Loxahatchee River Watershed Restoration Project

Ecological Subteam – Performance Measures

One of the Last Old Growth Cypress Floodplains in the SE Florida

Last Large Freshwater Wetland Corridor in Project Area

Vulnerable estuarine habitats

US Army Corps of Engineers

U.S.ARMY

Overview

- **Performance Measure and Evaluation Criteria Overview**

- **Linking Performance Measures to Project Objectives**

- **Understanding Risk and Uncertainty**

- **Ecological Areas and Performance Measures and Evaluation Criteria and Project Delivery Team (PDT) Feedback**

- **Next Steps**

Performance Measures and Evaluation Criteria

- **Performance Measure (PM) –**

  - ► **Documented process to measure restoration output to evaluate project objectives**

- **Evaluation Criteria (EC) –**

  - ► **Documents the process to evaluate whether or not restoration actions stay within environmental constraints**

Objectives and PM Table

Objective (Abbreviated)	PM 1 – Salinity	PM 4 – Watershed Hydrology	PM 9 - Connectivity
1. Restore wet and dry season flows to Northwest Fork of Loxahatchee River	√		
2. Restore and/or maintain estuarine communities (oysters, fish, seagrass)	√		
3. Increase natural area extent of wetlands		√	
4. Restore connections between natural areas			√
5. Restore native plan and animal species abundance and diversity		√	
6. Reduce water quality degradation risk			√
7. Increase recreational opportunities			

Ecosystem Focus Areas and PMs

Ecosystem Focus Area	PM 1	PM 4	PM 9
Watershed Wetlands – Freshwater Flora and Fauna		√	√
Cypress Swamp-River Floodplain - Freshwater Flora and Fauna	√		√
River with *Vallisneria americana* and Fish Larvae	√		
Estuary – Fish, Oysters, Seagrass	√		

Performance Measure 1

- <<insert Patti's presentation

BUILDING STRONG®

PM 4 Watershed Hydrology

- Mechanics
- Examples
- Recommendations to Improve

PM 4 - Evaluation Approach

1. Identify Major Wetland Plant Communities and Hydrology Criteria
2. Selection of Indicator Regions
3. Wetland Baseline Assessment using Wetland Rapid Assessment Procedure (WRAP)
4. Identify LECsR Model Cells
5. Adjust Existing Conditions Model Baseline and Calibration
6. Assign Weighting Factor for each Polygon
7. Model Output Evaluation
8. Field survey to verify current base model
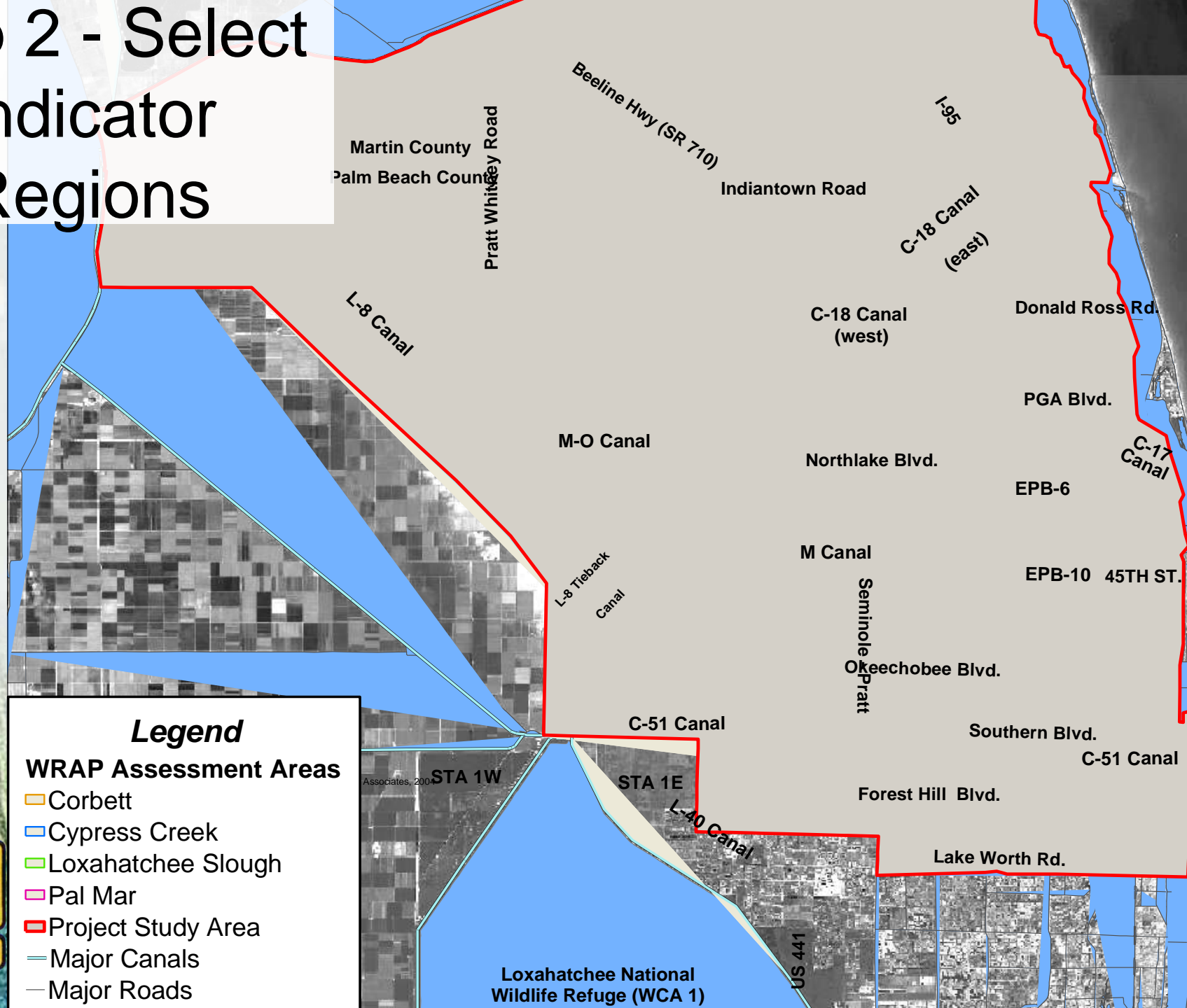8. Reassign WRAP scores for FWO conditions and Alternatives

