Modified Water Deliveries to Everglades National Park

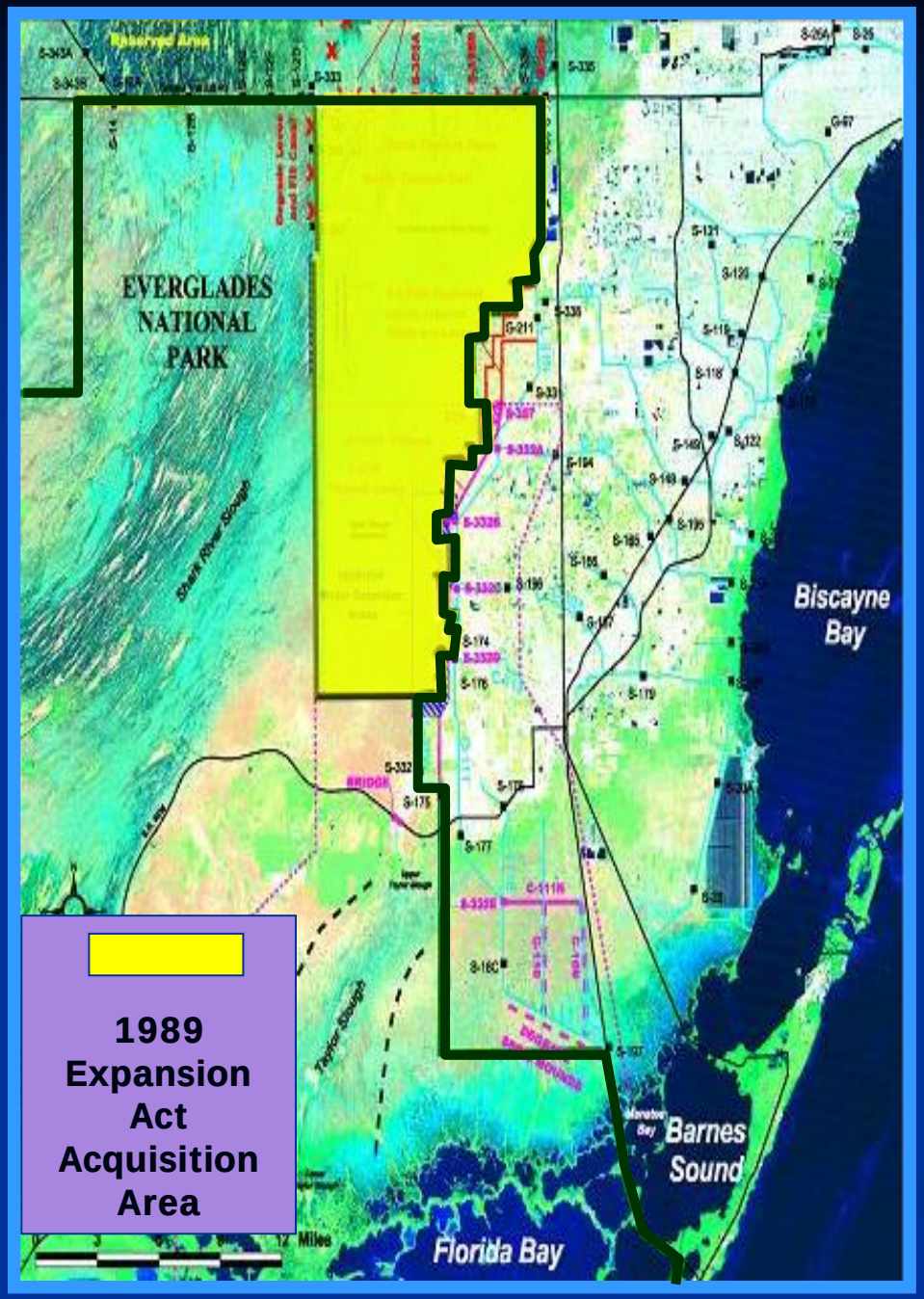
Tamiami Trail Modifications

Swales Pilot Project

Public Meeting
November 19, 2008

Presentation Topics

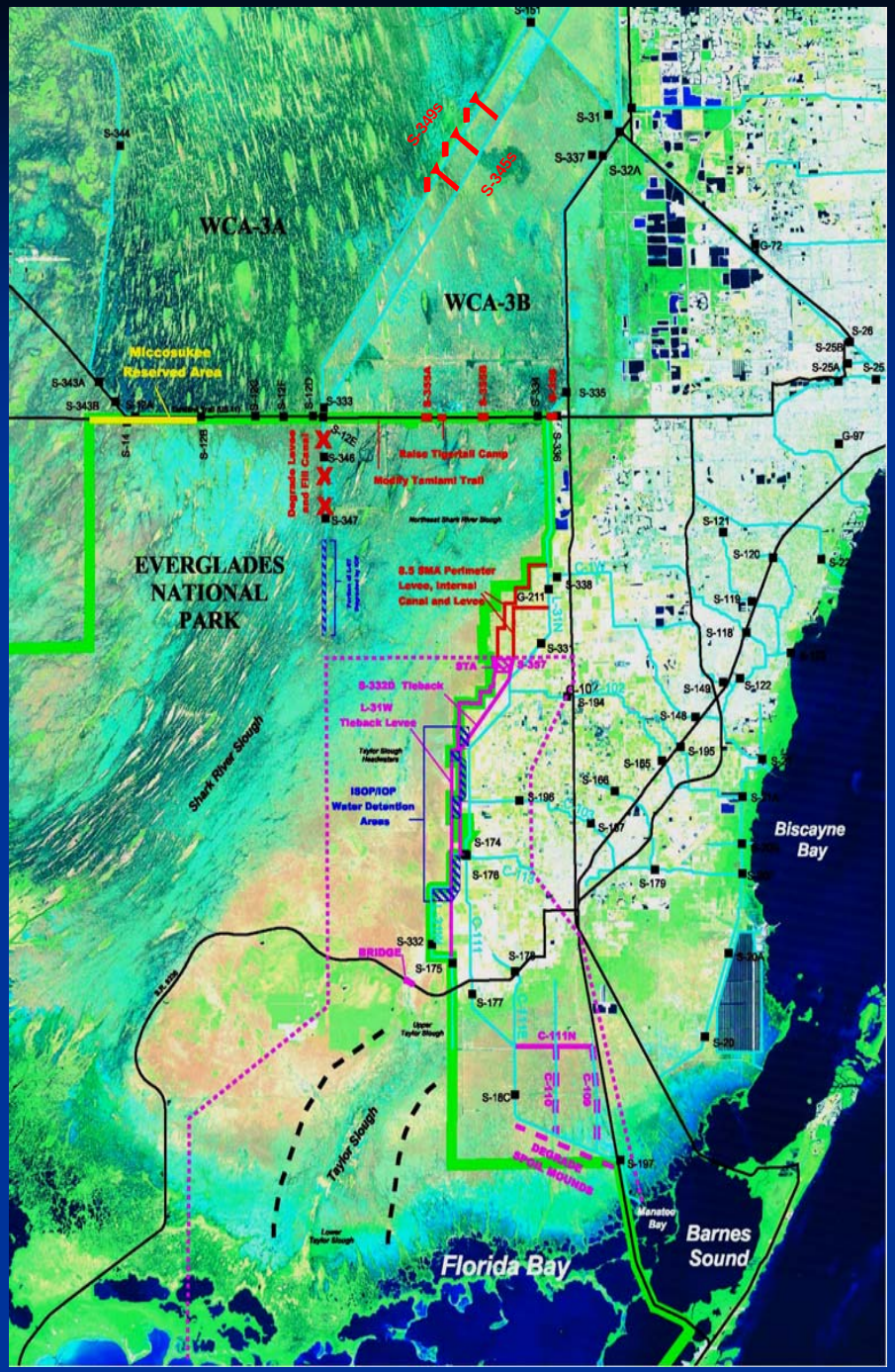
- Modified Water Deliveries Project
  - Congressional Authority
  - Project Components
- Limited Re-Evaluation Report (LRR)
  - Alternatives Evaluated and Tentatively Selected Plan
- Swale Project Overview
- NPS Preferred Alternative
- Preferred Alternative Implementation Schedule
- Major Hydrologic Findings
  - Roy Sonenshein
- Major Ecological Findings
  - Alicia LoGalbo



