Sam Jones – Abiaki Prairie C-139 Annex Restoration

July 15, 2016

Abiaki C-139 Update

- Abiaki C-139 Overview
- Site Ecology Research
- Wetland Reference Sites - Examples
- Maidencane Harvest and Planting Study
- Ongoing Construction – Phase I Restoration
- Future Construction – Phase 2 Restoration
- Construction Challenges

Abiaki C-139 Overview

Sam Jones - Abiaki Prairie C-139 Annex Restoration

Total Project Area = ~15,055 ac

Phase 1 = ~3,700 ac
(~900 acres of natural area / 2,800 acres of former citrus grove)

Phase 2 = ~11,355 ac

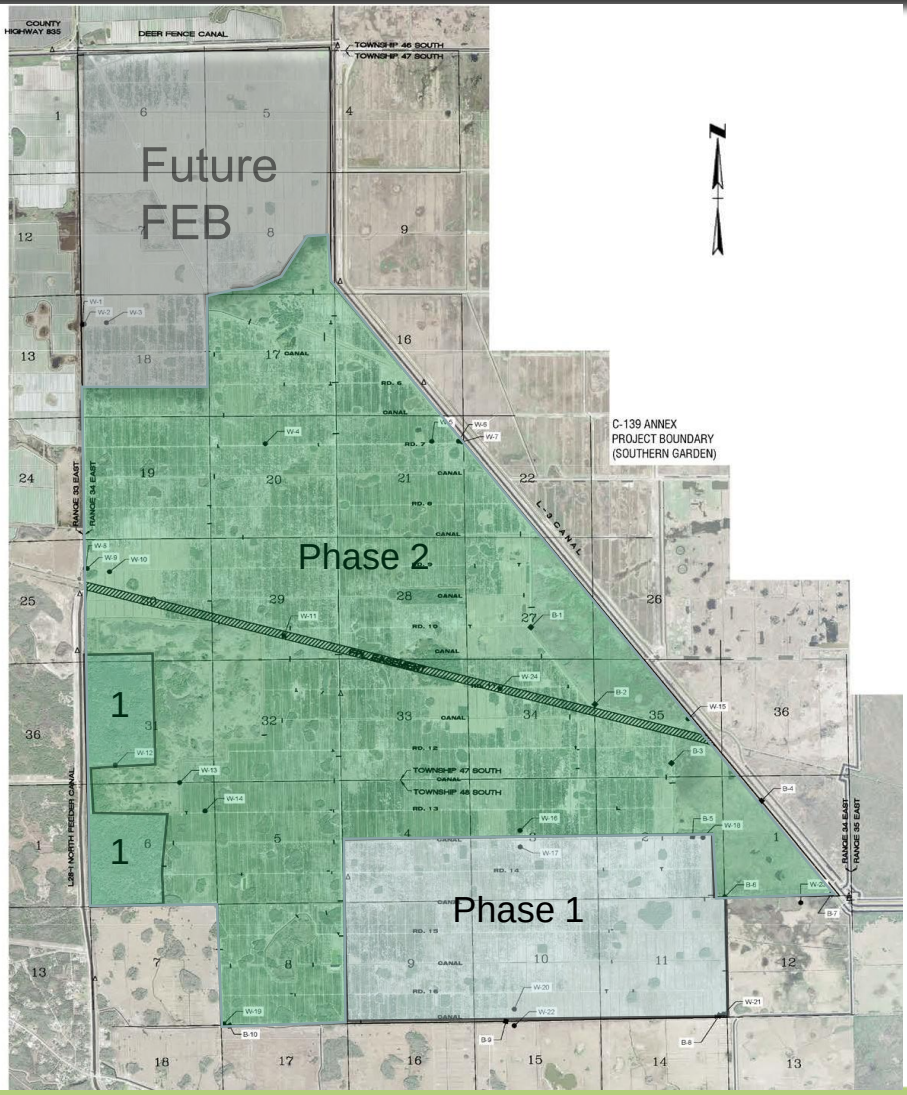
Future Flow Equalization Basin (FEB)

Schedule Phase 1:

- Phase 1 Construction:
  2016-2017

Schedule Phase 2:

- Modeling, Design and Permitting:
  2016 – 2017
- Construction:
  2018 (End of USSC Lease)

