SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Status of the DECOMP PHYSICAL MODEL (DPM)

Joint Meeting of Working Group and Science Coordination Group

22 October 2009

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Everglades Division of the SFWMD

sfwmd.gov

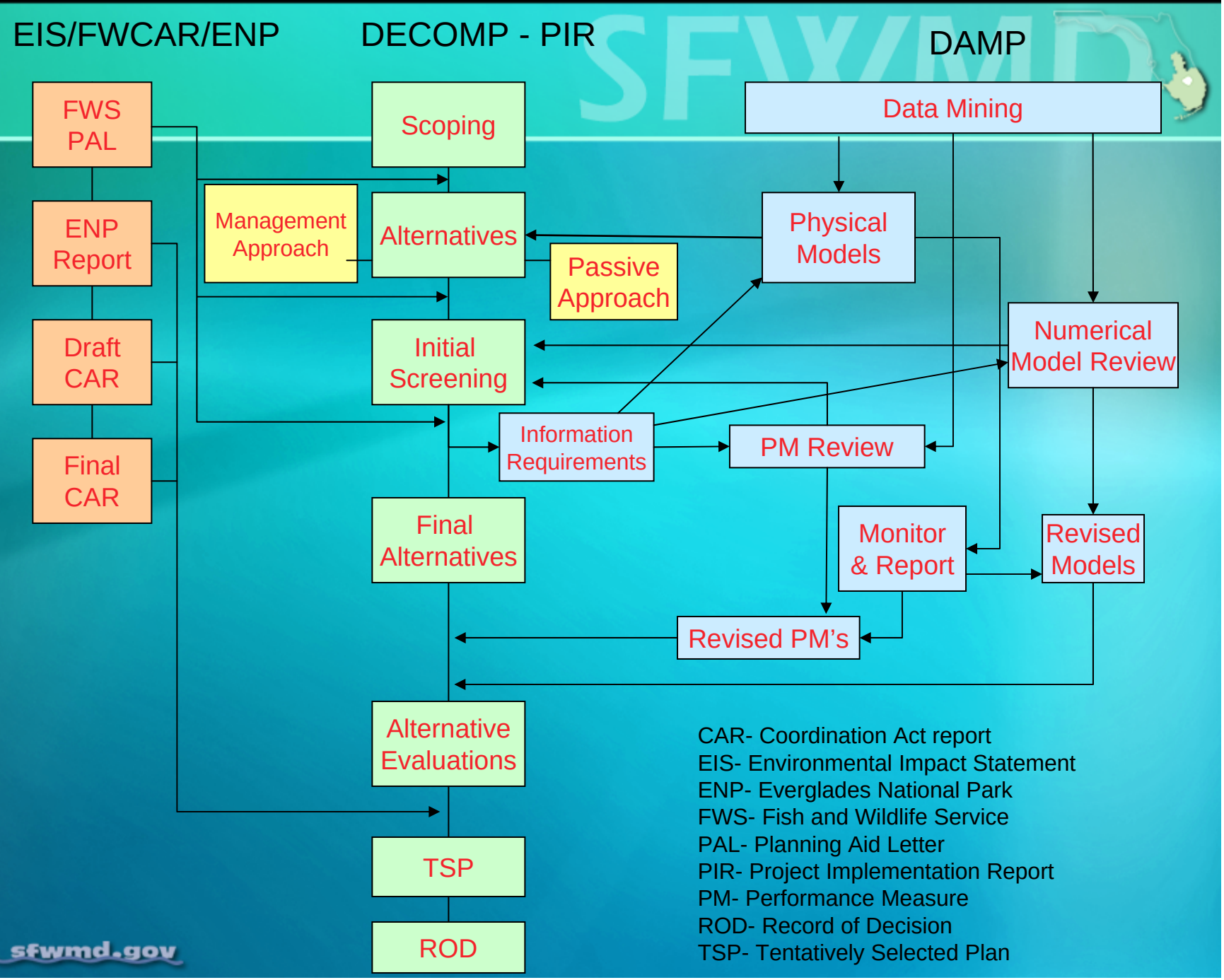
At Issue

- **By February 2005 it was recognized by the DECOMP Project Development Team (PDT) that there were fundamental problems hindering the development of the Project Implementation Report (PIR).**
- **Decomp Scientific Uncertainties:**
  - *Effects of partial versus extensive backfilling of canals*
  - *Quantification of the ecological benefits of sheetflow*
  - *Ecological effects of levee modifications*
  - *Water depth and hydroperiod tolerance of tree islands*
  - *Assessment of seepage*
  - *Calibration of hydrologic models*

The Solution: The DECOMP Adaptive Management Plan (DAMP) Physical Model

Purpose

- To addresses uncertainty and constraints in Everglades restoration to assist in the DECOMP PIR.
- Use multi-agency collaborative approach (with stakeholder input).
- To refine our understanding of ecological benefits to support the selection of alternative plans.
- Find best restoration design for DECOMP, without compromising water supply or flood control.
- To obtain a better scientific understanding of how “pristine” and “impacted” regions of the ecosystem will respond to hydrologic restoration.