Step 1 – Identified Major Plant Communities

Plant Community Type	Annual Avg. Water Depth (inches)	Inundation Duration* (days/yr)	Median Inundation Duration (days/yr)
Mesic Flatwood	Below ground	≤ 30	15
Mesic (Oak) Hammock	Below ground	0-60	30
Hydric Flatwood	0-6	30-60	45
Hydric Hammock	0-6	30-60	45
Depression Marsh	12-24	180-300	240
Wet Prairie	6-16	60-180	120
Strand Swamp	18-36	210-300	255
Floodplain Swamp	12-30	120-240	180
Dome Swamp	12-24	210-300	255

* Frequency coincides with wet weather patterns and existing groundwater conditions

Table - 1. Annual average water depth and annual inundation for major wetland plant communities identified within the Loxahatchee watershed.

Step 2 - Select Indicator Regions

Step 3 - WRAP Assessments

- **Example (Loxahatchee Slough) Existing Conditions Base** field score = 2.

Natural Area:	Loxahatchee Slough
Site:	Sandhill Crane
Polygon Number:	LS-3
Date of Visit:	06/29/04
Assessment Team Members Present:	B. Gunsalus (SFWMD); F. Griffiths (PBCDERM); B. Havae (PBCDERM); M. Tolbert (PBCDERM); S. Channon (PBCDERM); D. Sweetay (FWC); P. Balci (E&E)
Dominant FNAI Community Type(s):	Wet prairie; Depression marsh
Wildlife Utilization:	Score= 2.0
Wetland Overstory/ Shrub Canopy:	N/A
Vegetative Ground Cover:	Score= 2.0; some encroachment on the fridges
Adjacent Upland/ Wetland Buffer:	Avg. Score= 1.3 External buffer score= 1.6 (Major highway-40%; Natural areas-30%; Single family residential-10%; West leg of C-18 Canal-20%) Internal buffer score= 1.0
Field Indicators of Wetland Hydrology:	Score= 1.5; reduced hydroperiod (normal pool=6 inch vs 10-12 inch)
Water Quality Inputs And Treatment:	Score= 2.75; rainfall driven
Overall WRAP Score:	0.64
Other comments	Ditch drains the system; Sandhill crane site is under restoration by the SFWMD