Modified Water Deliveries Authorization

The Everglades National Park Protection and Expansion Act of 1989....

- Authorized the acquisition of 109,000 acres
- Authorized the Secretary of the Army to make modifications to C&SF Project "to improve water deliveries into the park and shall, to the extent practicable, take steps to restore the natural hydrological conditions within the Park."



MWD Project Features

Conveyance Features

- L-67 A and C
- L-29 (S-355 A and B)
- Tamiami Trail
- L-67 extension

Mitigation Features

- 8.5 Square Mile Area
- Osceola Camp
- Tigertail Camp

Seepage Control Features

- L-31N (S-356)

Limited Reevaluation Report: Tentatively Selected Plan (TSP)

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Characteristics of the LRR Selected Plan

- Two major components of the Selected Plan:
  - 1-mile bridge located in the eastern portion of the Northeast Shark Slough flow-way
  - Road improvements to the un-bridged portion of the highway to allow for a stage in the L-29 canal to increase from current 7.5 ft to 8.5 ft
- Swales were examined but not included in the decision associated with the LRR
- Swales are now being considered in this NEPA process
  - National Park Service is lead agency
  - Corps of Engineers is cooperating agency

Swale Pilot Project

Modified Water Deliveries to Everglades National Park

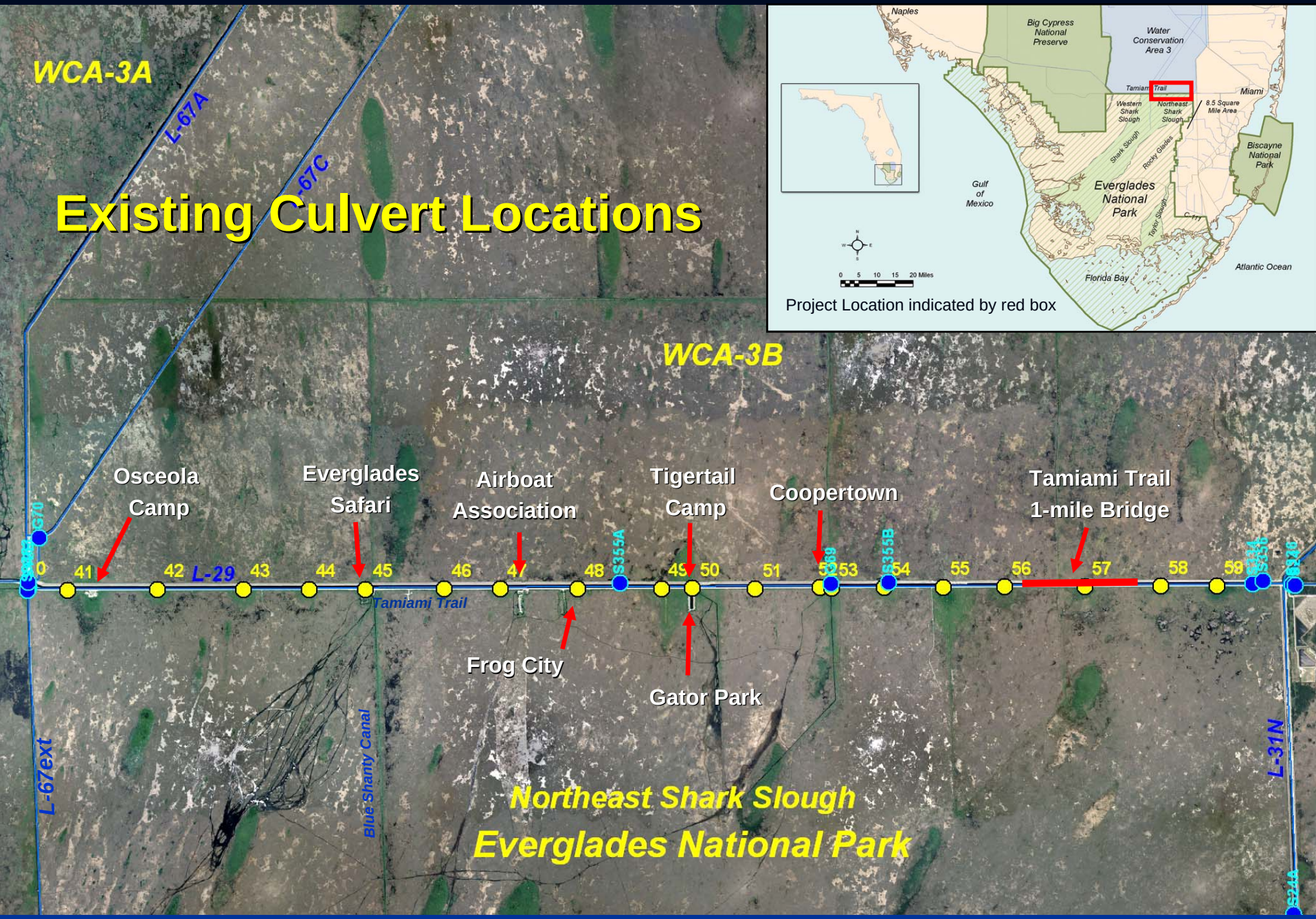
Swale Pilot Project Concept

- ENP and the Corps have agreed to pursue a pilot project at potentially two locations along Tamiami Trail to test the effectiveness of swales
- As proposed, each location would consist of a pair of culverts, one with a swale and one to act as a control to test effectiveness
- Corps will prepare a letter report and ENP an appropriate NEPA document for the pilot project
- If constructed, the data from the pilot swales will be used to determine the effectiveness of swales
- Additional NEPA will be required to construct additional swales if the decision is made that the swales are beneficial

