

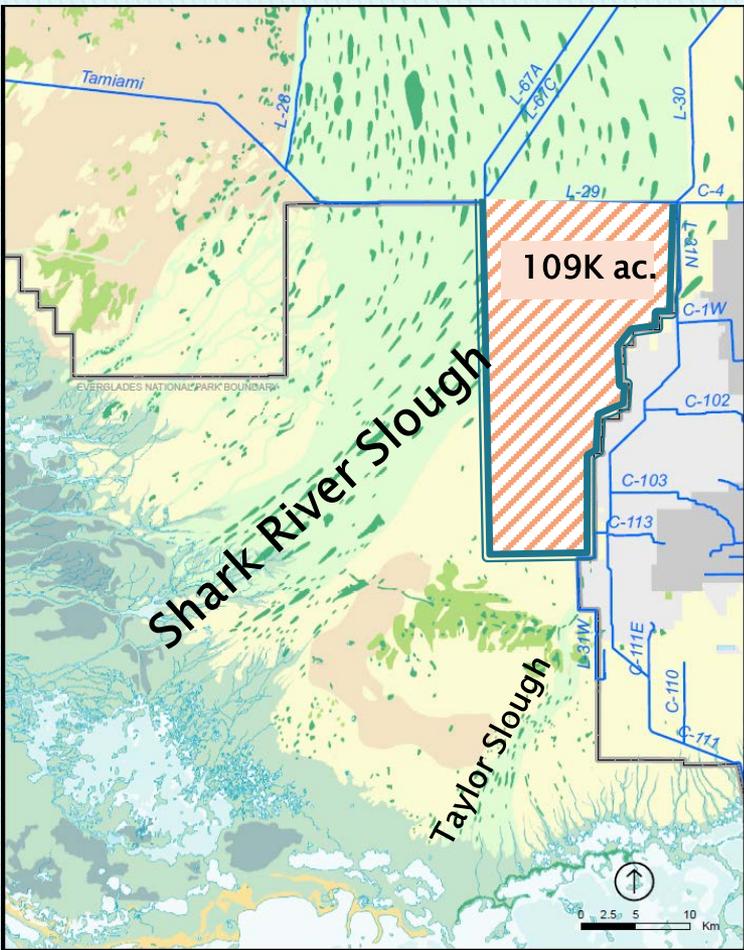
# Everglades National Park Ecological Monitoring Network

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**G-3273 / S356 Field Test PDT Meeting**

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# ENP Protection and Expansion Act, 1989



