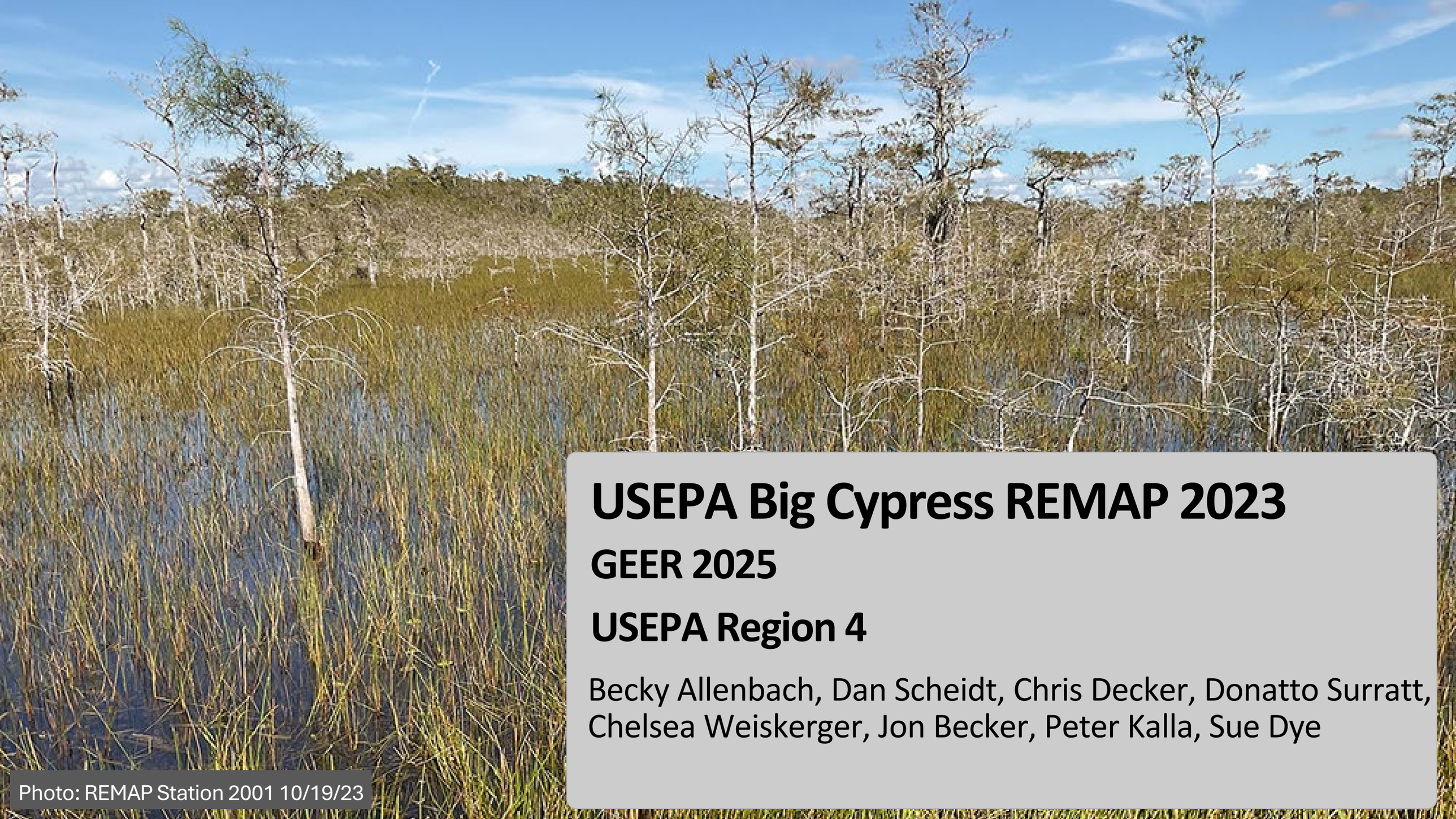


USEPA Big Cypress REMAP 2023

GEER 2025

USEPA Region 4

Becky Allenbach, Dan Scheidt, Chris Decker, Donatto Surratt, Chelsea Weiskerger, Jon Becker, Peter Kalla, Sue Dye

Photo: REMAP Station 2001 10/19/23

USEPA REMAP Overview

Regional **E**nvironmental **M**onitoring and **A**ssessment **P**rogram

Comprehensive Assessment

Evaluates health and changes throughout Everglades and Big Cypress ecosystems.