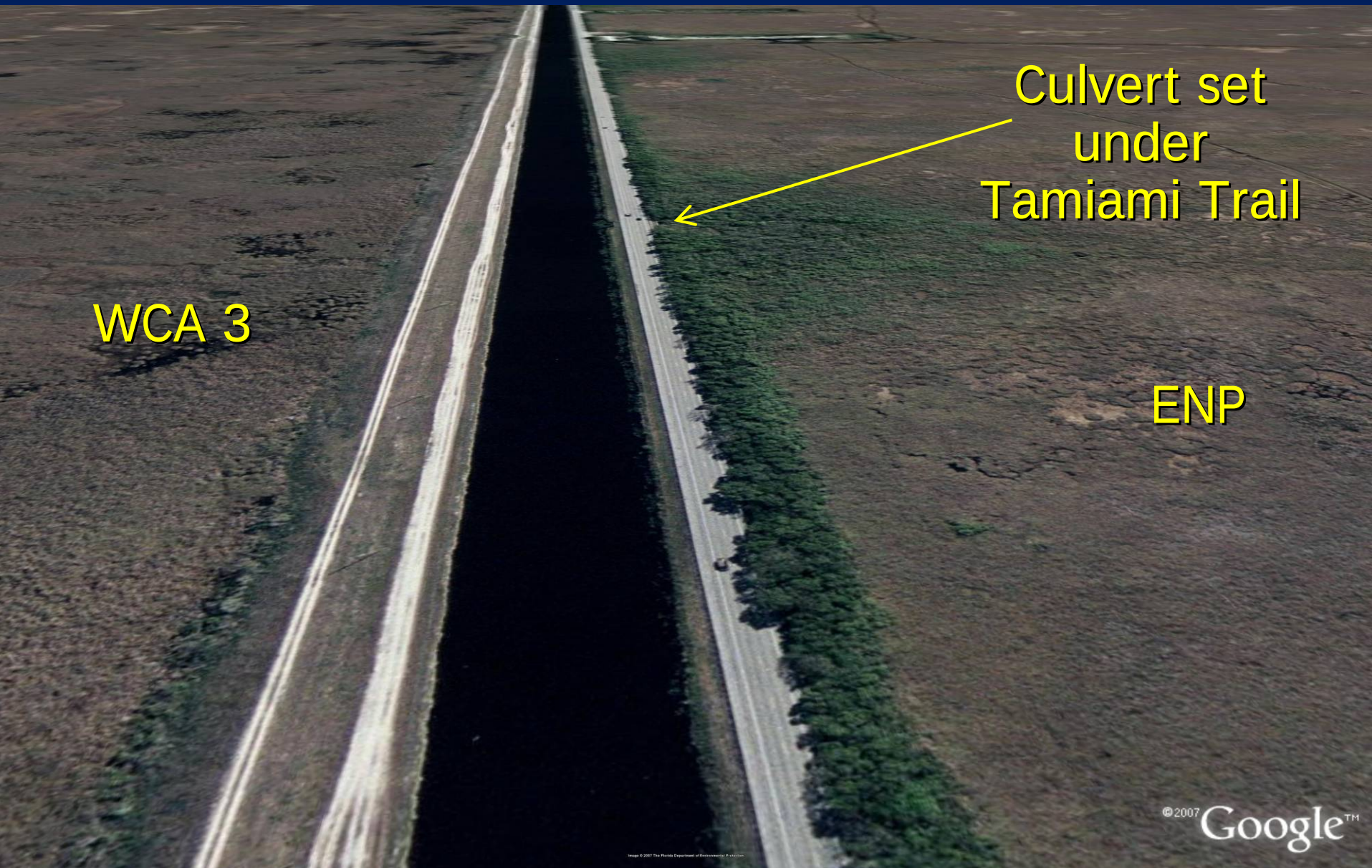
Spreader Swale Purpose and Need

- Pilot Purpose:
  - Determine if installation and functioning of spreader swales would be effective in improving hydrologic conditions in ENP
- Pilot Need:
  - Divergence of opinion on effectiveness
  - Need to test ability of spreader swales to contribute to MWD restoration goals
  - Analyze costs and benefits to support decision
  - Test effectiveness of incremental changes in water deliveries to ENP