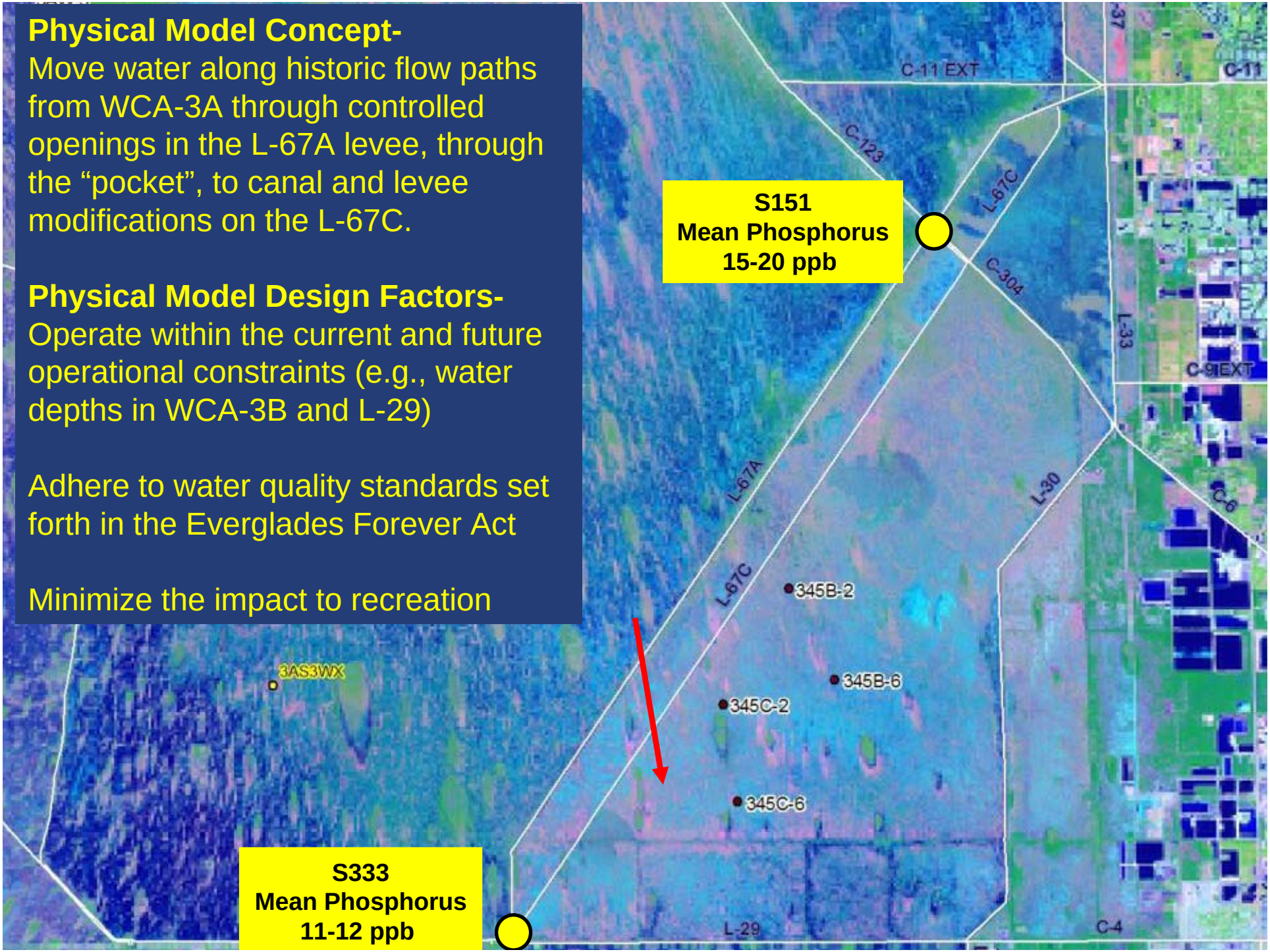
CAR- Coordination Act report
EIS- Environmental Impact Statement
ENP- Everglades National Park
FWS- Fish and Wildlife Service
PAL- Planning Aid Letter
PIR- Project Implementation Report
PM- Performance Measure
ROD- Record of Decision
TSP- Tentatively Selected Plan

Physical Model Concept-
Move water along historic flow paths from WCA-3A through controlled openings in the L-67A levee, through the “pocket”, to canal and levee modifications on the L-67C.

Physical Model Design Factors-
Operate within the current and future operational constraints (e.g., water depths in WCA-3B and L-29)

Adhere to water quality standards set forth in the Everglades Forever Act

Minimize the impact to recreation



A Brief History

- **Fall 2004-** Concept development to use large-scale field experiments (Physical Models) to reduce DECOMP uncertainties.
- **January 2005-** DECOMP Project Adaptive Management Strategy Development Workshop (DAMP).
- **February 2005-** DAMP, including physical models, *approach* presented to Quality Review Board (QRB) (Taplin).
- **April 2005-** DAMP presented to the NRC (Sklar)
- **September 2005-January 2006-** DECOMP scientific uncertainty, hypothesis, and physical model development.
- **March 2006-** "Description of the Physical Model Design Parameters" (Sklar, Newman, Hagerthey, Engle, Noe, Childers, and Trexler).

A Brief History

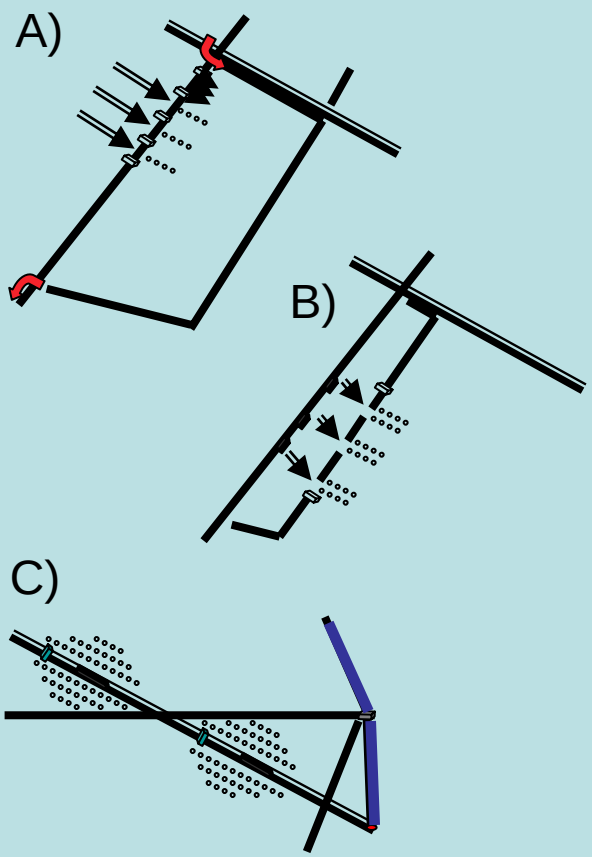
- **April 2006-** DAMP *concept* presented to the QRB. Includes Physical Model design options with the PRIUS model being favored.
  - Proposed design relied on 1 Modified Water Deliveries (MWD) conveyance/seepage feature (C&SF) (S-345)
  - Estimated cost of $10.3 Million over 5 years
    - $3.4M Levee Removal and Canal Backfill (assumed MWD in place)
    - $6.9M Monitoring and Field Assessment

