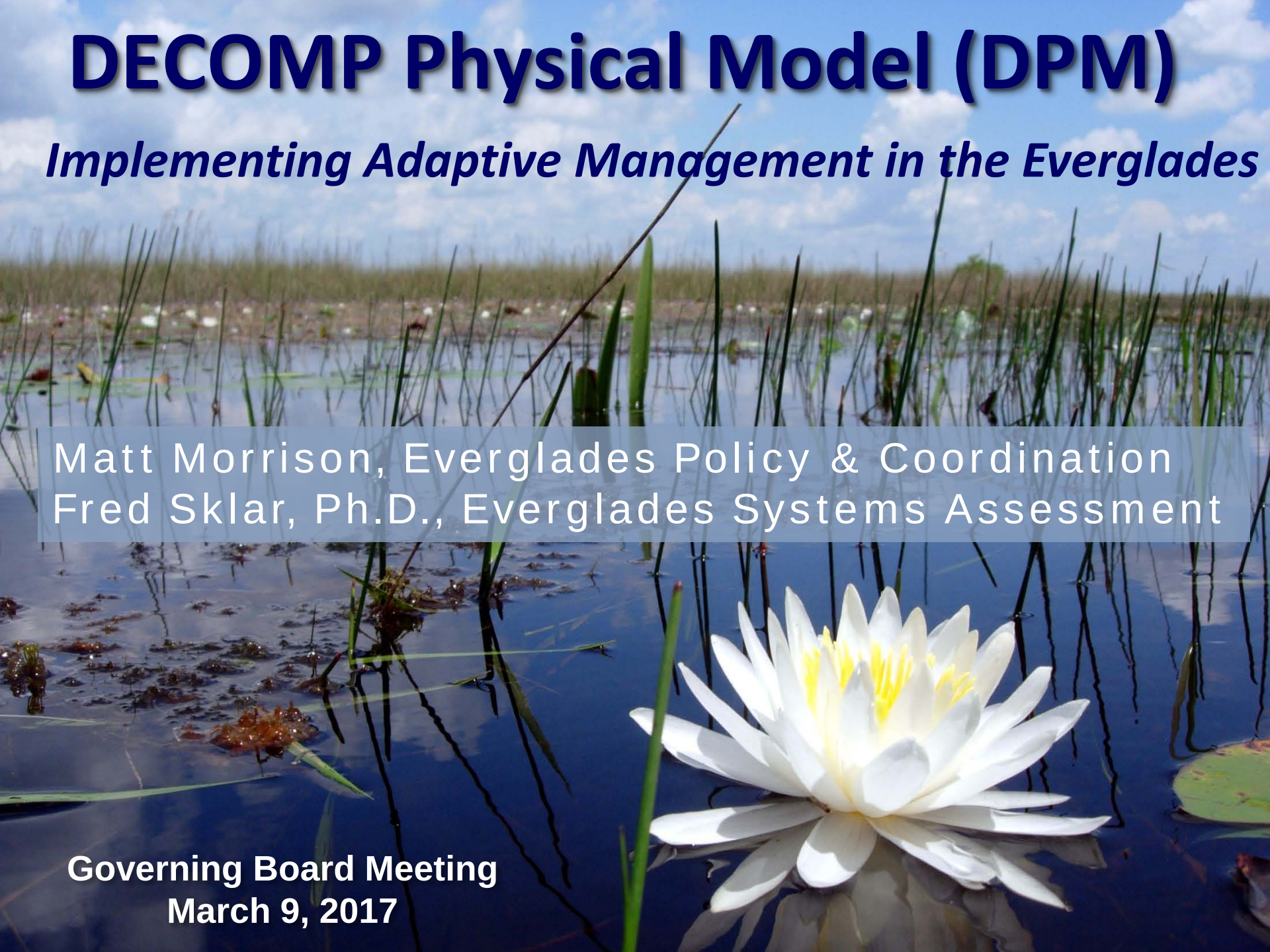
DECOMP Physical Model (DPM)

Implementing Adaptive Management in the Everglades

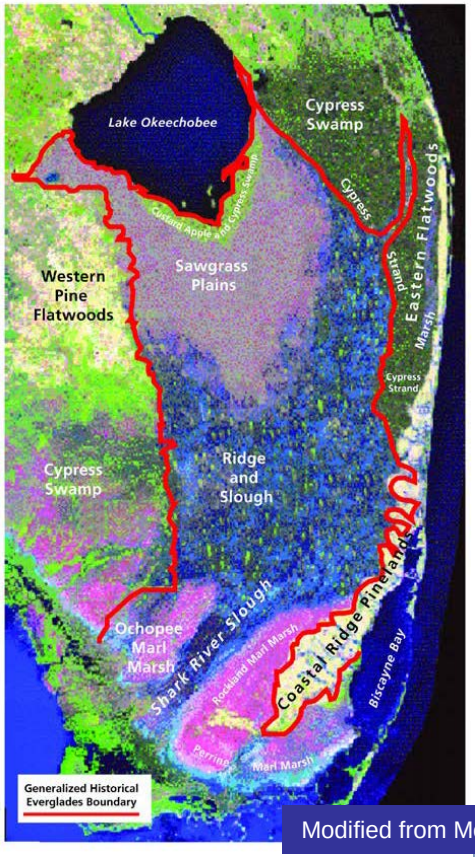


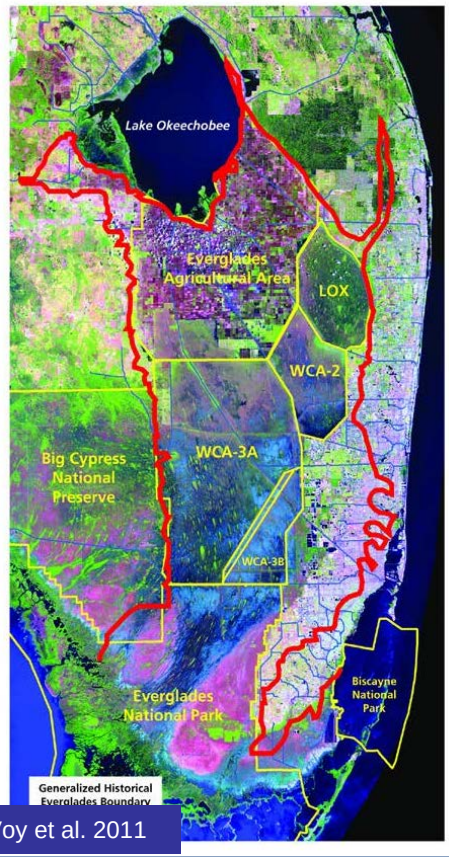
Matt Morrison, Everglades Policy & Coordination
Fred Sklar, Ph.D., Everglades Systems Assessment

Governing Board Meeting
March 9, 2017

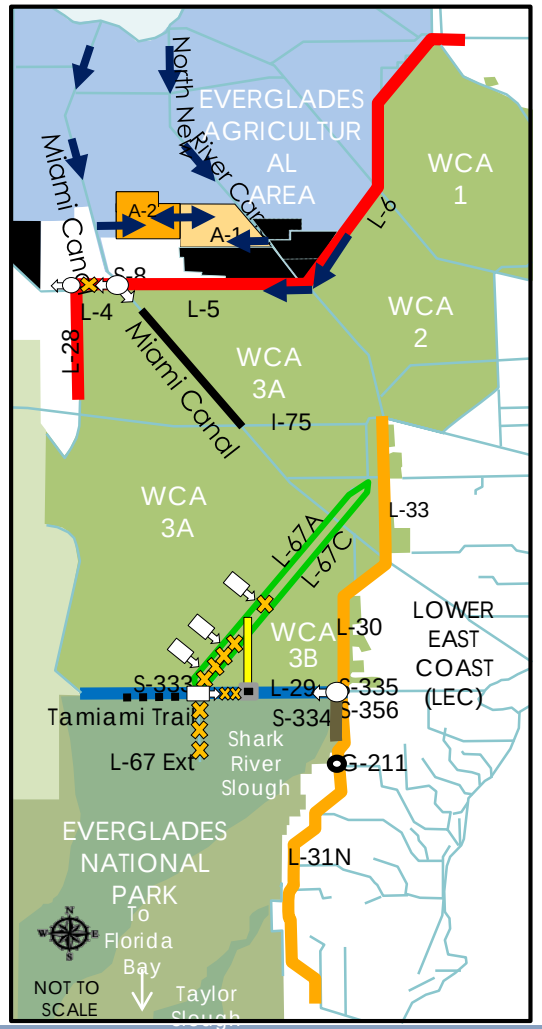
Central Everglades Planning Project (CEPP)

- Authorized in Water Resources Development Act in Dec 2016
- Projected Cost $1.98 Billion



