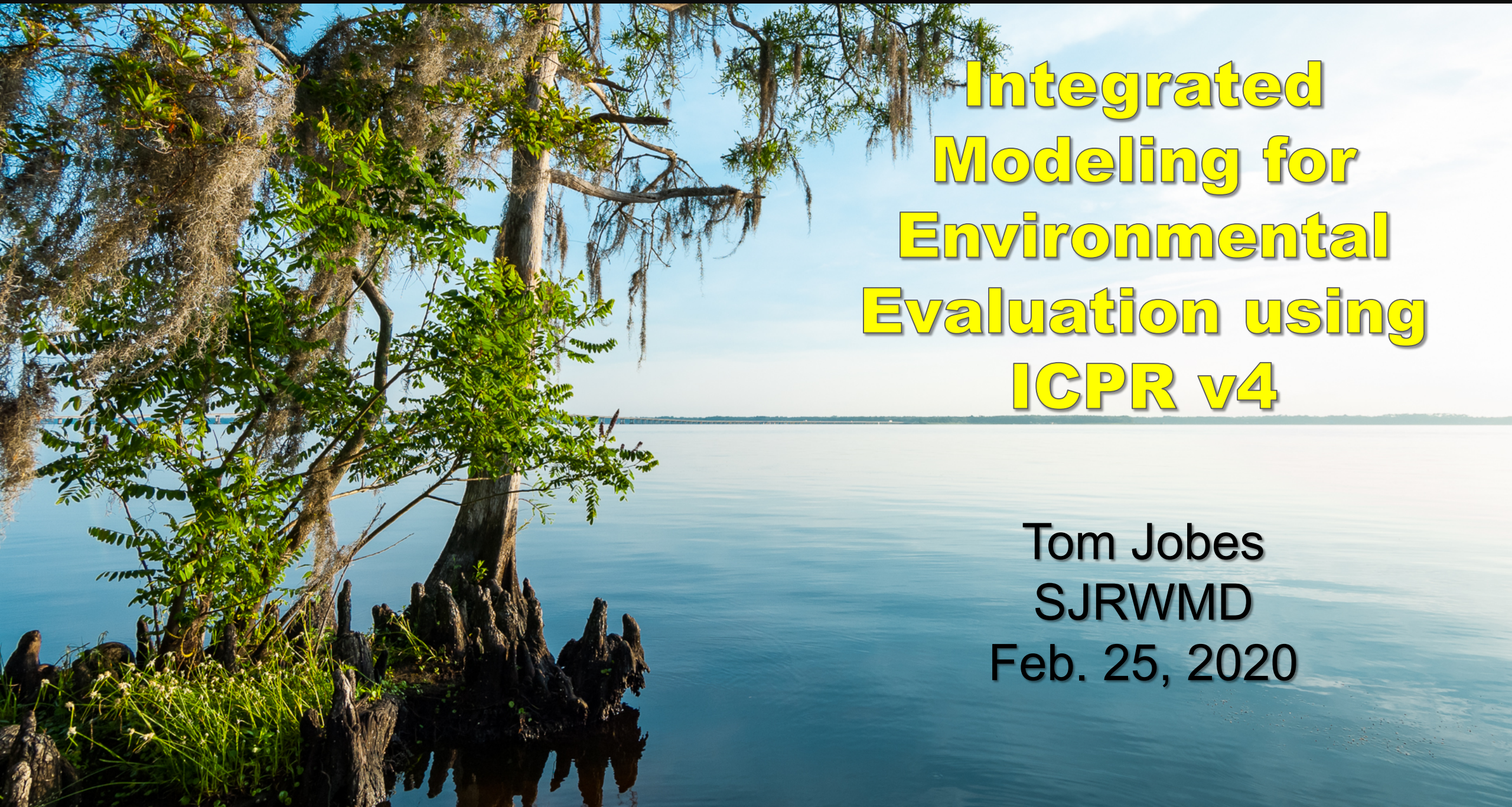


Integrated Modeling for Environmental Evaluation using ICPR v4

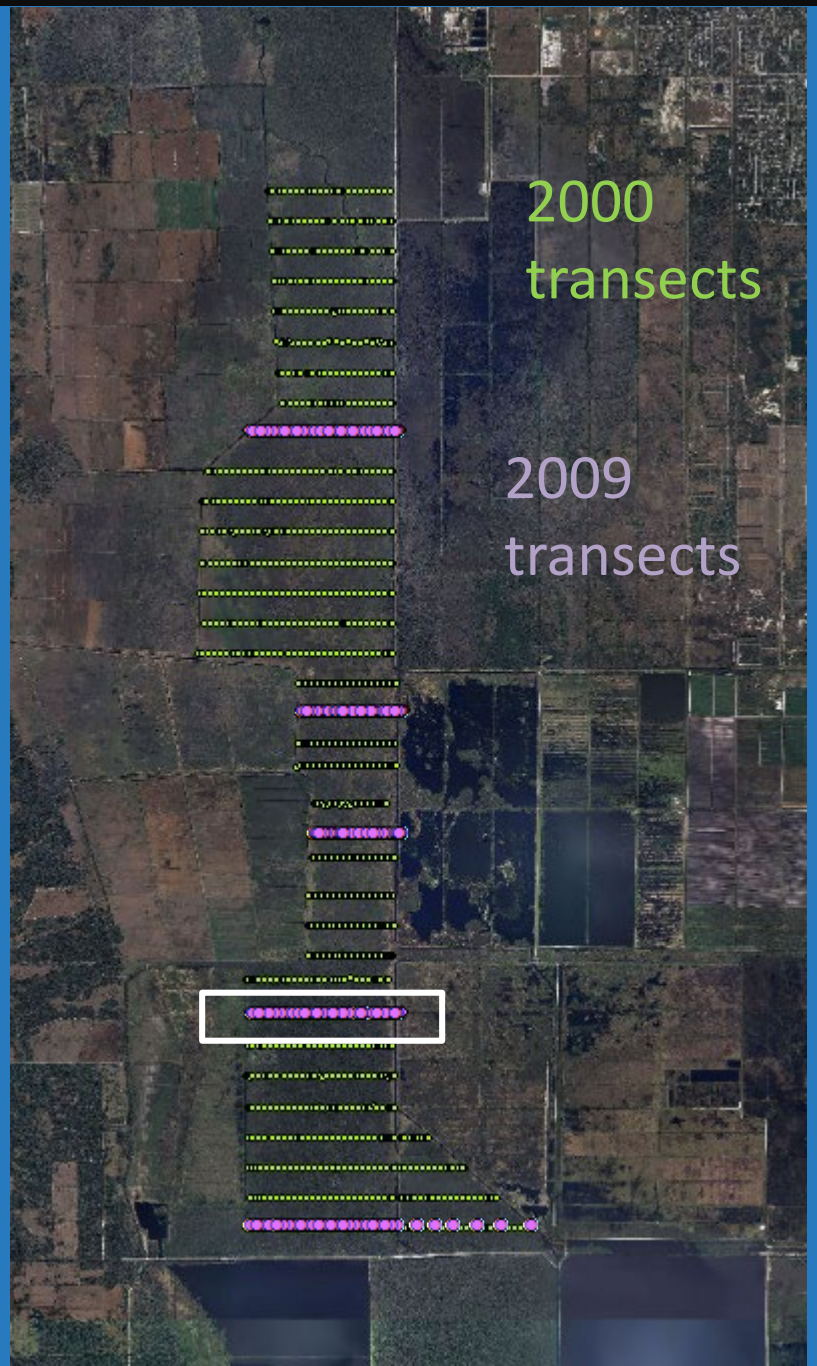
Tom Jobes
SJRWMD
Feb. 25, 2020

Background

St. Johns Marsh Conservation Area

- Near headwaters of Upper St. Johns River
- Approximately 35 square miles
- Land is owned and managed by SJRWMD
- Provides important water quality and ecological functions
- Managed flood flows from south and east