- **2006-2007-** Physical model design work progressed based on MWD C&SF features. This was also the period of "Bigger & Bolder" and Integrated Adaptive Restoration (IAR).

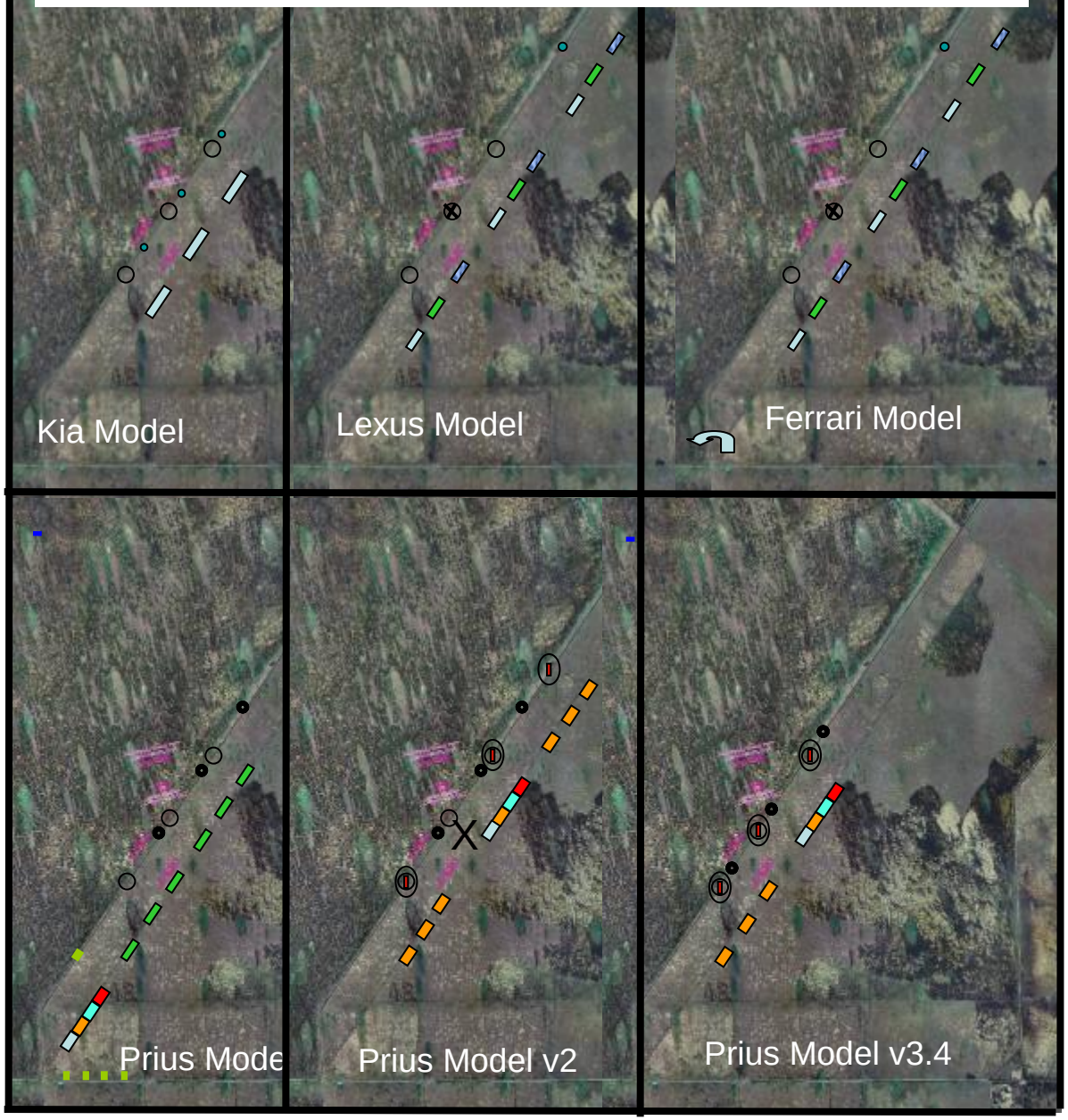
- **April 2007-** Physical Model presented at the National Conference on Ecosystem Restoration (Sklar).