Existing Culvert Locations



Tamiami Trail
Road Section at Culvert

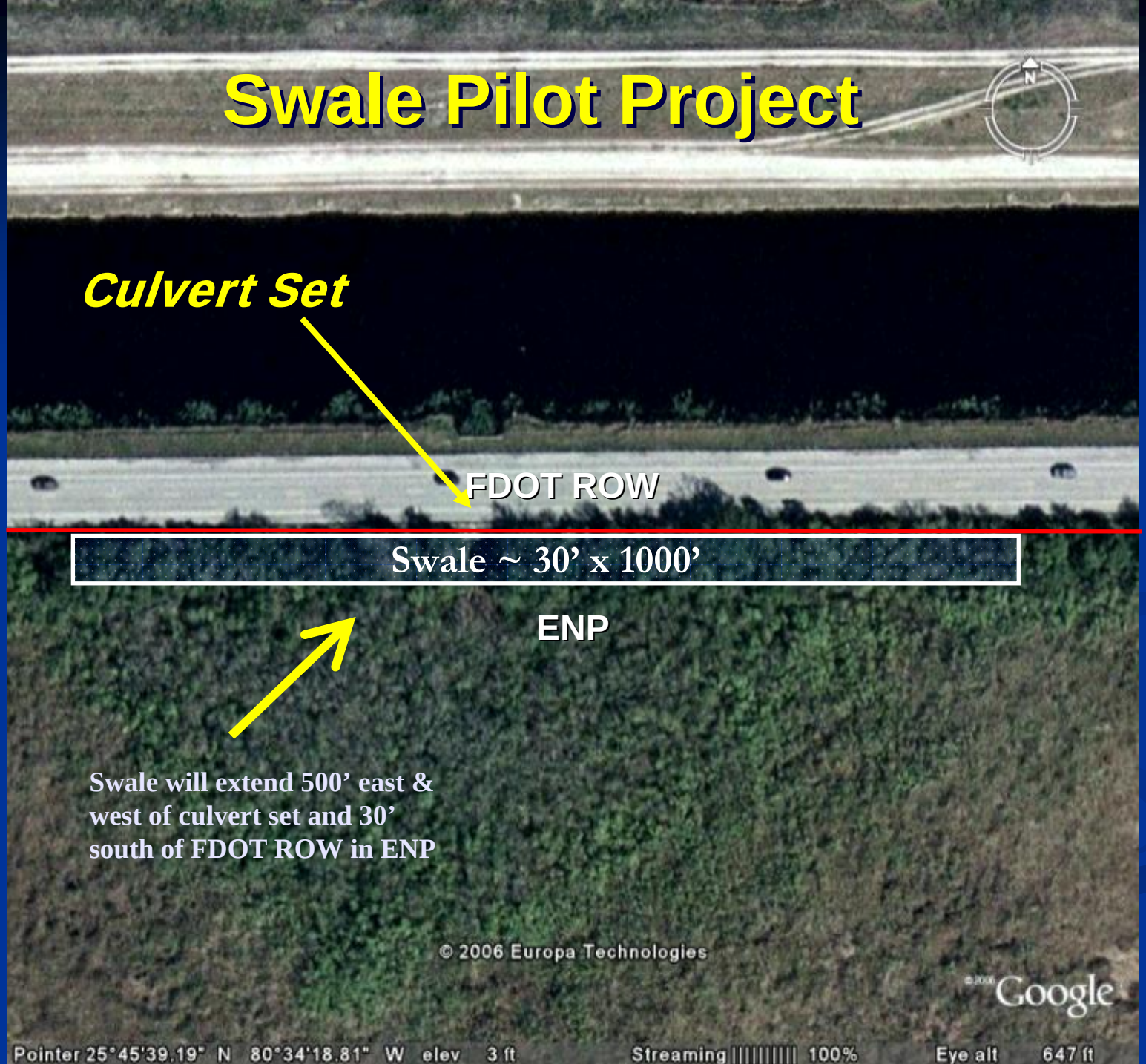


Existing Culvert in Tamiami Trail

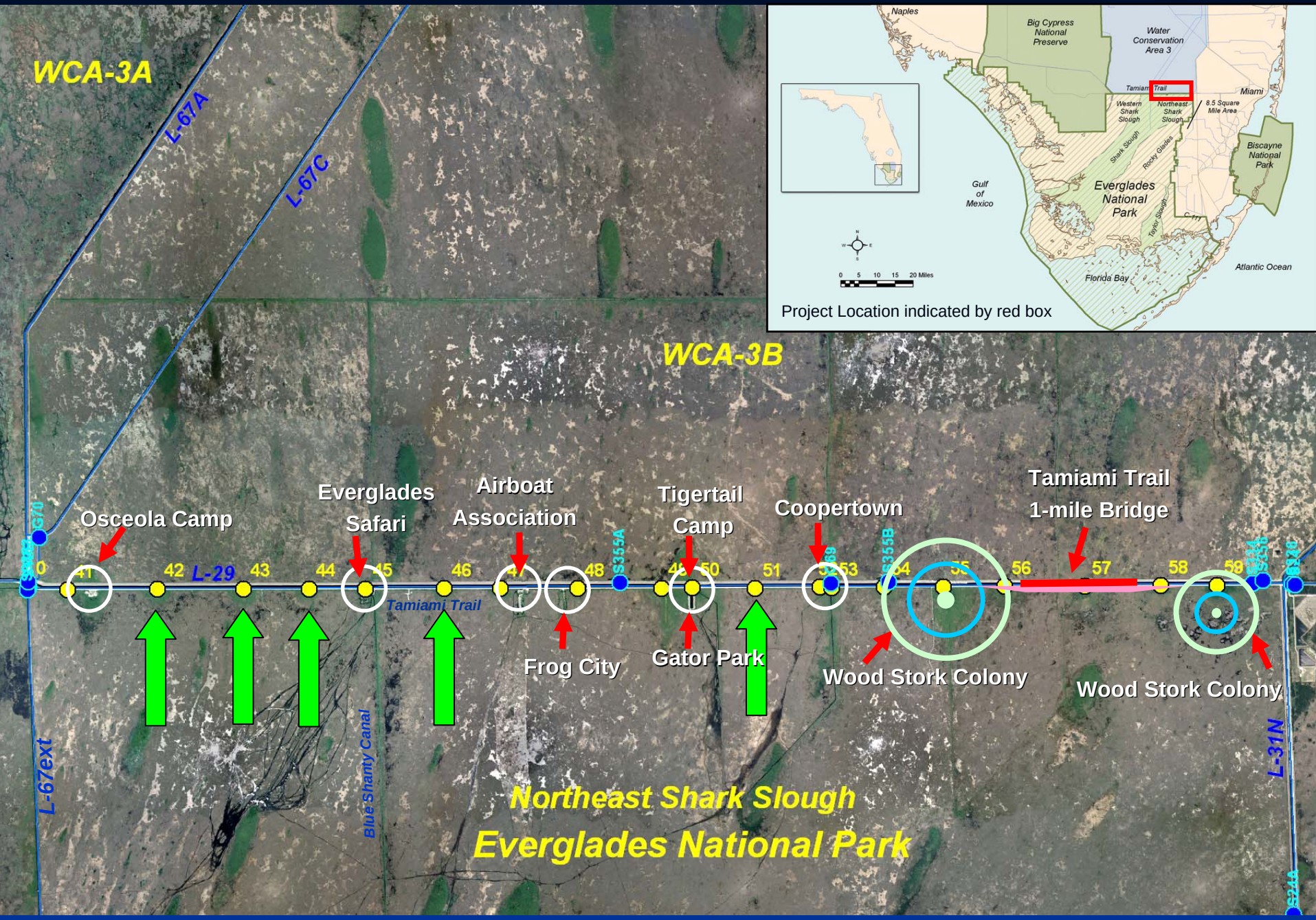
Culvert 57 Upstream

Culvert 57 Downstream

Swale Pilot Project



Potentially Available Culverts for Pilot Project



Swale Pilot Project: Alternatives

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Final Alternatives Considered