St. Johns River Water Management District



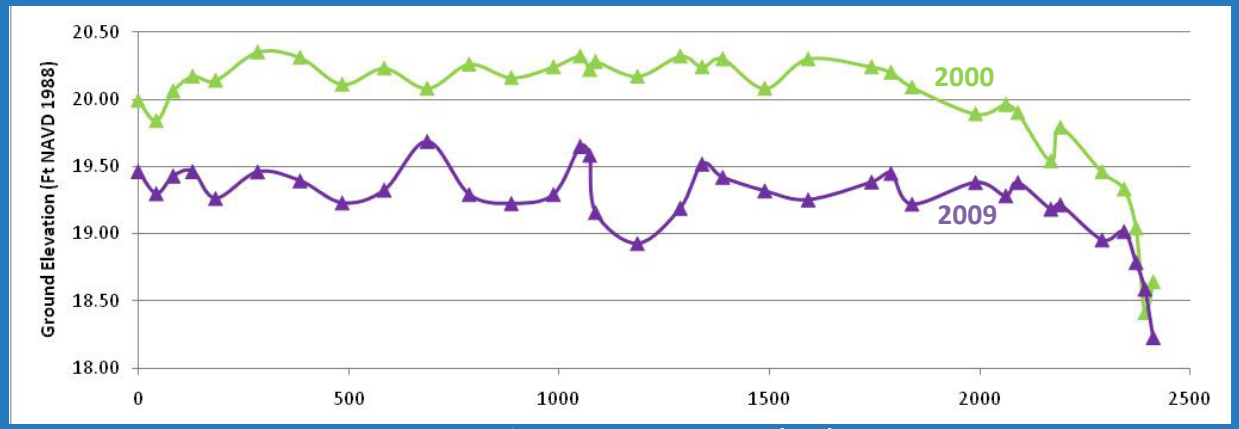
Courtesy of
Sandra Fox
SJRWMD

2000

- 35 transects
- 1,420 points
- ~500m between transects
- ~50 meters between points

2009/2010

- Repeat 5 transects
- 175 points
- ~same location

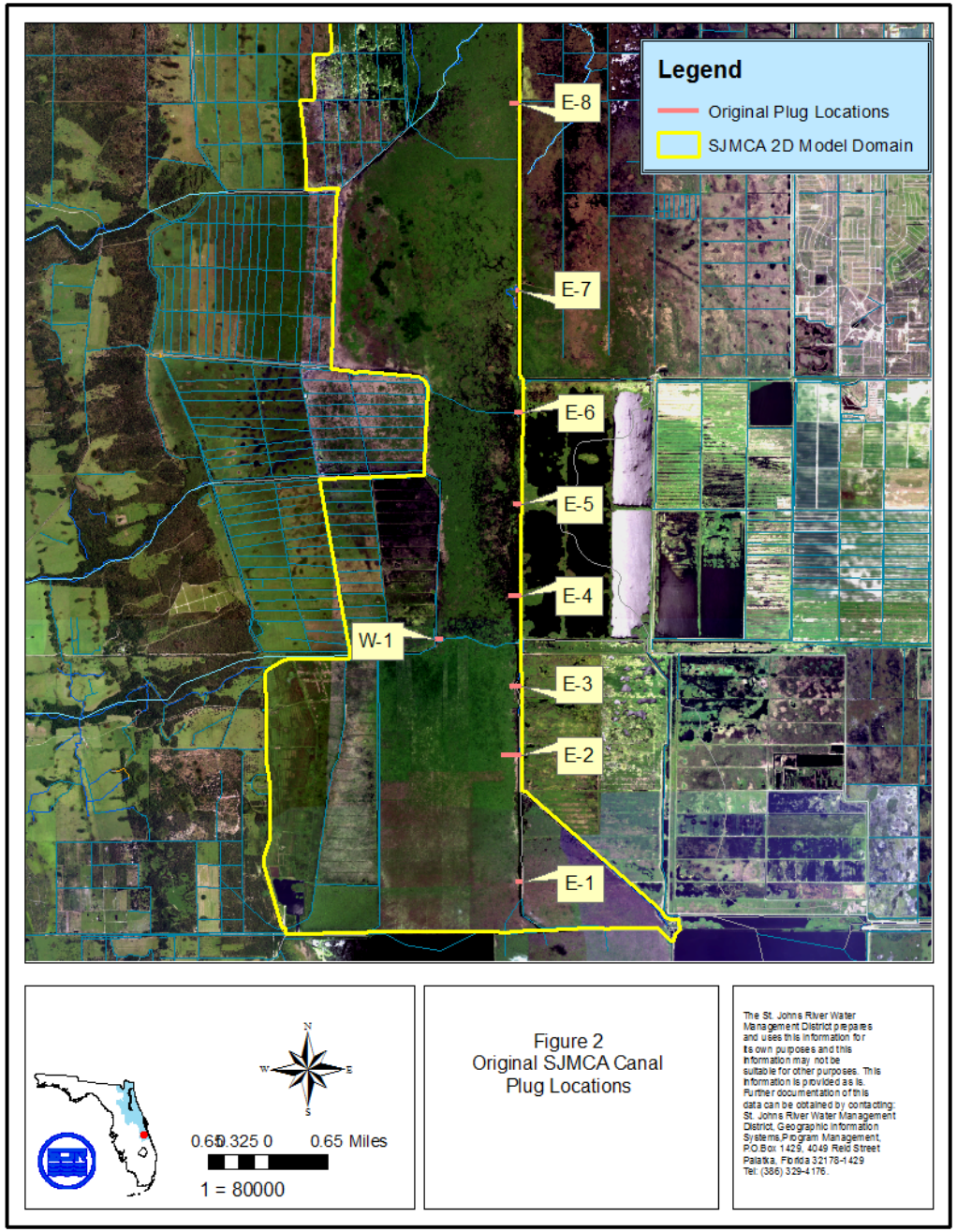


Distance along transect (m)

Background

Changes to Historic Conditions

- Canal plugs installed in the 1990s
- All but one were removed by early 2000s
- Former inflows diverted eastward into Three Forks MCA before returning to SJMCA



Model Selection

ICPR version 4 selected

Criteria:

- Represent 2D overland flows
- Continuous simulation
- Hydraulic structures
- Simulate surface/groundwater interaction
- Ease of use
- Reasonable cost