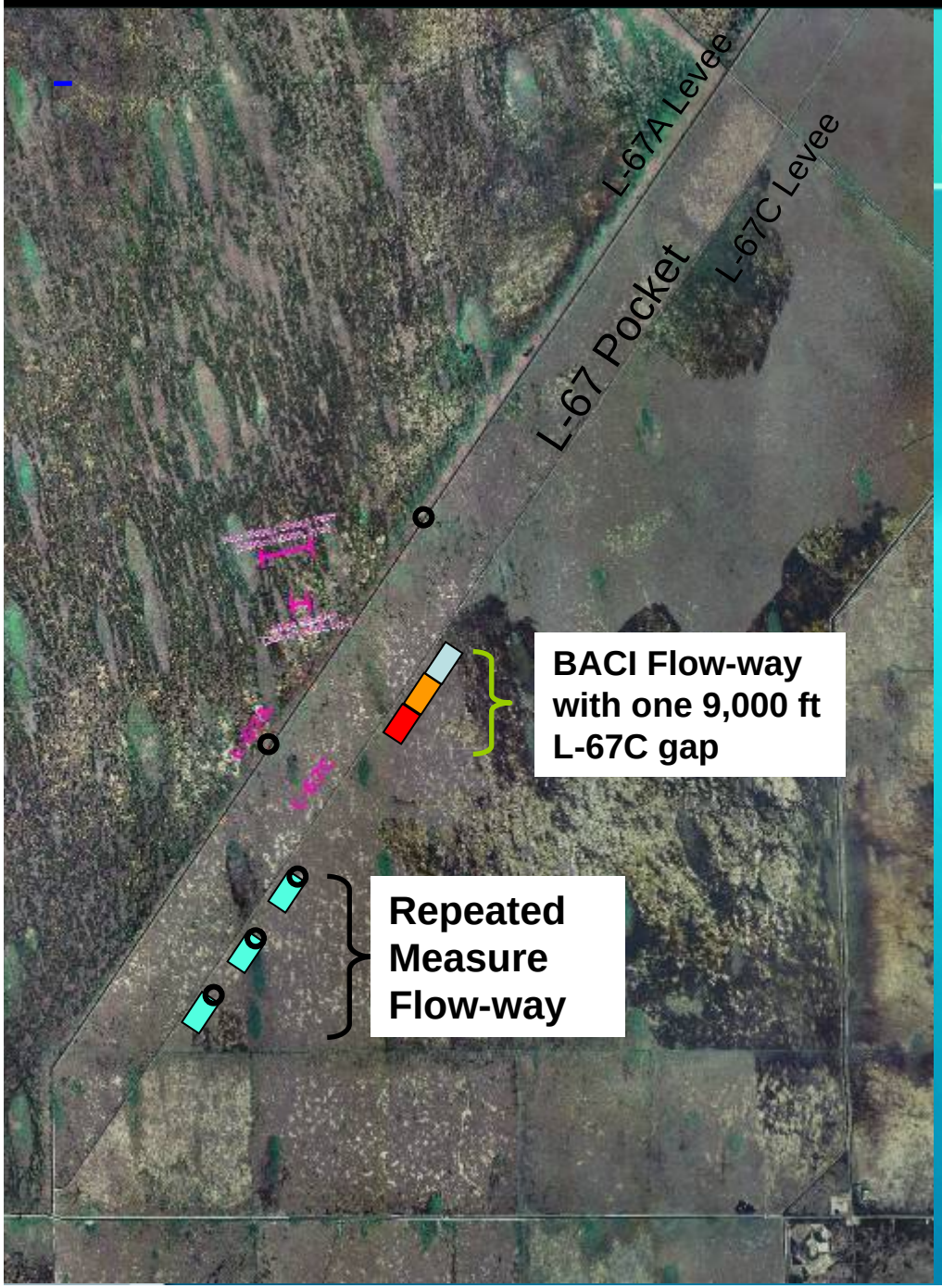
Physical Model Metamorphosis

Conceptual
Pocket Experiment
Designs 2005



Alternative DAMP Physical Models
2006-2007





THE DAMP PHYSICAL MODEL

February 2008

Prius Model v3.4

- 3000 ft gap (complete backfill)
- 3000 ft gap (canal plug with boat channel)
- 3000 ft gap (partial backfill)
- 3000 ft gap (no fill)

- Canal plug with boat channel

A Brief History

- **February 2008 -** Physical Model design put "on-hold" due to MWD financial and legal uncertainties.

- **July 2008-** DECOMP PDT decides to reinitiated project decoupled from MWD C&SF.

- **September 2008-** DECOMP Physical Model (DPM) design begins.
  - Move forward faster
  - Reduce uncertainties for DECOMP PIRs 2 & 3
  - Moving forward assuming $10.3M cost cap
  - Study design examines a pulsed-flow system
  - Reduced in scale

The Science Plan

TASKS

- Redesign the DPM without the MOD Waters features
  - Determined the feasibility of addressing DECOMP uncertainties
  - Developed ecosystem conceptual models
  - Developed sets of testable hypotheses
- Remain within the $10.3 million Cost Cap
  - **~$8 million construction; $2.3 million science**
- Identify constraints and assumptions
  - Appendices to Science Plan
- Identify the physical features required for the DPM and their locations
- Develop the Science Plan
  - Statistical design
  - Parameter determination for each hypothesis
  - Methods selection
  - Sampling frequency and logistics
- Conduct NEPA Scoping meetings

DPM Science Team

- SFWMD: Fred Sklar, Scot Hagerthey, Sue Newman, and Colin Saunders
- ACOE: Kelly Legault and Sue Wilcox
- USGS: Jud Harvey, Laurel Larsen, and Greg Noe
- ENP: Vic Engel
- USFWS: Kevin Palmer and Lori Miller
- Contractors/Consultants: Jed Redwine, Christa Zweig, and Joel Trexler

ENVIRONMENTAL ASSESSMENT

INSTALLATION, TESTING AND MONITORING OF A PHYSICAL MODEL FOR THE WATER CONSERVATION AREA 3 DECOMPARTMENTALIZATION AND SHEET FLOW ENHANCEMENT PROJECT

DRAFT ENVIRONMENTAL ASSESSMENT

September 2009

U.S. Army Corps of Engineers
Jacksonville District

Hydrologic Field Test

CENTRAL AND SOUTHERN FLORIDA PROJECT
COMPREHENSIVE EVERGLADES RESTORATION PLAN
DECOMPARTMENTALIZATION AND SHEETFLOW ENHANCEMENT OF WATER CONSERVATION AREA 3
HYDROLOGIC FIELD TEST