Before 1989

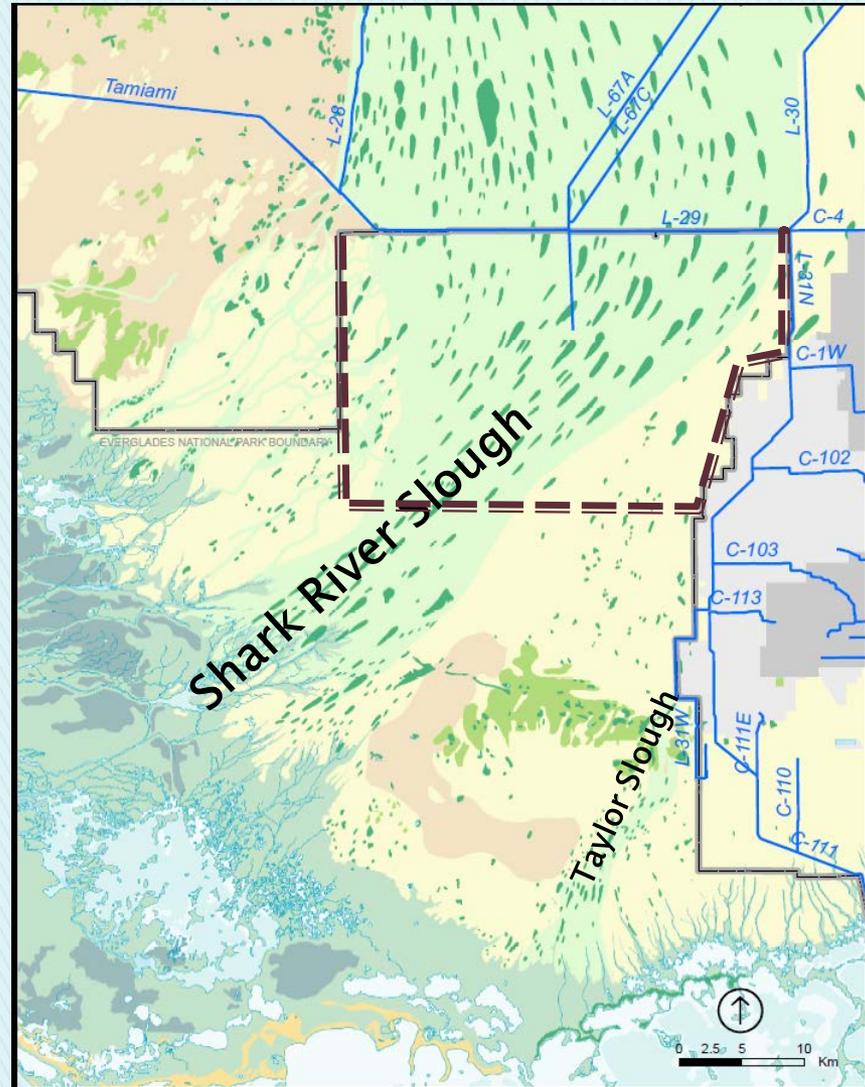


After 1989

# Study area

## Northern Shark River Slough

- **L-31 N (E) to BICY (W)**
  - East of L-67 Extension Canal
  - West of -L67 Extension Canal
- About 10 miles south of L-29 Canal



# Purpose

## Overarching goal:

- **assessing restoration successes and challenges, with contribution to adaptive management process**
  - **Support MDW:**
    - Operational testing and planning
    - Assessing project success
  - **Provide biennial reports**
    - Assess performance using well-accepted ecological indicators
  - **Establish & sustain a long-term ecological network**
  - **Complement other monitoring efforts (REMAP, RECOVER)**
  - **Assess ecological effects from other restoration projects (CEPP, TT Next Steps, CERP)**

# Design Considerations

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- Relevance to MWD and park resources
  - Focus on key project issues (constraints and ecological goals)
- Cost efficiency
  - Benefit from previous efforts (e.g. previous stations)
  - Monitoring network sustainability
- Quantitatively assess NSRS restoration
  - Use established ecological indicators
  - Measure at multiple scales (time and space)