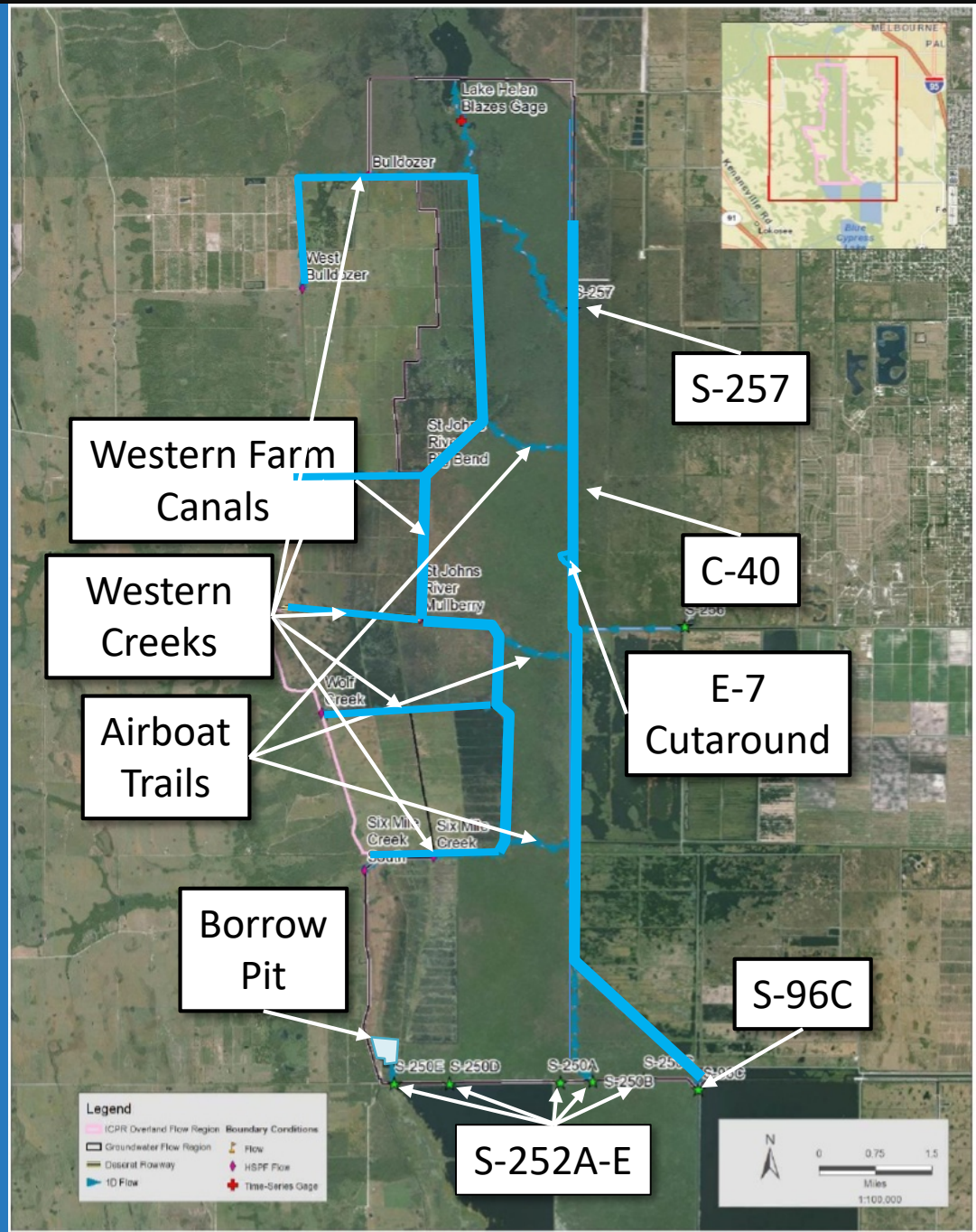
Jones Edmunds Associates contracted to develop base model

Streamline Technologies, Inc. (software developer) contracted to perform peer review

Model Development

SJMCA 1D Features

- Inlet structures
  - S-96C
  - S-252A-E
  - S-257 Weir
- C-40 and western farm canals
- E-7 cut-around channel
- 3 cross-marsh airboat trails
- Western creek and flow-way channels
- Pond control volume – borrow pit

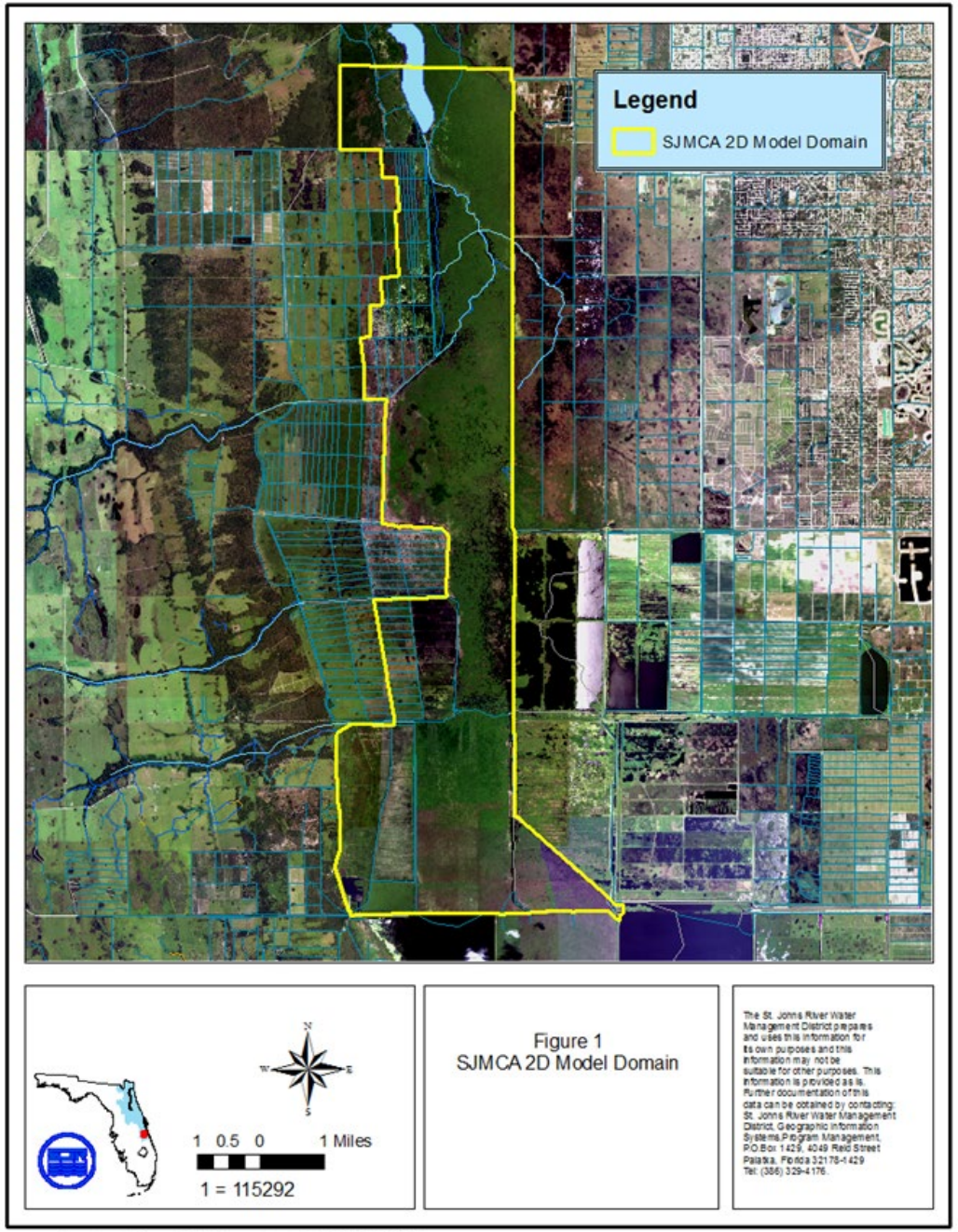


Model Development

SJMCA 2D Model

- Combination of 1D and 2D overland flow, plus 2D groundwater mesh
- Intended for design of structural improvements