Operational Guidance

CENTRAL AND SOUTHERN FLORIDA PROJECT

DRAFT OPERATIONAL GUIDANCE
FOR
WATER CONSERVATION AREA 3 DECOMPARTMENTALIZATION (DECOMP) AND SHEET FLOW ENHANCEMENT PROJECT - PHYSICAL MODEL

Science Plan

DRAFT

10 October 2009

THE DECOMP PHYSICAL MODEL SCIENCE PLAN

3

The Science Plan

UNCERTAINTY 1
The extent to which canals need to be Backfilled

UNCERTAINTY 2
The need for sheet flow to maintain ridge and slough patterns

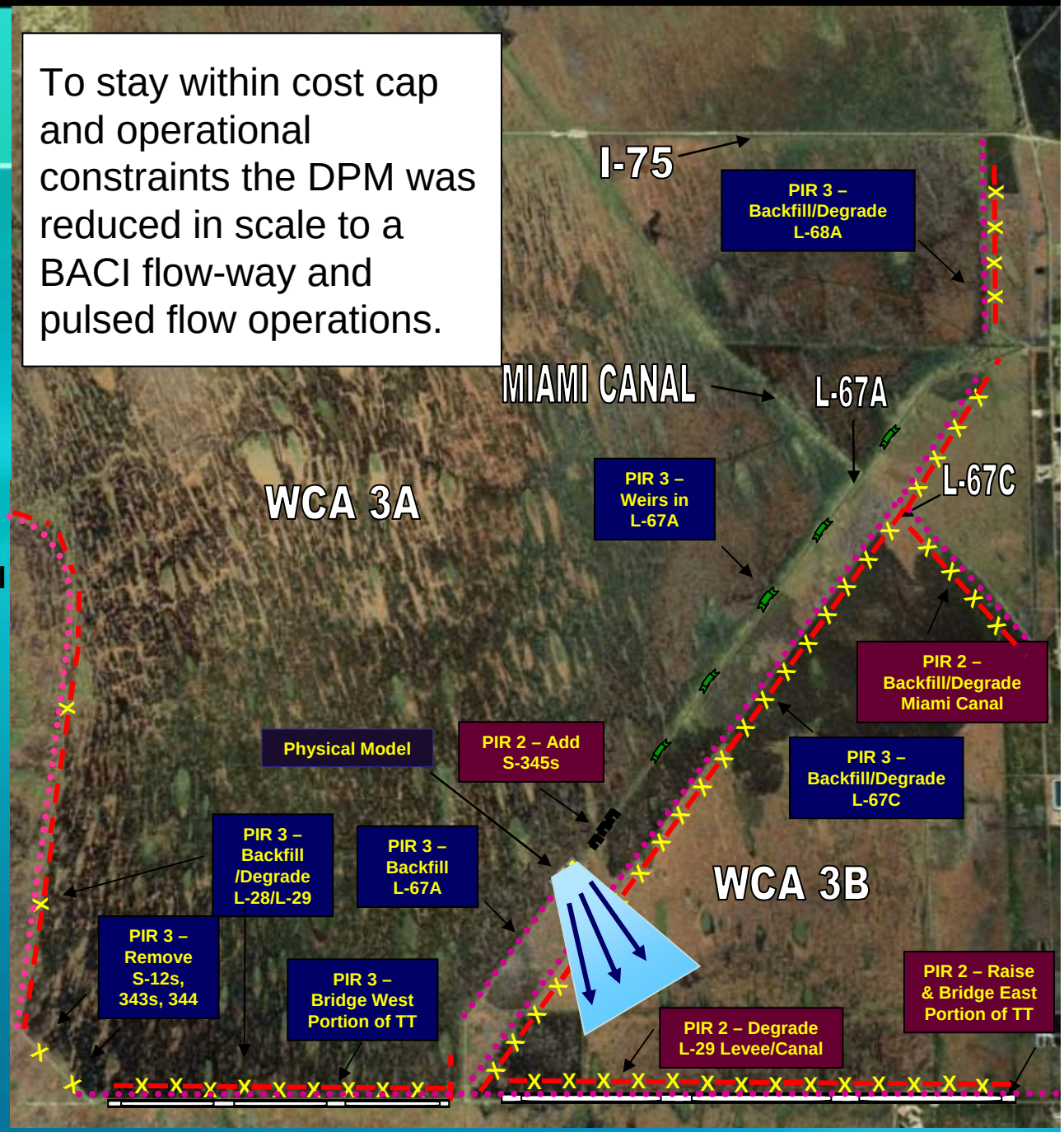
UNCERTAINTY 3
The hydrologic and ecological effects of levee modification

