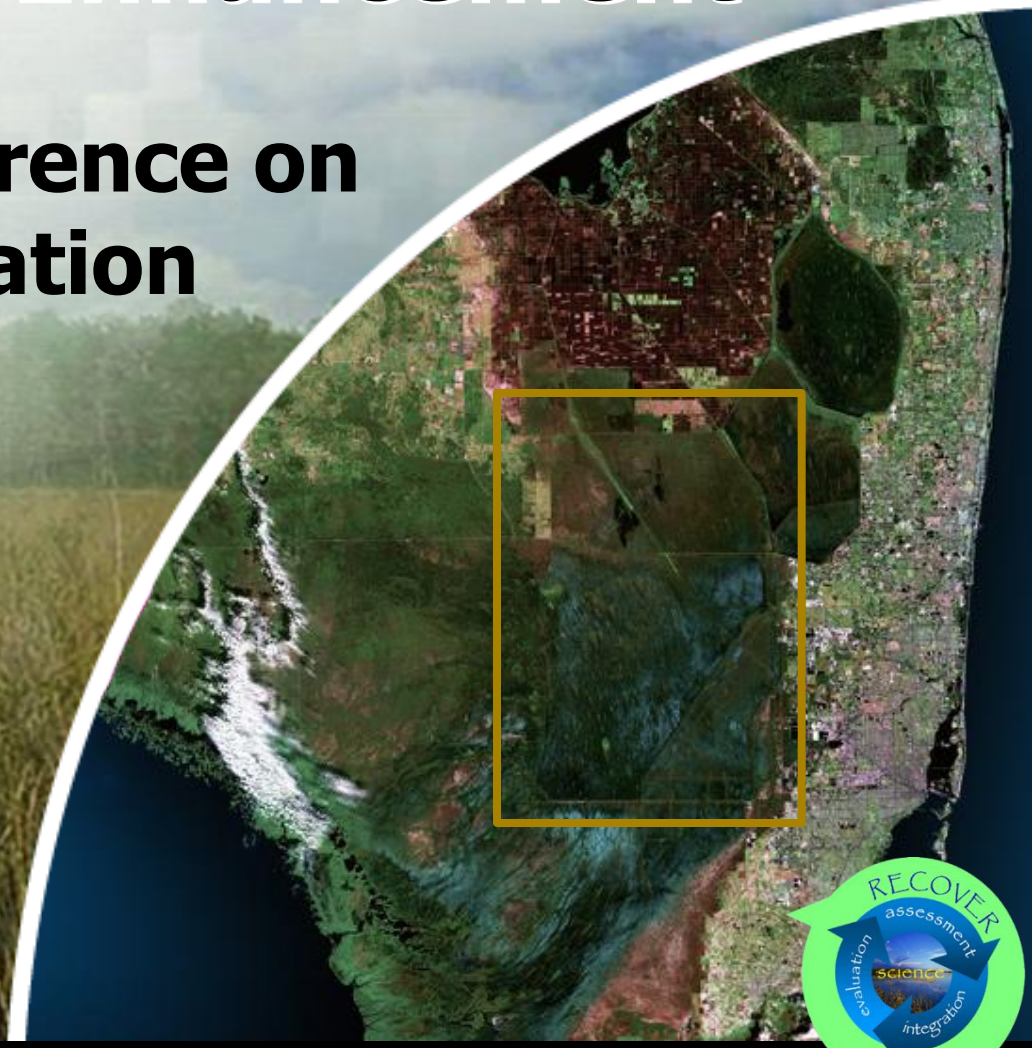
WCA-3A Decompartmentalization and Sheetflow Enhancement