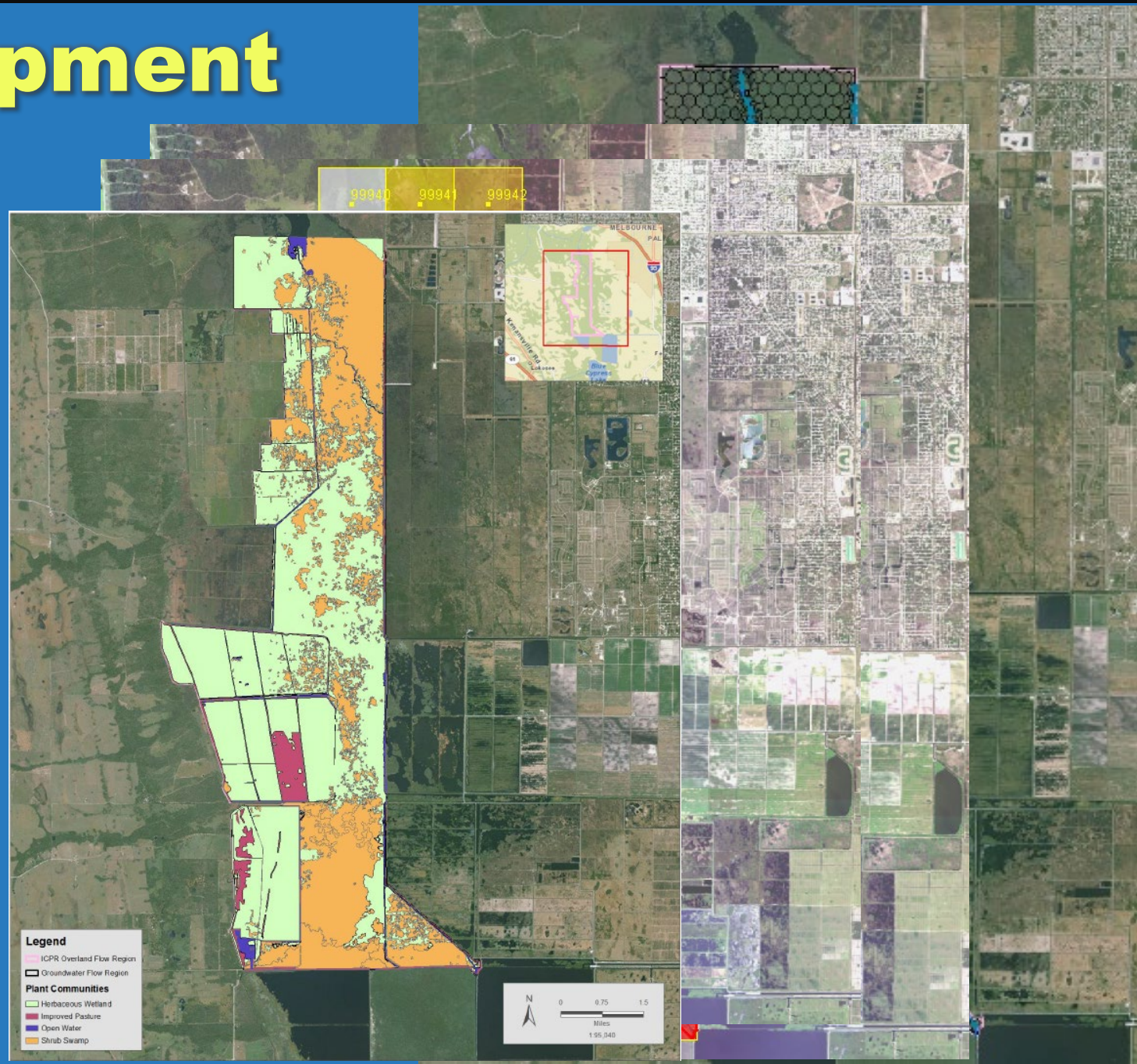
- Possible future additional uses include:
  - Evaluation of flowage easements on western boundary
  - Improved stage/discharge relationships for large-scale watershed models.



Model Development

2D Surface Region

- Breakpoints
- Breaklines
- 2D weirs
- Control volumes
- 8,500 surface nodes
- Lidar-based DEM



Model Development

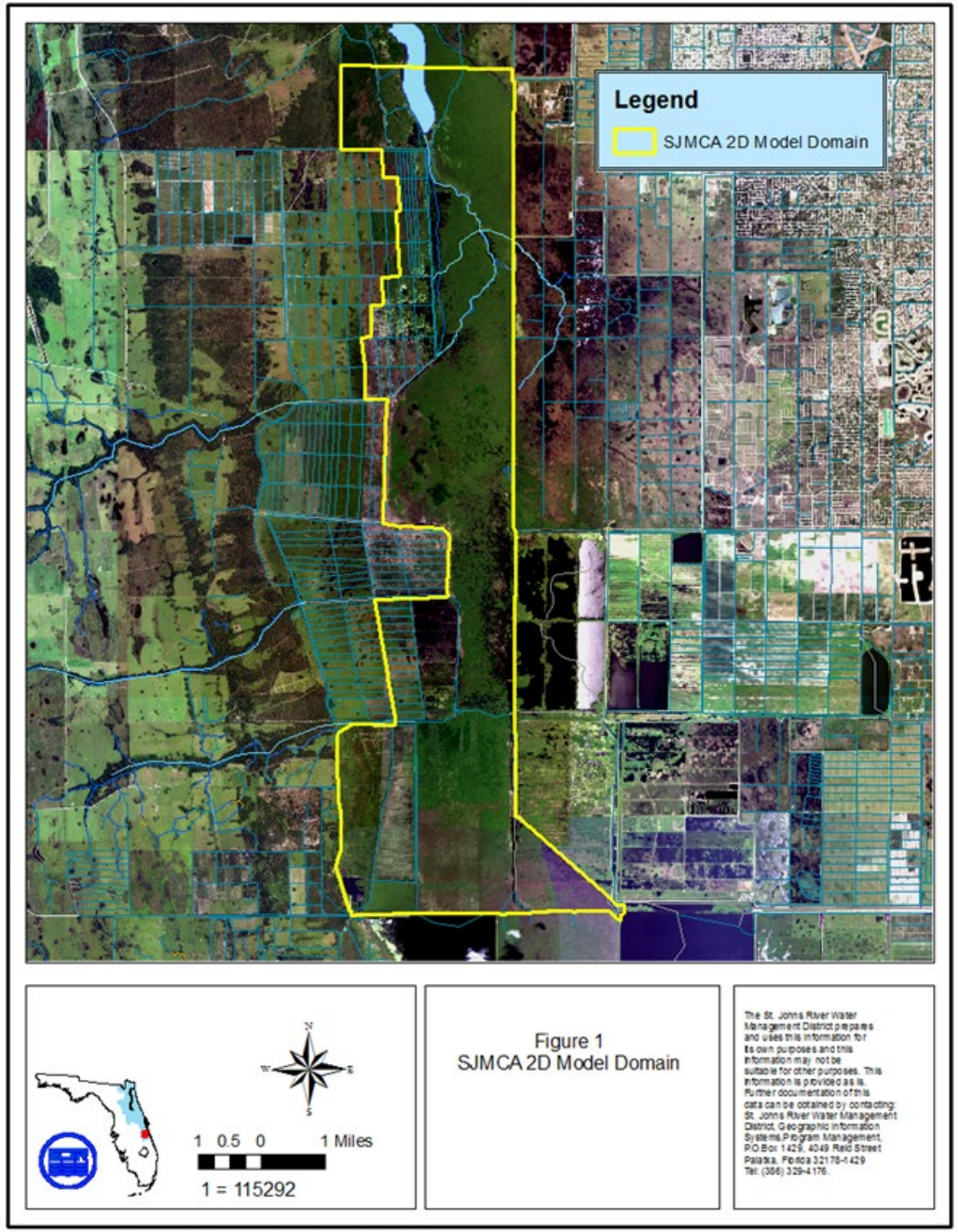
Groundwater Region

- 3,400 groundwater nodes
- Peat layer above sand aquifer
- Downstream boundary condition established using gauge data
- No leakance to UFA