- Alternative A: No Action Alternative
  - No changes to Tamiami Trail
- Alternative B: Structural Alternative
  - Construction of two spreader swales downstream of two existing Tamiami Trail culverts
- Alternative C: Non-Structural Alternative (Hydrologic Modeling)
  - Simulation of potential hydrologic effects of the pilot spreader swales
- Alternative D: Adaptive Management Approach
  - Hydrologic modeling followed by structural component

Swale Conceptual Designs: Orientation Perpendicular to Marsh Flow

Variation 1
1000 ft x 30 ft

Variation 2
Length and width dependent on site conditions

Variation 3
Length extends past downstream vegetation

Swale Pilot Project: Preferred Alternatives

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Environmentally Preferred Alternative

- Alternative "C" is the Environmentally preferred Alternative
  - Improving information related to the performance of spreader swales using enhanced hydrologic modeling would be more effective in meeting the six criteria[1] of Section 101 of NEPA than Alternatives A, B and D
  - The degree of uncertainty regarding the ability of spreader swales to provide measurable ecological benefits, coupled with the introduction of new disturbance associated with spreader swale construction, would make Alternatives B and D less able to meet the criteria

[1]Criteria are summarized on pg 36 of the EA. Also, CEQ guidance is "the alternative that causes the least damage to the biological and physical environment; it also means the alternative which best protects, preserves and enhances historic, cultural and natural resources."

NPS Preferred Alternative: Adaptive Management Approach

- **Alternative D is recommended as the Preferred Alternative in recognition that swales can't be evaluated without their construction; however,**
  - Wide difference of professional opinion and, therefore, large uncertainty in the ability of pilot swales to improve water deliveries to Everglades National Park
  - Coupled with the known adverse impacts to the wetlands affected by their construction, the National Park Service feels there is value derived from proceeding both cautiously and in an iterative manner
  - A simple hydrologic model for purposes of improving the park's confidence in the decision to build the pilot swales will provide a much firmer basis for proceeding with their construction
  - Modeling could provide insights into the function of the swales and would allow for design improvements that could reduce the known adverse impacts

NPS Preferred Alternative: Adaptive Management Approach

- Phase 1: Non-structural Investigations
  - Investigate ability of swales to improve flow through hydrologic modeling
  - If modeling results indicate we can be improve flow by 10% or more we would implement Phase 2
- Phase 2: Structural Investigations
  - Based on the results of the hydrologic modeling, topographic survey, and baseline monitoring select a final design for swale construction
  - Construct two pilot swales and conduct post-implementation monitoring
  - Complete an analysis of the monitoring data and report findings, including recommendation, in final report

Swale Pilot Project: NPS Preferred Alternative Implementation Schedule

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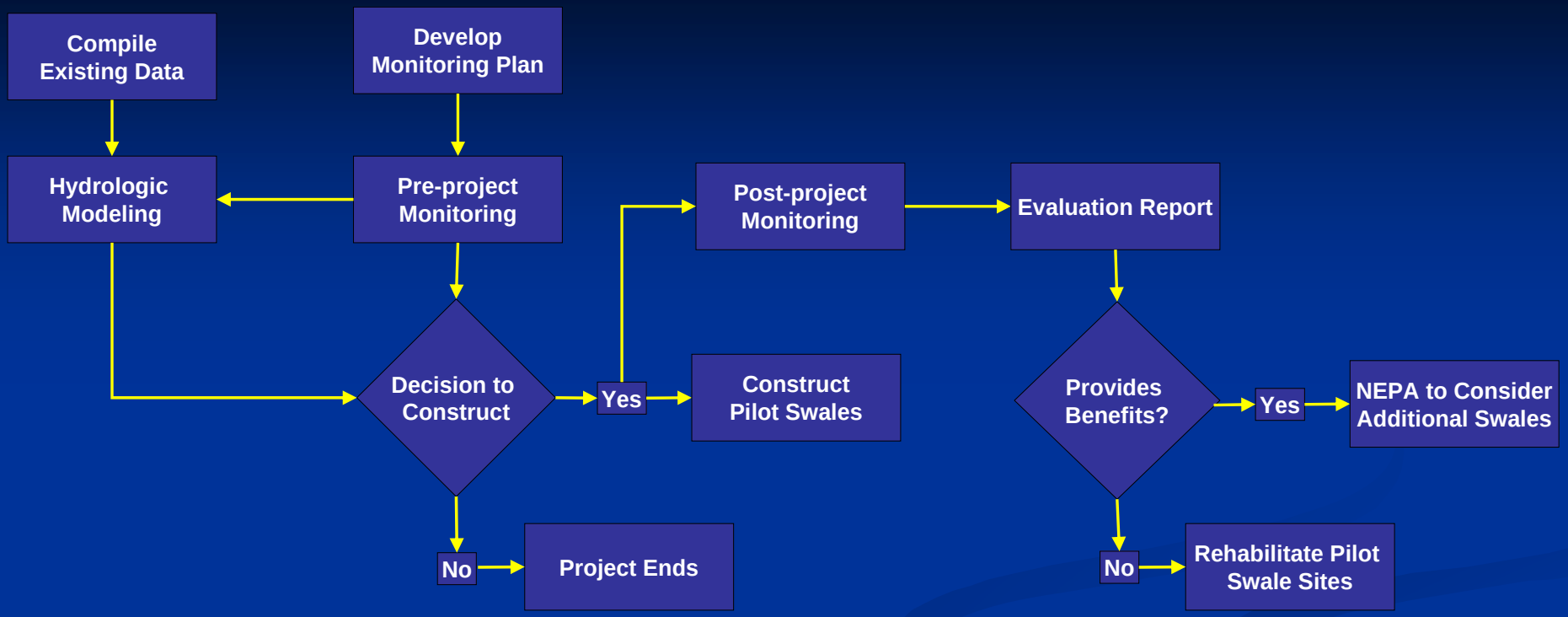
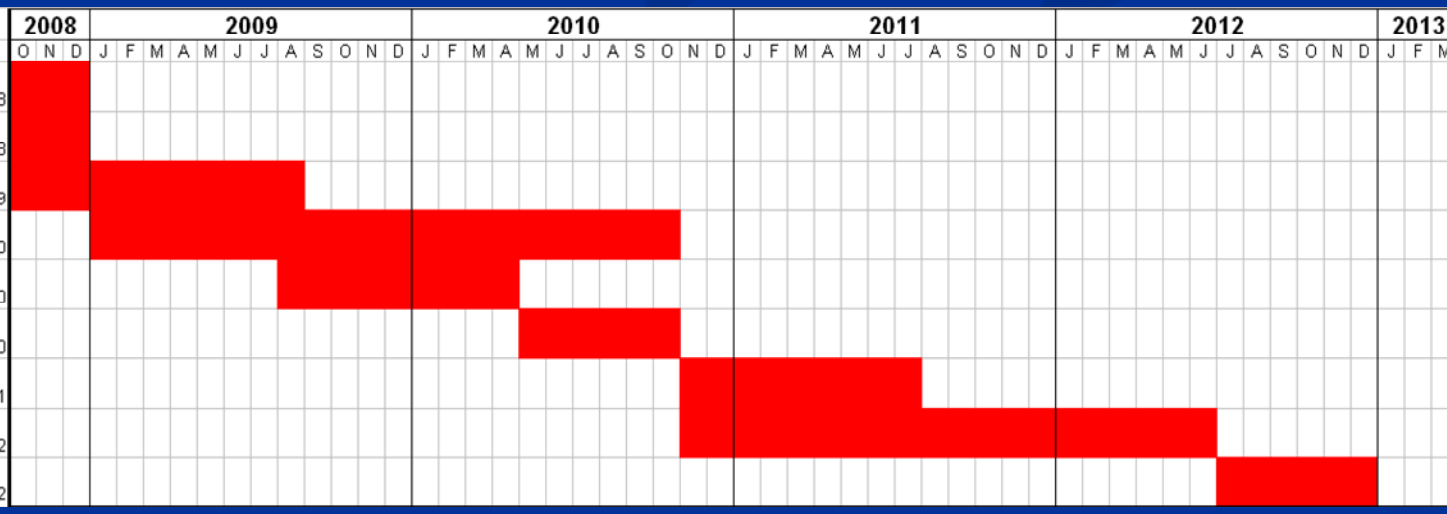
Implementation Schedule for NPS Preferred Alternative D