Probability-based Design

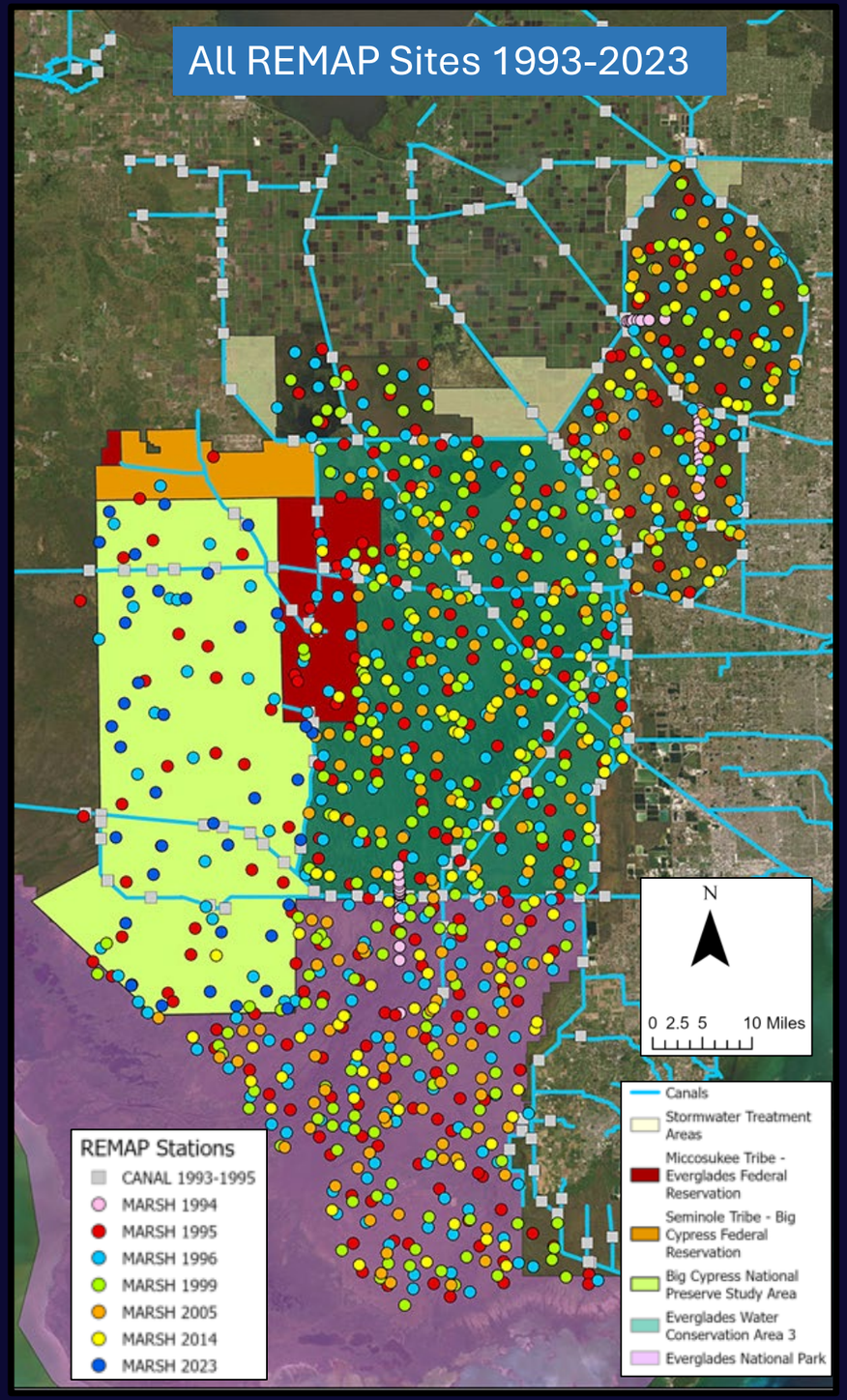
Random locations allow quantification of conditions across space with known confidence.

Multi-media Approach

Examines surface water, soil, prey fish, algal communities, and plants.

Extensive Sampling

Over 1300 different locations sampled since 1990s, all data publicly available.



REMAP Media and Analytes

Surface Water:

phosphorus, nitrogen, carbon, mercury, sulfur, depth, dissolved oxygen, conductivity, pH.

Periphyton:

phosphorus, nitrogen, carbon, mercury

Soil (0 - 10 cm):

phosphorus, nitrogen, carbon, mercury, depth, bulk density, organic content.

Biological:

mosquitofish – mercury

sawgrass - phosphorus, nitrogen, carbon, mercury

Photos and Field Observations:

Aerial/ground views, cattail presence, physical observations

Multiple REMAP Data Users. Over 20 Data Uses.

REMAP data supports diverse applications across environmental monitoring, research, and policy development.

Academic Institutions

Universities and research centers

Government Agencies

Federal and state

Scientific Organizations

Environmental research

Tribal Authorities

Protecting Tribal water and lands

Restoration Planners

Data-driven environmental decisions

RECOVER evaluation assessment science integration

Florida Department of Environmental Protection

National Park Service

U.S. Fish & Wildlife Service

U.S. Department of the Interior March 3, 1849

United States Environmental Protection Agency

Miccosukee Tribe of Indians of Florida

Seminole Tribe of Florida In God We Trust

South Florida Water Management District

US Army Corps of Engineers

Department of Justice

USGS science for a changing world

The Everglades Foundation

GEER Greater Everglades Ecosystem Restoration

FIU

National Academies Sciences Engineering Medicine

Friends of the Everglades Founded in 1969 by Marjory Stoneman Douglas

Florida Fish and Wildlife Conservation Commission

United States Sugar Corporation An Integrated Family of Agribusiness Companies

Tetra Tech, Inc.

NRCS Natural Resources Conservation Service

The University of Georgia

Sugar Cane Growers Cooperative of Florida

University of Florida

Smithsonian Environmental Research Center

The Road to REMAP 2023

Project Endorsement and Approval (2021)

- SFERTF and CERP RECOVER requested that EPA continue REMAP sampling and endorsed the project.

Development Phase (2021-2023)

- Secured substantial funding ($1.5M) through federal partnerships
- Developed study plan, established analytical protocols,
- Coordinated complex field logistics across multiple agencies.