# Stations

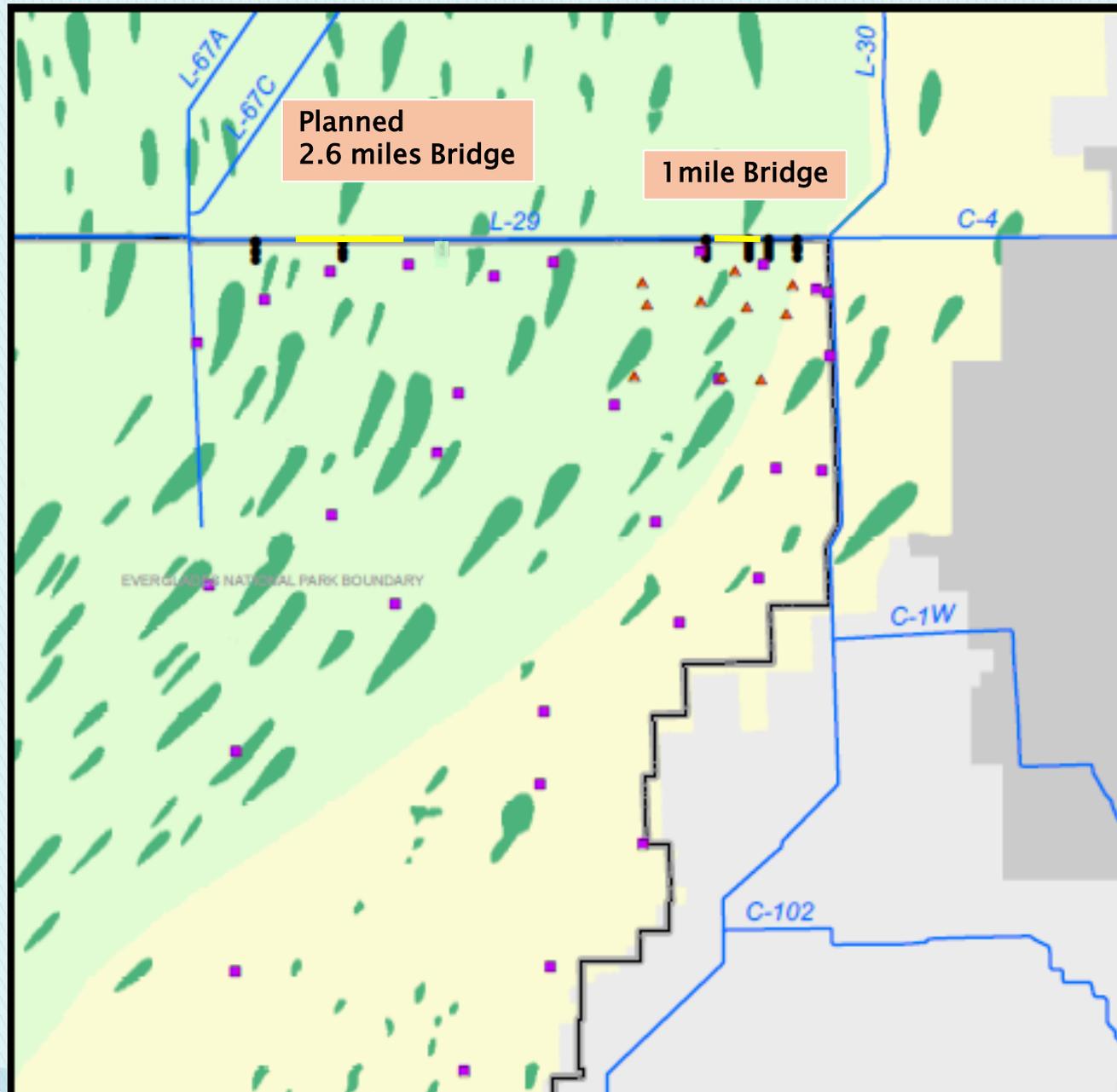
## EXISTING STATIONS

■ 30 sites, surveyed in 2006, 2008, 2012

▲ 10 sites, surveyed in 2012 wet, dry

## PROPOSED TRANSECTS

▬ 6 with 4 sites each



# Type of Stations

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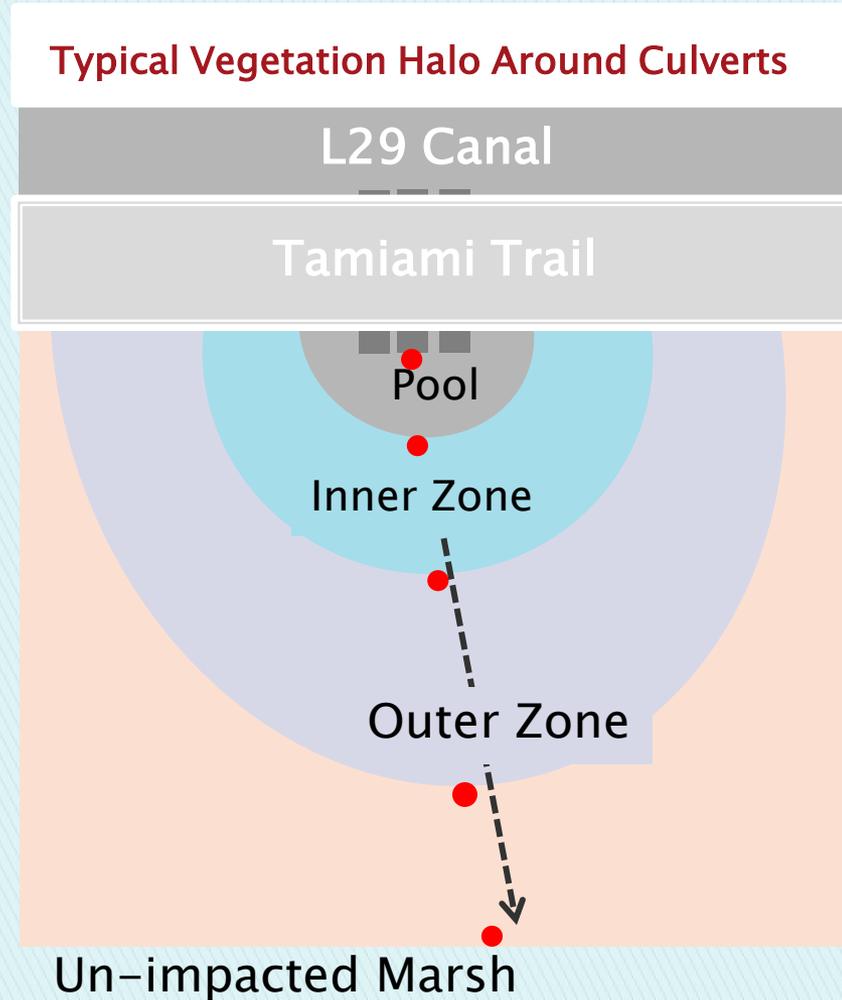
- Near Canal Transects (NCT):
  - Biannually sampled (wet & dry)
  - 4 eastern transects (culverts, 1-mile bridge)
  - 2 reference transects (near Blue Shanty)
  - 5 sites per transect
  - Transects West of L67 Ext. (future)
  
