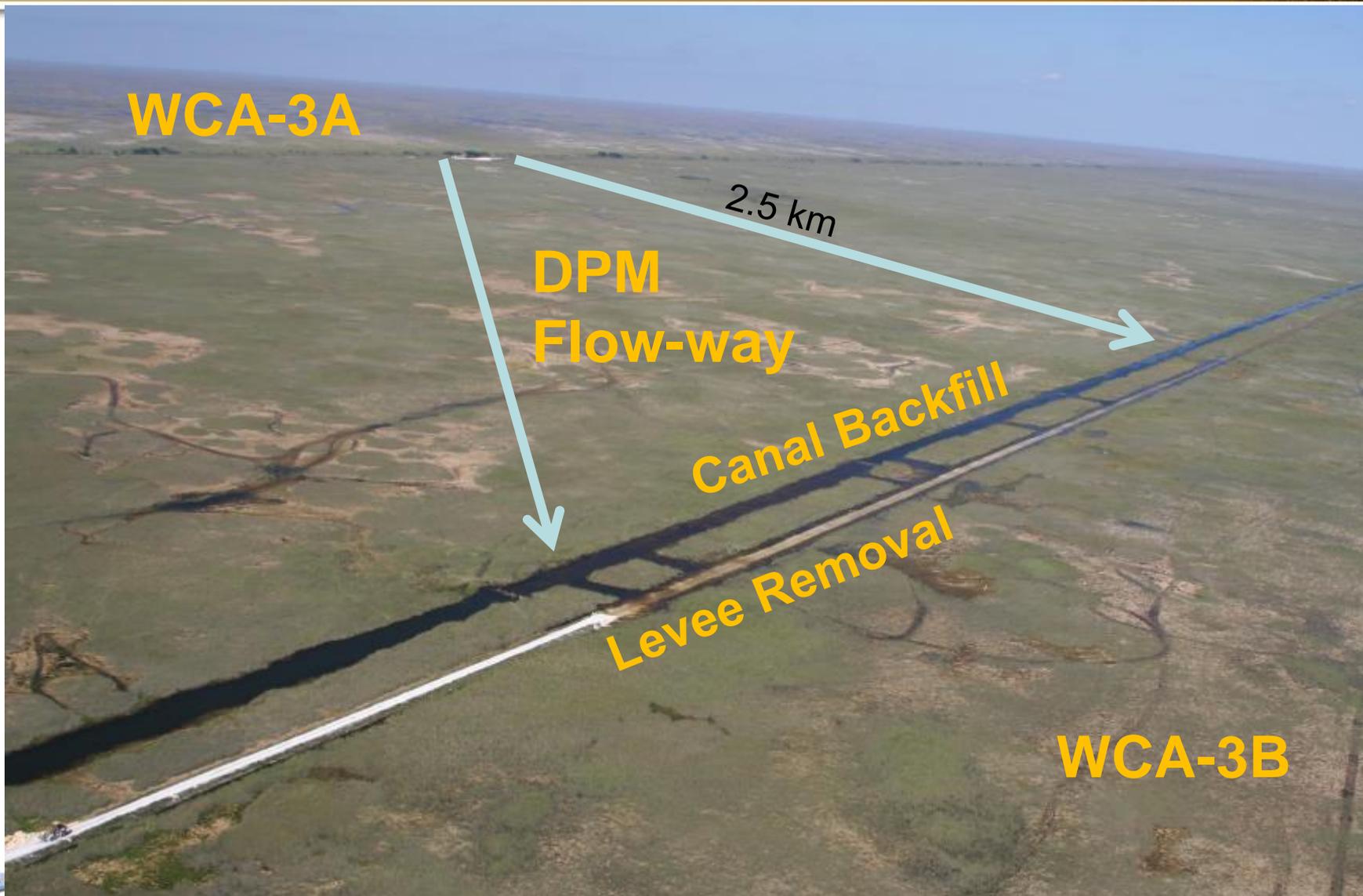


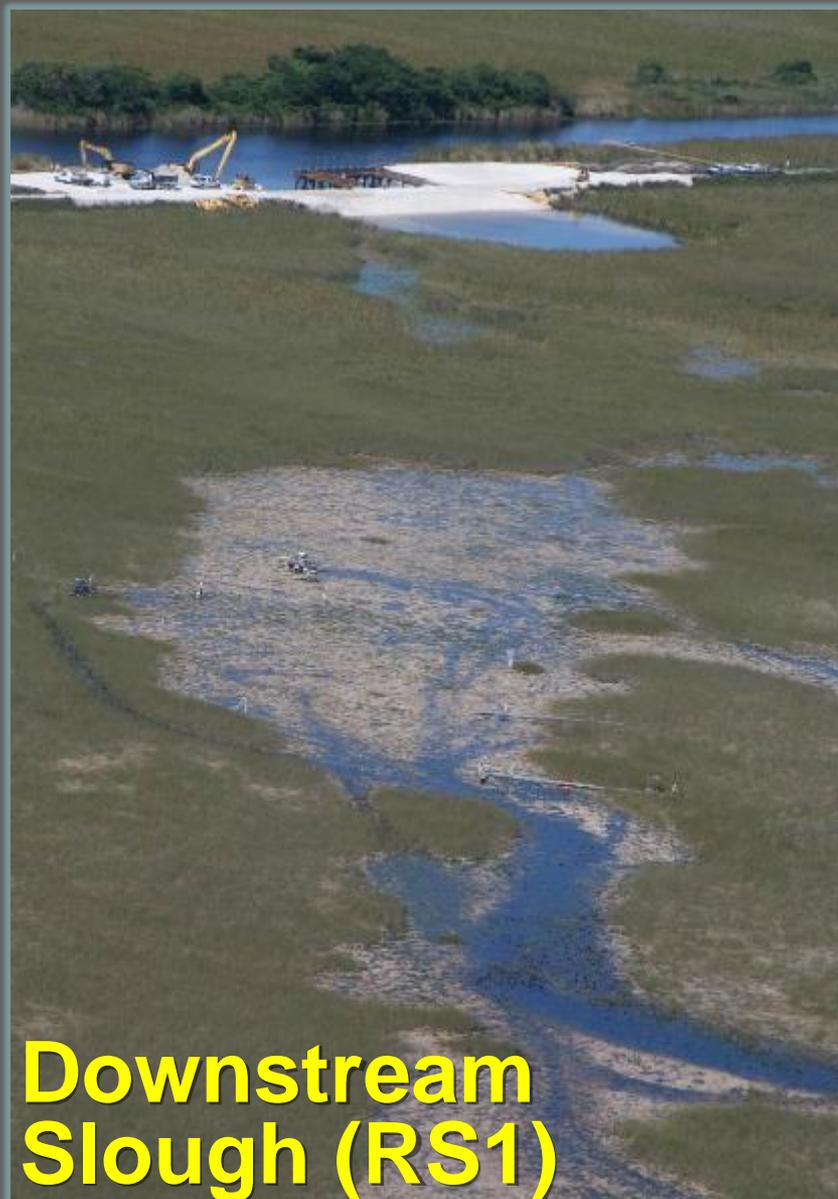
L67-C

Canal backfill & levee removal



The DPM Footprint







What is Being Measured?