Alternatives Analysis

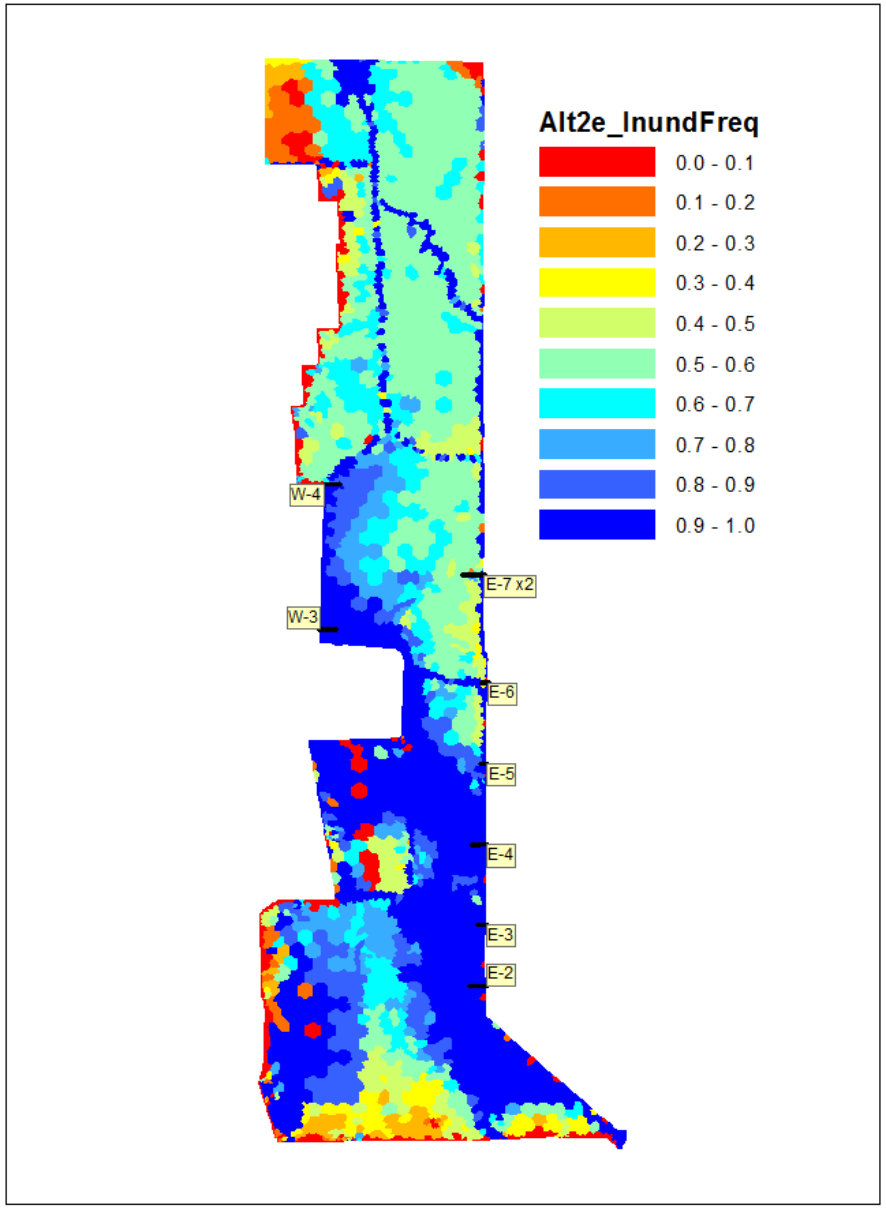
SJMCA 2D Model

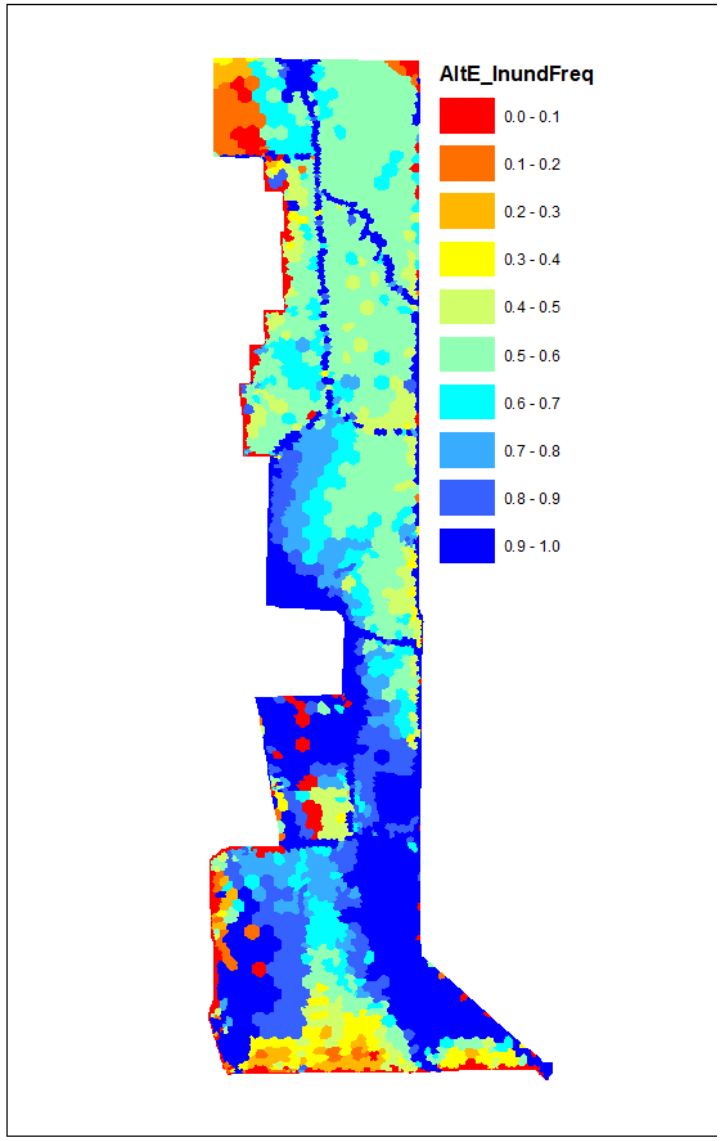
- Combinations of restored and new canal plugs and other features
- Alternatives were developed in three phases
- Environmental criteria applied for:
  - Percent inundation
  - Dry-down periods
  - Predicted vegetation community



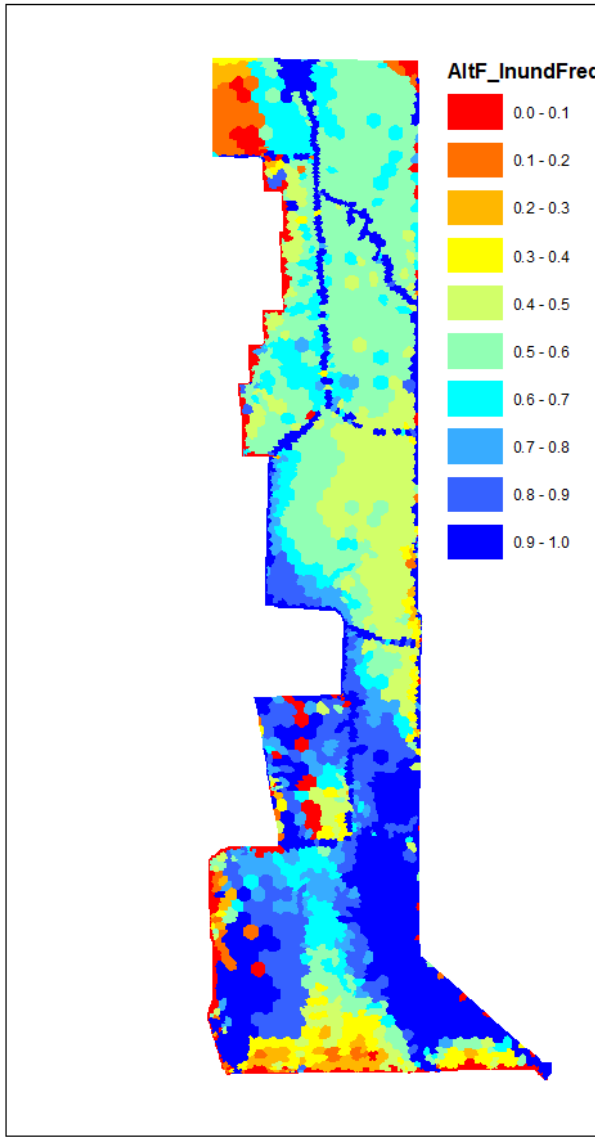
West Side Alternatives

Alt 1	none
Alt 2a	W-1, 2
Alt 2	W-1, 2, 3
Alt 2b	W-1,2,3,4
Alt 2c	W-3,4
Alt 2d	W-3,4,5
Alt 2e	W-3,4 + E-7 x 2