- Broad-scale Fixed Sites:
  - Annually Sampled (wet season)
    - NESRS (~40)
    - NWSRS (future)

# Vegetation Halos



# Near Canal Transects (NCT)

- Proposed stations



# Sample Type

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- Water Quality (ions, nutrients)
- Floc (CNP)
- Soil/Sediments (BD, LOI, CNP)
  - 0–2cm
  - 2–10cm
- Periphyton (CNP, biomass)
- Vegetation
  - Tissue (CNP)
  - Mapping (remote sensing, field plots)
- Aquatic Fauna (prey base)
- Hydrology
  - Water Depth
  - Hydroperiod

# Schedule

TYPE	Site	Yr1	Yr2	Yr3	Yr4	Yr5	Yr6	Yr7	Yr8
Water, Floc and Periphyton	NCT	<input type="checkbox"/>							
	FS		<input type="checkbox"/>						
Soil/ Sediment	NCT	<input type="checkbox"/>				<input type="checkbox"/>			<input type="checkbox"/>
	FS		<input type="checkbox"/>			<input type="checkbox"/>			<input type="checkbox"/>
Vegetation (Nutrients)	NCT	<input type="checkbox"/>							
	FS		<input type="checkbox"/>						
Vegetation Mapping			<input type="checkbox"/>			<input type="checkbox"/>			<input type="checkbox"/>
Aquatic Consumers	FS		<input type="checkbox"/>						

NCT, near canal transect sites  
 FS, fixed (sentinel) sites  
 Wet season survey  
 Wet and dry seasons surveys

Wet Season: Sept–Oct  
 Dry Season: Mar–Apr

# Current Plan (CESI)

- **Year-1 at Near Canal Transects (NCT):** water, floc, soil/sediment, periphyton, vegetation (CNP)—**this fall**
- **Year-2 at all sites (CNT and Fixed):** all sample types plus plant community mapping with ground truth surveys

MATRIX	FREQUENCY	STATION	PARAMETERS
Water Column	Biannually Annually	NCT Fixed	Major ions, nutrients
Floc	Biannually Annually	NCT Fixed	CNP
Soil/Sediment	Every 3 yrs	All Stations	TC, TN, TP, BD, LOI, TPI
Periphyton	Biannually Annually	NCT Fixed	CNP
Vegetation	Biannually Annually	NCT Fixed	CNP, species,
Aquatic Consumers	Annually	Fixed	Species, density and biomass

# Water Quality

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- Field Measurements
  - Specific Conductance
  - Temperature
  - pH
  - DO
- Laboratory<sup>1</sup>
  - Phosphorus
  - Nitrogen (organic and inorganic species)

<sup>1</sup> NCT Sites Samples next to L-29 Canal will be analyzed by a NELAC certified Lab

# Floc and Soils/Sediments

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- Floc
  - Thickness
  - Water depth
  - C,N, and P
- Soil/Sediments
  - Samples:
    - 0–2cm
    - 2–10cm
  - Soil Depth
  - Water Depth
  - Parameters:
    - C,N,P, and Pi
    - Loss on ignition (LOI)
    - Bulk density

# Periphyton

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- Field Parameters
  - Percent cover by type
  - Biovolume
- Lab Parameters
  - C, N and P
  - Dry weight
  - Ash-free dry weight (AFDM)
  - Chlorophyll-*a*
  - Biomass