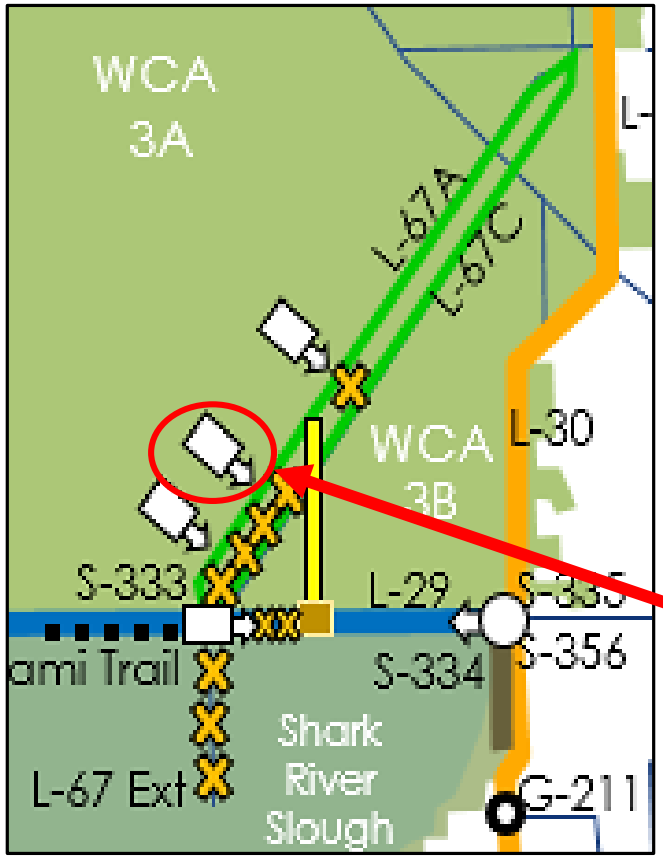


Modified from McVoy et al. 2011



Historic Everglades | C&SF Project | CEPP Plan

CEPP Distribution and Conveyance



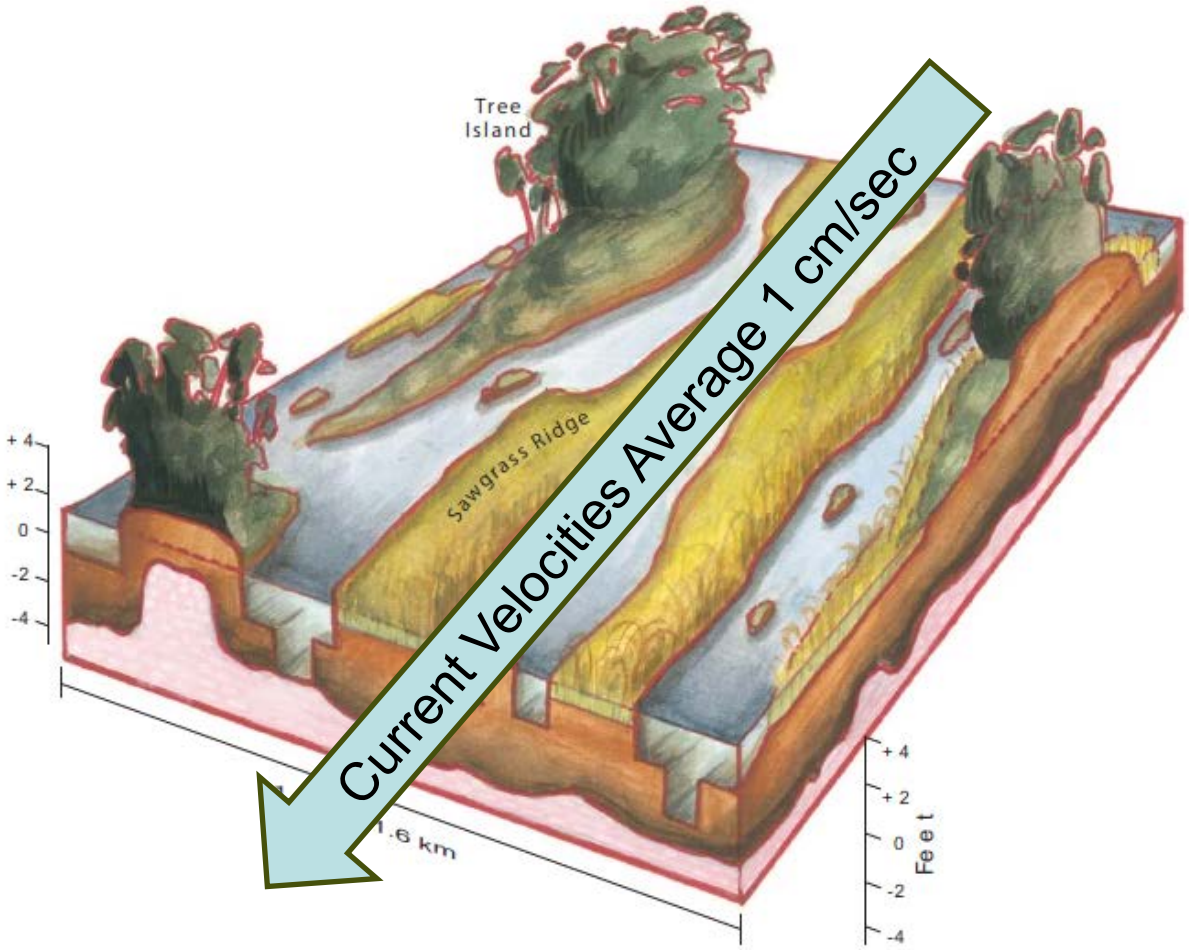
Decompartmentalization Uncertainties

- Extent of canal backfilling and levee removal required to maintain sheetflow
- Surface water flow velocity required for creating and maintaining ridge and slough habitat and landscape
- Influence of new project features on water quality

Decomp Physical Model

- Provides opportunities to address project uncertainties
- Includes adaptive management strategies to help inform project implementation and future project operations

Restoring Ecological Function Means Restoring the Ridge-Slough-Tree Island Pattern

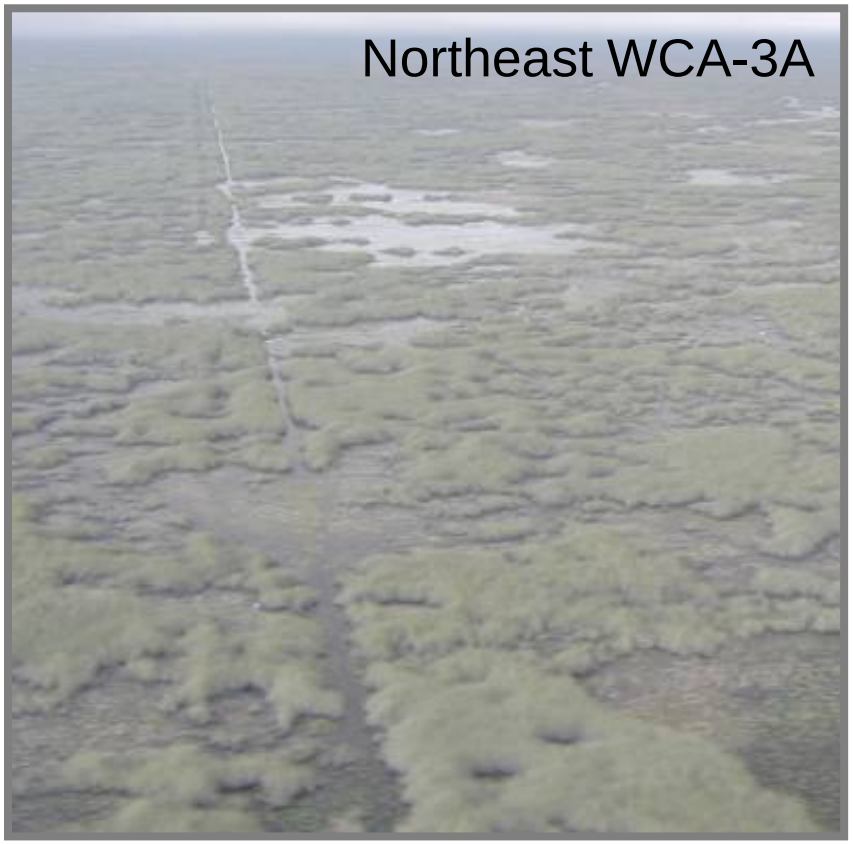


During the wet season, flows distribute nutrients, food and floc (Everglades "topsoil")

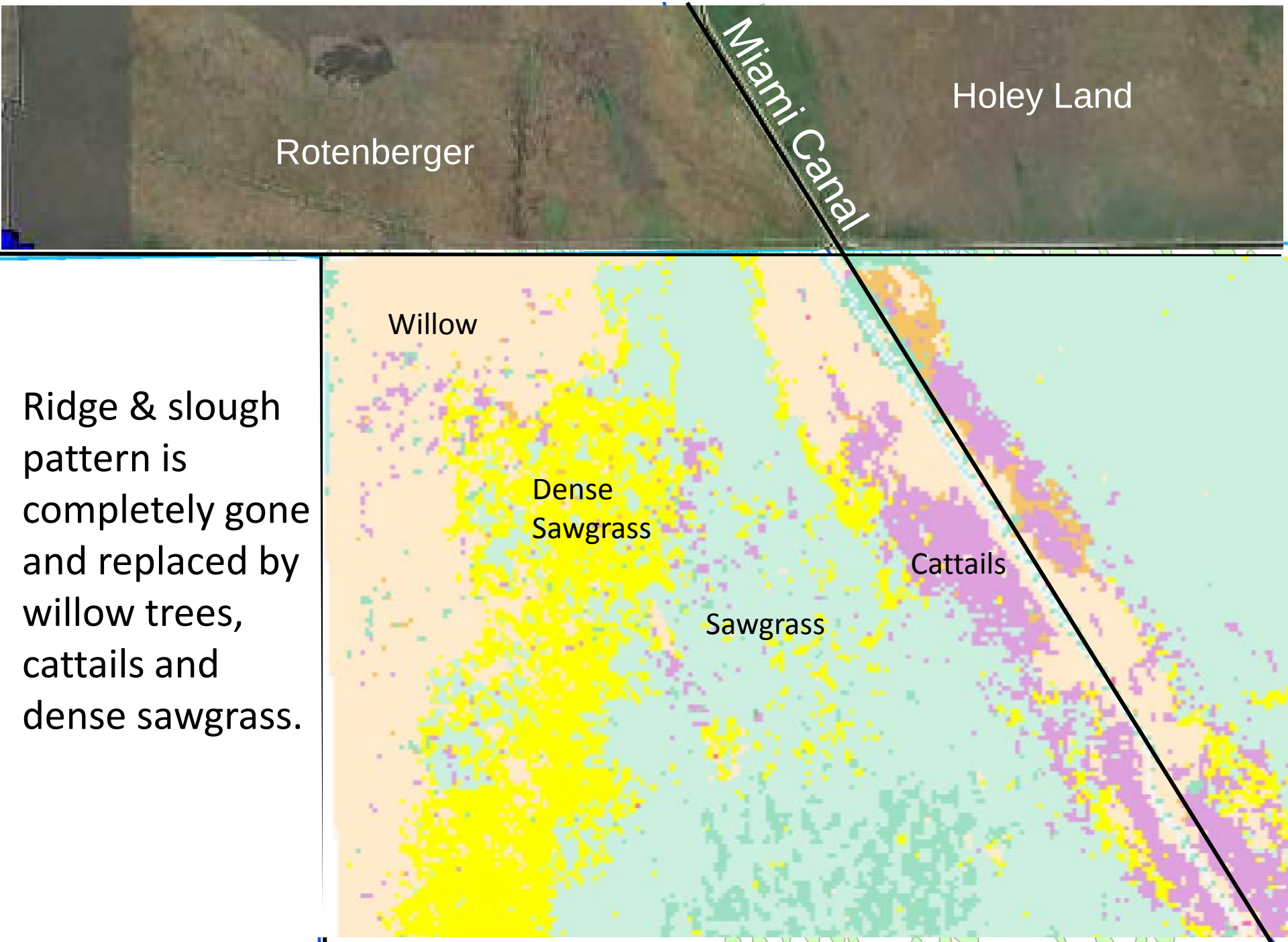
During the dry season, wading birds feed in the sloughs and nest in the tree islands