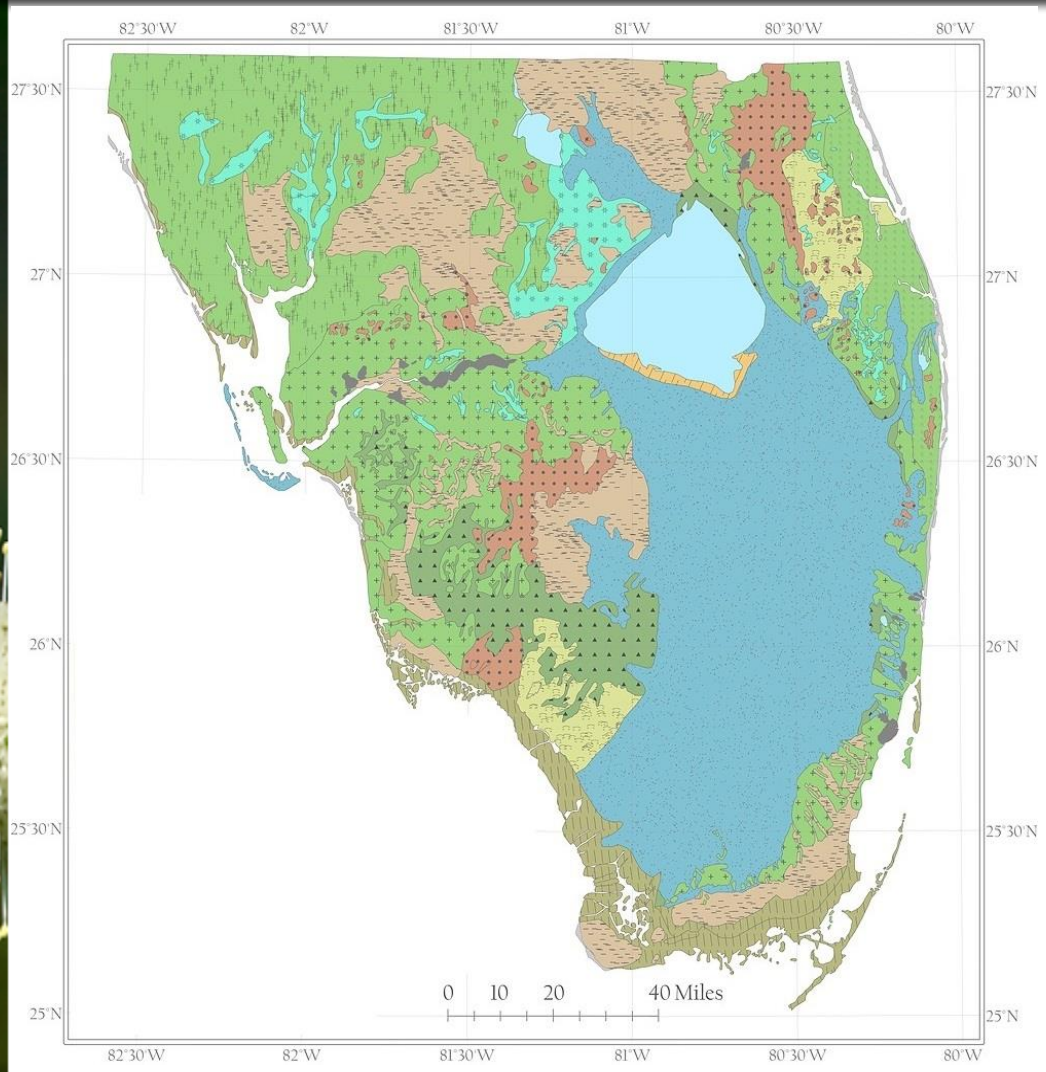


Site Ecology Research

1901 - John Kunkel Small Collection FL Archives

- John Kunkel Small, botanist, described the state of Florida as "the most interesting one, from a botanical standpoint"

Other Sources of Historic Information – Harshberger's Phytogeographic Map, 1913



Legend

- Forest of Pinus Caribaea
- Forest of Pinus Clausa
- Forest of Pinus Palustris
- Forest of Annona Glabra
- Cypress Swamps of Taxodium Distichum
- Coastal Mangrove Swamps
- Prairie Vegetation
- Freshwater Marshes
- Everglades
- Hammocks Vegetation
- Pine Savannas
- Lake Okeechobee