Activity	Start	Stop
Topographic Survey	Oct-08	Dec-08
Monitoring Plan	Oct-08	Dec-08
Hydrologic Modeling	Oct-08	Aug-09
Pre-Project Monitoring	Jan-09	Oct-10
Plans and Specifications	Aug-09	Apr-10
Contracting	May-10	Oct-10
Construction	Nov-10	Jul-11
Post-Project Monitoring	Nov-10	Jun-12
Evaluation Report	Jul-12	Dec-12



Swale Pilot Project: Major Hydrologic Findings

Modified Water Deliveries to Everglades National Park

Benefits and Impacts:

Hydrologic Considerations

Culvert 48
May 2008

- Downstream pool and vegetation at culvert

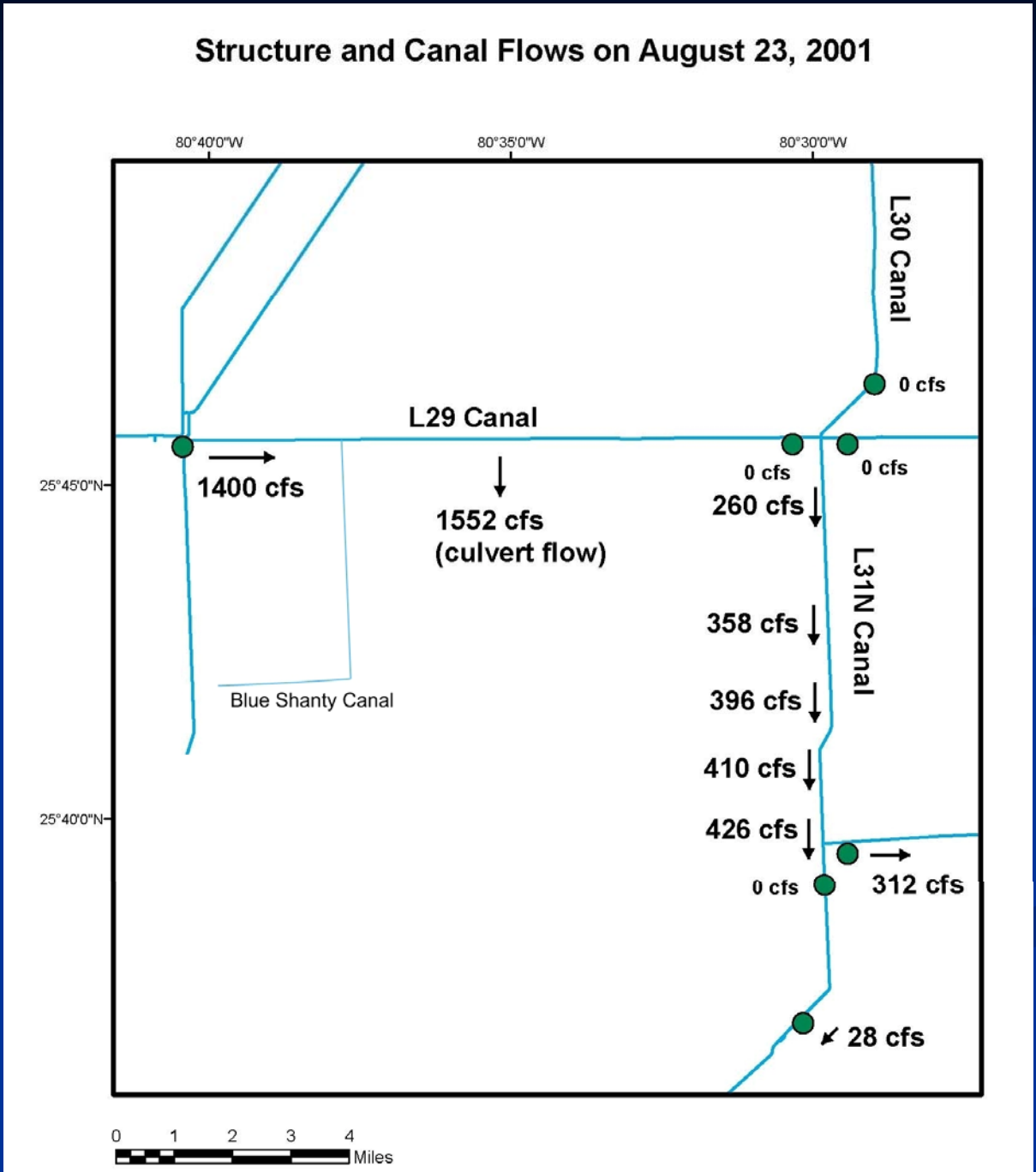
Hydrologic Analysis

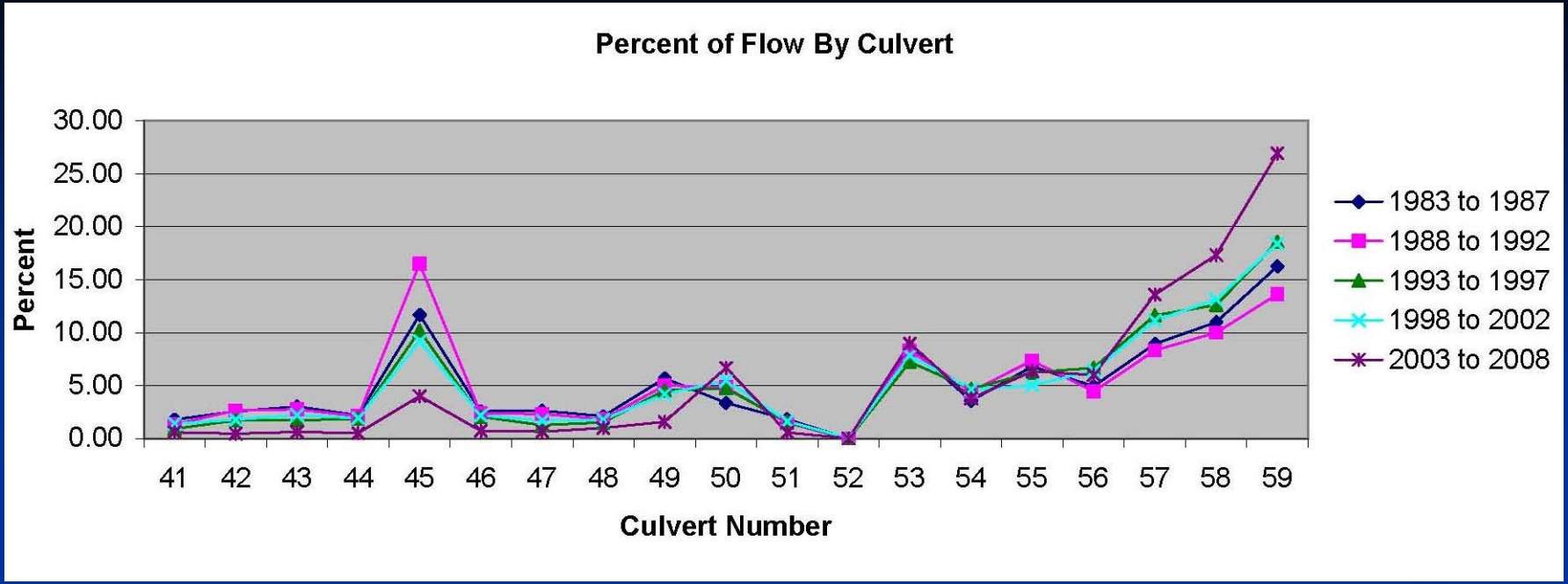
- Monitoring flow and stage before and after swale construction
- Model flow downstream of culvert based on available field data

Modeling Plan

- Model culvert located away from boundary levees
  - Minimize ground water seepage effect
  - Minimize east-west flow across model boundary
- Model culvert not associated with a canal
- Sensitivity analysis of resistance to flow factor
- Use available monitoring data for calibration
  - Currently existing monitoring stations
  - Stations installed for baseline monitoring
- Success defined as 10 percent improvement in flow