Performance Cells Chosen to Monitor the Accuracy of the Lower East Coast Sub Regional Model, LECSR, In the North Palm Beach Comprehensive Everglades Restoration Program, CERP
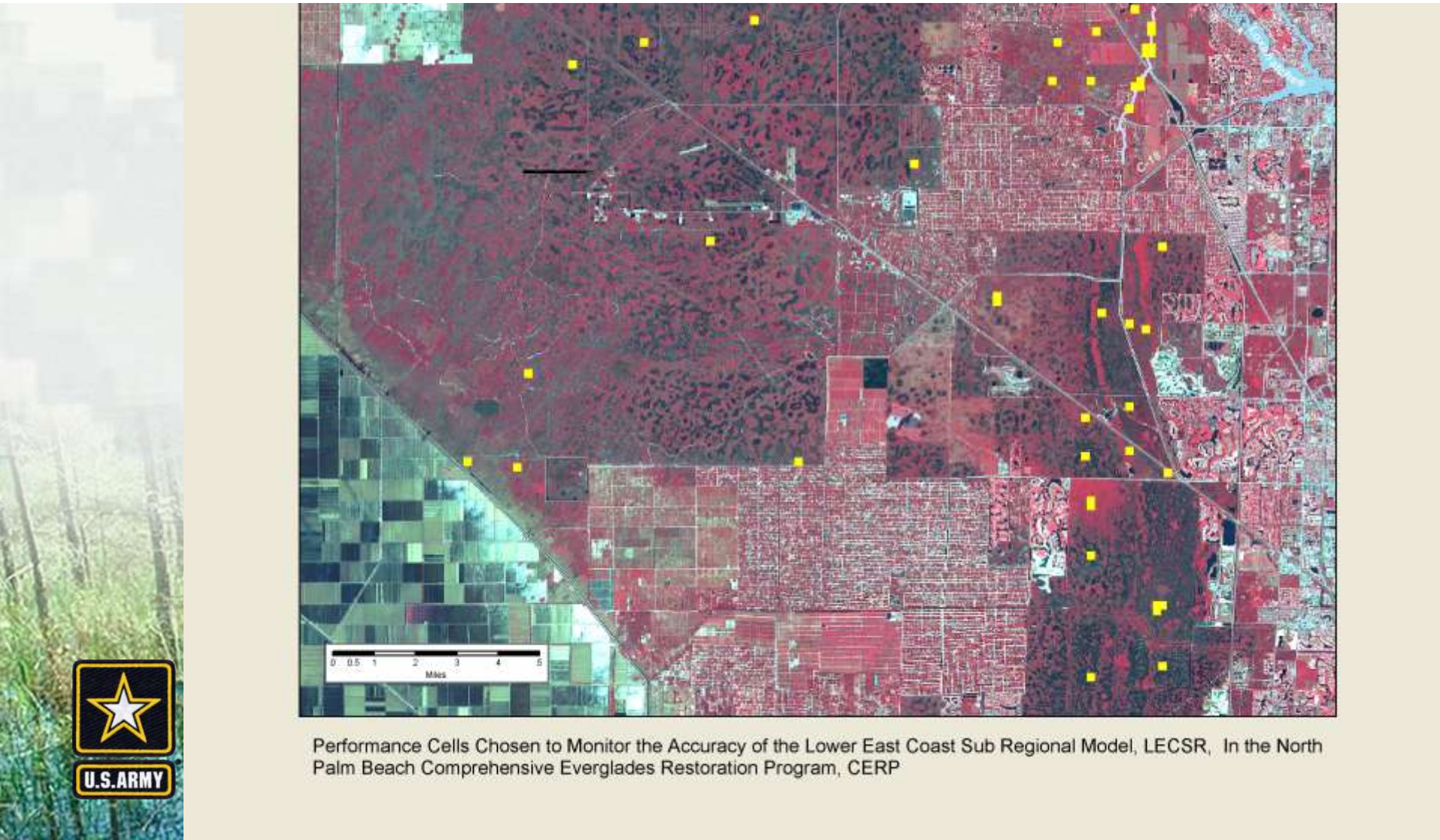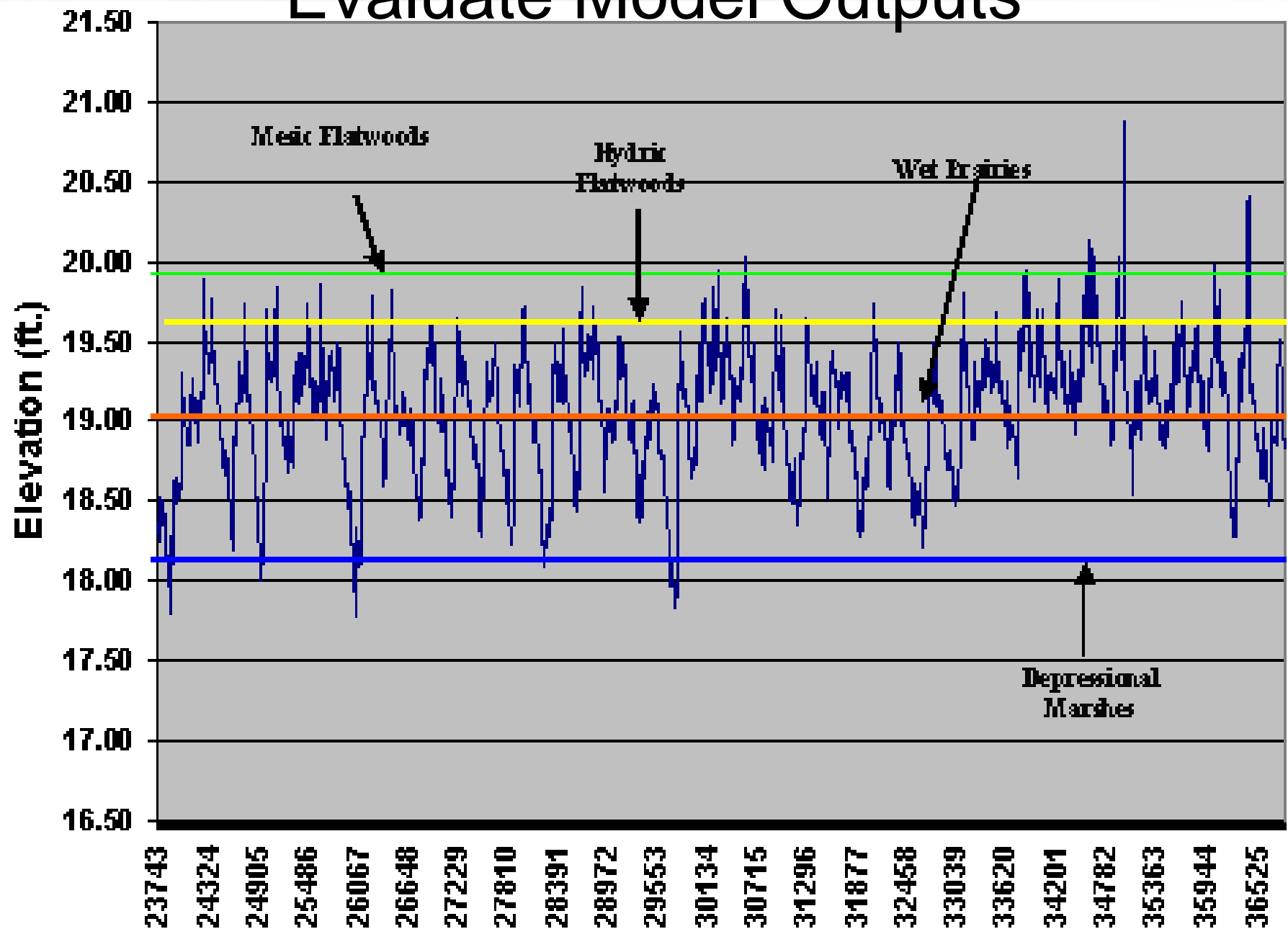
Step 5 - Adjust Existing Conditions Base Model Output with Field Survey Results