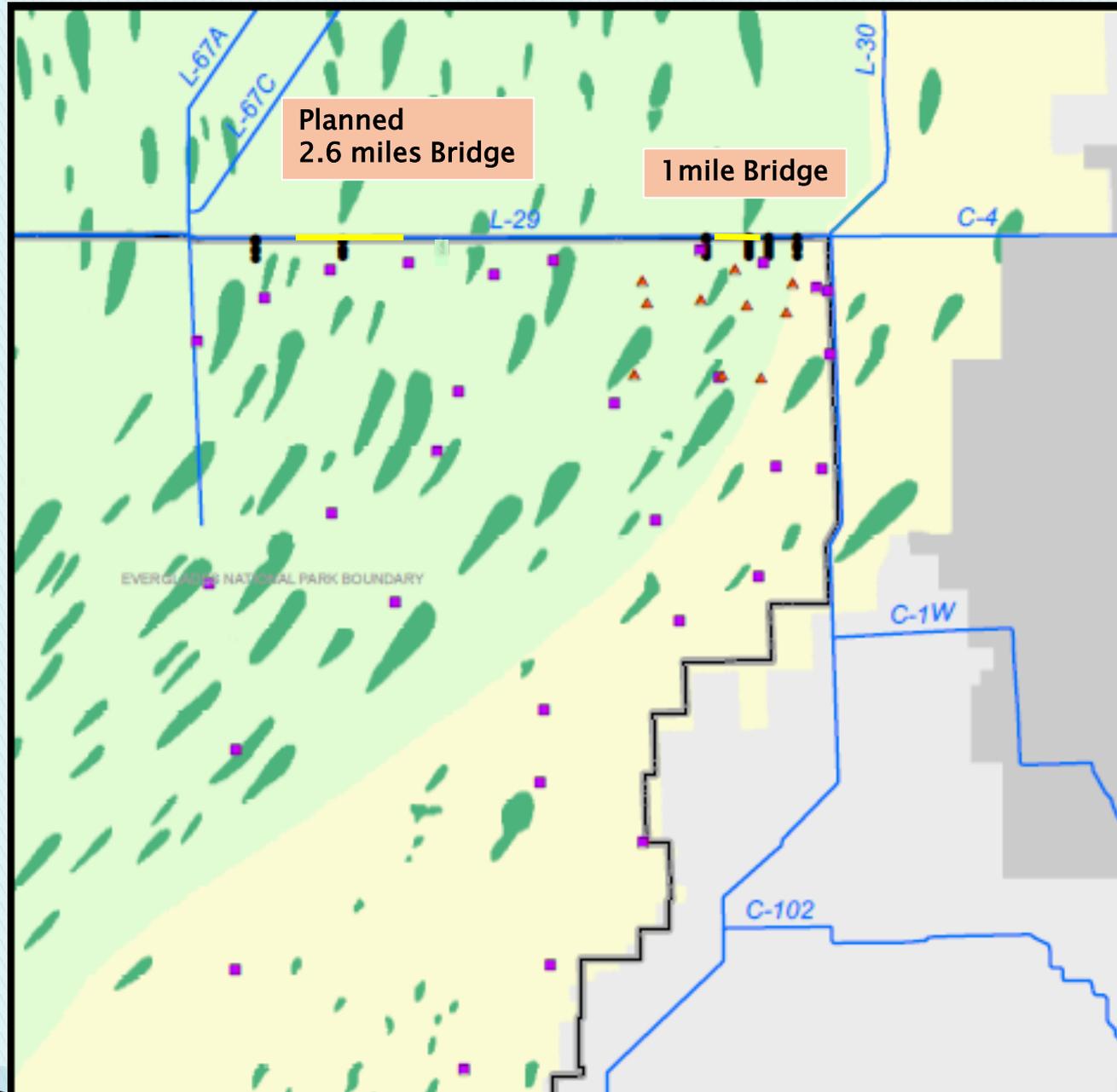
# Stations

## EXISTING STATIONS

- 30 sites, surveyed in 2006, 2008, 2012
- ▲ 10 sites, surveyed in 2012 wet & dry season

## PROPOSED TRANSECTS

- ┆ 6 with 5 sites each



# Vegetation

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- Tissue (CNP)
- Mapping:
  - Ground-truth surveys
  - Satellite imagery

# Aquatic Consumers

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- Density and Biomass
  - Total fish
  - Bluefin killifish
  - Flagfish
  - Crayfish
    - Everglades
    - Slough
  - Non-native fish
- Other fish species  
and invertebrate density

# Summary

- ENP is developing a marsh monitoring network for northern Shark River Slough
- The first two years of MWD field tests are currently being funded by CESI:
  - There will be an initial survey at NCT this fall (2014)
  - A full survey at NCT (dry, wet seasons) and Broad-Scale Fixed Site (wet) next year (2015)
- The following six years may be funded by NPS
- Input from other federal agencies, the state, and the scientific community is essential to finalize the design of the network.