UNCERTAINTY 4
Hydrologic tolerances of tree islands

UNCERTAINTY 5
Stage and seepage relationships

UNCERTAINTY 5
Model calibration

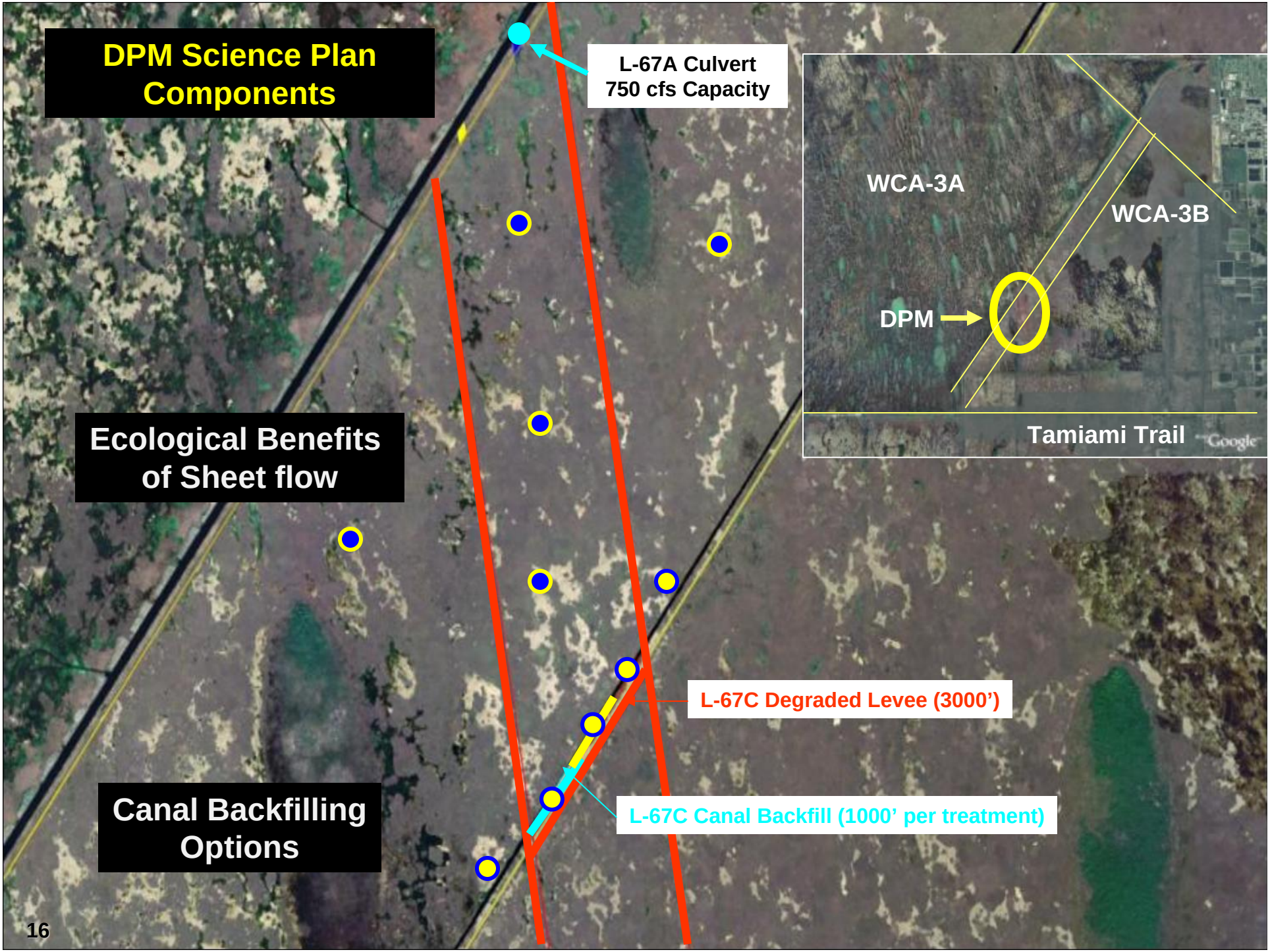
To stay within cost cap and operational constraints the DPM was reduced in scale to a BACI flow-way and pulsed flow operations.



The Science Plan

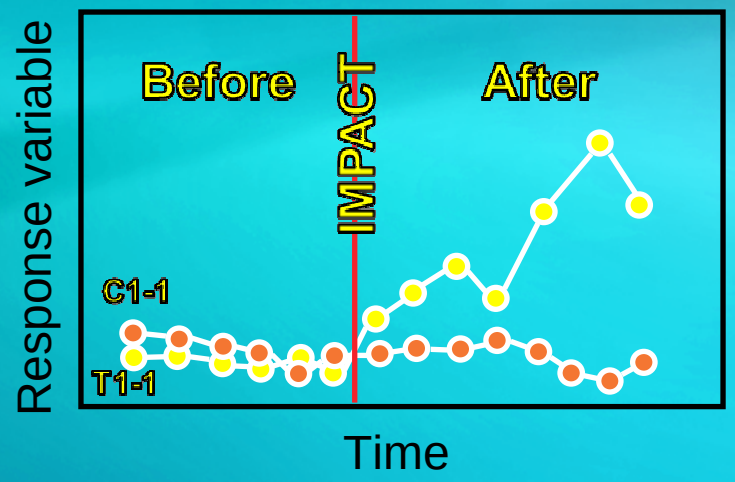
Constraints & Assumptions

- Developed a Constraints Document
  - Operations- cannot exceed 8.5 feet NGVD in WCA-3B nor operate during hurricane season.
  - Water Quality- cannot violate EFA
  - Tree Islands- cannot do harm to tree islands
  - Wildlife- cannot do harm to wildlife
- Conducted a Hydrologic Analysis for the feasibility of the DPM to produce velocities greater than the critical entrainment velocity of 2-3 cm/sec.
- Defined the likely period of operation and detailed analysis to determine test durations and operational criteria.


DPM Science Plan Components
L-67A Culvert
750 cfs Capacity
WCA-3A
WCA-3B
DPM
Tamiami Trail
Google
Ecological Benefits of Sheet flow
L-67C Degraded Levee (3000')
Canal Backfilling Options
L-67C Canal Backfill (1000' per treatment)