- Current Base Model verification- Field Surveys

- Used field indicators (moss collars, water stain lines, adventitious rooting, etc.)

- Measured Normal pool, High pool and Upland edge Elevations

U.S.ARMY

BUILDING STRONG®

Evaluate Model Outputs

Existing Conditions Base Example

- LS-3 (an evaluation cell in the Loxahatchee Slough) is a Depression Marsh. The median value is 240 days/yr inundation

- In order for LS-3 to get a WRAP score of 3, LECsR output would have to equal 240*36 = 8,640.

- Field score / max score = 2/3 = 0.66. 0.66 * 8640 = 5,760 (the number of days the cell would have been inundated to receive a field score of two).

- For LS-3 in the existing conditions base, the cell would be inundated 5,773 days with the calibration line set to an elevation of 16.51.

Weighting Factor

- Weighting Factor added to correctly scale ecological condition (non-linear) using WRAP score (linear)

WRAP Score	Weighting Factor
0.85-1.0	1.0
0.70-0.84	0.75
0.55-0.69	0.5
0.40-0.54	0.25
<0.40	0.1

- $(WRAP_{score-x} \; Acres_{indictor \; region-x}) * Weighting^{factor-x}$

Evaluation Example

- **Example – Calculating the Existing Conditions Base Score**

- LS-2 (an evaluation cell in the Loxahatchee Slough) is a Depression Marsh. The median value is 240 days/yr inundation

- In order for LS-2 to get a WRAP score of three, LECsR output would have to equal 240*36 = 8,640.

- **Existing Conditions Base** field score = 2.

- Field score / max score = 2/3 = 0.66. 0.66 * 8640 = 5,760 (the number of days the cell would have been inundated to receive a field score of two).

- For LS-2 in the existing conditions base, the cell would be inundated 5,773 days with the calibration line set to an elevation of 16.51.

Evaluation Example Continued

- **Future Without Conditions** LS-3 target = 8,640; LS-2 calibration line = 16.51; number of days above calibration line in FWO LECsR output = 5,581.

- FWO WRAP adjusted hydrology score = (5,581/8,640) = 0.65

- WRAP Score = 0.65 * 3 = 1.9.

- **Example** - L-3 LECsR Alternative X

- Inundation duration is 7,776 days.

- 7,776/8640 = calculated adjusted WRAP score =0.91.