Big Cypress Sampling (October 2023)

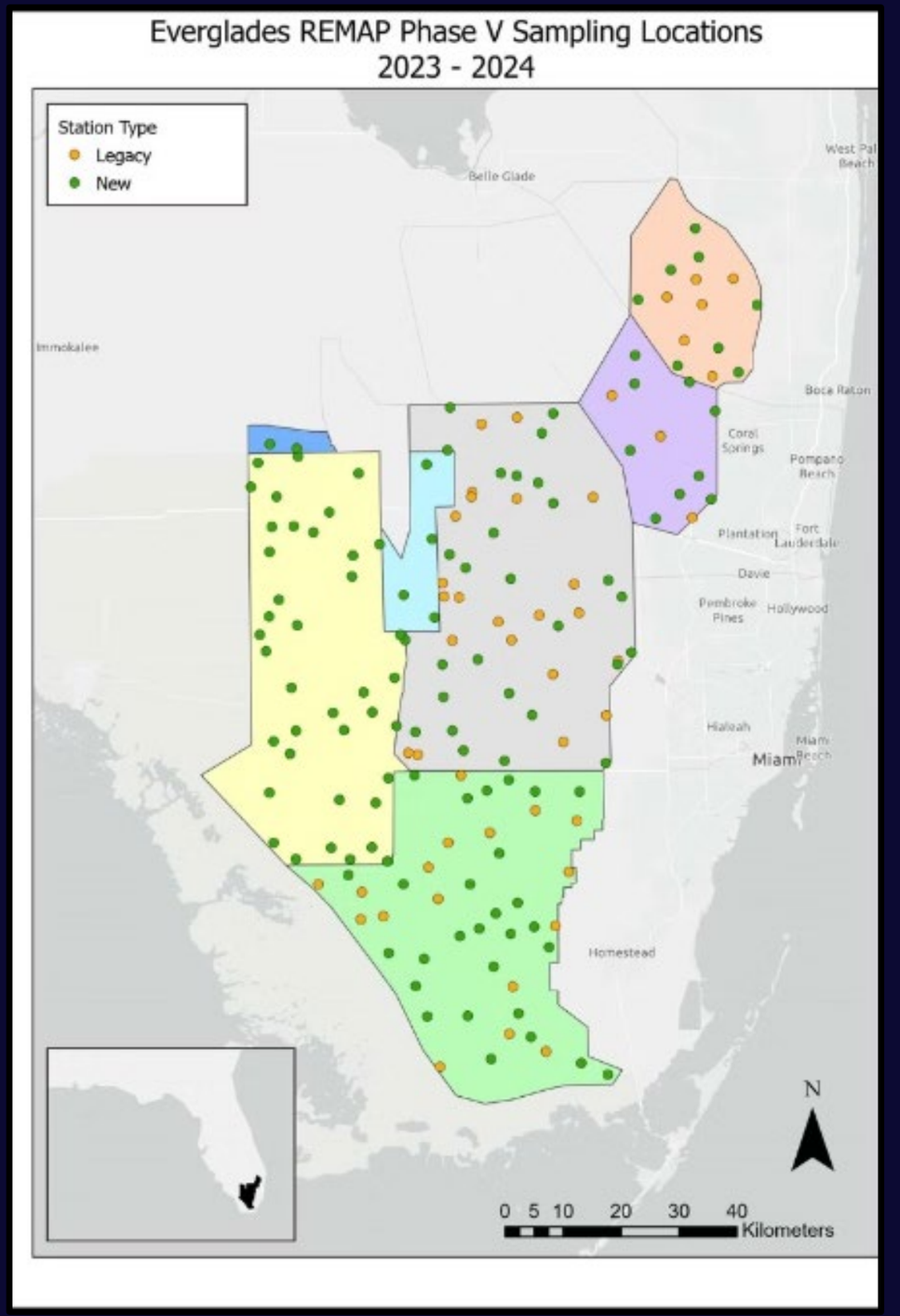
- Successfully conducted sampling in challenging wetland conditions.
- 1900+ field measurements, 700 samples across 38 sites

Everglades Sampling (September 2024)

- Completed Everglades sampling at 98 stations.

Analysis and Reporting (2024-2026)

- BCNP draft report expected May 2025.