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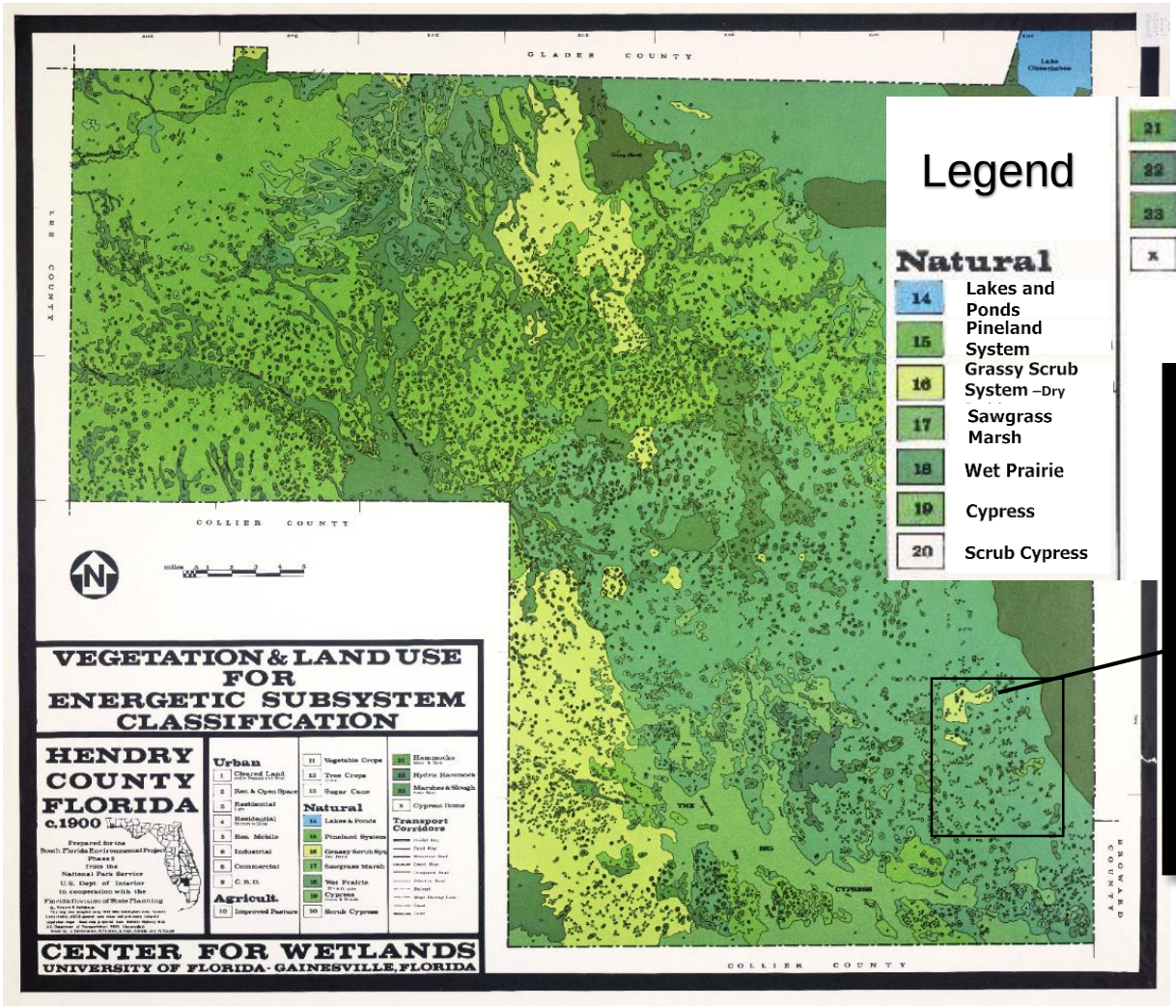
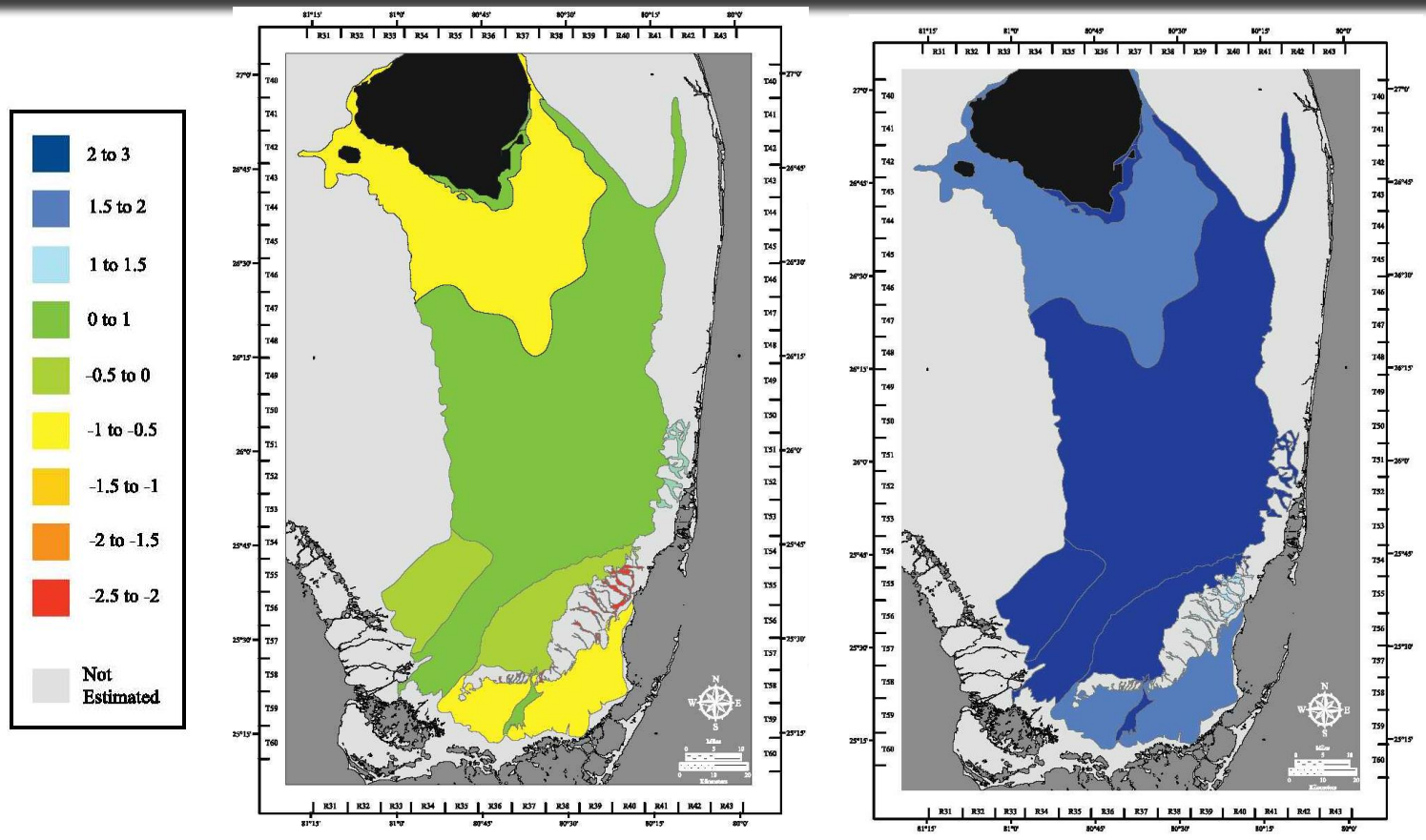
UF Center for Wetlands 1966: Est. 1900 Vegetation, Hendry County