4th National Conference on Ecosystem Restoration

1 – 5 August 2011

Baltimore, Maryland

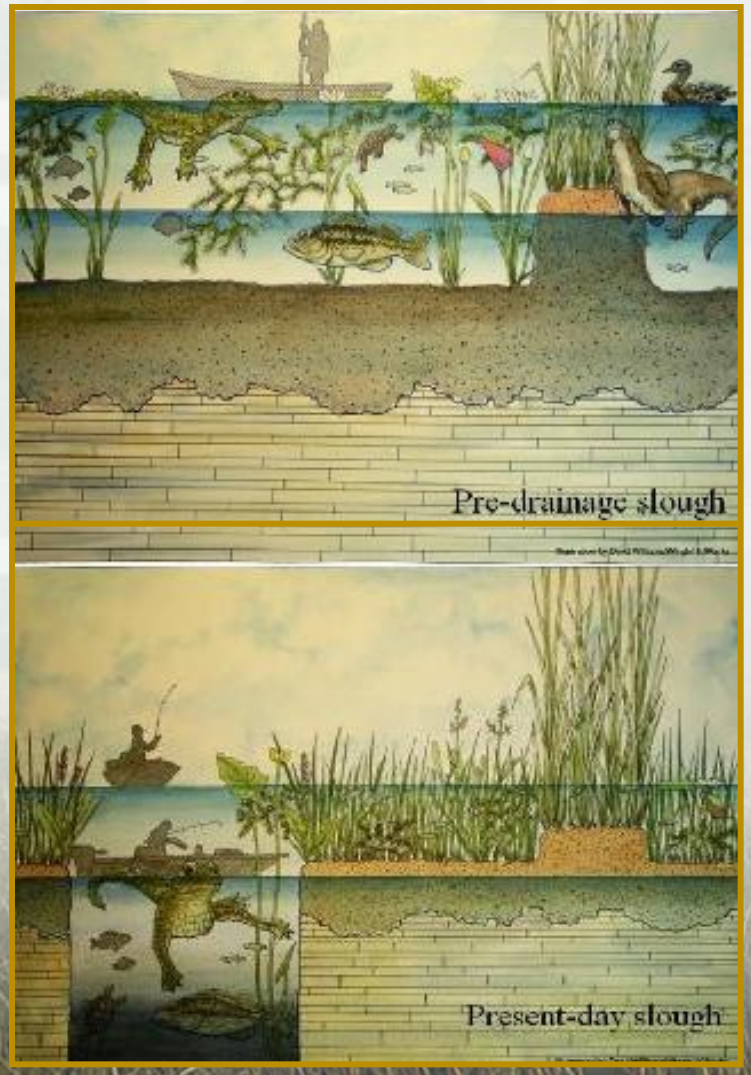
Agnes R. McLean
RECOVER (NPS)



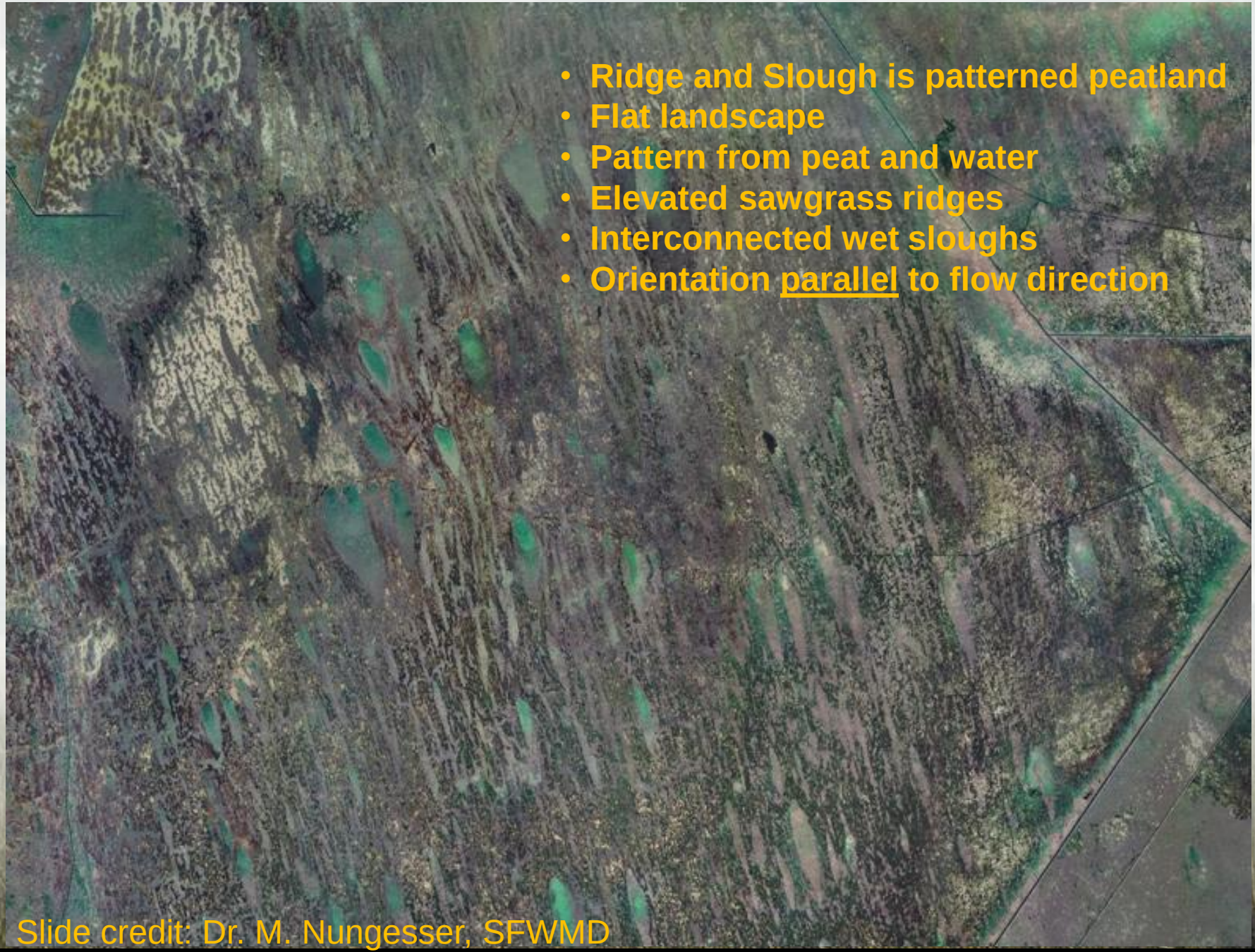
Presentation Outline

- Overview – What is Decomp?
- Adaptive Management
- Decomp Physical Model
- Benefits Methodology
- Unresolved Issues