Typical Wet Season Water Budget with Flow in Canals, Culverts, and at Structures

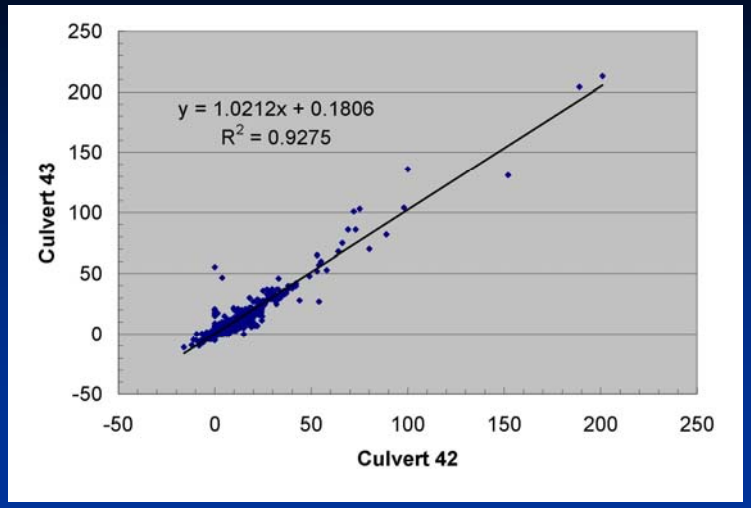


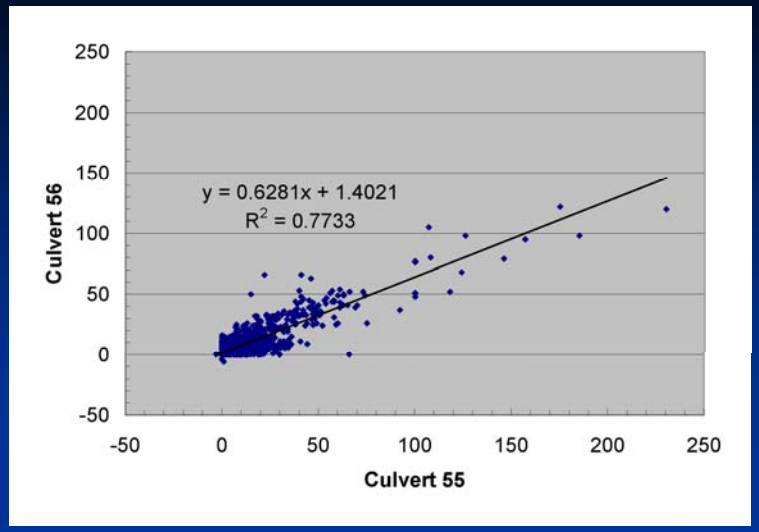


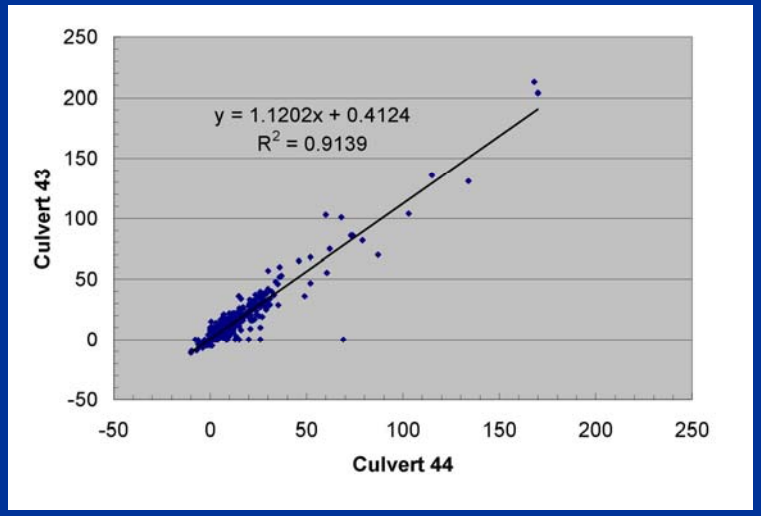
- Culverts shown west (41) to east (59)
- Highest flows at:
  - Culverts associated with canals (45, 50, 53)
  - Culverts near eastern levee (57, 58, 59)
- 1983 – S333 operational
- 2002 – lower half of L67 extended removed
  - Backwater effect reduced flow in western culverts

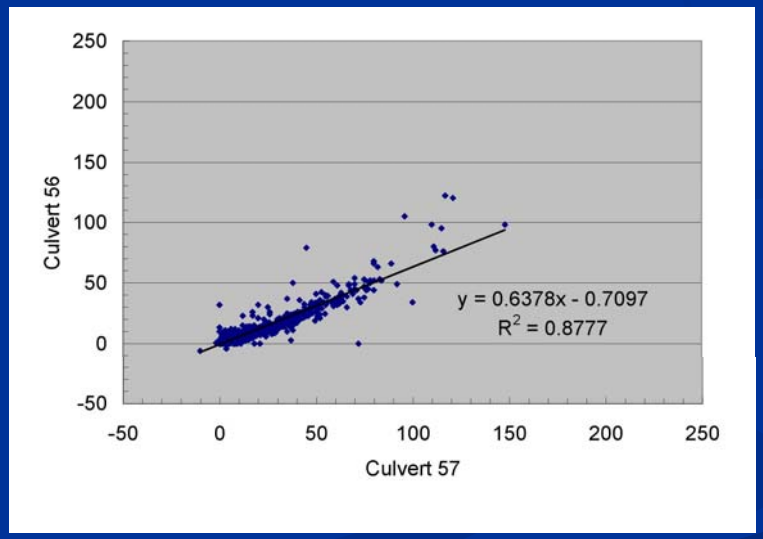
Monitoring Plan

- GOALS:
  - Provide baseline data for modeling
  - Monitor change in flow associated with swale, using nearby culvert as control
- Continuous flow meter at outlet of center culvert
- Meters installed at pilot swale location and control culvert
- Continuous stage recorder at outlet of culvert
- Continuous stage recorder downstream of vegetation
- Success defined as 10 percent improvement in flow









Discharge, cfs

Discharge Relationships Between Adjacent Culverts

Swale Pilot Project: Major Ecological Findings

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Water Quality and Soils Impacts from Pilot Spreader Swales

- Construction activities will likely increase turbidity and Total Suspended Solids in the water column
- Excavation of the vegetation layer and soils may cause nutrient assimilation to occur further downstream in ENP
- If spreader swales increase hydrologic conveyance:
  - increased pollutant loading may occur
  - additional pollutants may be transported further into ENP
- Impacts will be assessed in the monitoring program

Proposed Water Quality and Soils Monitoring

- Goal: assess potential effects of the pilot spreader swales on water quality and soil conditions within the project area and downstream marsh
- Monitoring sites upstream, within, and downstream of pilot spreader swales
- Monitoring to occur during baseline and post-construction phases:
  - Soil (total phosphorus, total nitrogen, bulk density, and ash-free dry weight)
  - Water quality (flow, color, depth, dissolved oxygen, turbidity, total suspended solids, pH, specific conductivity, temperature, ammonia, nitrogen, total nitrogen, nitrite- and nitrate nitrogen, total phosphorus, orthophosphate, and total nitrogen)

Impacts to Vegetation from Pilot Spreader Swales

- Vegetation would be removed within the project footprint during pilot spreader swale construction (~2.9 up to ~4.3 acres)
- Vegetation community structure may be altered since excavation of vegetation layer and soils may cause nutrient assimilation to occur further downstream in ENP