- **Hydrology**
 - A network of sites for stage, water depths, flow direction, and velocity
 - Hydraulics of L-67A culverts (head and tail water stages and cfs)
 - Synoptic mapping of water depth and velocity in conjunction with flow manipulations
 - Vegetation mapping for hydraulic resistance
 - Tracer studies (SF6 tracer and dye)
 - Canal hydraulics

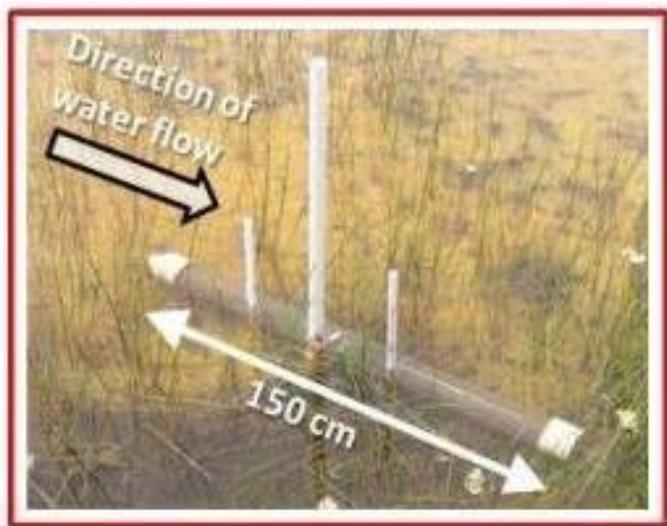
- **Physical Transport**
 - Synoptic mapping of surface water biogeochemistry and sediment erosive properties
 - Resuspension and deposition of natural particles (LISST)
 - Particle transport (Floc tracers, sediment traps, biogeochemical markers)

- **Biological**
 - Environmental monitoring (dissolved oxygen, pH, temperature, specific conductivity)
 - Fauna characterization (native and exotic) and movement
 - Vegetation and periphyton structure

Flow Dynamics Downstream



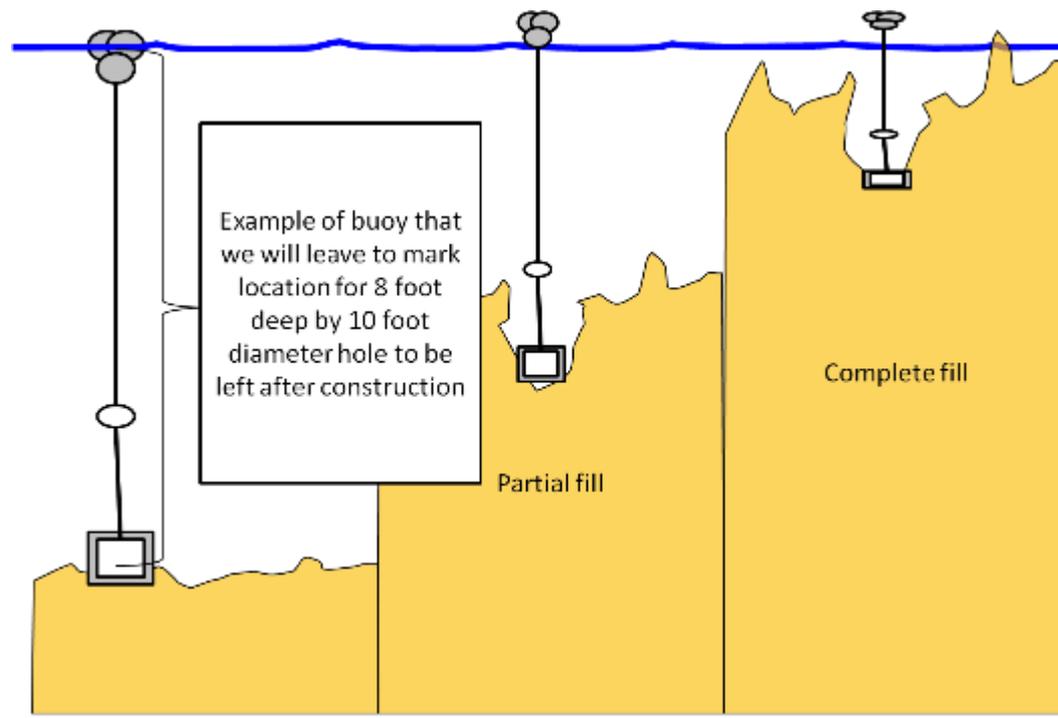
Sediment Characteristics in the Canal and in the Marsh