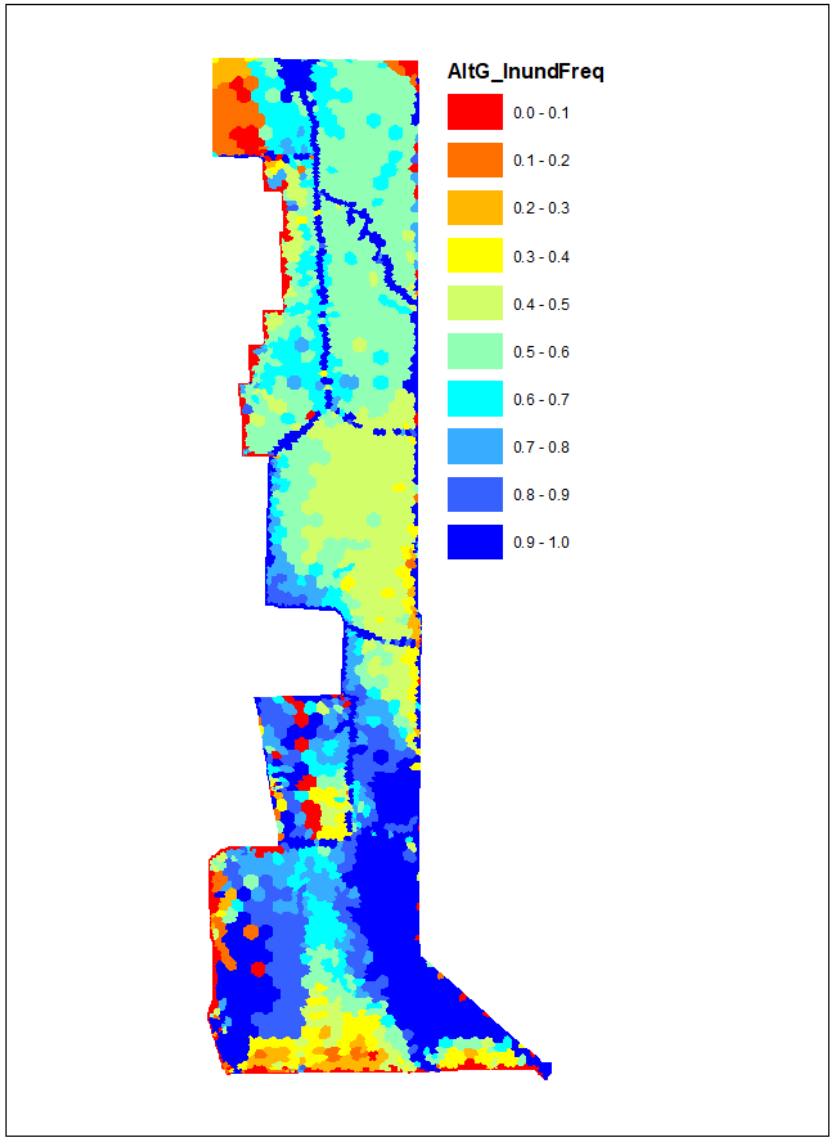




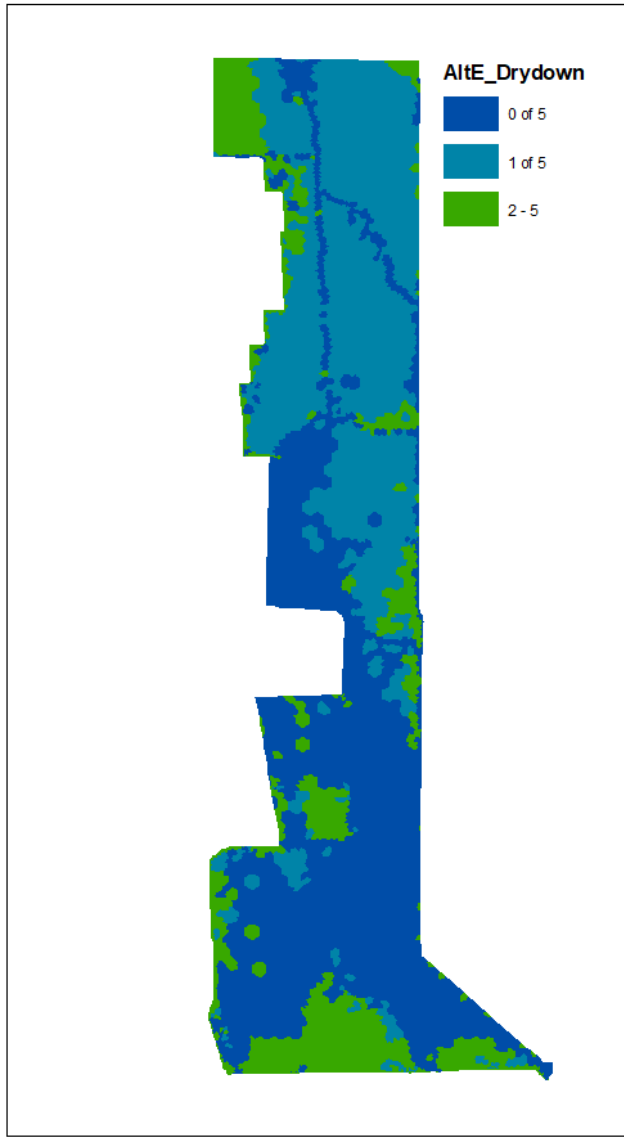
Alt E: All 36”; Apr-Jun



Alt F: All 60”; Apr-Jun



Alt G: All 60”; Jan-Dec



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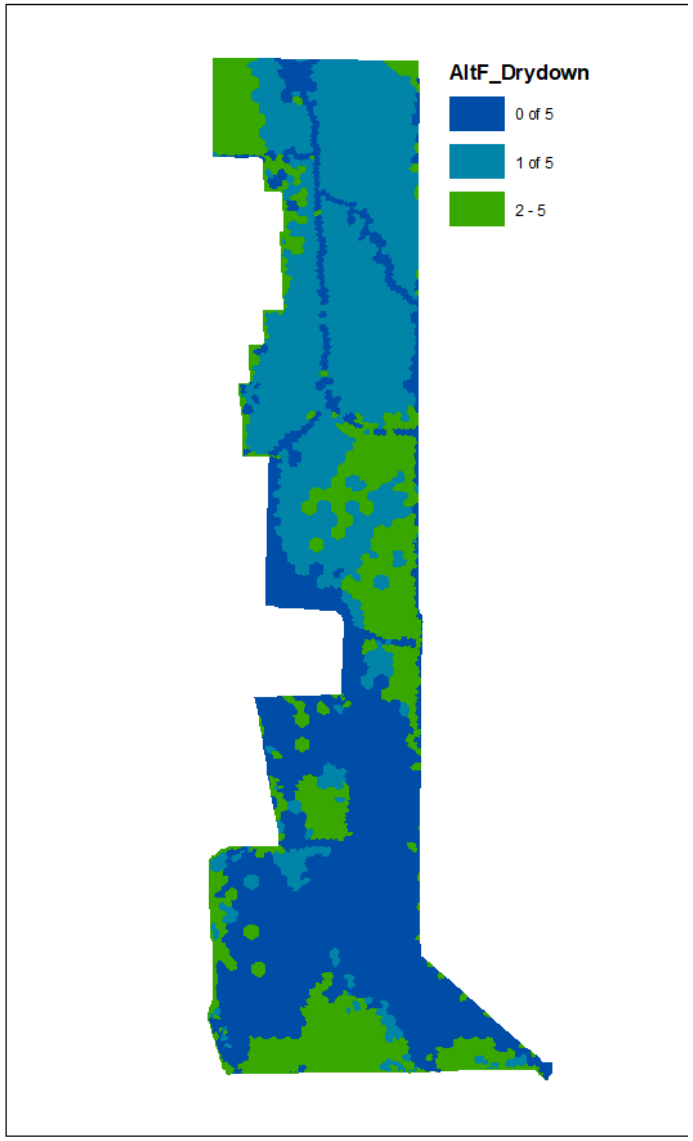