Problem Statement – Effects of Compartmentalization



- Canals draw water from surrounding wetlands
- Levees and canals result in:
  - dry-outs during dry season
  - deep-water, nutrient-enriched habitats for expansion of nonnative pest plants and organisms
  - diminished aquatic habitat



Slide credit: Dr. M. Nungesser, SFWMD

The intent: remove the impacts of impoundments, levees and canals

Pre-drainage ridge & slough landscape

Impacted ridge & slough landscape

Willow thicket monoculture – NW WCA 3A

Loss of pattern – southern WCA 3A

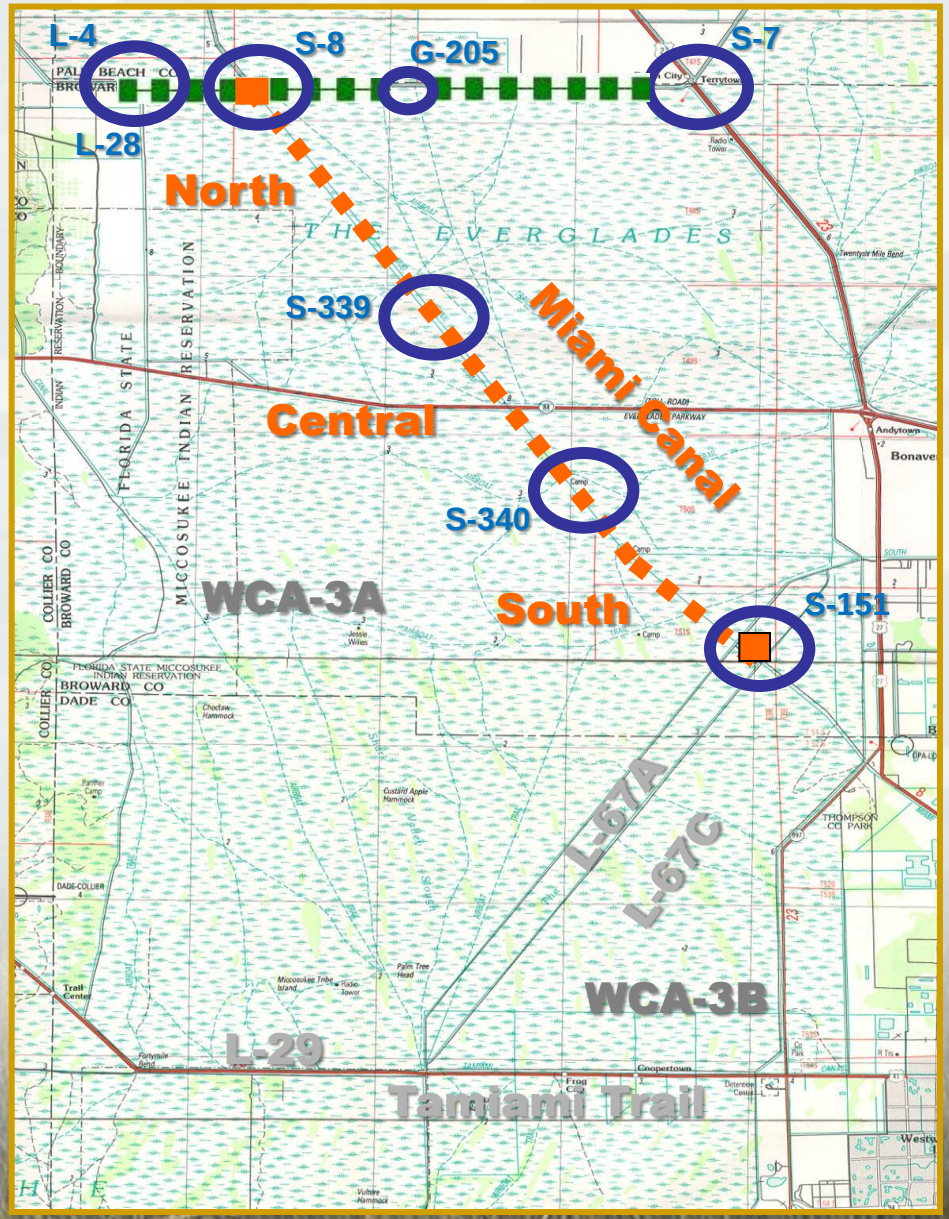
DECOMP PIR 1

DECOMP PIR 1
Initial Conceptual Alternatives

- Hydration Restoration Feature
  1. Full Northern Boundary
  2. West of G-205 to L-28
- Miami Canal Feature
  1. North
  2. Central
  3. South
  4. Complete, other combinations