REMAP Data Comparisons

REMAP Marsh Survey

- REMAP 2023 - 38 sites
- REMAP 1995-96 - 47 sites

SFWMD Marsh Monitoring

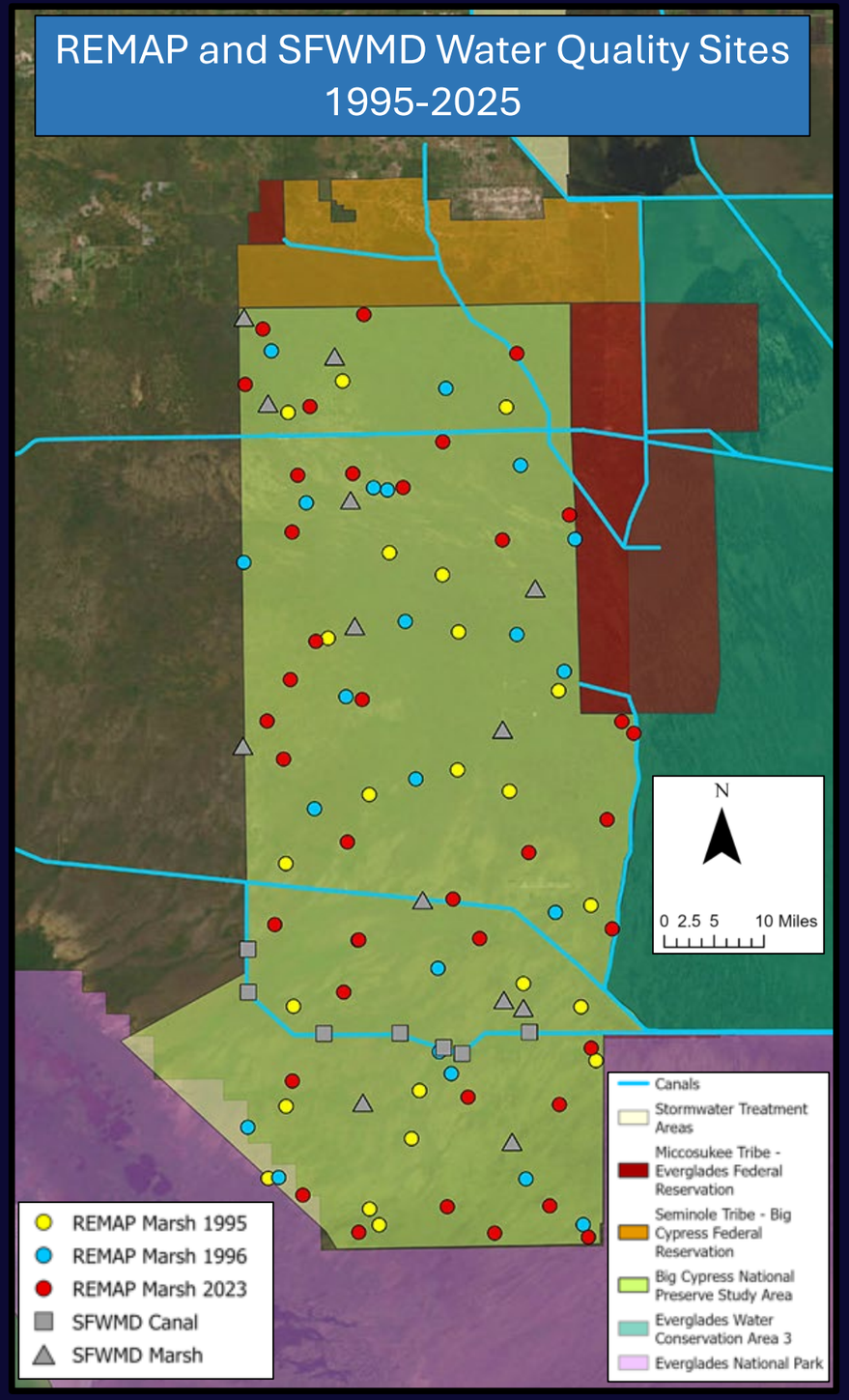
- Up to 13 sites from 1994-2011

SFWMD Canal Monitoring

- 7 sites from 2012-2025

SFWMD Soil Data

- 117 sites from 2003



Why Big Cypress in 2023

Data Gaps

No marsh water quality monitoring since 2011.

No WQ reports since 2004, no soil data since 2003.

Strategic Location

Eastern BCNP coincides with potential future restoration

Impacts (WERP) and previous REMAP 1995-96 study.

Timing

Baseline data needed for restoration assessment.

Sampling Reality

Difficult to sample in Big Cypress

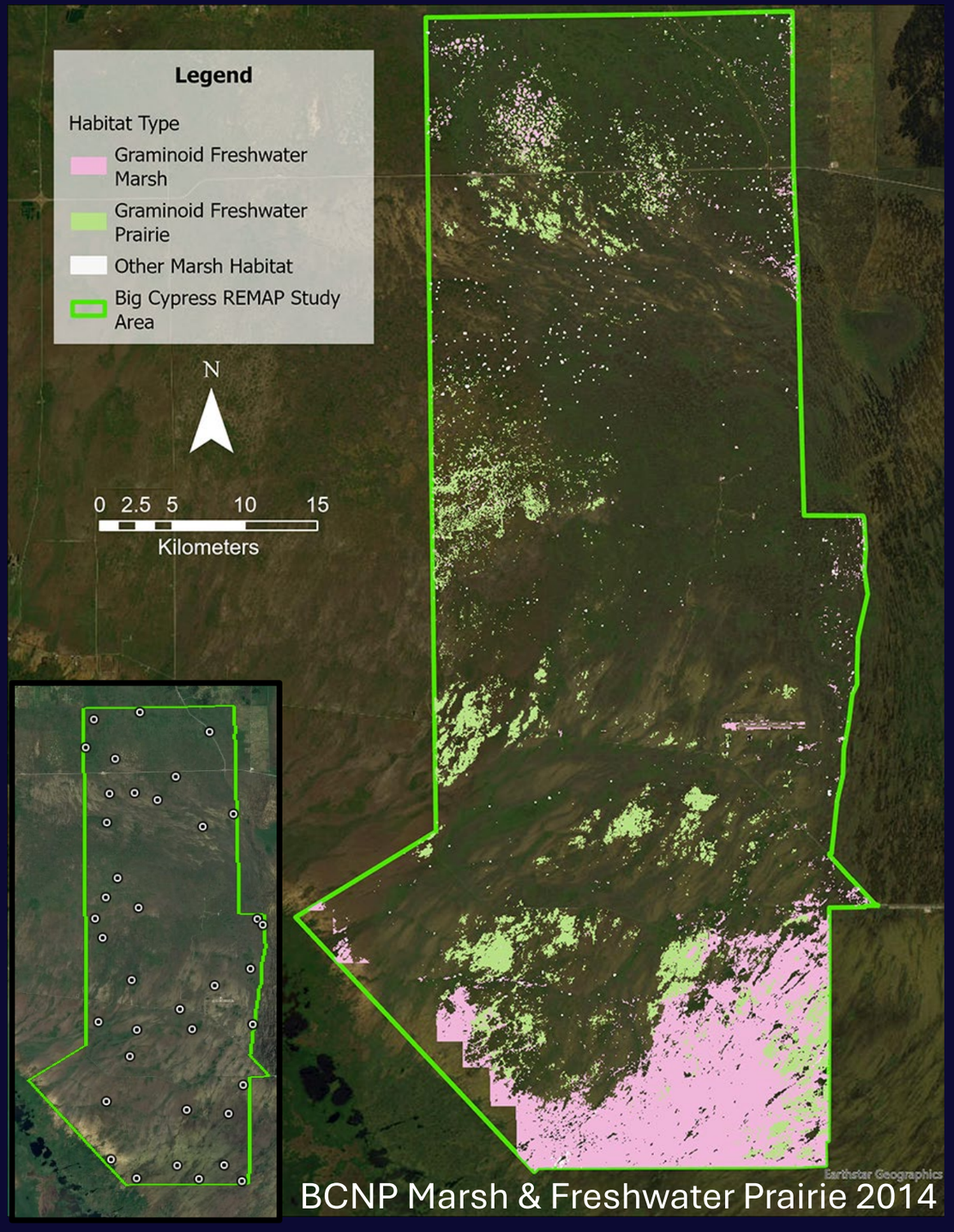
38 marsh sites chosen for helicopter accessibility.

