

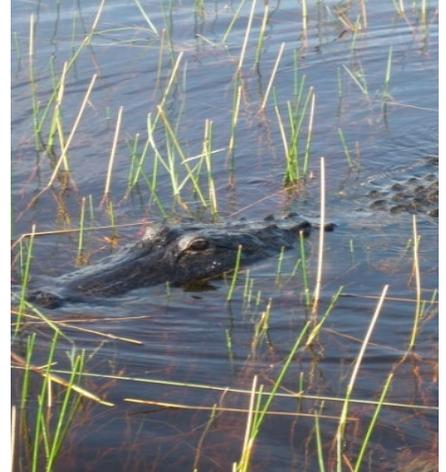


Syncing Success: Linking Modeling and Monitoring to track Restoration Progress in the Greater Everglades

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**Greater Everglades Ecosystem
Restoration Conference
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REstoration COordination VERification

- **Interdisciplinary collaboration** of agencies, tribes, and institutions
- Conducts scientific and technical **evaluations** and **assessments** to improve the Comprehensive Everglades Restoration Plan (CERP) ability to restore the south Florida ecosystem while providing for the region's other water-related needs
- Supports CERP with a **system-wide** and **integrative perspective**



Background – The Greater Everglades Region



Restoration Goals

- Sheet flow and water depth patterns
- Oligotrophic nutrient status
- Landscape patterns
- Wading bird nesting and freshwater predator/prey trophic interactions
- American alligator populations

CERP Projects

1. Central Everglades Planning Project (CEPP)
2. Broward County Water Preserve Area



2024 RECOVER System Status Report Greater Everglades Assessment

GREATER EVERGLADES | REGIONAL SUMMARY
RECOVER STATUS: FAIR ● ● ●

I) OVERVIEW

- The Greater Everglades includes the Water Conservation Areas (WCAs) (including Arthur R. Marshall Loxahatchee National Wildlife Refuge, Everglades National Park (ENP), and eastern Big Cypress National Preserve (Figure 1)).
- The landscape includes a peat-dominated system of ridges, sloughs, and tree islands, higher elevation prairies and pine rocklands with marl substrates, and some areas of cypress and other forested wetlands.
- Challenges include loss of overall water volume within the landscape coupled with unnatural timing and distribution of flows, disruption of sheetflow due to the system of canals and levees, unnatural recession rates and excessive dry-downs below the soil surface, loss of peat soil, drowning of tree islands, elevated nutrients in inflowing water and legacy nutrients within and near canals and structures, and system-altering invasive species.

II) KEY TAKEAWAYS

- Monitoring data for Greater Everglades indicators are consistent with expectations from the 2026 increment of Interim Goals (i.e., little to no change) (Table 1). Little change was expected within the Greater Everglades region by 2026 because few projects were expected to be implemented (Figure 2, Table 2).
- Hydrologic conditions improved in Shark River Slough (SRS) and flow improved in Taylor Slough (TS) during the Reporting Period, largely due to incremental testing and final implementation of the Combined Operational Plan.
- Low hydroperiods and water depths remain a concern in northern WCA3A, TS, and Lostmans Slough, and more water is needed in late dry season (March – May). Conversely, higher than normal water levels remain a concern in southern WCA3A.
- Except for two years of record wading bird nesting, hydrologic improvements have not yet translated to significant ecologic responses.
- Invasive species, including Brazilian Pepper (*Schinus terebinthifolius*) and the Asian swamp eel (*Monopterus albus*), are impacting tree islands and aquatic fauna, respectively, and are also causes of concern.

III) REAL WORLD STATUS AND TRENDS

Table 1. Status of Greater Everglades indicators during the Baseline Period (Water Year (WY) 2005-WY2017), Reporting Period (WY2018-WY2024), and the most current data available (varies by indicator). The Change from Baseline column shows the change in status from the Baseline Period to Reporting Period (up arrow for better, down arrow for worse, horizontal arrows for no change). Indicators with a status of "N/A" do not currently have spotlight methodology developed.

Indicator	Baseline Period	Reporting Period	Current Status	Change from Baseline Period	Progress Towards Interim Goals
Interim Goal Indicators					
Hydroperiod/Depth	POOR	FAIR	FAIR	↑	Consistent with Interim Goal
Water Volume and Sheetflow	POOR	FAIR	FAIR	↑	Consistent with Interim Goal
Soil Oxidation	POOR	FAIR	GOOD	↑	Consistent with Interim Goal
Spatial Extent of Vegetation	N/A	N/A	N/A	-	Not enough information available
Ridge and Slough Pattern	POOR	FAIR	FAIR	↑	Consistent with Interim Goal
Tree Island	FAIR	FAIR	FAIR	↔	Consistent with Interim Goal
Marl Prairie	FAIR	FAIR	FAIR	↓	Some areas consistent with Interim Goal
Aquatic Fauna (wet season)	FAIR	FAIR	FAIR	↓	Consistent with Interim Goal
American Alligator	FAIR	FAIR	FAIR	↑	Consistent with Interim Goal
Wading Birds	POOR	FAIR	POOR	↑	Consistent with Interim Goal
Everglade Snail Kite	N/A	N/A	N/A	-	Not enough information available
Non-Interim Goal Indicators					
Aquatic Fauna (dry season)	GOOD	FAIR	GOOD	↓	-
Periphyton	FAIR	FAIR	FAIR	↔	-
Overall Region Status					
Greater Everglades	POOR	FAIR	FAIR	↑	Consistent with Interim Goal