Analysis of Project Alternatives

- Conduct hydrologic model simulations
- Ecological/Environmental benefit assessment
- Estimate costs for each feature and multiple alternative combinations
- Economic analysis will be conducted in an incremental manner to determine the plans most cost effective in producing desired outcome



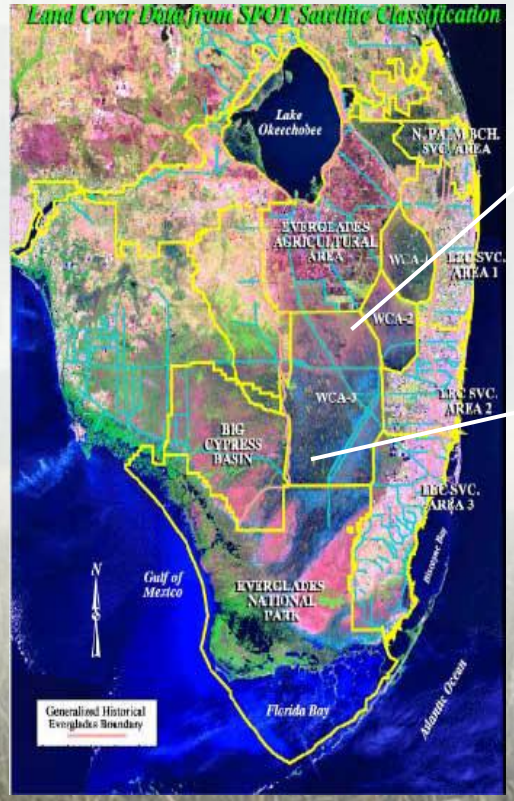
DECOMP PIR 1 Objectives

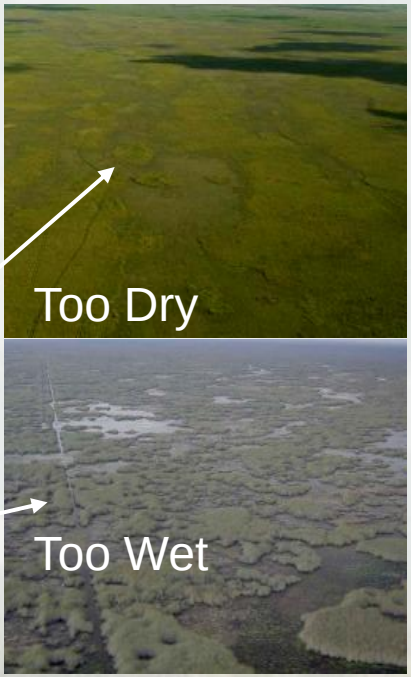
- Near-term:
  - Improve natural patterns of sheet flow and marsh water depths and surface water durations adjacent to the Miami Canal between S-8 and S-151, and across northern WCA 3A
  - Eliminate the harmful effects that deep-water canals in the interior Everglades marshes have on aquatic fauna (e.g., increased mortality among immature alligator age classes during dry periods; un-natural marsh fish size classes and fish species composition)
  - Reduce or eliminate organic soil loss and improve dry season habitat for aquatic fauna in northern WCA 3A marshes (e.g., alligator body condition; fish populations and species structure)

DECOMP PIR 1 Objectives

- Long-term:
  - Improve hydrology and hydrologic recession rates to increase wading bird foraging and nesting success
  - Increase the abundance of forage fish and crayfish populations in WCA-3A
  - Increase spatial extent of functional wetlands and restore vegetative composition, habitat function and ridge and slough patterning, including tree islands

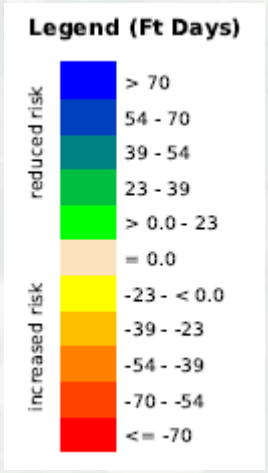
Performance Measures





- Project Performance Measures:
  - Inundation Duration in the Ridge and Slough Landscape
  - Soil Oxidation
  - Correlation of Flow Magnitude and Direction
  - Sheet Flow in the Ridge and Slough Landscape
  - Slough Vegetation
  - Small-Sized Freshwater Fish Density

Soil Oxidation (Reduced Drought Risk)