Deep Within the Everglades, Away From Any Influence of High Nutrient Inflows, Sloughs are Disappearing

Pre-drainage ridge & slough landscape pattern (50% slough)



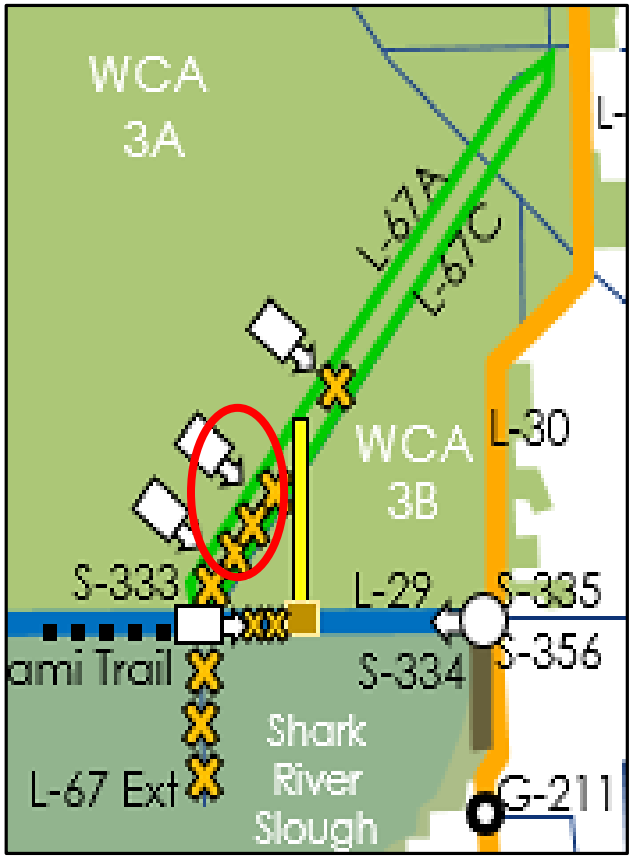
Impacted ridge & slough landscape pattern (30% slough)



Ridge & slough pattern is completely gone and replaced by willow trees, cattails and dense sawgrass.

Restoring Ecological Function Means Restoring the Ridge-Slough-Tree Island Pattern

What is the Decomp Physical Model (DPM)?



- A landscape manipulation (levee removal, canal fill and inflow culverts) designed to provide critical information of the hydrologic and ecological targets for Everglades restoration
- A pilot study that provides “ecological lift” to a drained system
- It is the second largest Adaptive Management project in the USA

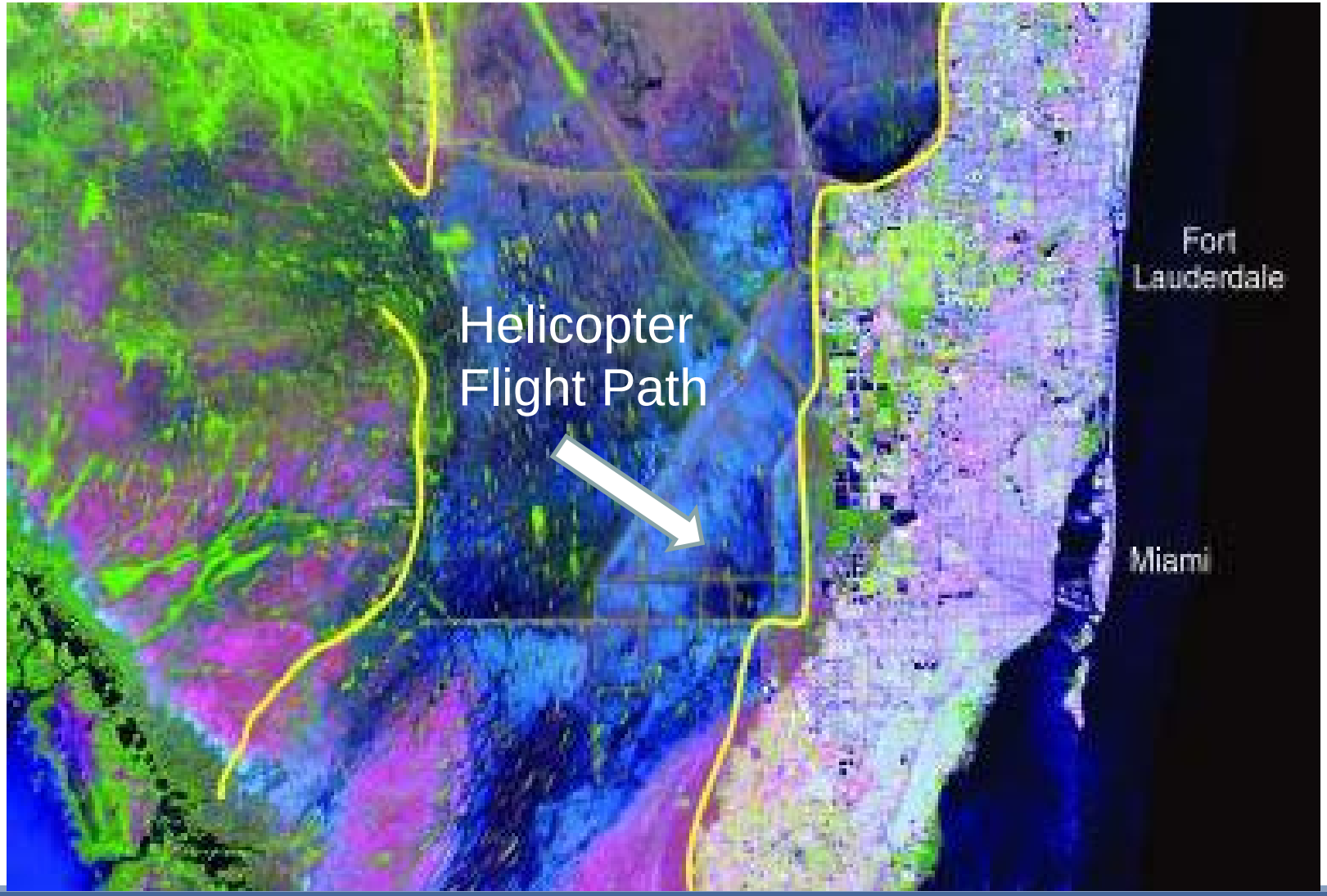
Specific Questions to be Answered by DPM

Uncertainty 1: 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?