REMAP Big Cypress

October 2023 Sampling Design

- Trees and dense vegetation dominate Big Cypress habitats.
- Open marsh habitat chosen for helicopter accessibility.
- 15.5% of study area

- Marsh habitat is:
  - typically flooded for longer duration.
  - more likely to have water present.
  - oligotrophic and vulnerable to phosphorus enrichment.



BCNP Marsh & Freshwater Prairie 2014

Surface Water Phosphorus

Surface water phosphorus shows a significant north-south gradient with higher concentrations in northern stations consistent with historical data.

North-South Gradient

Significant gradient from north to south ($p<0.05$, Dunn's test).

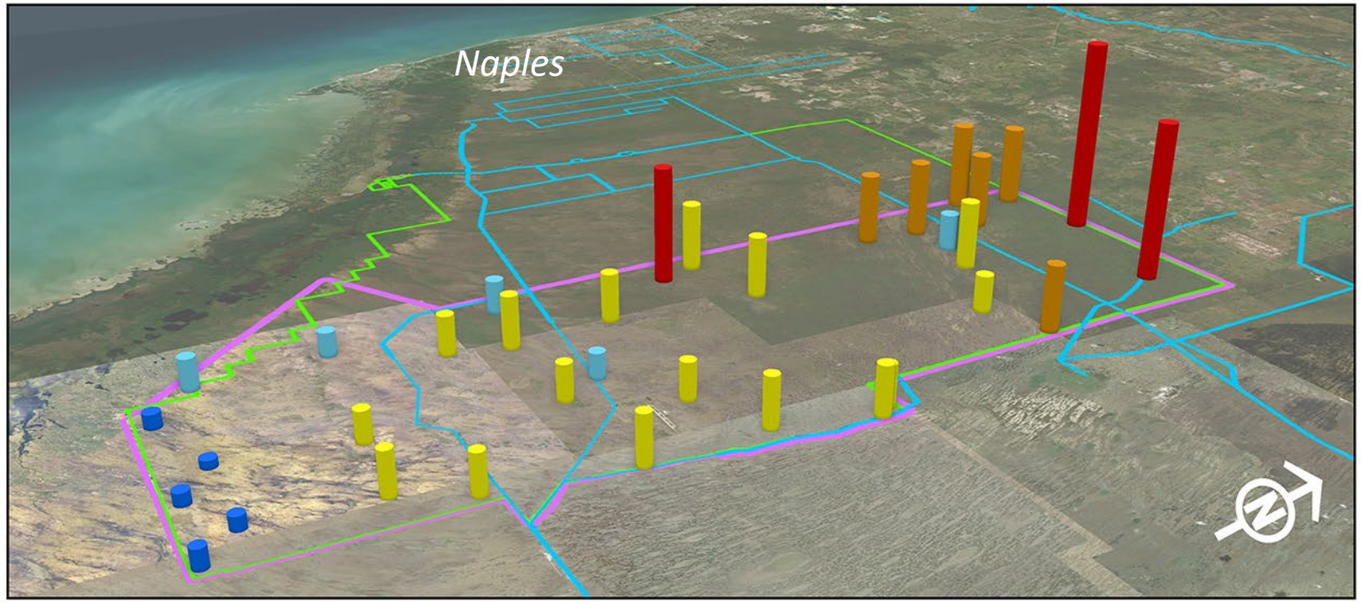
Concentration Range

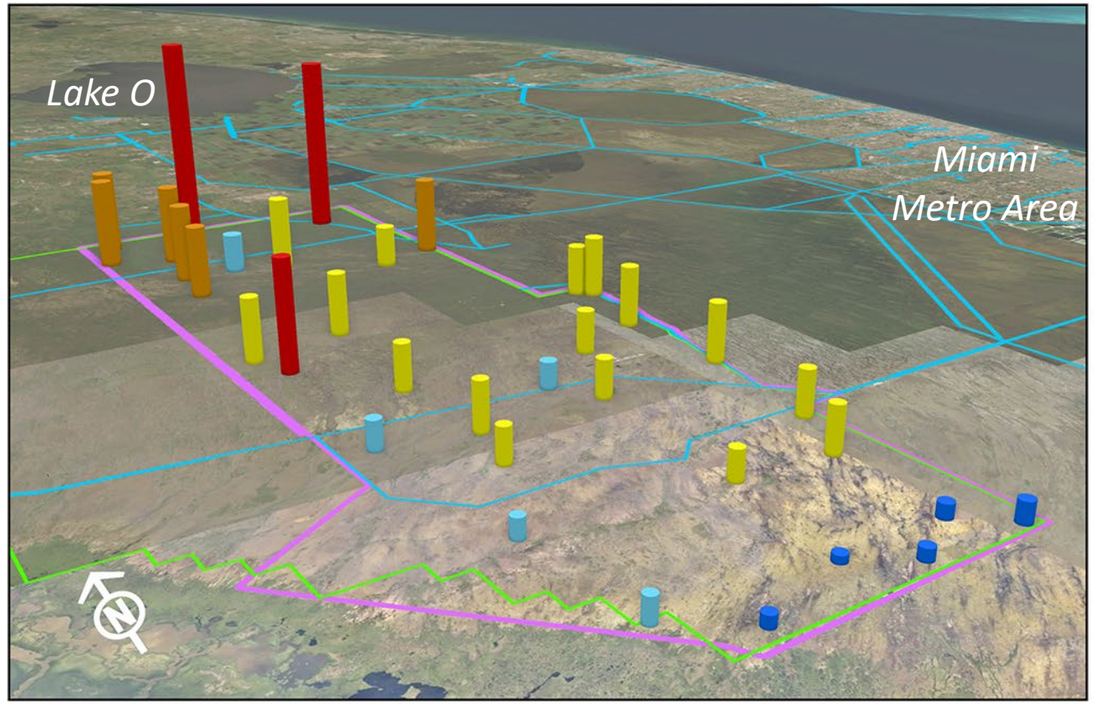
Northern BCNP stations: 15-33 µg/L.

Southern stations: 8.0 µg/L.

Historical Consistency