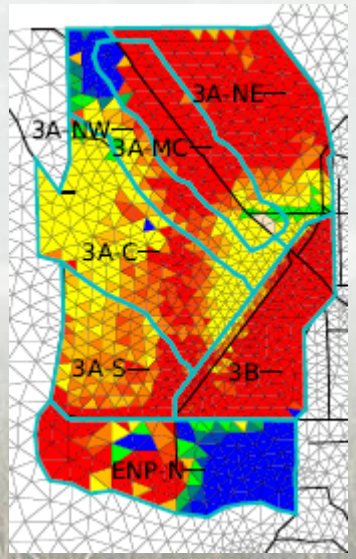


All Zones
FWO vs ECB

Drying Event Severity

FWO - ECB

Simulation period:
1965-01-01 to 2000-12-31



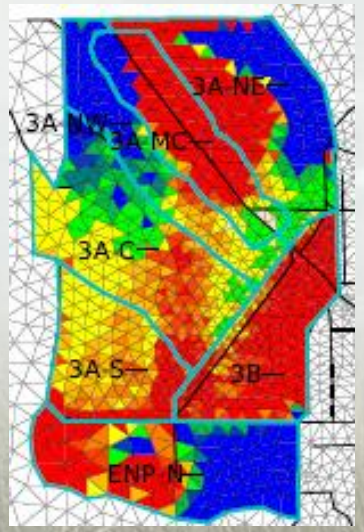
No Project

All Zones
ALT_G vs ECB

Drying Event Severity

ALT_G - ECB

Simulation period:
1965-01-01 to 2000-12-31



Full HRF Only

All Zones
ALT_B vs ECB

Drying Event Severity

ALT_B - ECB

Simulation period:
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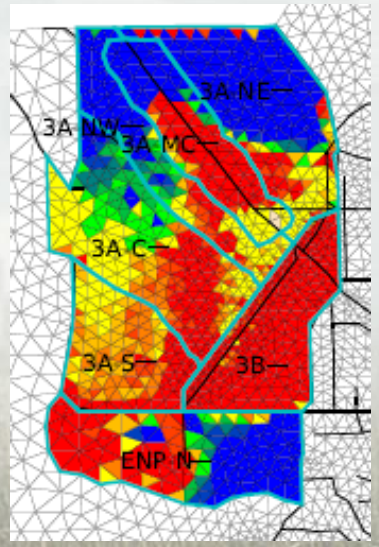