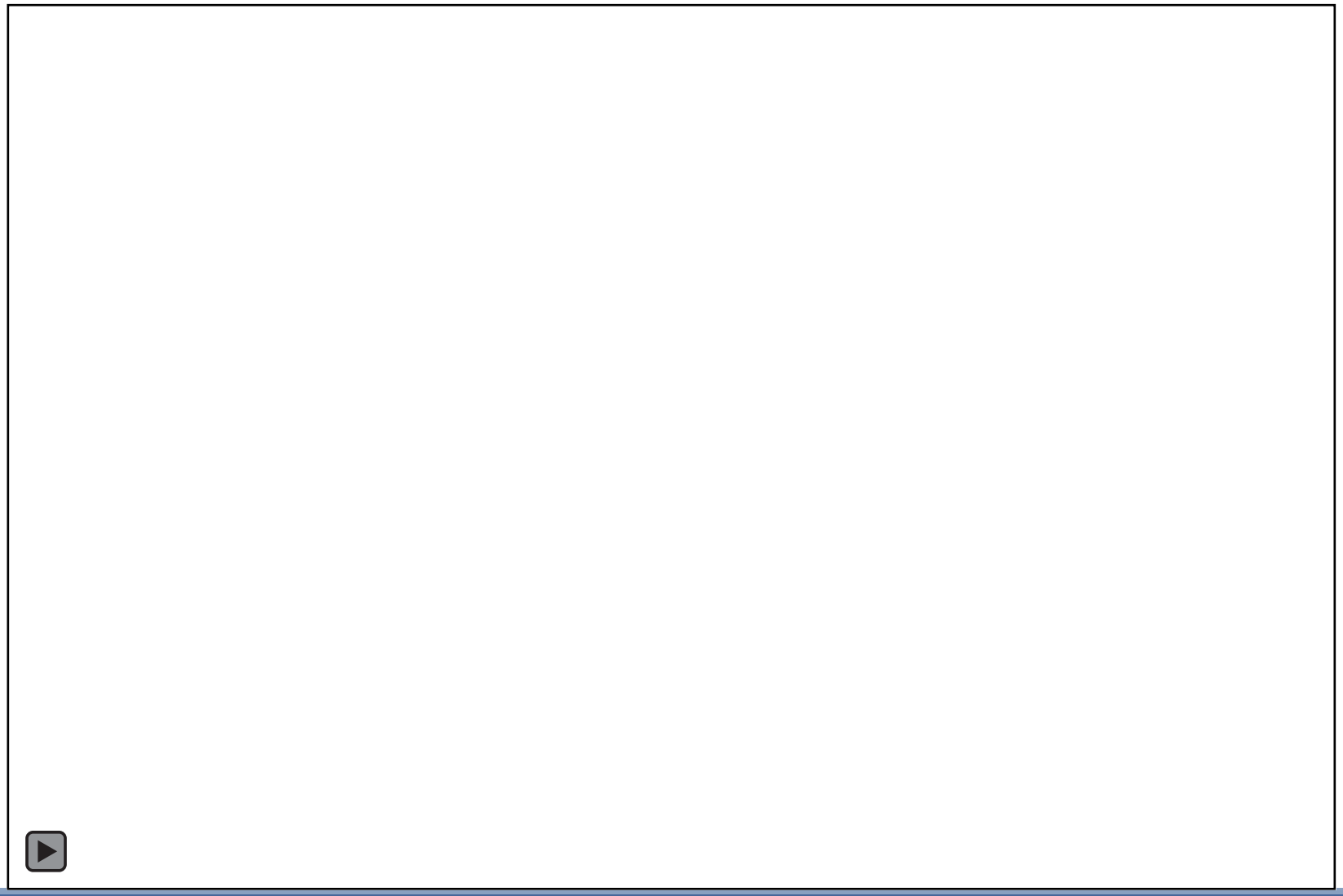
Uncertainty 2: Hydrology: Do canals need to be completely backfilled in order to achieve hydrologic restoration?

Uncertainty 3: 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?