THE DPM SCIENCE PLAN

BACI Statistical Design and Proposed Schedule



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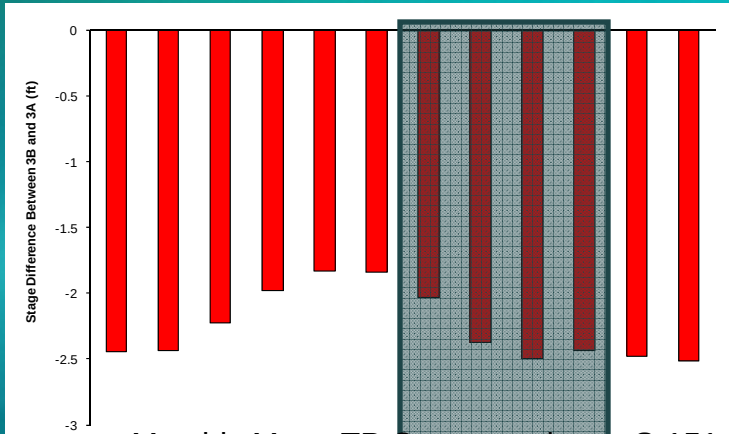
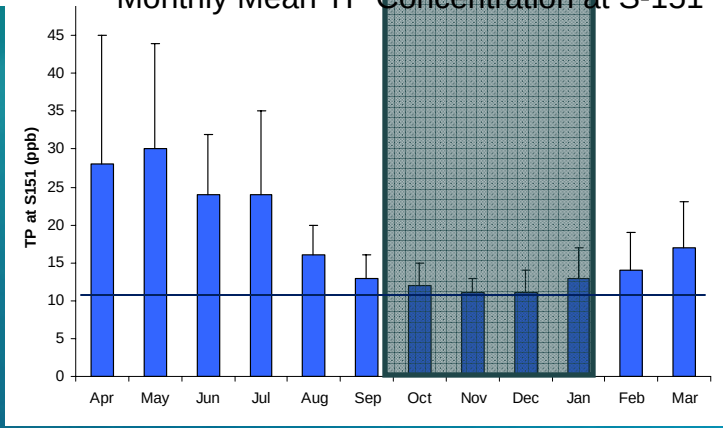
Operational Window (OW)
October-January
Estimated 17-41 days of Operation

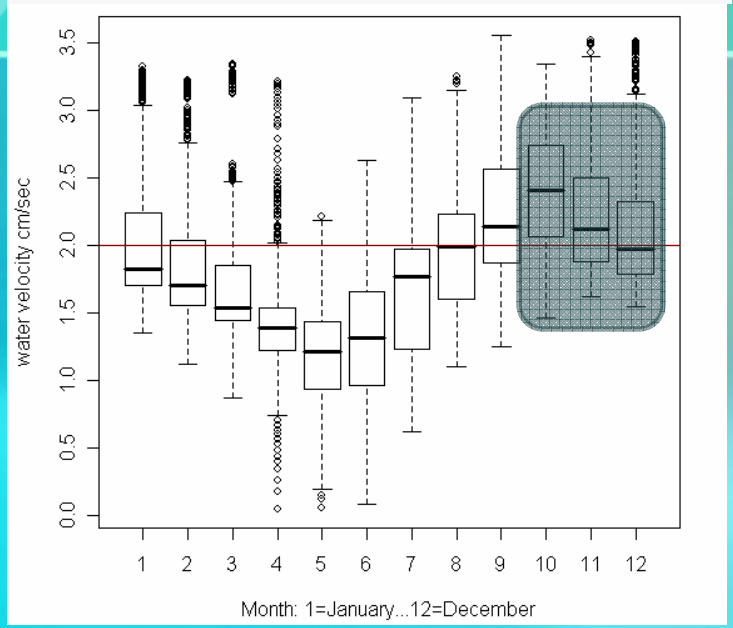
Monthly Mean Stage Difference WCA-3the B-WCA-3A