"Landscapes and Hydrology of the Predrainage Everglades" SFWMD 2011



- Water depths in the pre-drainage Everglades
- Long-term average annual flow, at the end of the dry season (left)
- long-term average annual high, at tend of the wet season (right).

WETLAND REFERENCE SITES - EXAMPLES

Reference Sites: Maidencane Flats

Expansive areas of Maidencane with Sawgrass and Hammock Vegetation

Diverse Wetland Habitats

Maidencane flats, marsh species, wildflowers, sawgrass, hammock

Maidencane Harvesting and Study

Maidencane Donor Site – Pond 1, C-139

Maidencane Harvesting/Planting

POND 1 DONOR SITE:

- 150 Acres of remnant native maidencane
- Harvest Estimate : 2,000 bushels per acre
- Planting Density Estimate: 60 bushels per acre
- Planting Rate Estimate: 40 acres of maidencane can be harvested/planted daily.
- 150 donor acres x 2,000 bushels harvested per acre/ 60 bushels planted per acre = 5,000 acres potentially restored in Phase 1
- 1 acre maidencane harvested = 33 acres maidencane planted

Annual Biological Phasing

C-139 : ANNUAL BIOLOGICAL PHASING

MONTH	EXOTIC REMOVAL		MAIDENCANE DONOR SITE	SITE REVEGETATION EFFORTS	
January	Mechanical Removal				
February	Mechanical Removal				
March	Mechanical Removal	Herbicide		Harvest/Plant Maidencane	
April	Mechanical Removal			Harvest/Plant Maidencane	Burn Seed Source
May	Mechanical Removal	Herbicide	Fertilize Maidencane		Burn Seed Source
June	Mechanical Removal		Fertilize Maidencane		
July	Mechanical Removal	Herbicide		Plant Aquatic Vegetation	
August	Mechanical Removal			Plant Aquatic Vegetation	
September		Herbicide		Plant Aquatic Vegetation	
October				Plant Aquatic Vegetation	
November		Herbicide		Plant Aquatic Vegetation	Collect/Direct Seed
December	Mechanical Removal				Collect/Direct Seed

Dry Season

Wet Season

Pond 1: Maidencane Donor Site

Maidencane Rhizomes

Rhizome - a continuously growing horizontal underground stem that puts out shoots and roots at intervals.

Maidencane Donor Site: Post Harvesting

Planting Test Plots

Study Goals:

Minimize inefficiencies and maximize transplanting success

- **Maidencane – Sprigger/digger and ‘pizza cutter’ methodologies**
- **Maidencane - planting dates Spring/Summer/Fall/Winter**
- **Torpedo grass - herbicide type/timing/concentration**
- **Torpedo grass – one year vs. two years of treatment**

Ongoing Construction – Phase I Restoration

Phase I: Project Boundaries

Phase 1 = ~3,700 ac (~2,800 acres of former citrus grove/ 900 acres of natural area)