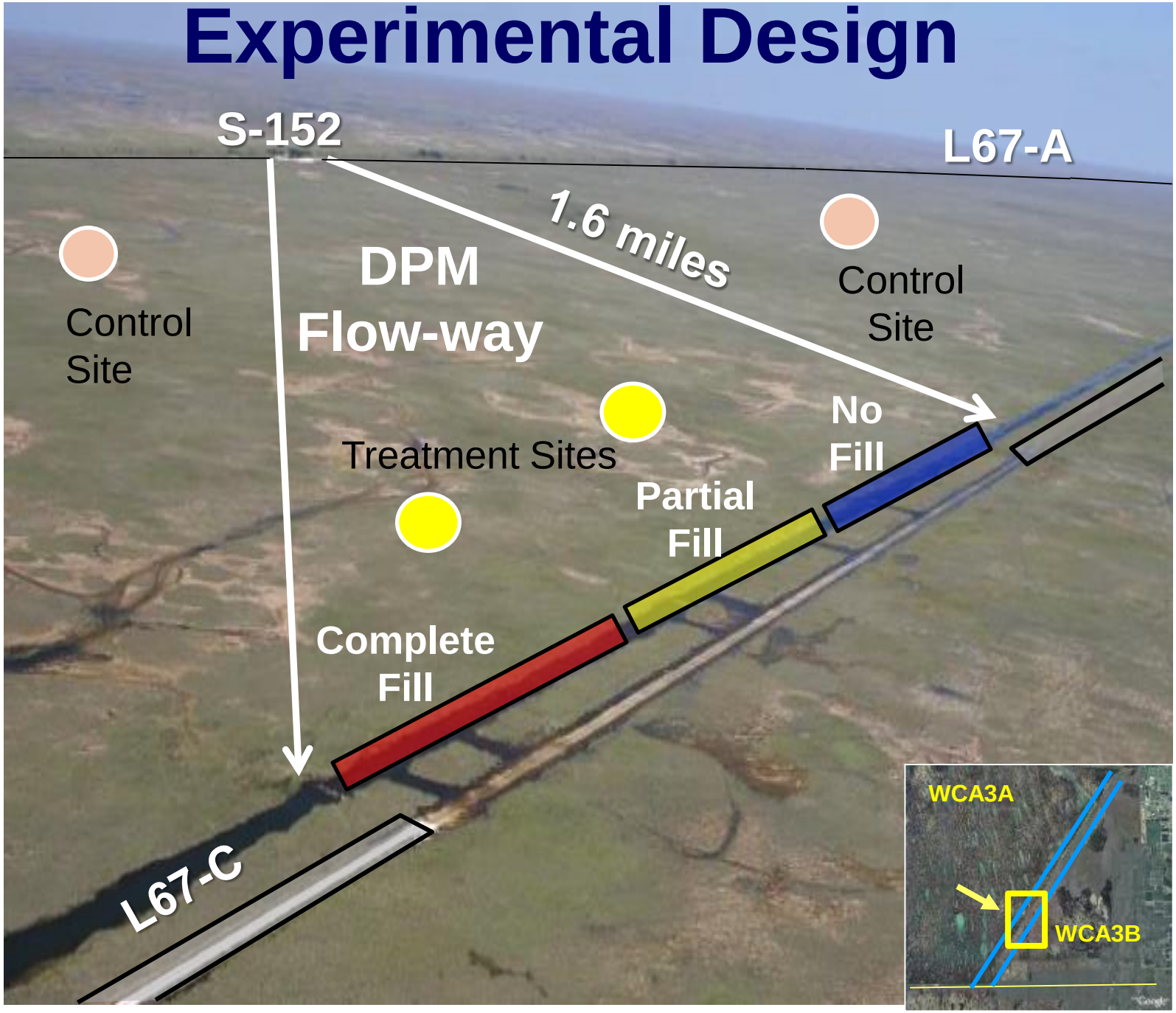
Aerial Overview of DPM Project Location



Aerial Overview of DPM Project Location



Experimental Design

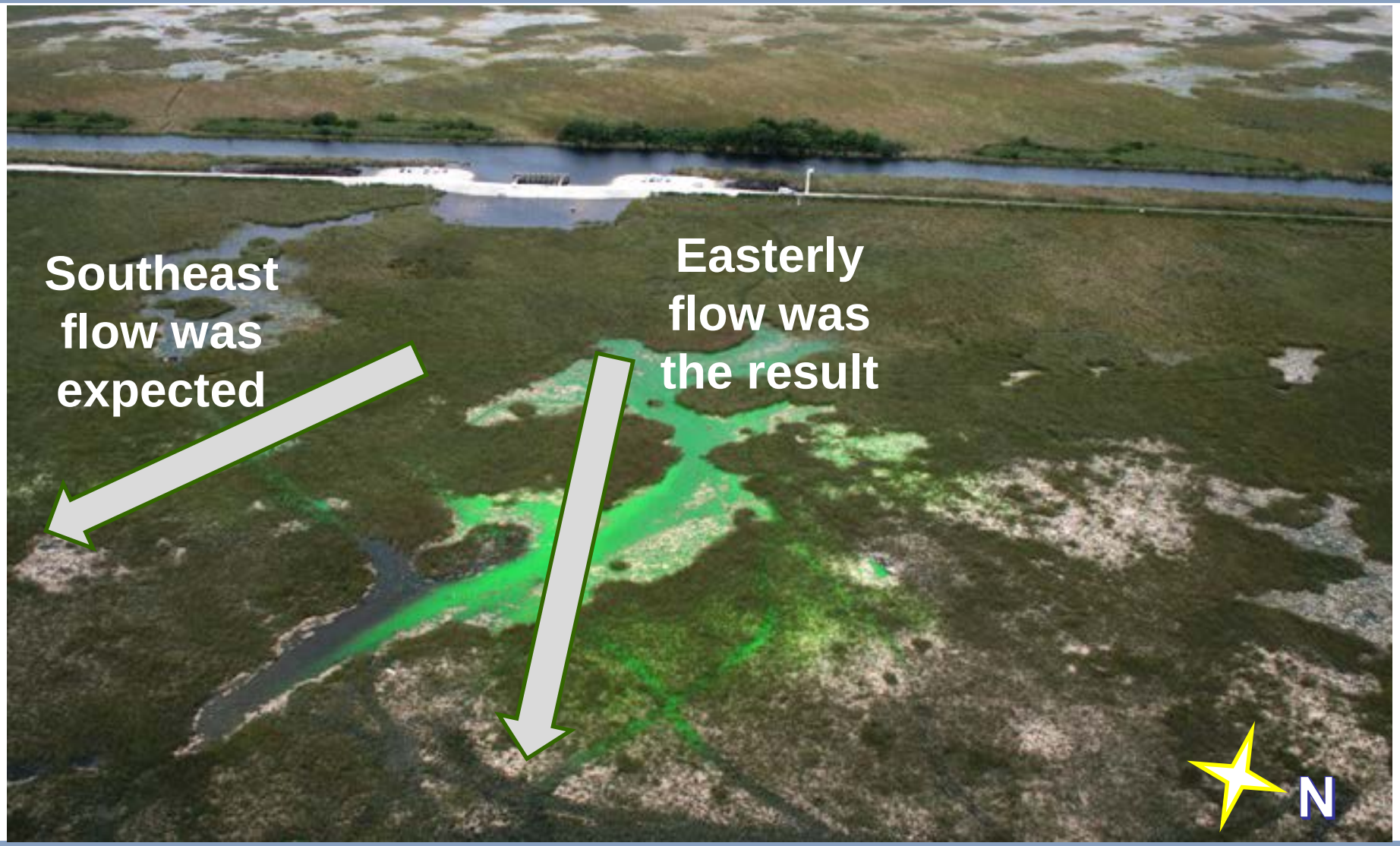


U.S. Army Corps of Engineers was Responsible for Project Construction

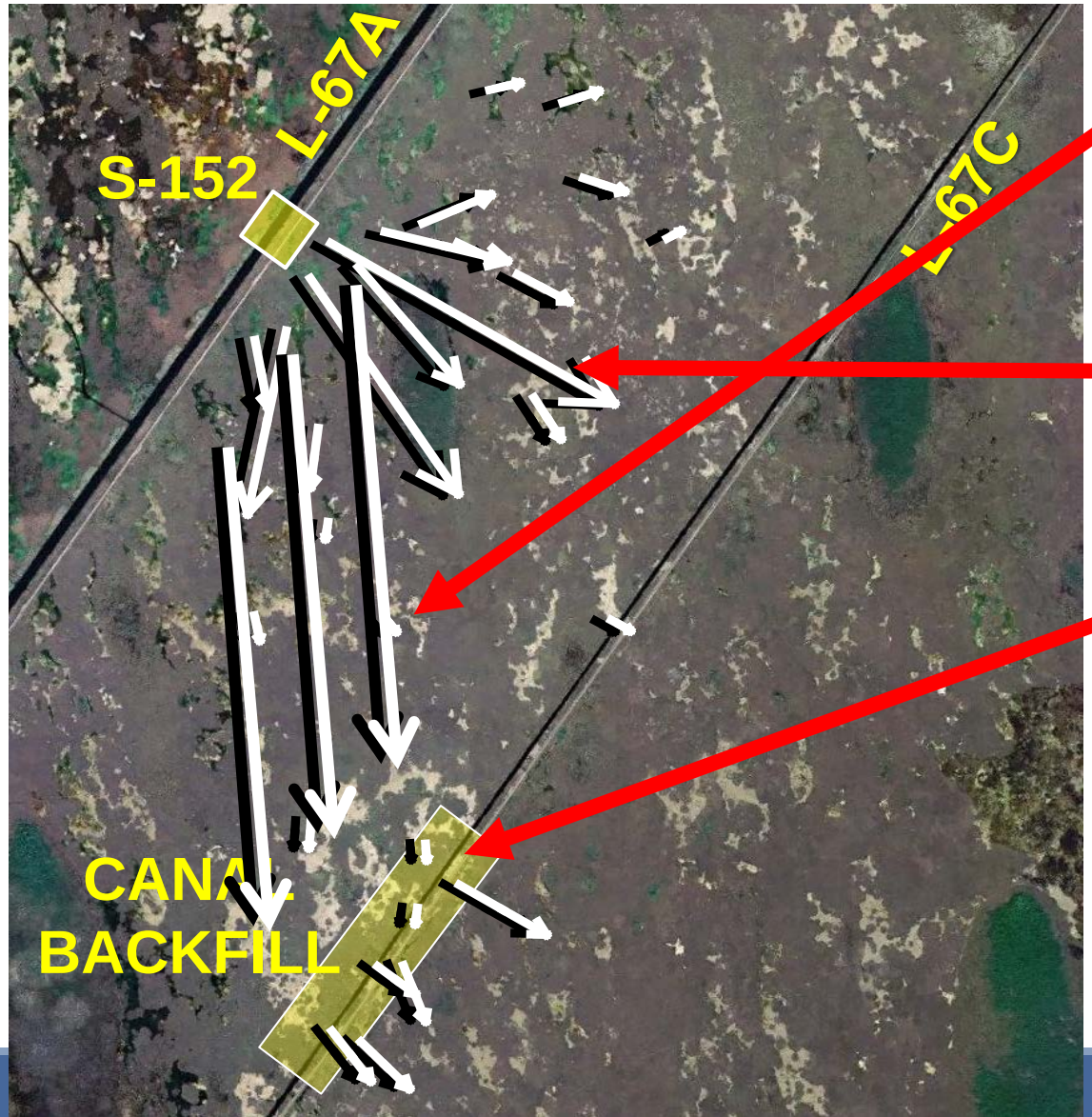
S-152 Discharge Structure includes 10 – 60” gated culverts

L67C canal backfill & levee removal

High Velocities (3-4 cm/sec) in the Sloughs at 1300 hrs, But Not in the Direction Expected



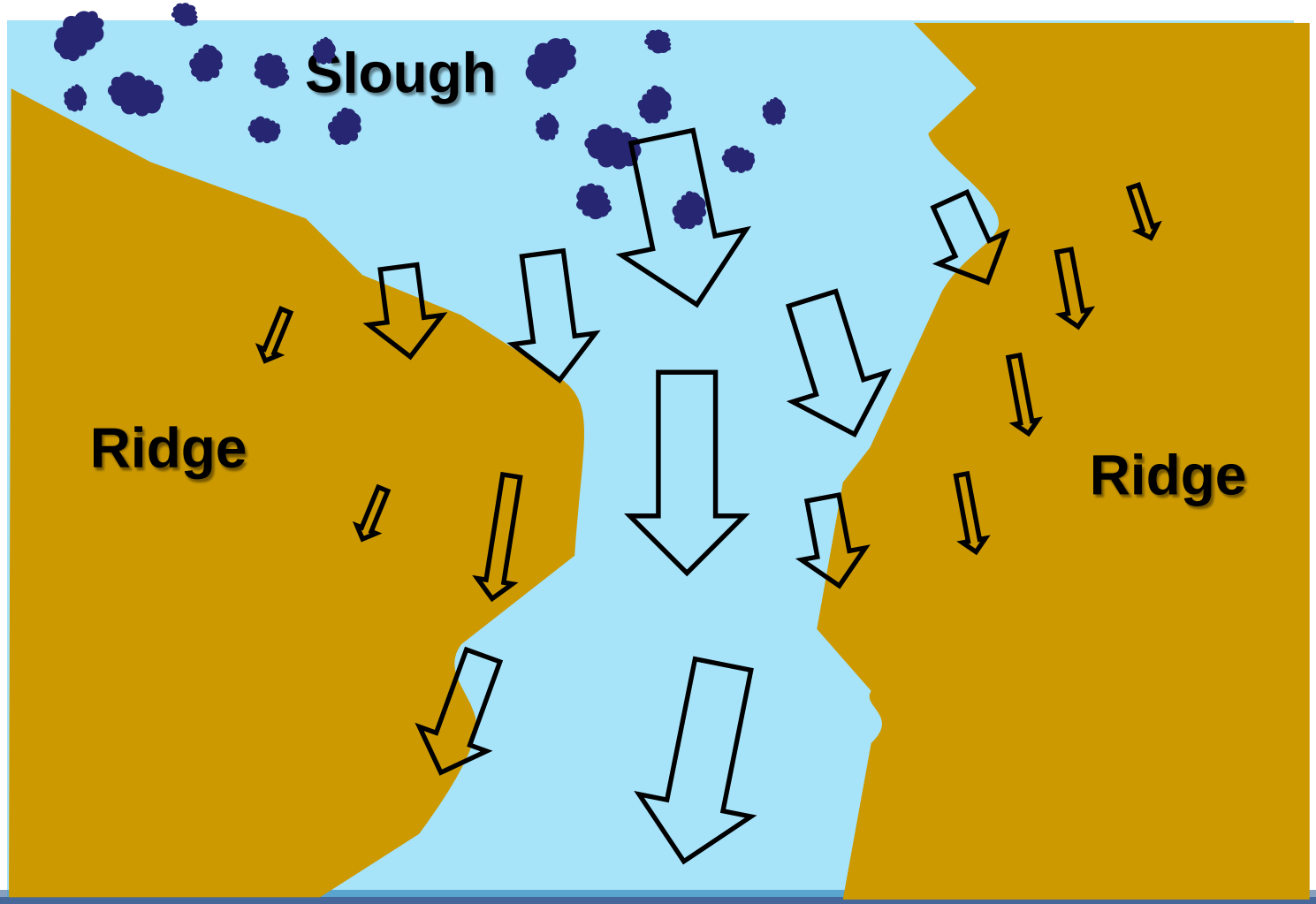
DPM Hydrologic Flow Fields: Using Velocimeters and Water Tracers