# OTHER STUDIES

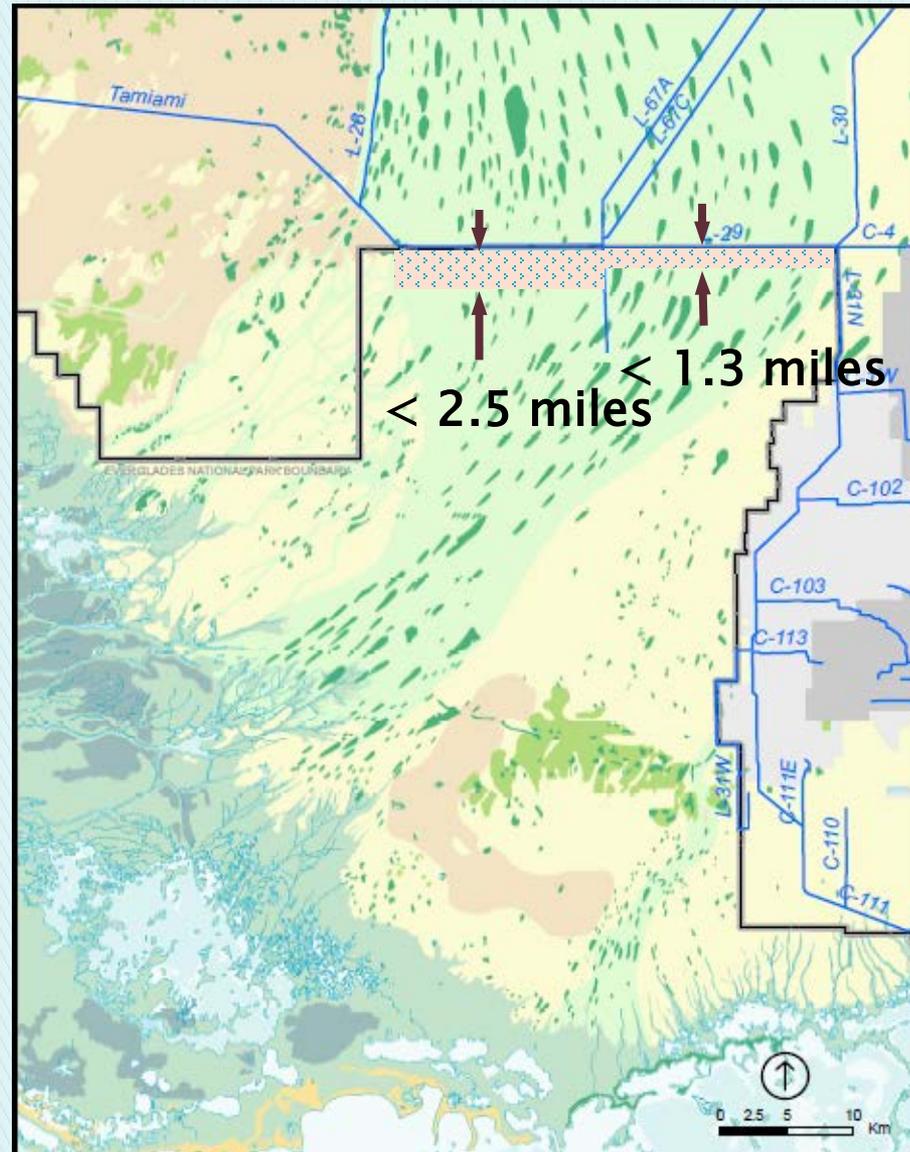
Doren et al., 1969

Childers et al., 2003

Gaiser et al., 2009, 2013

Bramburger et al., 2011

Osborne et al., 2013



# Modified Water Deliveries (MWD)

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- Improve water deliveries to park
  - Timing
  - Schedules: rain driven, natural variability
  - Quantities
- Improve distribution of deliveries to park (NESRS)
- Protect park's natural resources

# Ancillary Data

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- Water Depth
  - EDEN
  - Site specific (HOBO)
  - Standard Ruler (field visits)