Phase I: Construction Schedule

Earthwork

- **Start of Phase I Earthwork: Spring 2016**
- **Estimated 'Reverse Farming' Construction Rate:**
  20 acres leveled per day
- **11 months allotted to contractor to complete grading work**
- **November 2016 – substantial completion date of Phase I site grading**

Phase I:
Site Restoration Activities

Remove Citrus Groves and Treat Exotics

Remove Drainage Pipes and Irrigation

Copper Remediation Methodology: Site Leveling Technique

Fine Grading:
Restore Nuanced Micro-topography

Sprigger Digger – Maidencane Rhizome Planting

Rhizomes Planted: 60 Bushels/Acre – 50 Acres in 2016

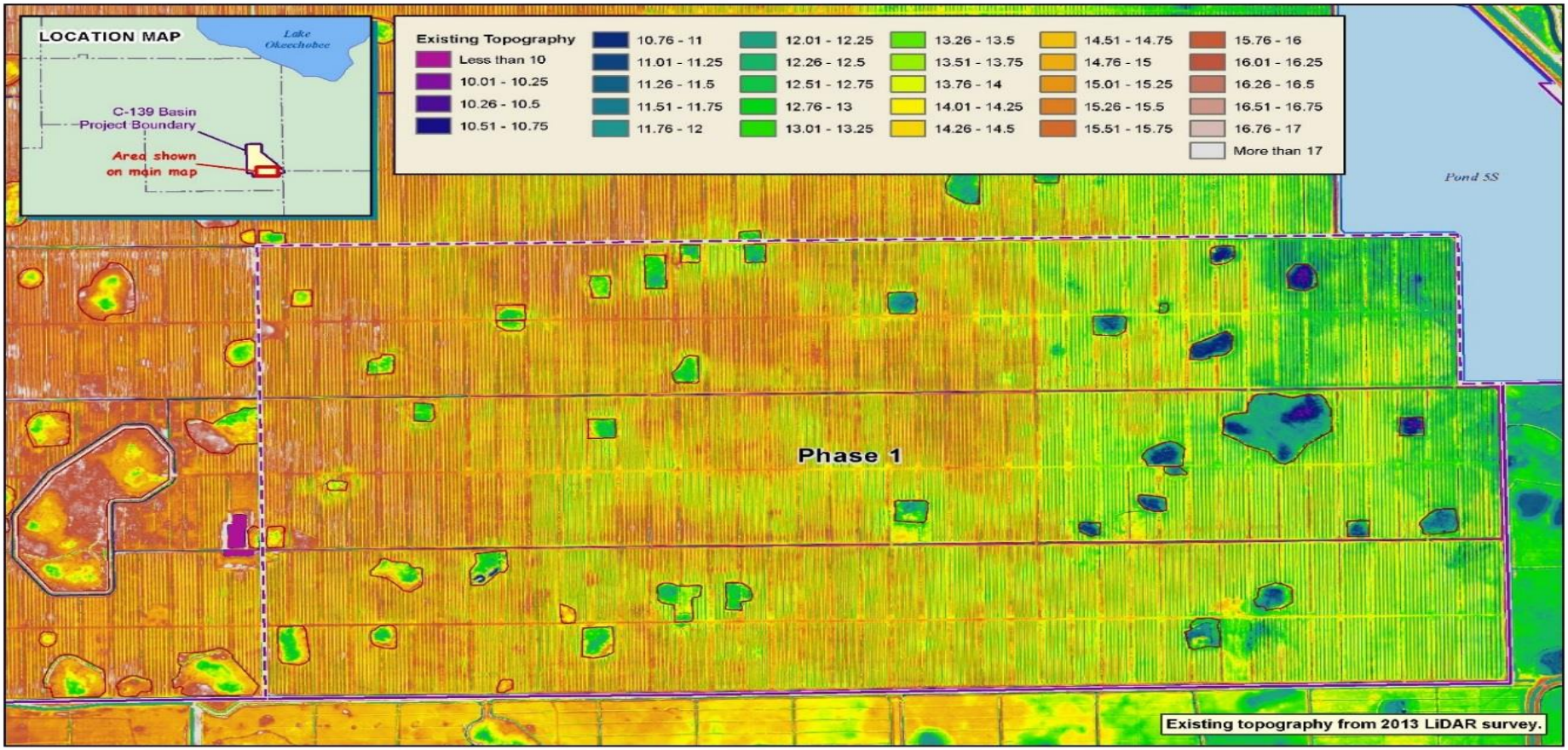
Planting Success: Rhizomes Now Sprouting

Sprigger Digger Technique: Plant Dormant and Prior to Summer Rains

Wet Season Rains: Ongoing Hydroperiod Restoration

Remnant Onsite Wetlands: Exotics Cleared - Native Plant Regeneration

Site Grading:
Wetland Restoration vs. Wetland Construction



BASE CREDITS:
All elevations are in feet, relative to NAVD 1988.
State plane projection, Florida east zone, NAD 83-HARN, US feet.