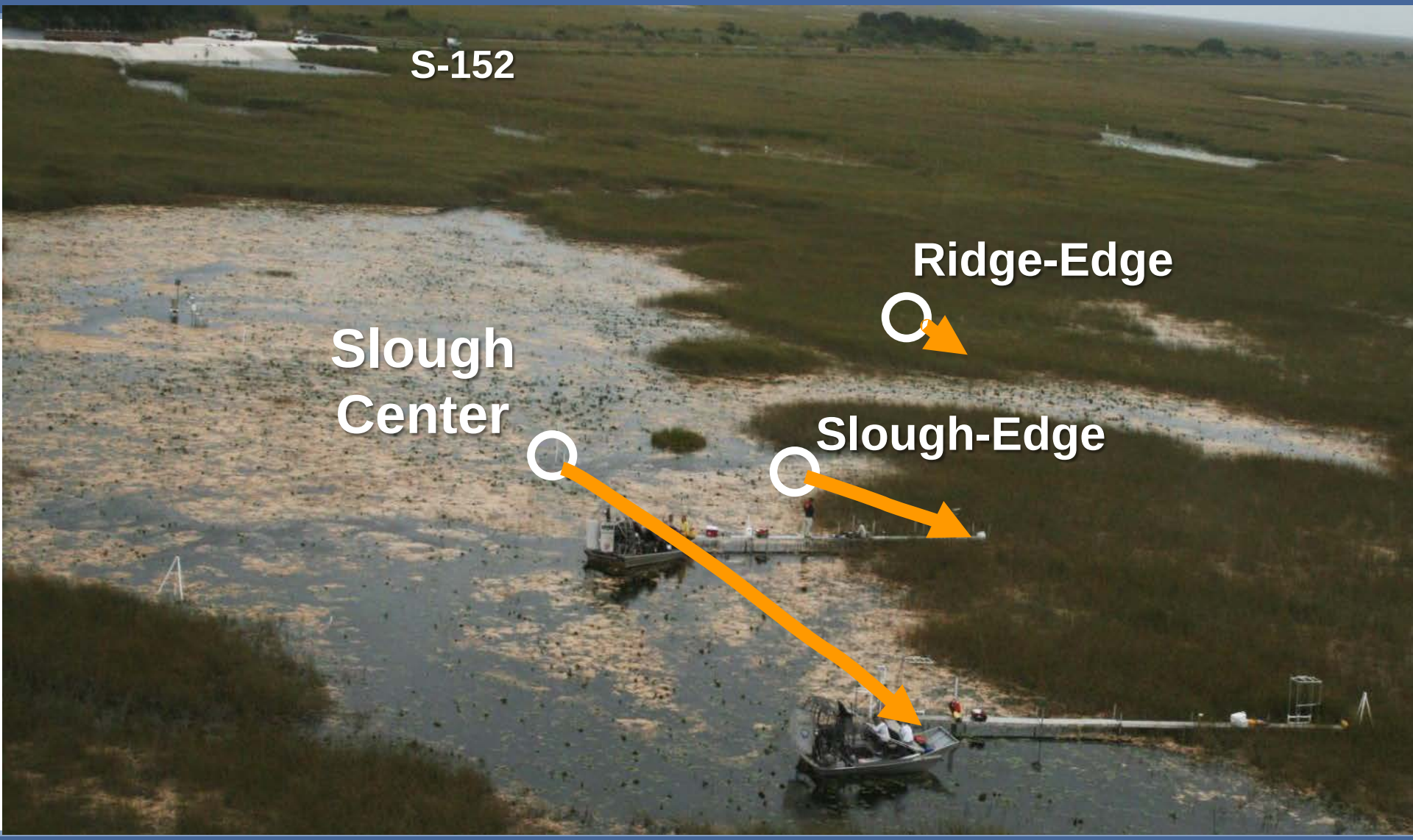
- Flows did not follow the ecologically preferred pattern
- Velocities across the pocket ranged from 2 -10 cm/sec
- High flows were detected in the gap in the L-67C

Why do we care about velocity?

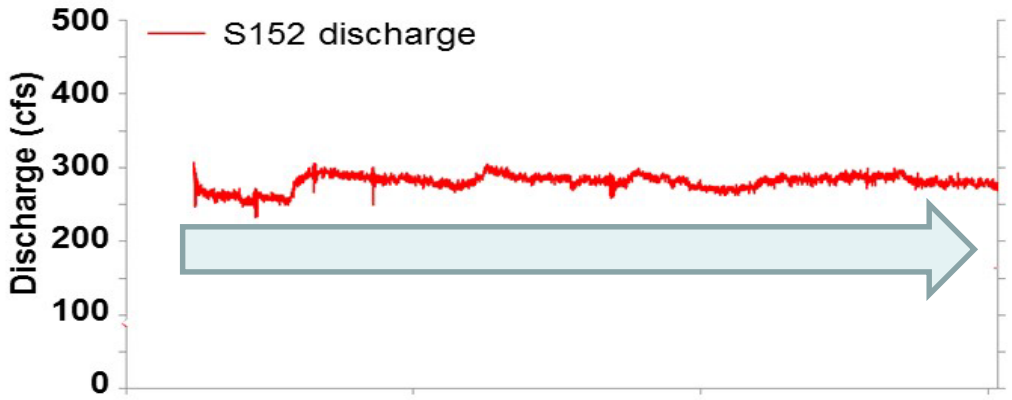
Because high flows can redistribute floc from sloughs to ridges



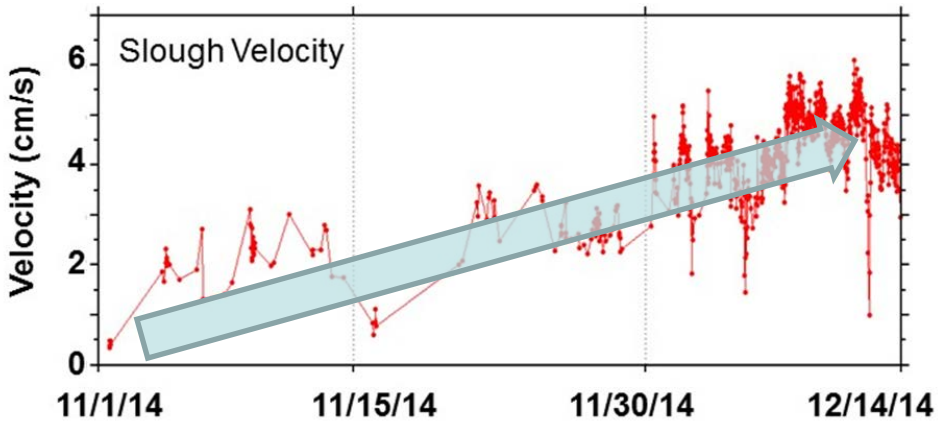
Tracking Floc Movement and Deposition



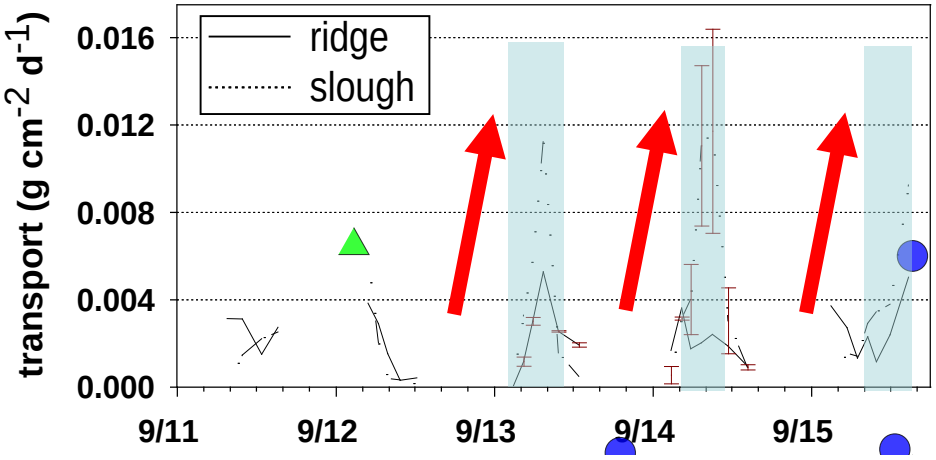
Sustained Flows Resulted in Increased Slough Velocities & Floc Transport