- Disturbance from soil and vegetation removal is expected to make the area more vulnerable to exotic plant species spread and expansion of cattails
- Impacts will be assessed in the monitoring program

Photograph southeast of Culvert 42 by Roy Sonenshein

Proposed Vegetation and Periphyton Monitoring

- Goal: assess potential effects of the pilot spreader swales on vegetation and periphyton within the project area and downstream marsh
- Monitoring sites within and downstream of pilot spreader swales
- Monitoring to occur during baseline and post-construction phases:
  - Periphyton (type, cover, biovolume, and total phosphorus)
  - Vegetation (abundance, diversity, and distribution)

Photograph southeast of Culvert 43 by Roy Sonenshein

Wildlife Impacts from Pilot Spreader Swales

- Pilot spreader swales will result in an overall loss of habitat that provides resting, shelter, and foraging sites for wildlife
- Less mobile wildlife in the pilot spreader swale footprint would be killed during the pilot spreader swale construction
- Pilot spreader swales may alter alligator behavior since alligators are known to leave natural marsh habitats for deeper artificial refuges
- Pilot spreader swales may provide refugia for large native fish species and other exotic aquatic species
- Impacts will be assessed in the monitoring program

Proposed Fish and Aquatic Invertebrate Monitoring

- Goal: assess potential effects of the pilot spreader swales on fish and invertebrate species within the project area and downstream marsh
- Monitoring sites within and downstream of pilot spreader swales
- Monitoring to occur during baseline and post-construction phases:
  - Fish and apple snails (abundance, diversity, distribution, and spatial patterns)
  - Key environmental information (hydroperiod, water depth, dissolved oxygen, and temperature)

Special Status Species Assessment

- Special status species:
  - American alligator
  - Florida panther
  - Cape Sable seaside sparrow
  - Eastern indigo snake
  - Everglade snail kite
  - West Indian manatee
  - Wood stork
- Potential pilot spreader swale sites are not within the wood stork or Everglade snail kite management zones

Panther photograph by Rodney Cammauf

Proposed Site Rehabilitation Plan

- Goal: Return impacted areas to a more natural marsh habitat found throughout much of NESS if pilot spreader swales are constructed and do not meet hydrologic improvement criteria
- General baseline conditions to be captured through data gathering and photography
- Monthly monitoring and maintenance
- Exotic vegetation and snails would be managed throughout the affected areas