South Florida Water Management District
3301 Gun Club Rd, West Palm Beach, FL 33406
561-686-8800 - FL WATS 1-800-432-2045
P.O. Box 24680 - West Palm Beach, FL 33416-4680

C-139 Annex Restoration, Phase 1 Topography

0 0.2 0.4 0.6 0.8 1 Mile
0 0.5 1 1.5 Kilometers

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September 2015

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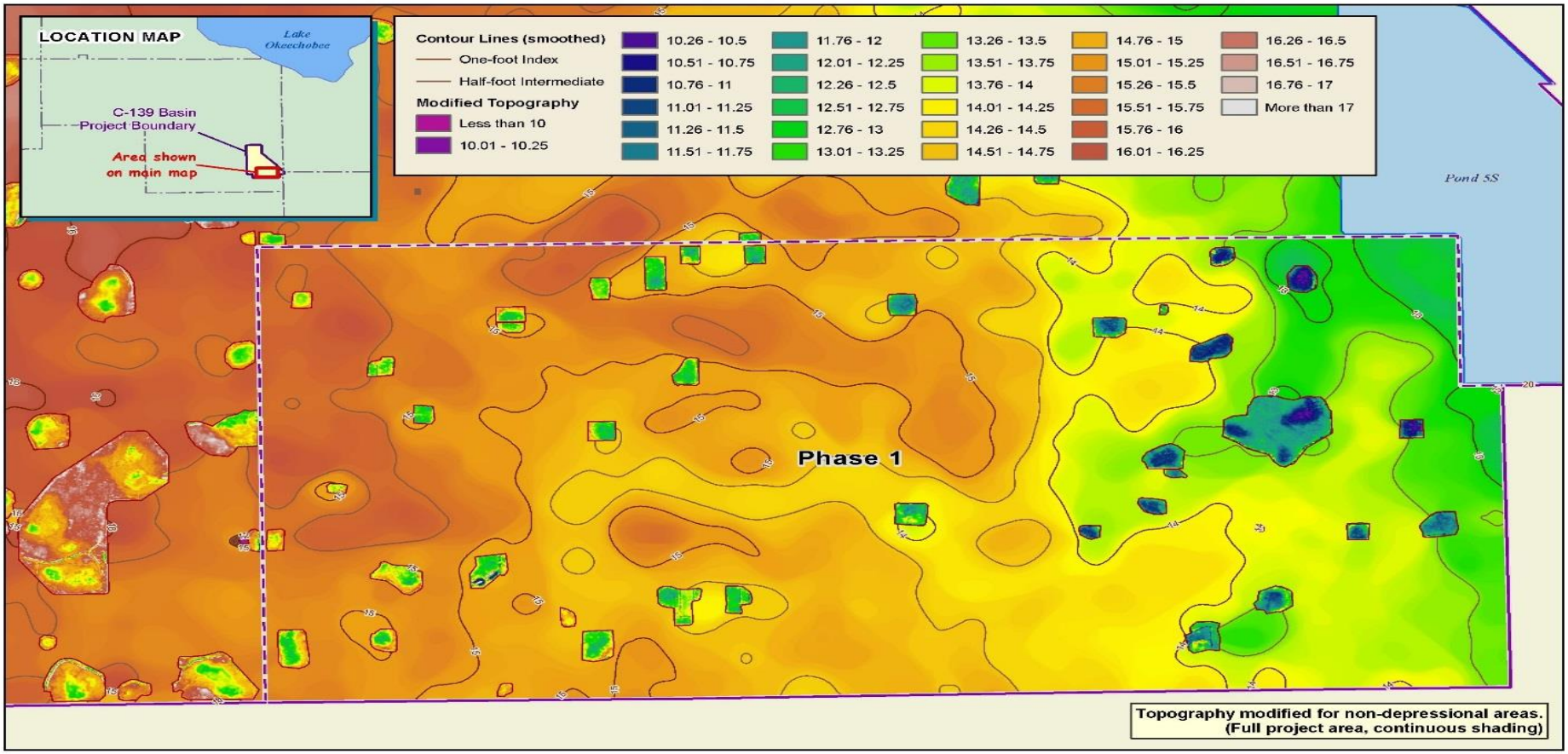
Post Leveling: Wetland Surface Flow and Wetland Depressions