- WRAP score = 0.91*3 = 2.7

Functional Units Example

Equation: (WRAP $^{score\text{-}x}$ Acres $^{indictor\ region\text{-}x}$) * Weighting $^{factor\text{-}x}$

- LS-2 Area: 3,849

- FWO: WRAP Score = 0.65. Weight =0.5

- Alt X: WRAP Score = 0.91. Weight = 1.0

	▷ Straight Score	Weighted Scores
FWO:	2,501	1,251
Alt X :	3,503	3,503

BUILDING STRONG®

Improvements to PM 4

- Use FWC Hydrologic Assessment Results to Improve Corbett Evaluation

- In addition to PM 4, use output of seasonal hydrology and water depth in key areas

BUILDING STRONG®

Questions and Additional Feedback on PM 4 Watershed Hydrology?
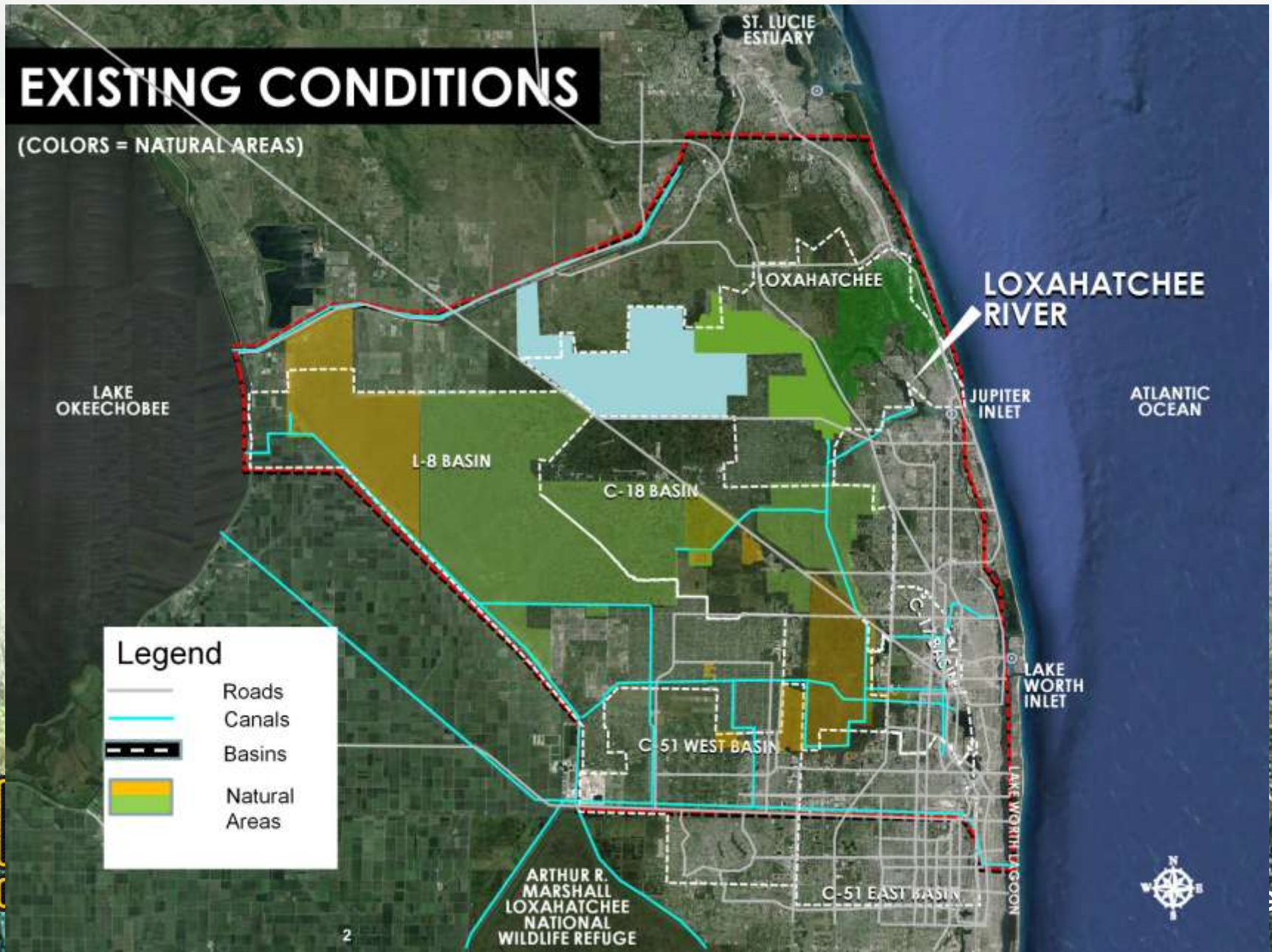
BUILDING STRONG®
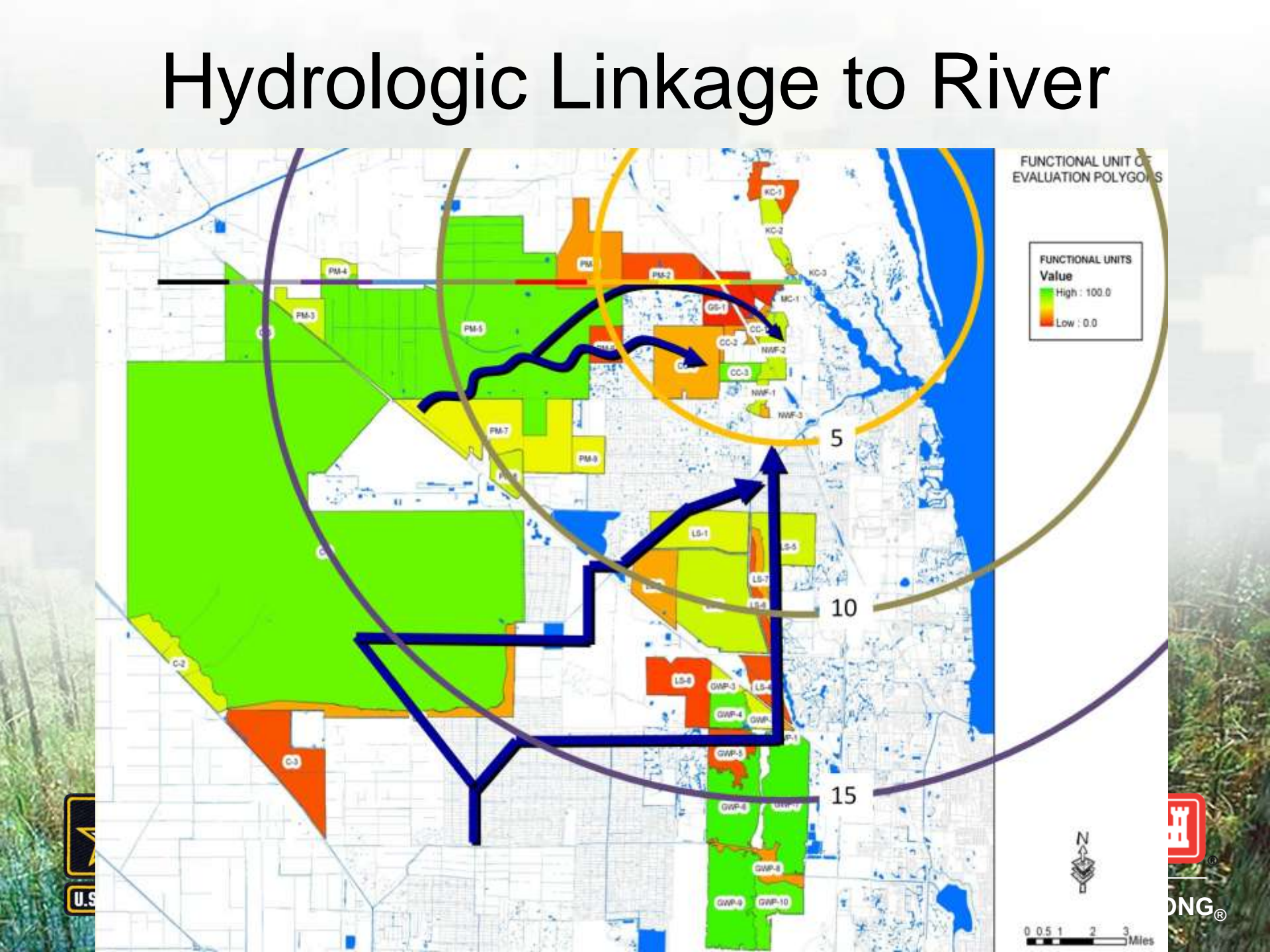
PM 9 - Connectivity