Discharge from S-152 was constant



Slough velocities <u>increased</u> with sustained flow



Floc transport <u>increased</u> with sustained flow

Data from J. W. Harvey, J. Choi, M. Dickman

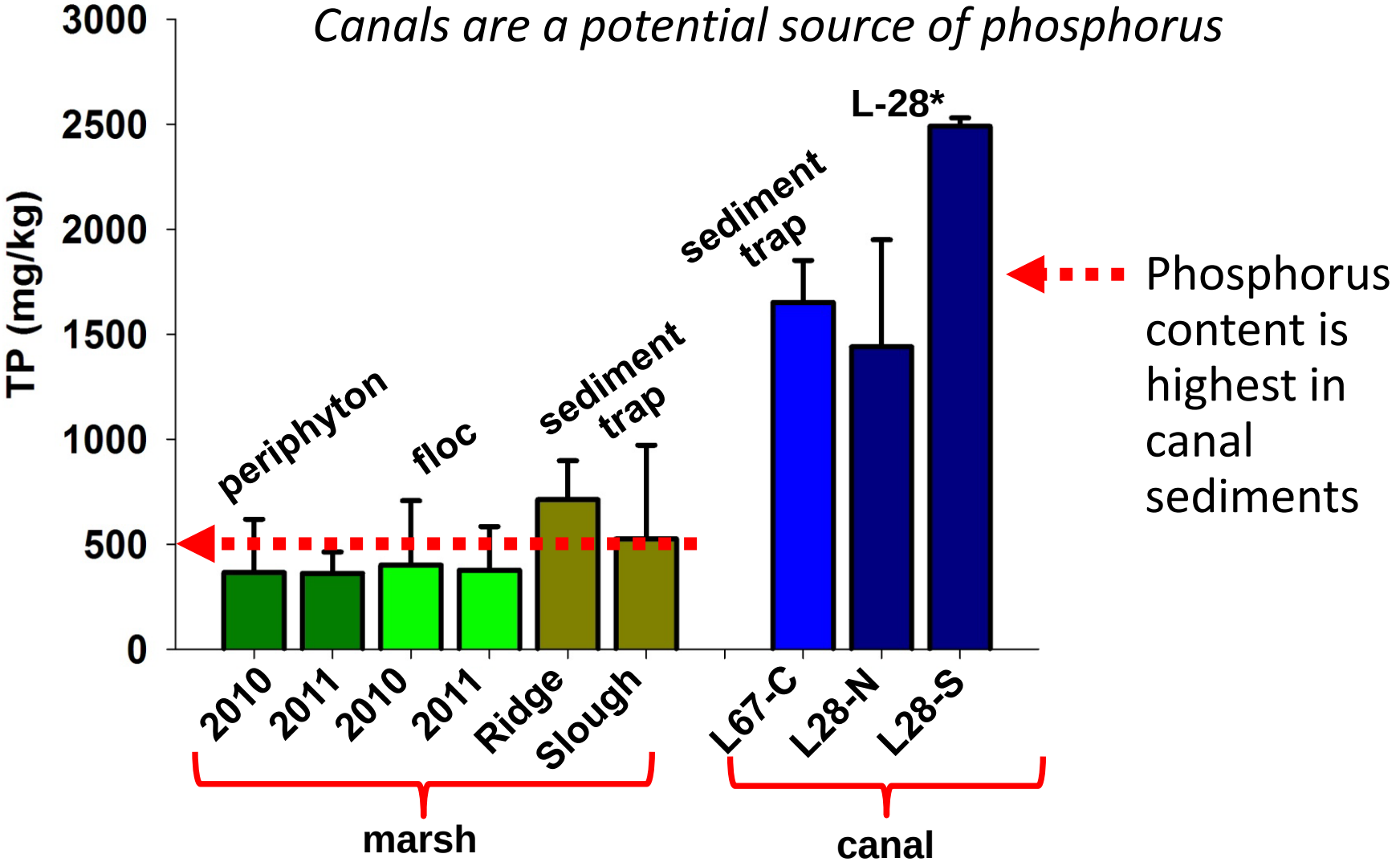
Floc Response to Flow

Canal Restoration Uncertainties

- Do canals reduce natural sediment transport?
- Do canals mobilize high-Phosphorus canal sediments?
- Does backfilling effectively bury canal sediments?
- Does backfilling alter fish habitat quality?

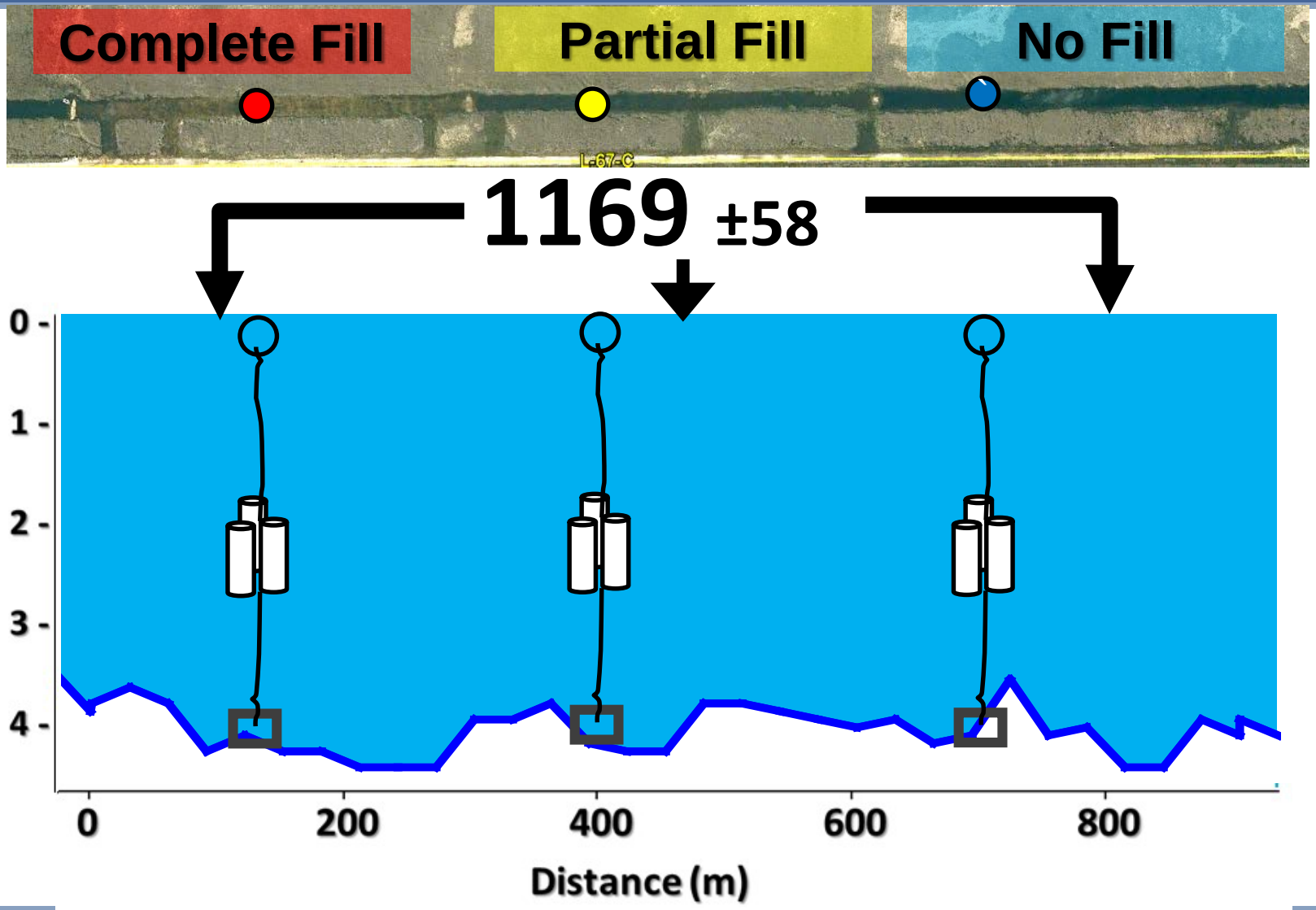
Phosphorus Sources: Marsh vs Canal

Canals are a potential source of phosphorus

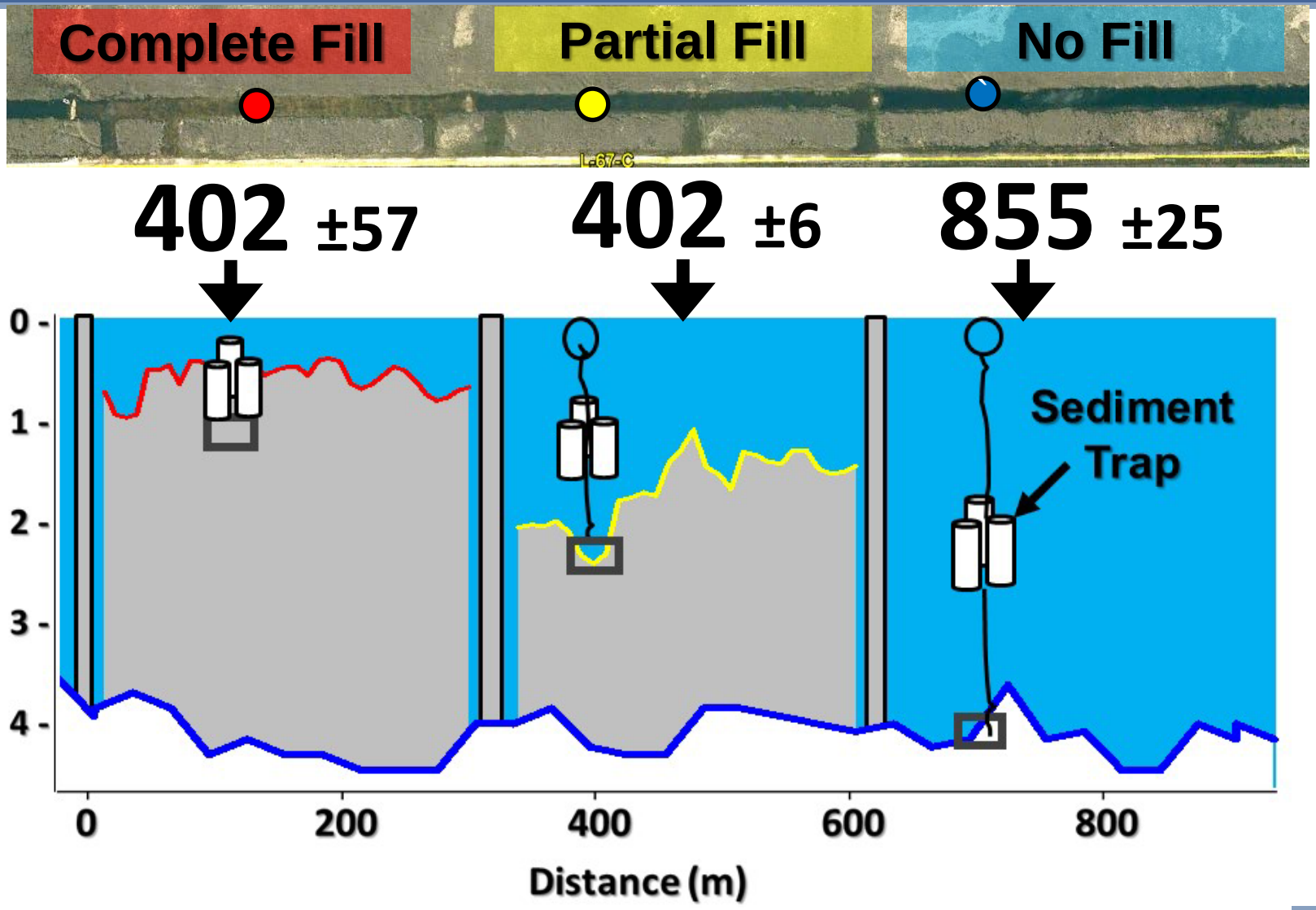


Data from L. Larsen (UCB), J. Harvey (USGS), C. Saunders and C. Coronado-Molina (SFWMD).
* L-28 data from Merkel & Hickey-Vargas 2000