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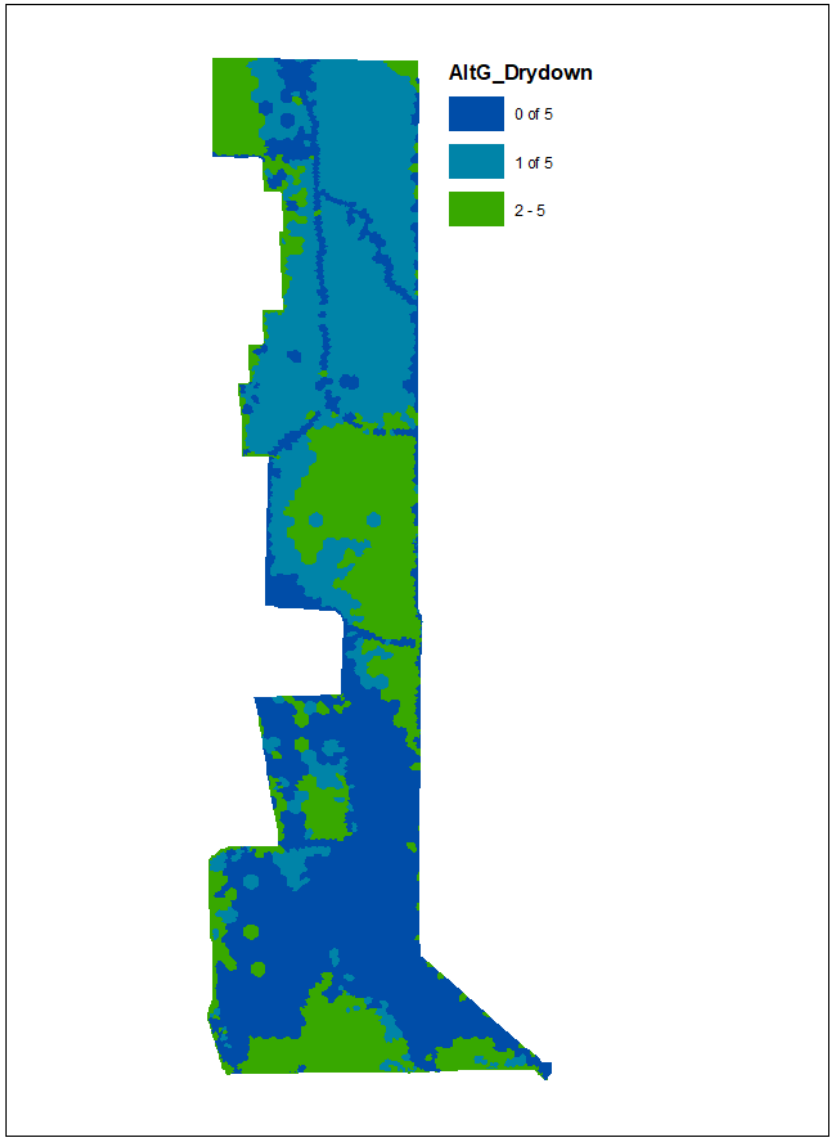

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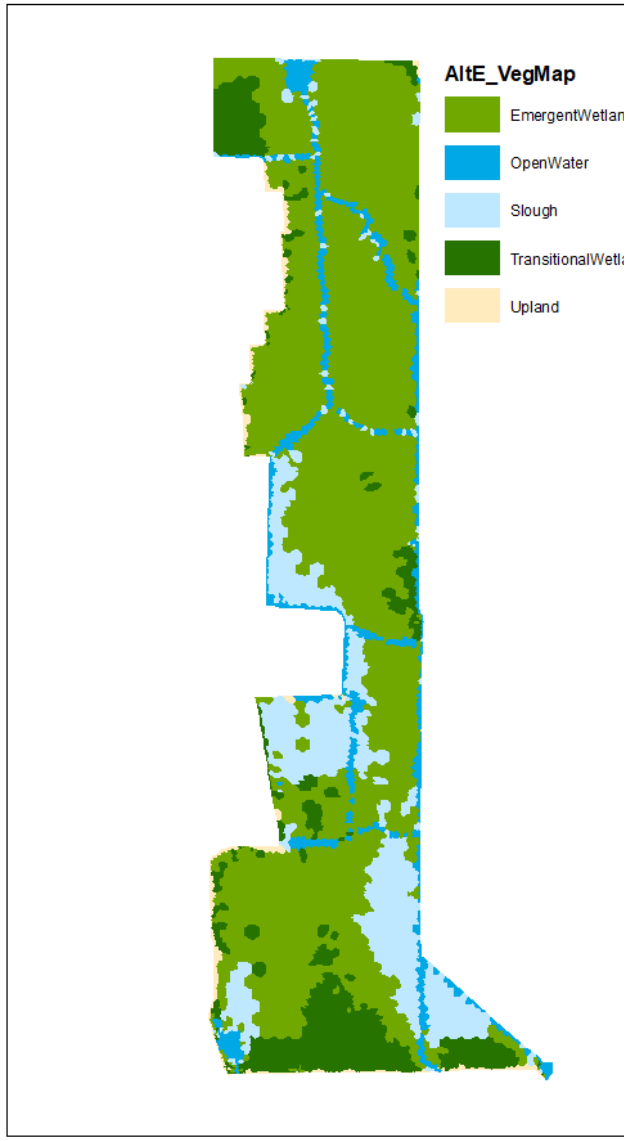

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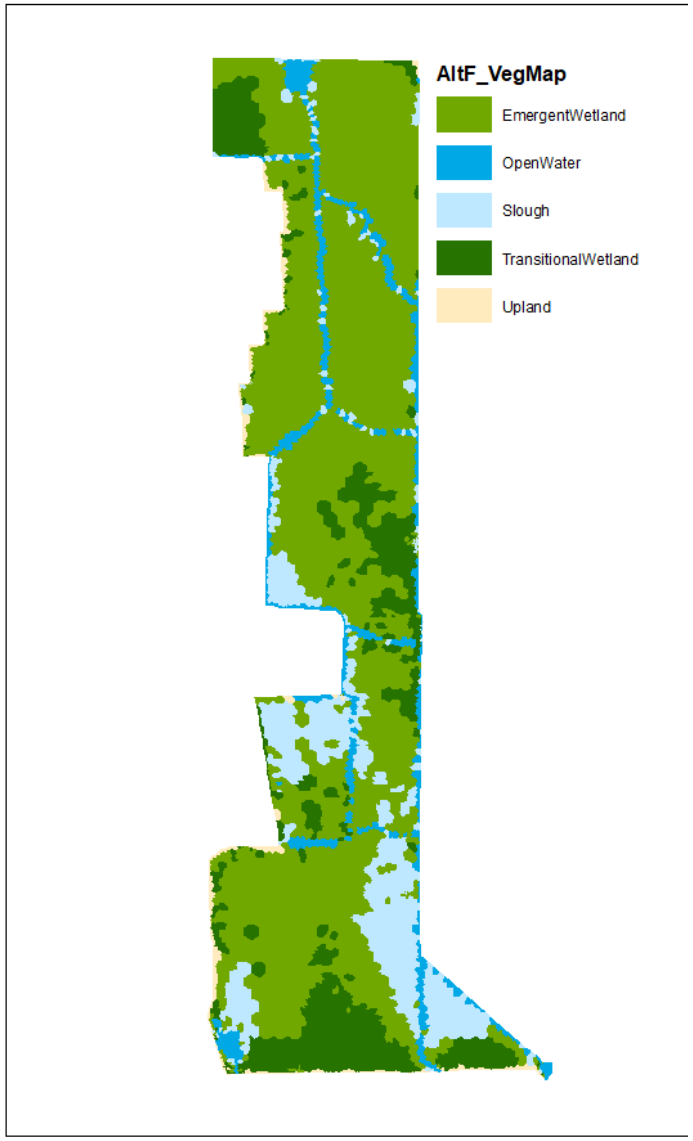