- Mechanics
- Examples
- Recommendations to Improve
- Next Steps in SMART Planning Context

Connectivity

Hydrologic Linkage to River

Existing and Proposed Greenways

Existing Greenways in Dark Green **(FDEP, 2013)**

Florida Ecological Greenways Network

- **Ecological Greenways Critical Linkages**
- **Ecological Greenways Opportunities**
- **Conservation Lands**

BUILDING STRONG®

Water Quality Improvements

- Score 0 - Connectivity and restoration actions do not provide additional water quality improvements.

- Score 12.5 - Connectivity and restoration actions improves water quality by partially allowing for sheetflow across natural lands, natural flow ways providing some treatment, but also utilizing the canal system.

- Score 25 - Connectivity and restoration actions improves water quality by allowing for only sheetflow across natural lands and natural flow ways.

U.S. ARMY

BUILDING STRONG®

Flora and Fauna Species

- **67 species of concern (state and Federal) potentially benefit from project**

- **Options:**
  - ► **assign ranking according to # of species reconnected or**
  - ► **include qualitative write-up species benefits**

27
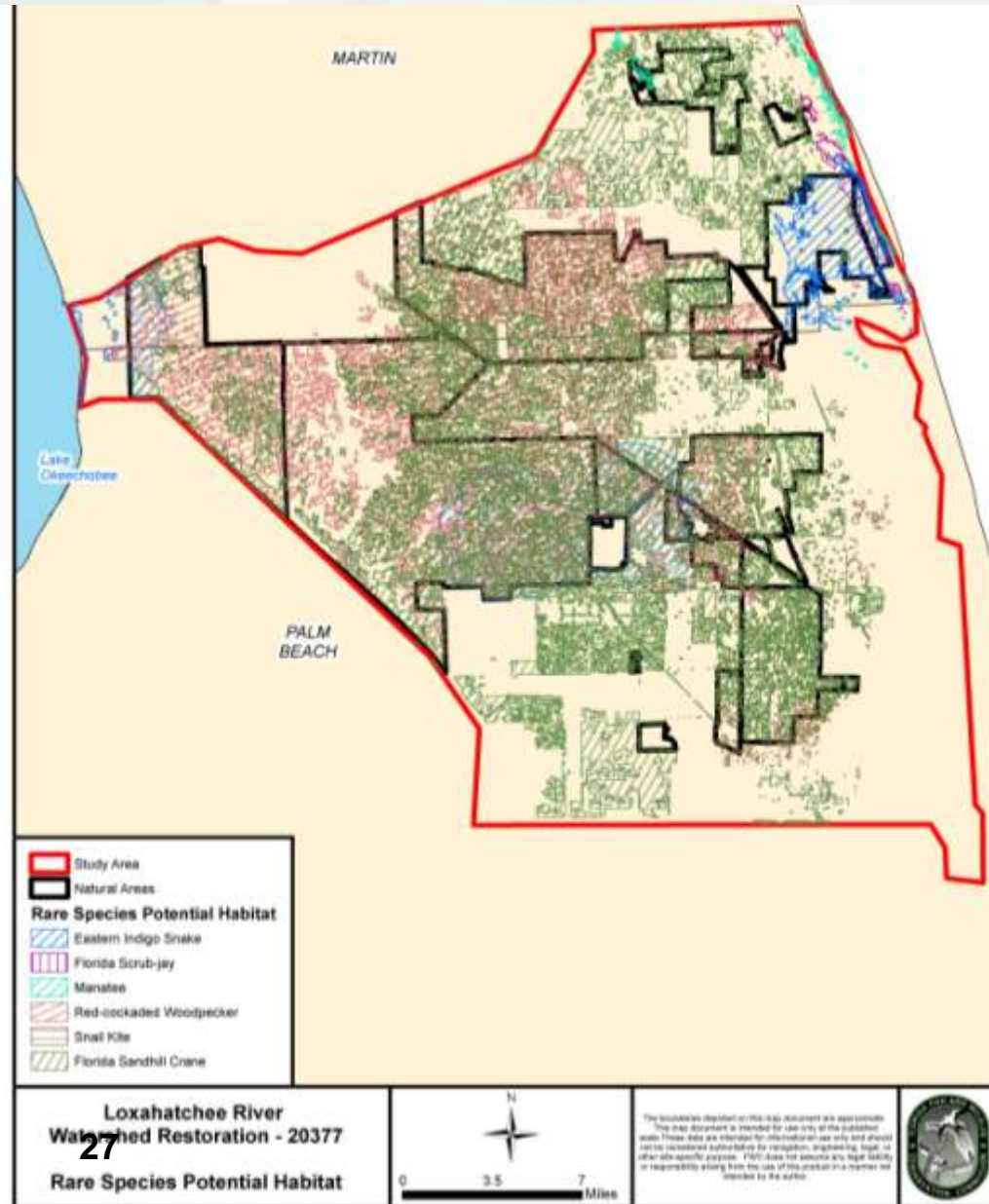
Scoring – No= 0, Partial = 12.5, Yes = 25.
Total Score Possible is 100

Hydrologic/Spatial Connectivity Matrix	Criterion Value based on Subteam Assessment	Maximum Score Possible
Connection provides historic hydrologic linkage which contributes to the restoration of downstream areas and improved quantity, timing and distribution of water. Connections that are closer to the river based on GIS analysis will be scored higher than those further away. See Figure 2 example.	12.5	25
Connection is part of a proposed greenbelt. See Figure 3 example of greenbelts.	25	25
Connectivity promotes water quality improvements and protects water quality.	0	25
Connectivity contributes to the support of wildlife populations by improving the foraging range, territory, or migration path of listed or rare endemic species (See Figure 4 for an example of Wildlife Layers). Wildlife utilization scores are used from the Wetland Rapid Assessment Procedure scoring sheets to identify the value of reconnecting various segments of natural areas.	12.5	25
TOTAL SCORE	50	100