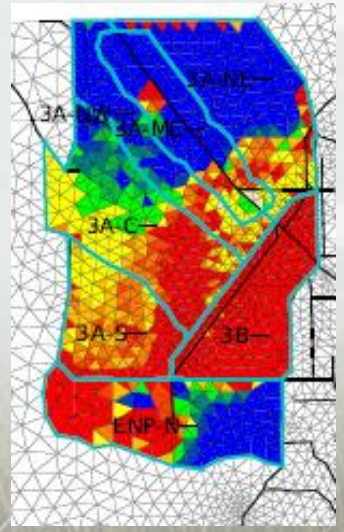
Full HRF/ North Backfill

All Zones
ALT_A vs ECB

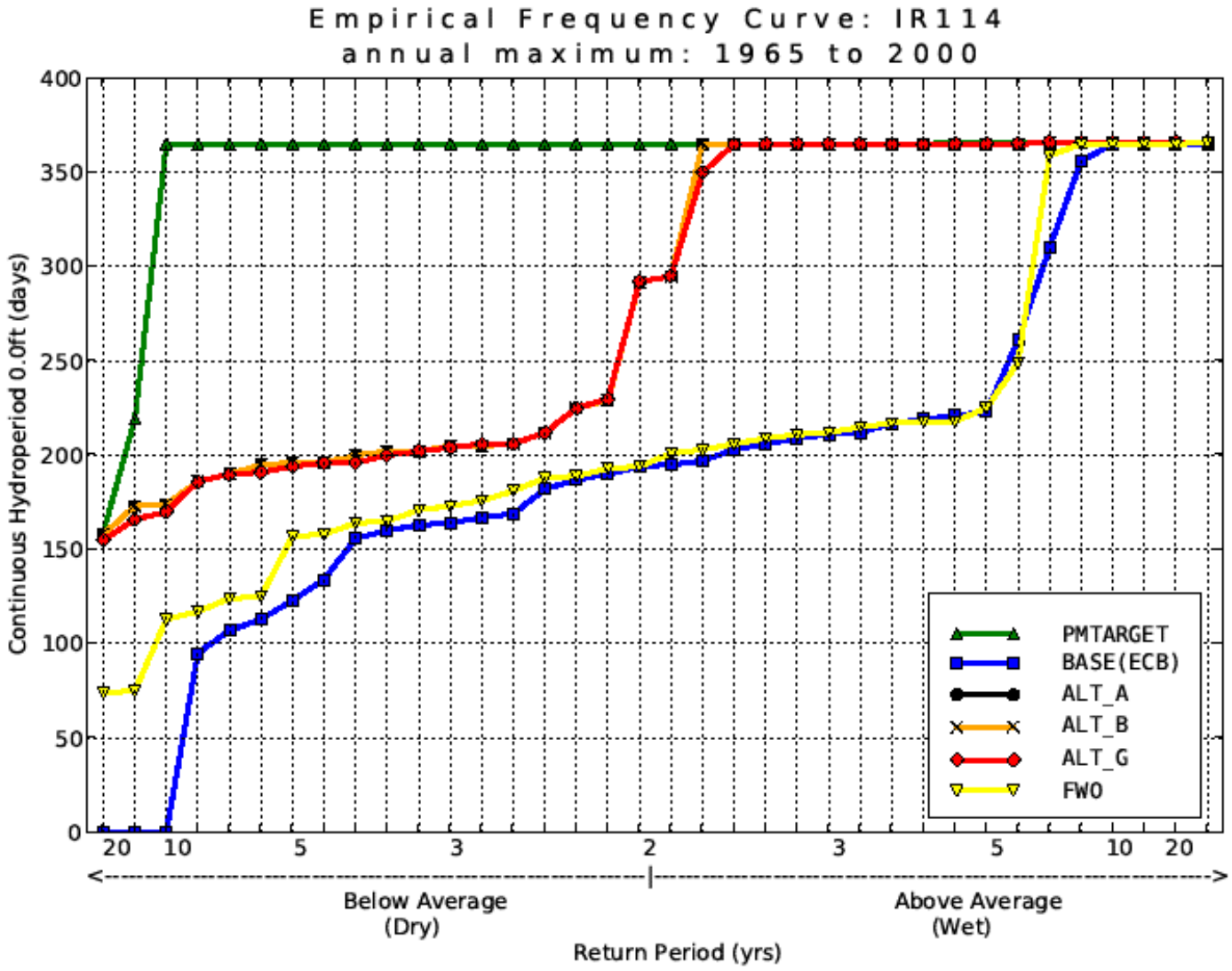
Drying Event Severity

ALT_A - ECB

Simulation period:
1965-01-01 to 2000-12-31



Full HRF/ Full Backfill

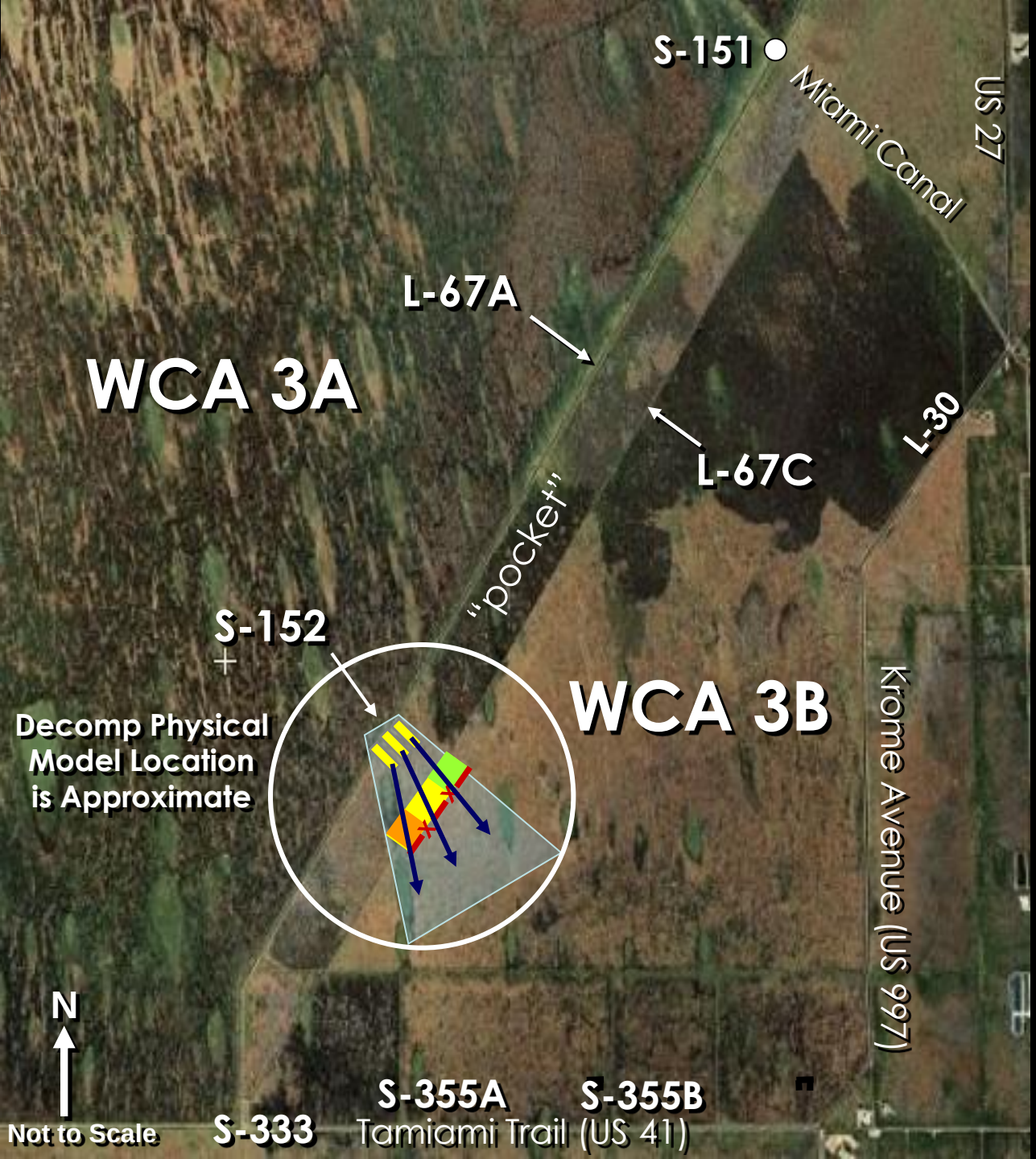

Empirical Frequency Curve: IR114
annual maximum: 1965 to 2000
Continuous Hydroperiod 0.0ft (days)
400
350
300
250
200
150
100
50
0
20
10
5
3
2
3
5
10
20
PMTARGET
BASE(ECB)
ALT_A
ALT_B
ALT_G
FWO
Below Average
(Dry)
Above Average
(Wet)
Return Period (yrs)

Why Adaptive Management?

- In any restoration program where there is:
  - lack of knowledge or disagreement about how the ecosystem functions,
  - uncertainty in the outcome of a restoration design (management actions),
  - lack of consensus or uncertainty about restoration endpoints,
- Then the application of adaptive management principles into project planning and implementation substantially improves chances of restoration success
- Categories of uncertainty
  - Scientific/technical
  - Policy/management
- Decision-critical uncertainty
  - A subset of uncertainties that, if not addressed, may impair decision making during CERP planning and implementation and increase the risk that the program/project will not meet its restoration goals and objectives.

DECOMP Scientific Uncertainties

- Is complete backfilling of canals an ecological and/or a hydrological necessity for restoration?
- What are the quantifiable ecological benefits of sheet flow and ecosystem benefits?
- Is it necessary to completely remove levees?
- What are the water depth and hydroperiod tolerances of ridges, sloughs, and tree islands?
- What are the effects of water levels in WCA-3B and Shark River Slough on seepage to the Lower East Coast?
- Would hydrologic models used to evaluate design alternatives benefit from better parameterization?