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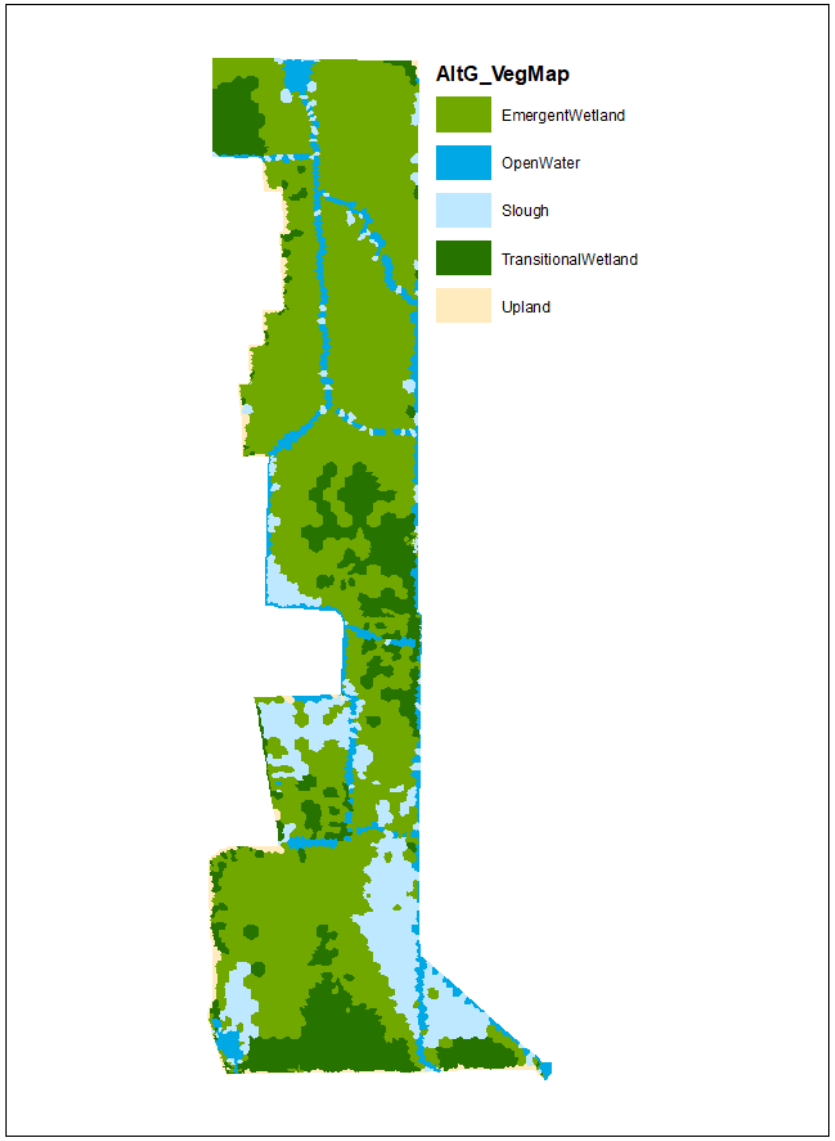


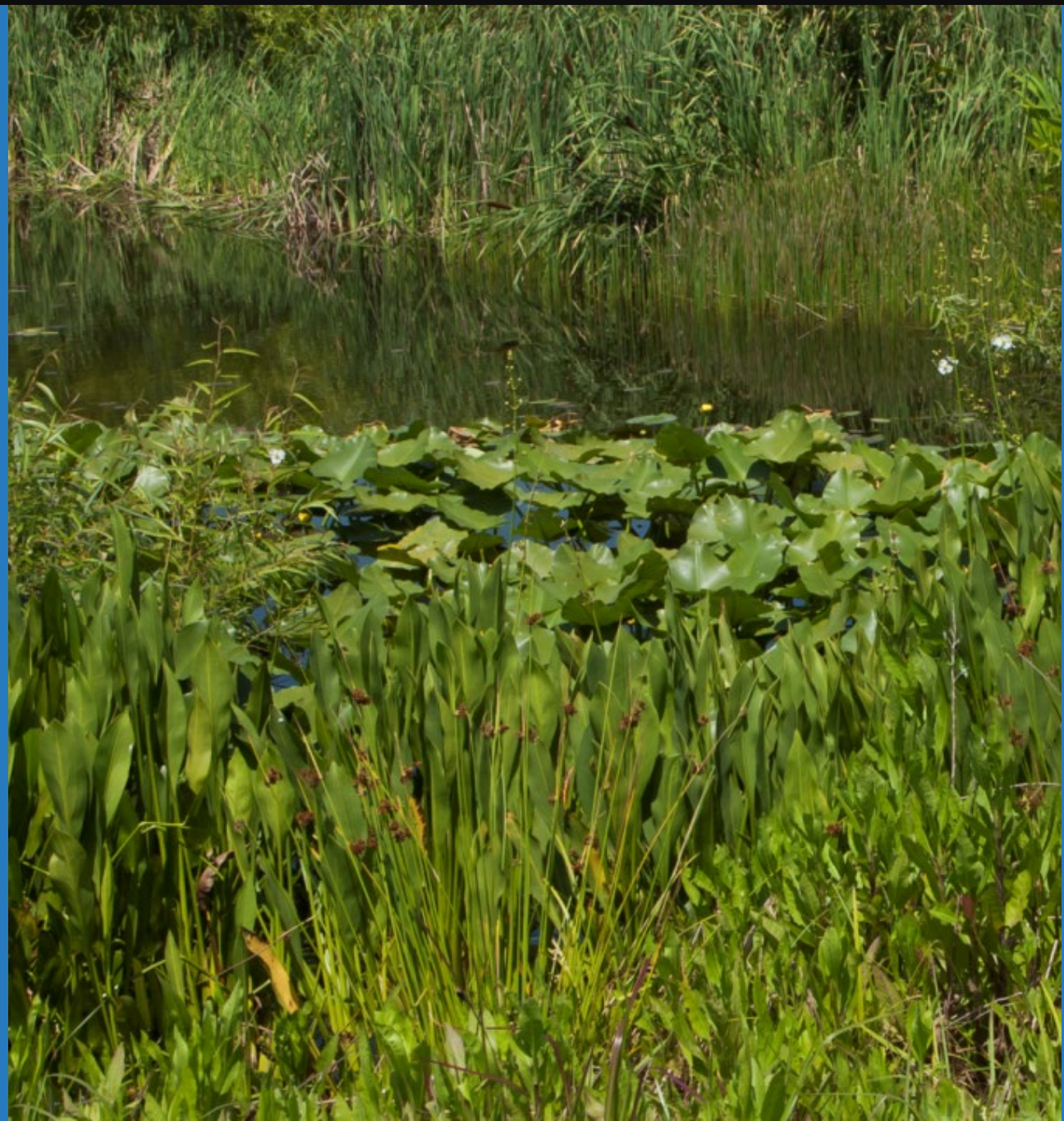
Alt G: All 60”; Jan-Dec

Model Outcome

Preferred scenario (Alternative E):

- ~1,700 additional acres (12%) protected from oxidation
- ~1,800 additional acres (13%) predicted to maintain most desirable vegetation categories

Restoration partially complete; the remainder pending further flood control analysis and other concerns.



Project Team

- Jones Edmunds Associates
  - Model development, calibration, initial alternatives
- Streamline Technologies: Pete Singhofen
  - Support, review, code modifications
- SJRWMD
  - Hector Herrera – USJRB Restoration Project overall management
  - Tom Jobes – work order management, modeling
  - Rayner Fernandez – modeling support, postprocessing scripts
  - Steven J. Miller, Kimberli Ponzio, Dianne Hall – environmental analysis
  - Sandra Fox – DEM analysis and corrections

Contact: Tom Jobes — *tjobes@sjrwmd.com*

Questions?