Results align with SFWMD data from 1999-2011.





Legend

- Big Cypress Study Area
- BICY Boundary
- Canals

Surface Water Phosphorus (µg/L)

- ≤ 8.00
- 8.01 - 10.00
- 10.01 - 15.00
- 15.01 - 20.00
- 20.01 - 32.89

Phosphorus Gradient Statistical Analysis

1 North-South Gradient

REMAP 2023 shows strong north-south gradient *(rho = 0.81).*

2 Historical Confirmation

Historic data (SFWMD 1994-2011) shows consistent pattern with moderate gradient *(rho = 0.44).*

3 WERP Application

SFWMD data used in FDEP report for WERP restoration phosphorus targets.

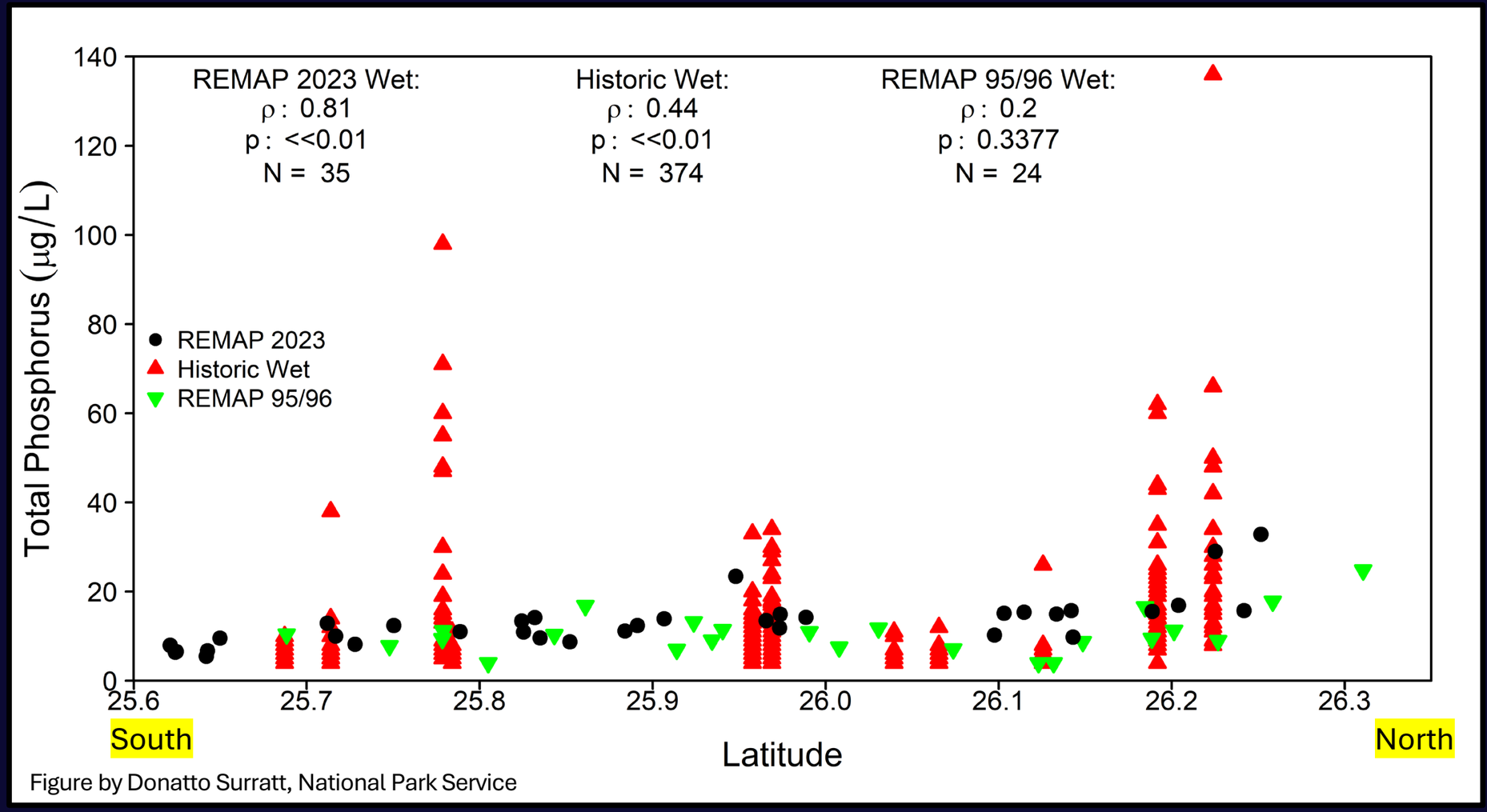


Figure by Donatto Surratt, National Park Service

Big Cypress National Preserve Mercury

Human Health

Florida Department of Health (2025): women of childbearing age and young children – do not eat largemouth bass from BCNP.