Decomp Physical Model Project Features

S-152 structure:
passes controlled flows from WCA-3A, across "pocket", to WCA-3B

L-67C canal and levee gap:
three different 1,000 ft long canal backfill treatments comprising 3,000 ft

Legend

- Temporary Gated Culverts
- Levee Gap
  - No Backfill
  - Partial Backfill
  - Complete Backfill
- Sheetflow
- Levee Degrade

Decision-Critical Uncertainties

- How to balance water quantity and quality needs in achieving Decomp restoration goals and objectives; and
- How to ensure the project functions well with current water quantities to achieve near-term restoration benefits, without limiting its ability to accommodate future water quantities to achieve long-term system restoration benefits

Benefits Methodology

Three-pronged approach:

- Ecologic and hydrologic performance evaluation of alternative plans by best professional judgment using project objectives
- Decomp Benefits Quantification: formal benefits calculation that generates habitat units using a spreadsheet "model"
- Non-Metric Multidimensional Scaling statistical analysis to provide a quality check on the effects of weighting and combining performance measures within the spreadsheet model

Ecologic and Hydrologic Evaluation

- The cumulative results of the individual rankings of predicted plan performance for each alternative plan showed that the best performance is expected from Alternatives A and B, with A generally superior to B for most hydrologic metrics
- Alternative G showed only minor improvements over the Future Without condition, perhaps not great enough to be detected by ecological monitoring
- These rankings are based only on comparative differences in hydrologic performance among the three alternative plans, and do not translate into actual predictions of ecological responses in the natural world