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Ongoing Restoration Efforts

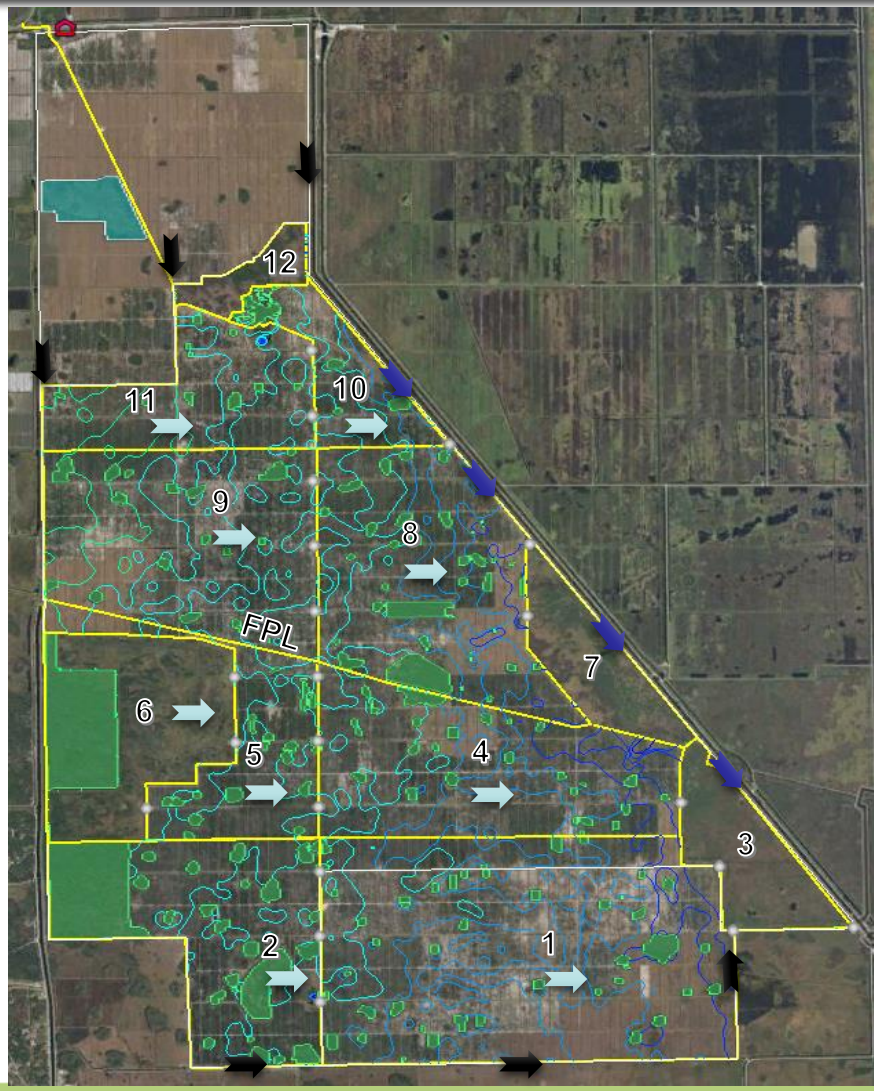
Future Construction –

Phase 2 Restoration

Phase 2: DRAFT Construction Site Plan

Basic Design Elements:

- **Restoration Areas: Abiaki 1 to 12**
- **Monitoring and Maintenance Road Network**
- **Basin Flow: West to East with Cascading Basins**
- **Abiaki 3: One Proposed Discharge Structure**
- **Retrofit USSO for culvert flow**
- **Abandon majority of wells – keep some for standby use**
- **Levee/Canal System along South Perimeter and Seepage Control Pump Station**



From Citrus Grove to Restored Wetlands

1. Site within SFWMD Control
2. Removal of citrus trees (clearing, pile, burn, smooth)
3. Removal of citrus irrigation (tubing, wells, pumps, housing, piping, tanks)
4. Mow vegetation in ditches prior to 1rst exotic treatment
5. 1rst exotic treatment of cleared citrus grove areas
6. Prescribed burn of cleared citrus grove areas
7. 2nd – 5th exotic treatment sweep of cleared citrus grove
8. Prior to site grading, verify exotic eradication success - additional time/treatments needed?
9. Exotic treatment/removal in remnant wetland areas (mechanical and hand removal)
10. Level grove blocks Soil monitoring and stabilization
11. Identify groundcover donor site
12. Herbicide and fertilize groundcover donor site
13. Identify groundcover areas available for harvest
14. Identify max area of groundcover restoration planting; does the identified donor site produce enough material?
15. 1st groundcover harvest
16. 1st groundcover planting
17. Rest period: groundcover donor site recovery and regrowth
18. Fill lateral canals and excavate deep refugia areas
19. Construct/retrofit perimeter site controls (toads, levees, berms, canals)
20. Construct/retrofit water control structures
21. Construct/retrofit internal roadway network
22. Construct seepage pump
23. Plant aquatic vegetation in wetlands as appropriate
24. Collect seed for wetland diversity
25. Direct seed for wetland diversity
26. Monitoring for evidence of success – water, wildlife, vegetation
27. Implement adaptive management
28. Functional units available for release

Permitting the Restoration Plan

- **USACE**
  - **Application Submitted:**

    May 2016
- **FLDEP**
  - **Application Submittal Target:**

    Fall 2016

Construction Challenges

Interactions with Local Wildlife

Vigilance and caution is required - but overall this is a good thing!