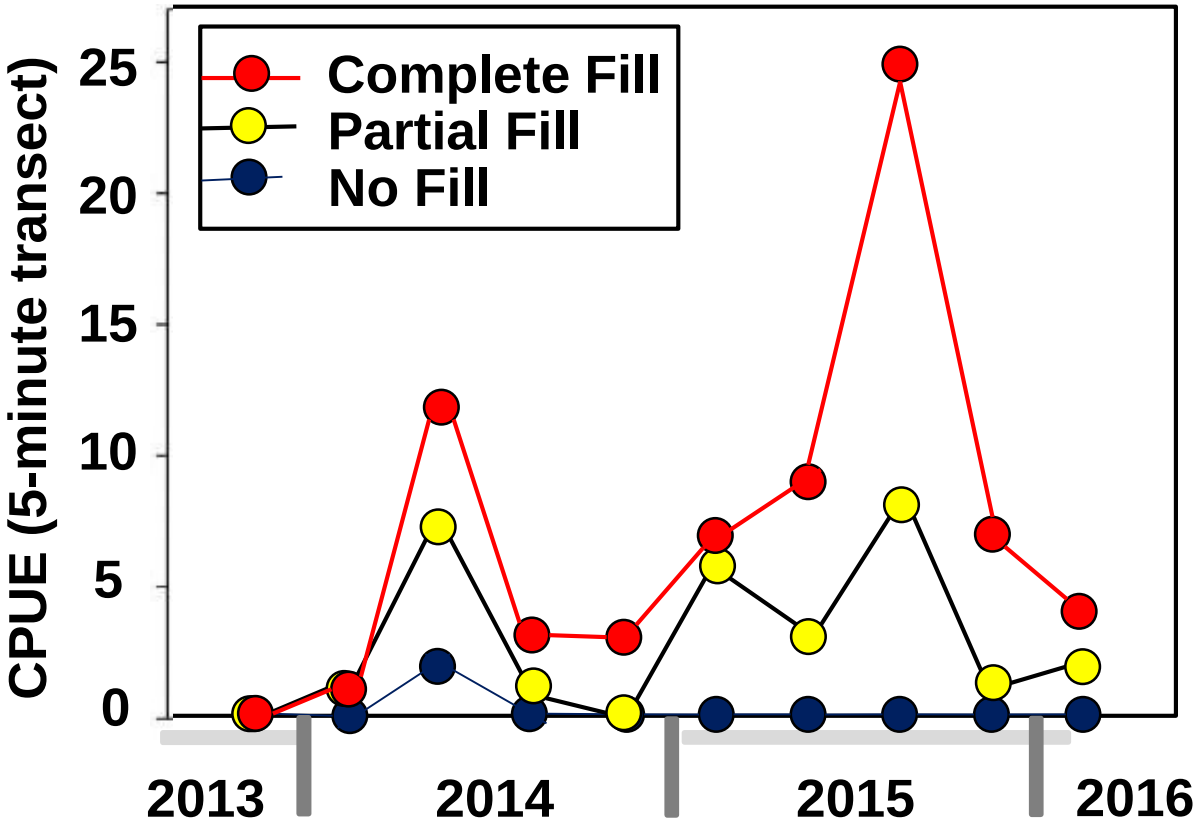
Phosphorus Levels in L67C Canal Sediments *Before* Backfilling (mg/kg ±SE)



Phosphorus Levels in L67C Canal Sediments *After* Backfilling (mg/kg ±SE)



Backfilling and Fish Habitat Quality



Backfill treatments created more high quality fish habitat

Revegetation of backfill areas continues to evolve and will be monitored as part of DPM Phase 2

CPEU = Catch per Unit Effort

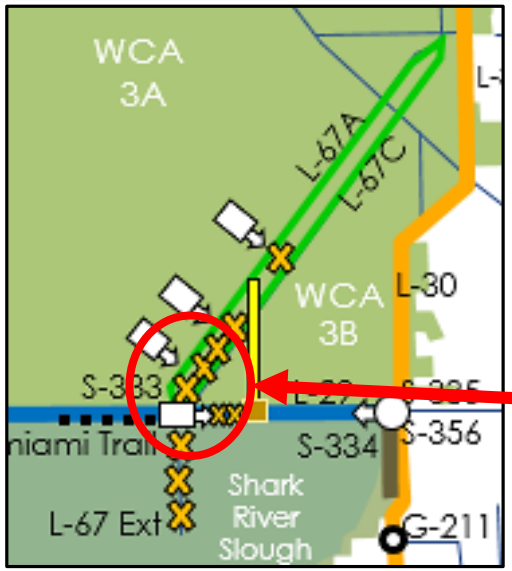
Data from J. Trexler

Key Decomp Physical Model Results*

- Surface water flows are not following the historic ridge and slough flow-paths.
- Sustained flows and high velocities are needed to rebuild the ridge and slough topography.
- Sustained flows increase slough velocities and sediment transport.
- Canals with limestone fill can prevent canals from acting as sediment traps.
- Backfilling canals can improve habitat quality for large fish.
- Canals with limestone fill can cap the legacy phosphorus and reduce sediment phosphorus transport downstream.

*** Findings are preliminary as canal treatments continue to recover from construction disturbance and re-vegetation**

Extending Operation of the DPM



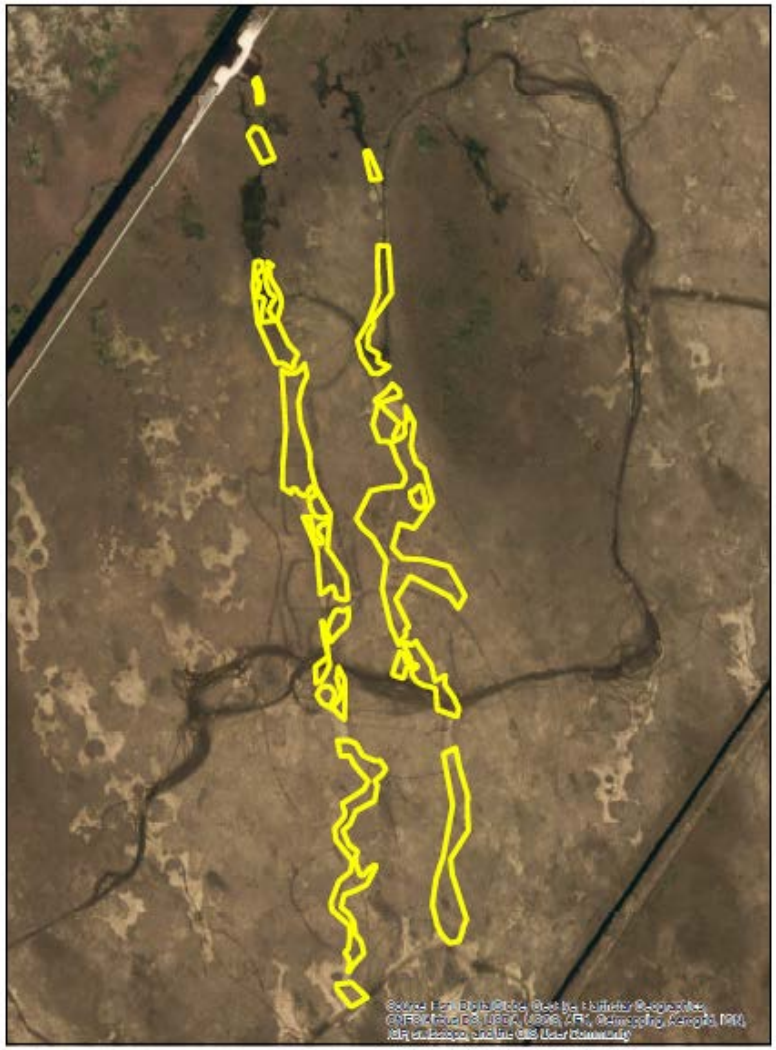
- In February 2016, DEP Emergency Order authorized continued use of S-152 to aid in relieving high water conditions in WCA3A
- Extended operation of the DPM over the next three years will increase flows into WCA-3B and reduce uncertainties associated with the Blue Shanty Flow-way
- Contract is item #20 on the March Governing Board agenda

DPM Phase 2: Focus on food-webs, *slough modifications* & WCA-3B

Can we "jump start" flow restoration?

DPM Phase 2: Focus on food-webs, *slough modifications* & WCA-3B

We will test the “jump start” concept by reconnecting old sloughs in the “pocket”



Questions?

Agenda Item # 20

Resolution No. 2017 - 0304

A Resolution of the Governing Board of the South Florida Water Management District to enter into a four-year contract with Florida Atlantic University to conduct field monitoring for assessing biological responses to sheetflow and canal filling, as part of the Decomp Physical Model project in an amount not to exceed $550,000 of which $125,000 is budgeted in Fiscal Year 2016 - 2017 from Alligator Alley Toll funds and the remainder is subject to Governing Board approval of future year budgets. (Contract No. 4600003624)