Normalized Scores for Zone 3A-MC

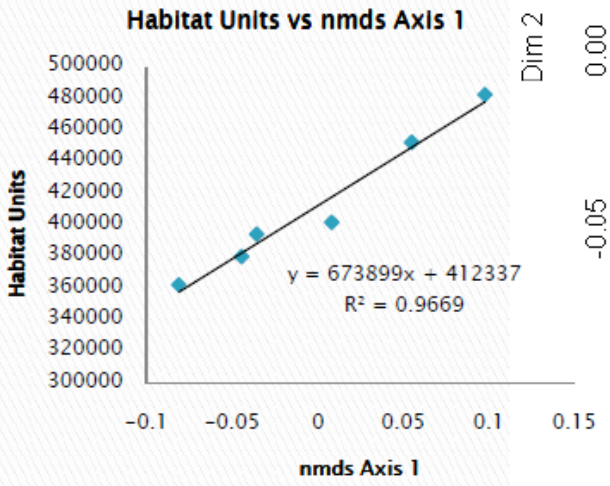
Metric #	PM Metric	PCB	ECB	FWO	ALT_A	ALT_B	ALT_G	test
1.1	Inundation Duration in the Ridge and Slough Landscape -- PPOR Inundated	14.8	26.4	20.7	62.0	54.7	32.4	100.0
2.1	Sheetflow in the Ridge and Slough Landscape -- Timing	NA	NA	NA	NA	NA	NA	NA
2.2	Sheetflow in the Ridge and Slough Landscape -- Continuity	21.4	23.1	23.1	53.7	35.8	24.5	100.0
3.1	Hydrologic Surrogate for Soil Oxidation -- Drought Intensity Index	9.2	29.2	15.6	79.9	23.9	3.7	100.0
4.1	Correlation of Flow Mag and Dir in Ridge & Slough Landscape – Magnitude	49.3	49.3	49.3	100.0	63.2	45.9	100.0
4.2	Correlation of Flow Mag and Dir in Ridge & Slough Landscape – Direction	59.0	59.0	59.0	100.0	72.9	65.7	100.0
5.1	Slough Vegetation Suitability -- Hydroperiod	23.0	34.3	25.9	47.0	32.3	27.5	100.0
5.2	Slough Vegetation Suitability -- Drydown	39.2	56.4	31.1	44.5	39.0	35.6	100.0
5.3	Slough Vegetation Suitability -- Dry Season Depth	36.5	32.1	31.5	37.1	32.5	31.4	100.0
5.4	Slough Vegetation Suitability -- Wet Season Depth	22.3	37.2	24.7	30.5	24.0	20.9	100.0
6.1	Small-Sized Freshwater Fish Density	78.4	81.5	79.0	75.7	75.9	79.7	100.0
7.1	Ecological Connectivity -- length	0.0	0.0	0.0	100.0	31.8	0.0	100.0
7.2	Ecological Connectivity -- area	NA	NA	NA	NA	NA	NA	NA
7.3	Ecological Connectivity - tree islands reconnected	0.0	0.0	0.0	100.0	50.0	0.0	100.0
	3A-MC	29.4	35.7	30.0	69.2	44.7	30.6	100.0

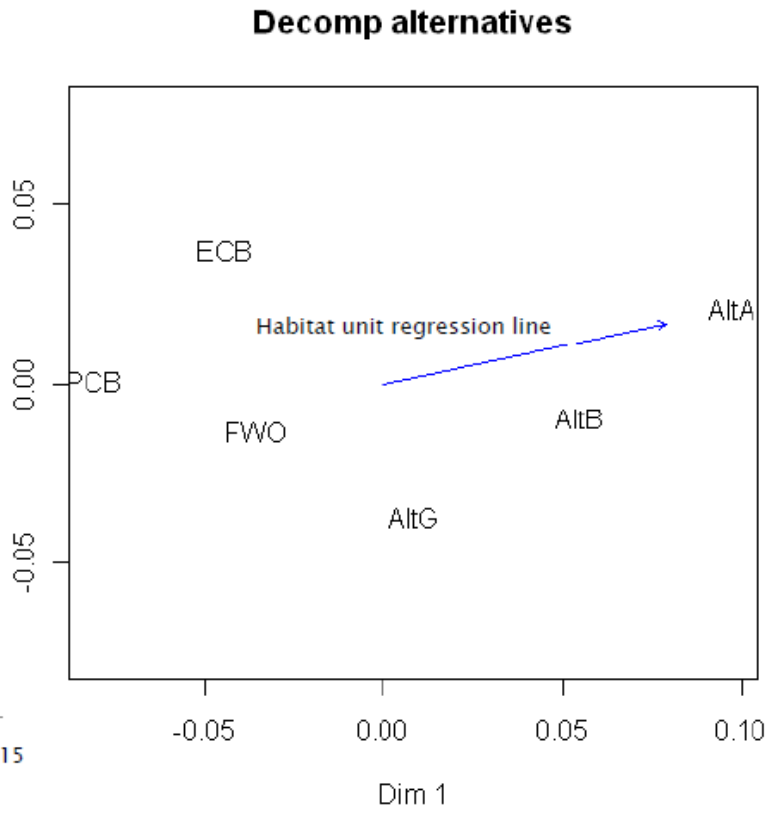
DRAFT SCORES – SUBJECT TO CHANGE

Non-metric Multidimensional Scaling Analysis

Results from initial Decomp simulations

Entirely consistent with DBQ and other scoring processes





Unresolved Issues

- **Water quality**
  - Water quality
    - Water quality
      - Water Quality
        - Water quality
- **Water quality**
- **Recreation**

Multi Pronged Strategy to Evaluate, Assess, and Address WQ

1. Performance Indicators of Nutrient Risk
   a. Soil Oxidation – Modeling to evaluate potential dry-out frequency of WCA-3A, 3B, and Everglades National Park
   b. ELM modeling to evaluate total phosphorus (TP) water column concentrations, TP soil concentrations, and TP loading or P accumulation rates
2. Modeling to support evaluation of potential risk
3. Expert assessment
4. Monitoring, assessment, and adaptive management

Recreation and access


Thank you
Questions?
RECOVER
assessment
science
integration
evaluation