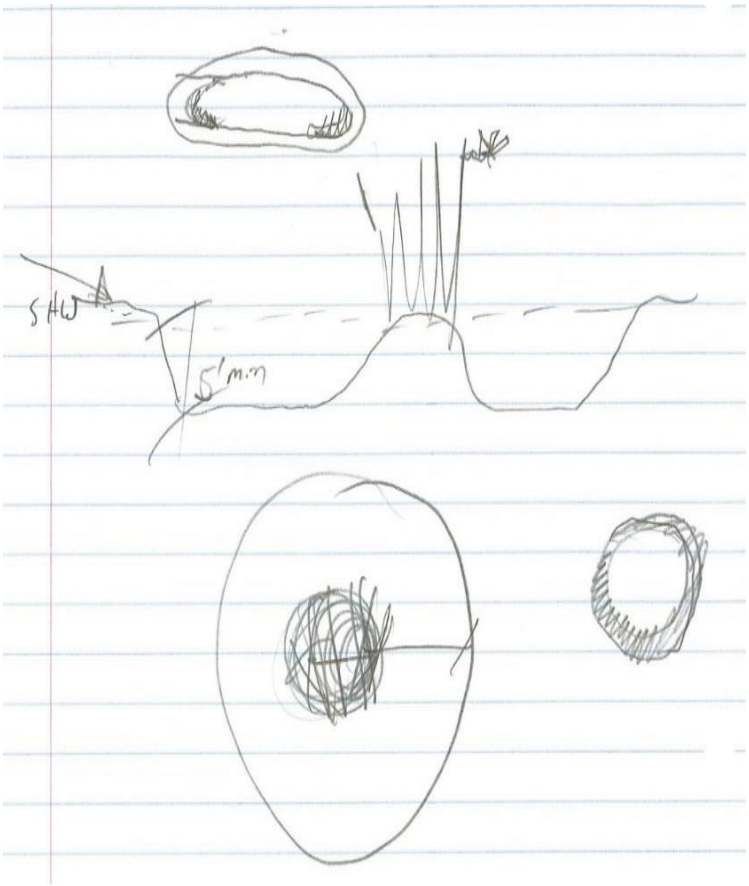
Existing FPL Transmission Lines

Monthly Coordination Meetings with FPL Staff

Remnant Exotic Vegetation – Torpedo Grass

Ongoing Herbicide Applications and Onsite Research

Onsite Fill Deficit – Multidisciplinary Design Collaborations



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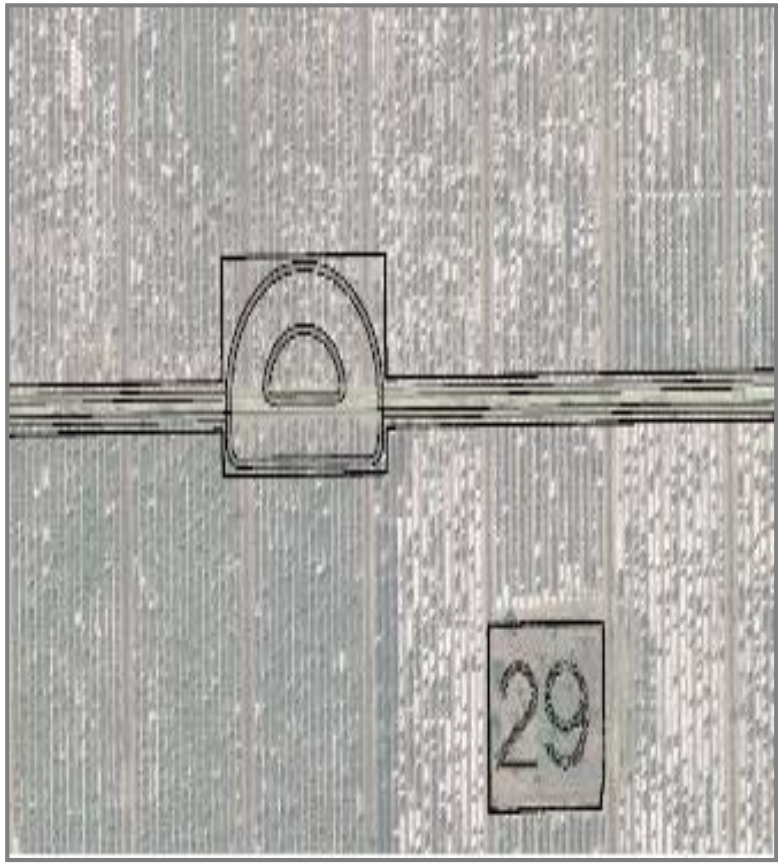

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Deep Water Refugia/Nesting Islands Generate Construction Fill Material

Aerial Overview of Phase I

Abiaki C-139: Construction Overview

Questions?