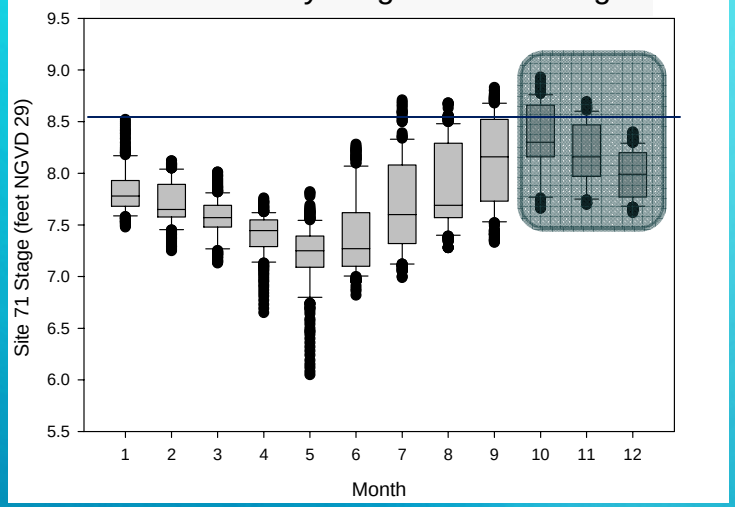
Monthly Mean TP Concentration at S-151



Mean Monthly Predicted Velocity at S-71 Gauge



Mean Monthly Stage at S-71 Gauge

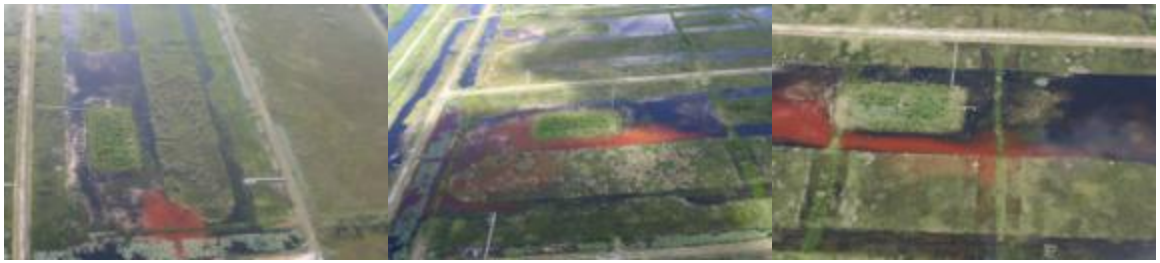


THE DPM SCIENCE PLAN

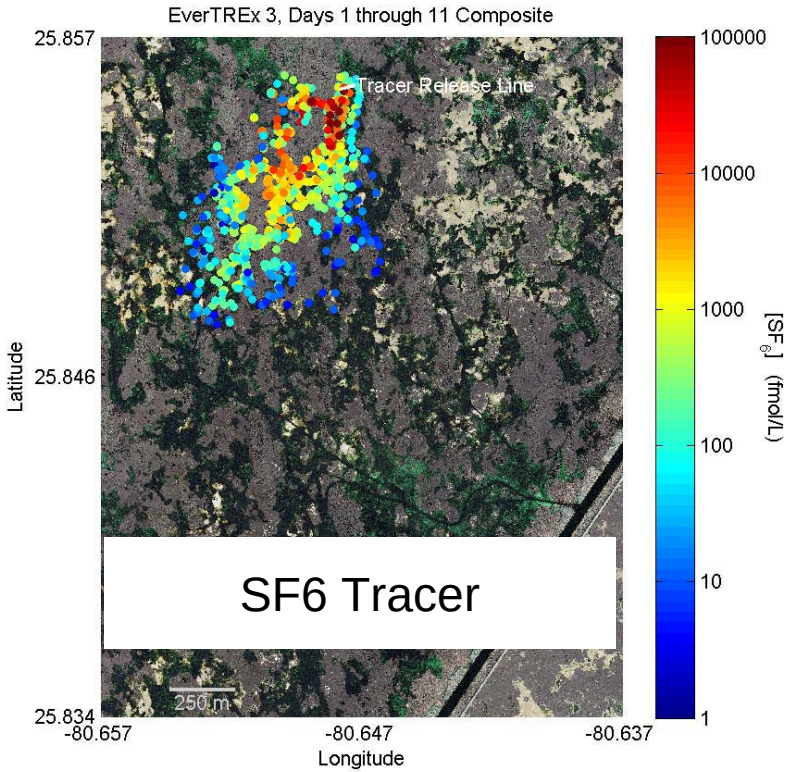
MEASUREMENTS

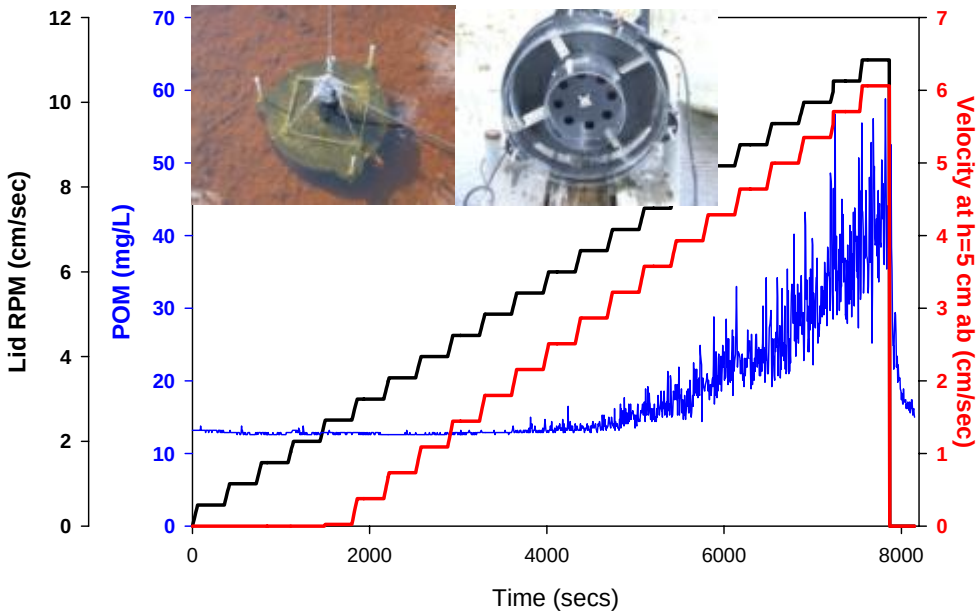
- **Hydrology**
  - A monitoring network for stage, depths, flows, and velocities.
  - Hydraulics of L-67A culverts (head and tail water stages and cfs).
  - Synoptic mapping of water depth and velocity in conjunction with flow manipulations.
  - Vegetation mapping for hydraulic resistance.
  - Tracer studies to map direction and velocity of surface water flows.
  - Intensive monitoring (flow direction and velocity, water depths and stages).
- **Physical Transport**
  - Synoptic mapping of sediment erosive properties.& surface water biogeochemistry.
  - Intensive monitoring (resuspension, deposition, floc tracers, sediment traps, biogeochemical markers, ecosystem metabolism)
- **Biological**
  - Environmental monitoring (dissolved oxygen, pH, temperature, specific conductivity).
  - Fauna characterization and movement (Native and Exotic)
  - Vegetation monitoring.

DPM Utilizes State-of-the-Art Technologies in an Integrated Approach



Rhodamine Dye





Critical Entrainment Velocity and Erosion Threshold

The Science Plan

Schedule

- **National Environmental Policy Act (NEPA)**

NEPA Scoping Meeting	Feb 2009
Draft EA	Sep 2009
Final EA; NEPA Complete	Jan 2010

- **Experimental Design**

Finalize DPM Experimental Design	Feb 2009
Develop Science Plan	Jun 2009
Scientific Peer Review	Sep 2009

- **Design Plans and Specs**

Plans and Specs	Jan 2010-Apr 2011

- **Installation and Testing**

Pre Impact Monitoring	Oct 2010-Sep 2012
Construction	Apr 2011-May 2012
Post Impact Monitoring	Oct 2012-Feb 2014
Removal	Mar 2014

THE DPM SCIENCE PLAN

Conclusions

- DPM is a BACI designed experiment to evaluate uncertainty associated with DECOMP:
  - Canal Backfilling
  - Ridge and Slough Development
- Designed within the DECOMP footprint with due consideration to operational and environmental constraints.
- An interdisciplinary approach brings together multiple agencies with vast scientific and engineering experience in the Everglades.
  - The agencies are also well equipped for conducting this work.
- Mechanisms are in place to report findings to decision makers in a timely manner.