Questions and Feedback on PM 9 Connectivity?
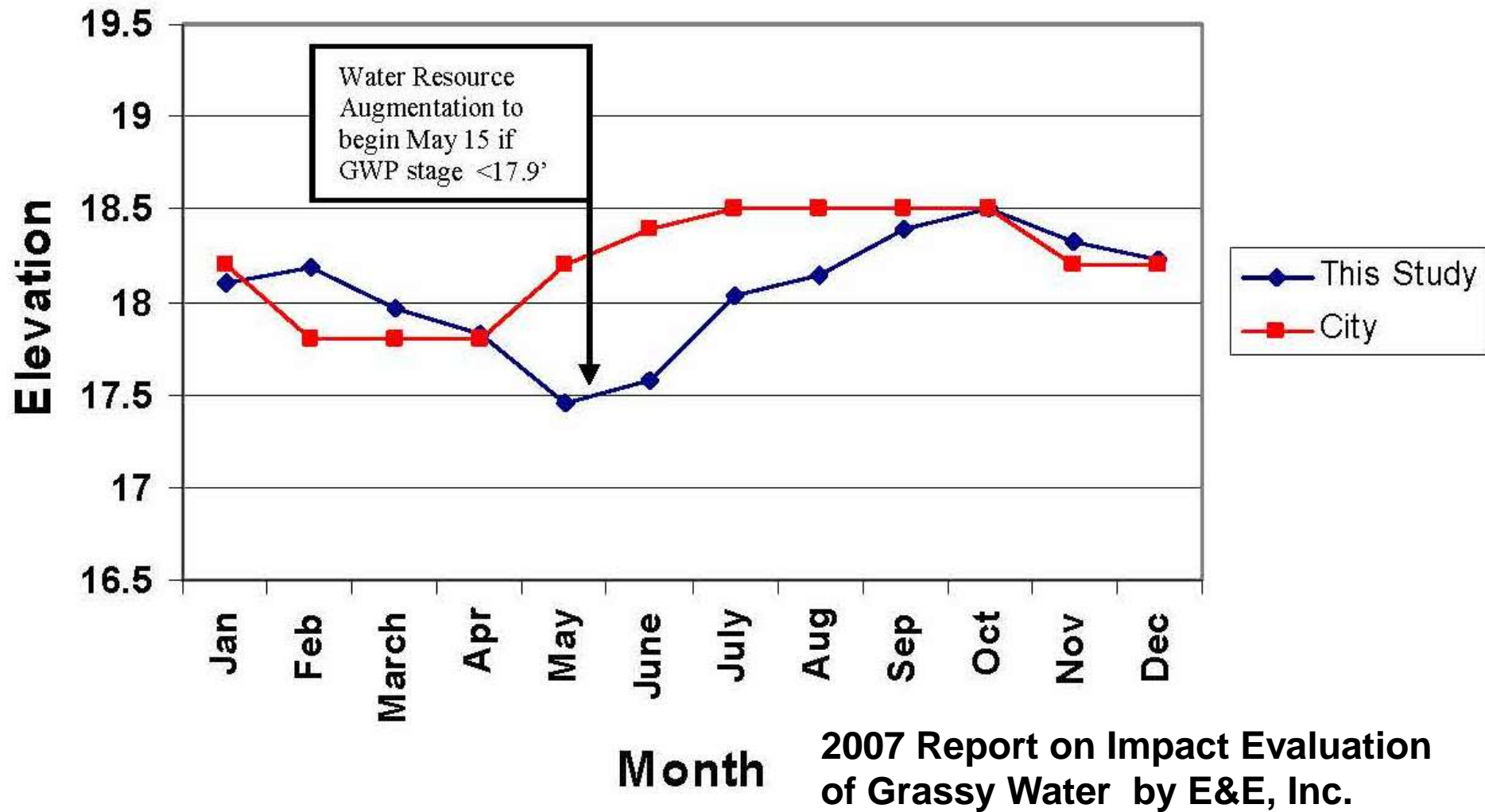
BUILDING STRONG®

Evaluation Criteria 5 – Grass Waters Preserve

- **Revisions underway**

- **Balance multiple criteria**
  - ►Wetland plant communities,
  - ►Snail Kite/Apple Snail,
  - ►Loxahatchee River Flows,
  - ►Water Supply, and
  - ►Water Quality)

Grassy Waters Preserve
Water Catchment Area GWP/WCA
Area of Vegetation Mapping
— GWP/WCA Boundary
— Vegetation Mapping Boundary

Northlake Blvd.

Bee Line Highway

M Canal

30

U.S.ARMY

Need to Identify Ideal Stage Criteria

2007 Report on Impact Evaluation of Grassy Water by E&E, Inc.

Questions and Feedback on Grassy Waters Preserve Evaluation Criteria

BUILDING STRONG®

U.S.ARMY

Water Quality - Evaluation Criteria