Wildlife

Florida panthers in BCNP had high mercury (67 parts per million) during 2004-14 (Florida Fish and Wildlife Conservation Commission).

Management Action

Florida established a mercury Total Maximum Daily Load, approved by USEPA in 2013, to protect human health by reducing mercury in gamefish. Atmospheric sources are to be reduced by 86%.

EPA and FWS Thresholds

Risk thresholds identified to protect birds and mammals.

- EPA target is 77 ng/g
- FWS target is 100 ng/g.

REMAP 2023 Mosquitofish Mercury

Key Findings:

No Gradient North to South

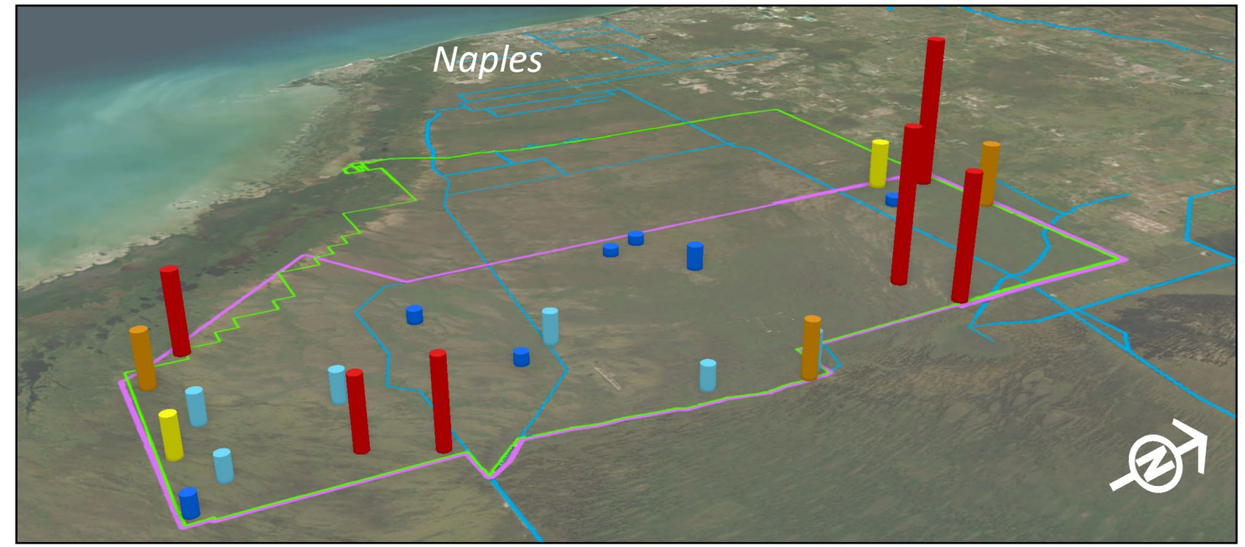
(p>0.05, Dunn's test)

Areas of Ecological Concern

Some sample sites shows concentrations above EPA and FWS thresholds to protect birds and wildlife.

Targets to protect birds/mammals:

- 77 ng/g (EPA)
- 100 ng/g (FWS).



Legend

- BICY Boundary
- Big Cypress Study Area
- Canals

Total Mercury in Fish (ng/g)

- 11 - 36
- 37 - 56
- 57 - 76
- 77 - 99
- >100

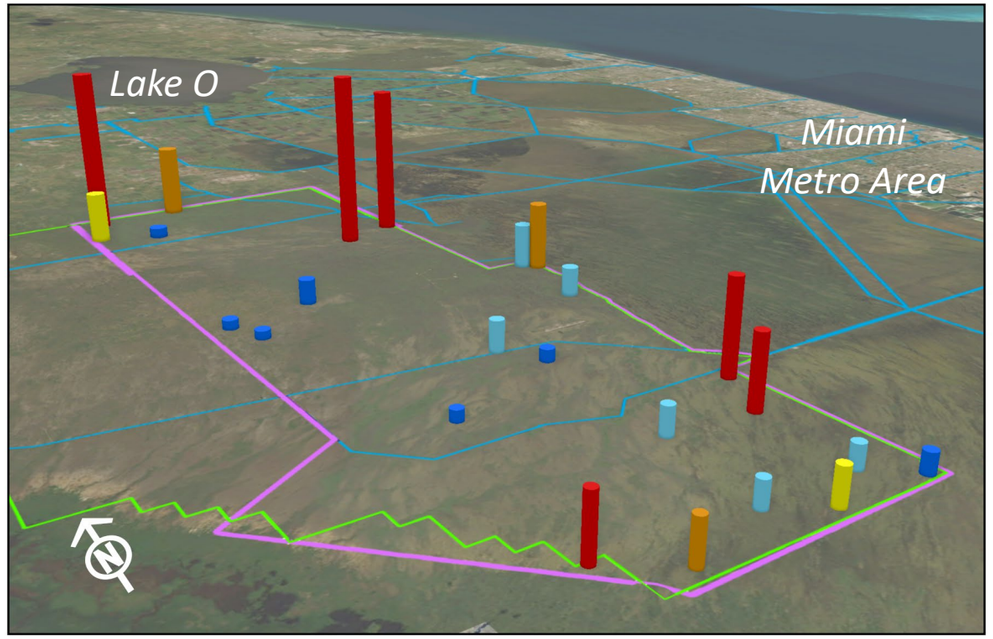


Figure by Jon Becker, USEPA Region 4

REMAP 2023 Mosquitofish Mercury

36% above USEPA target

Marsh Area fish >77 ng/g THg

95% CI: 25.15-45.37%

24% above USFWS threshold

Marsh Area fish >100 ng/g THg

95% CI: 16.57-34.42%

Targets to protect birds/mammals:

- 77 ng/g (EPA)
- 100 ng/g (FWS).

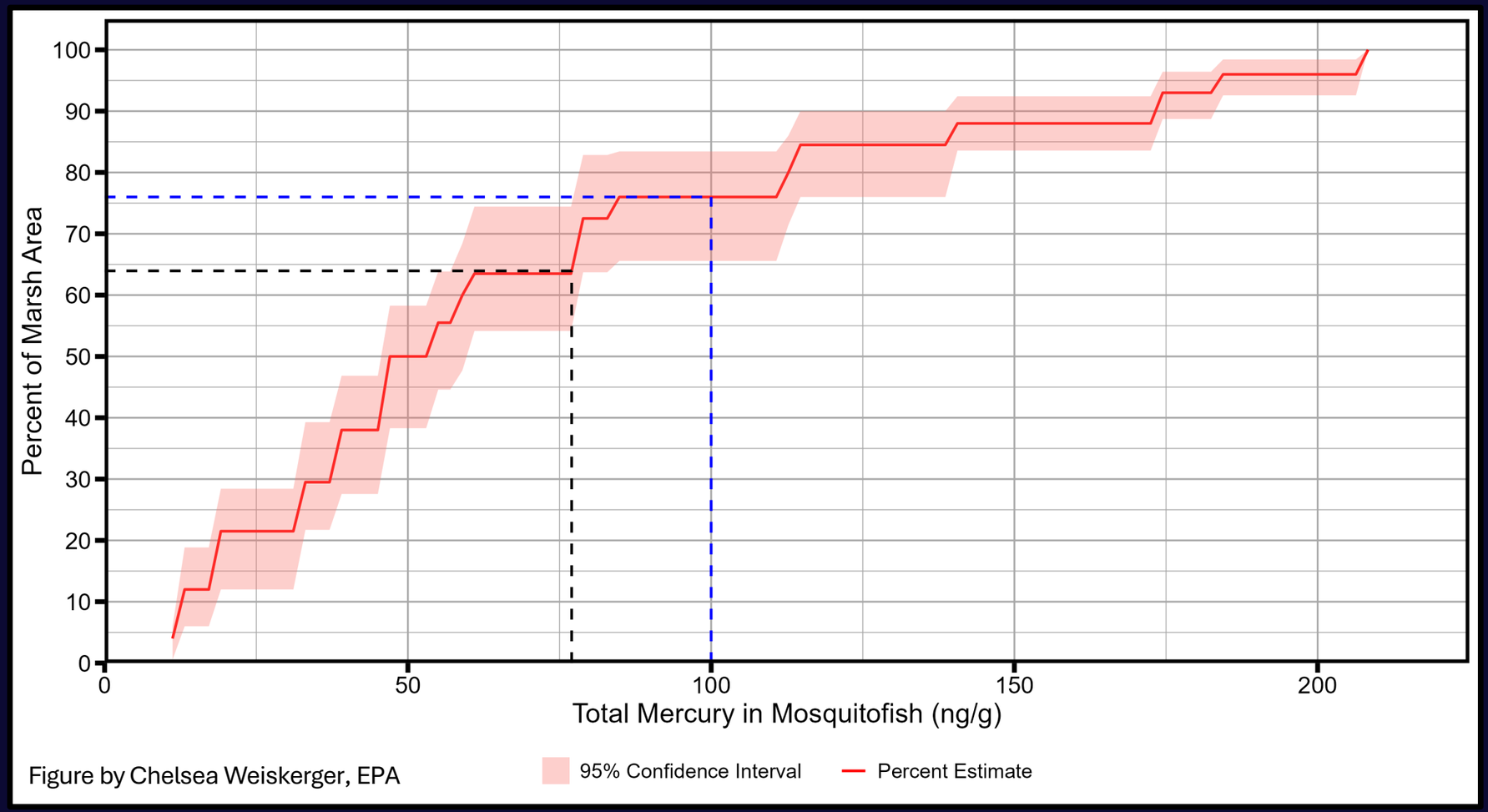


Figure by Chelsea Weiskerger, EPA

Key Conclusions

Critical Data Gap Filled

First comprehensive data collection in Big Cypress marshes since early 2000s.

Clear Phosphorus Gradient

Strong north-south gradient confirms historical patterns.

Mercury Concerns

24-36% of marsh area exceeds target fish mercury levels.

Monitoring Program Value

Results demonstrate importance of continued environmental monitoring to detect changes in this sensitive ecosystem.

Guiding Ecological Restoration

REMAP data provides essential scientific foundation for restoration planning by the State of Florida, Army Corps of Engineers, Department of Interior, Tribal authorities, and others.

REMAP Data are Available to the Public

Search for :
"EPA Everglades REMAP"

https://www.epa.gov/everglades/environmental-monitoring-everglades

Big Cypress Report will be released in 2025.

Made possible by:

FIU