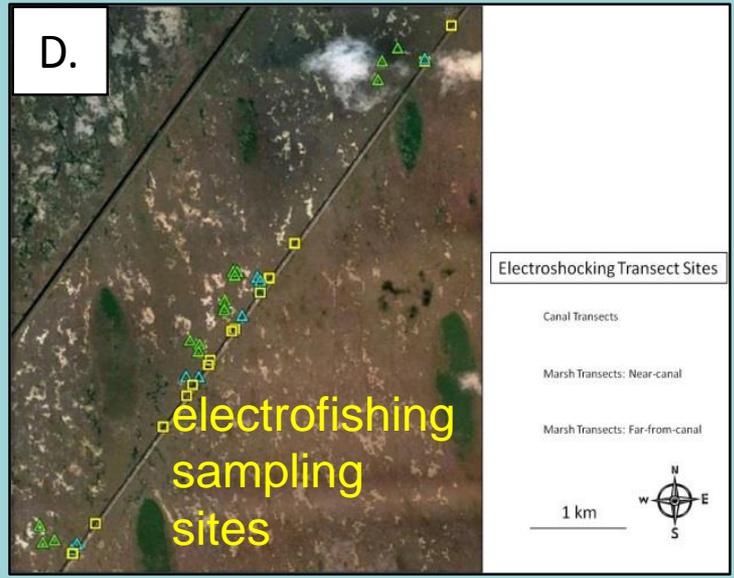
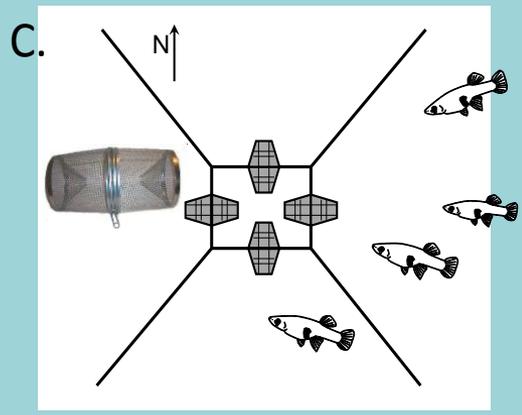
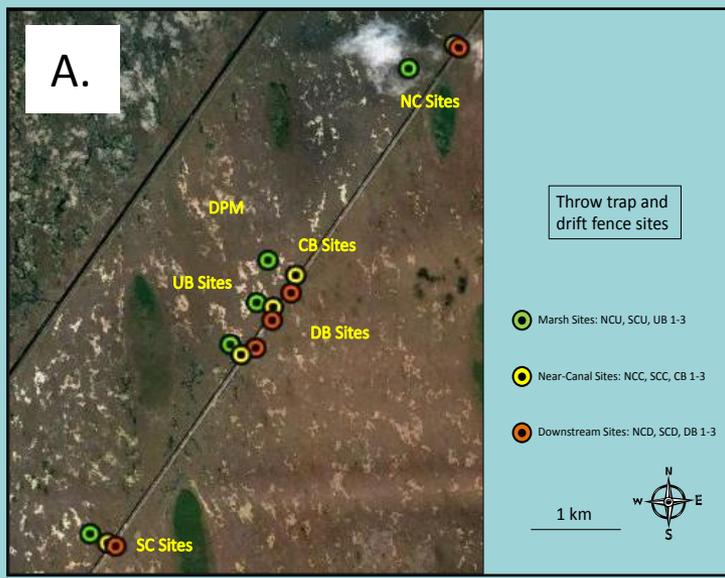
Marsh sediment traps



Canal sediment traps



Fish Response to Canal Treatments





Opening Day Nov. 5, 2013



USACOE and SFWMD Open Culvert Gates