DECEMBER 2024
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Opportunities to improve:

1. Better align evaluation and assessment
2. Identify ecologically-relevant thresholds to determine indicator status
3. Better define the desired restoration condition for each indicator



Better align evaluation and assessment

- **Wading birds - misaligned**

- **Evaluation (Interim Goal)**

- Approach: Wader Distribution Evaluation Modeling (WADEM)
- Metrics: Suitability of wading bird foraging habitat



- **Assessment (Field Monitoring)**

- Approach: Colony transects, Aerial surveys
- Metrics: Nesting effort (Foraging ratio, Wood Stork initiation date, coastal ratio, and supercolony interval)

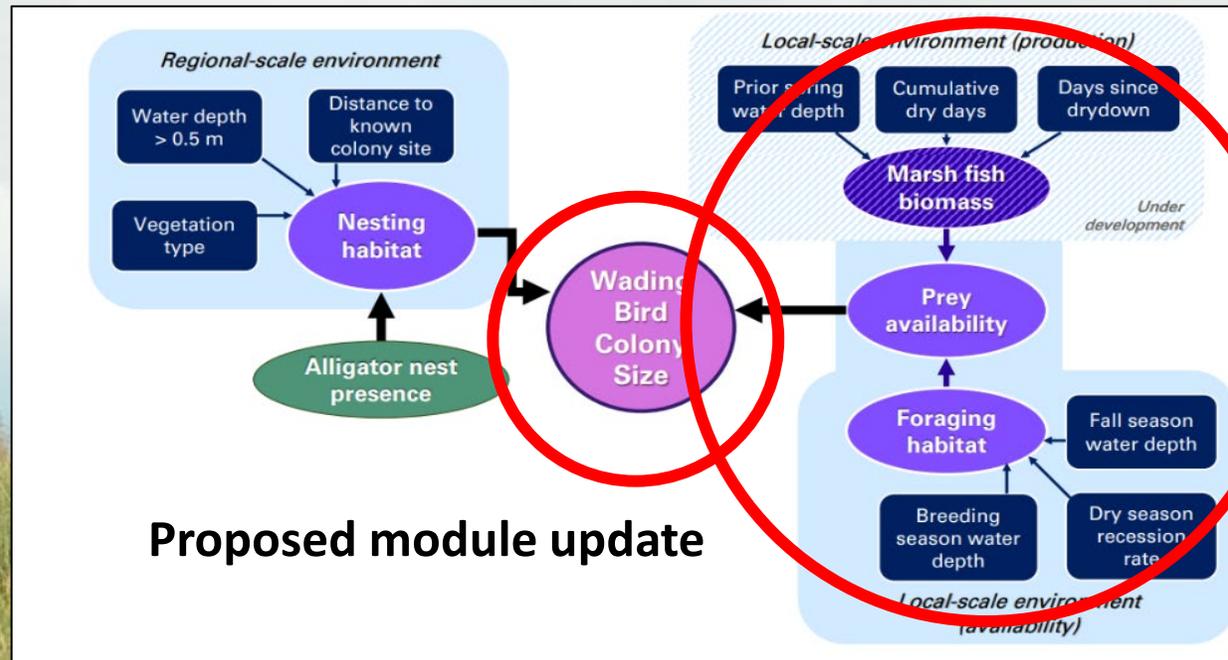
Not a direct comparison between foraging habitat suitability and nesting effort



So, what are we doing about it?

- Better integrate trophic indicators using the RECOVER Everglades Vulnerability Assessment
 - wet/dry season prey and nesting effort (Wednesday poster session #68)
- Wading bird workshop series and performance measure

Tools used in project evaluation and assessment



Identify ecologically-relevant thresholds to determine indicator status

▪ Tree Islands

▪ Evaluation (Interim Goal)

- Approach: Modeled water surface elevation and compared to tree island elevation data for 400 tree islands
- Metrics: **inundation duration** (% tree with <10% inundation)



▪ Assessment (Field Monitoring)

- Approach: Compared observed water surface elevation to tree island elevation; Collection of demography data on eight tree islands
- Metrics: **inundation duration**; tree ingrowth, mortality, regeneration, and basal area

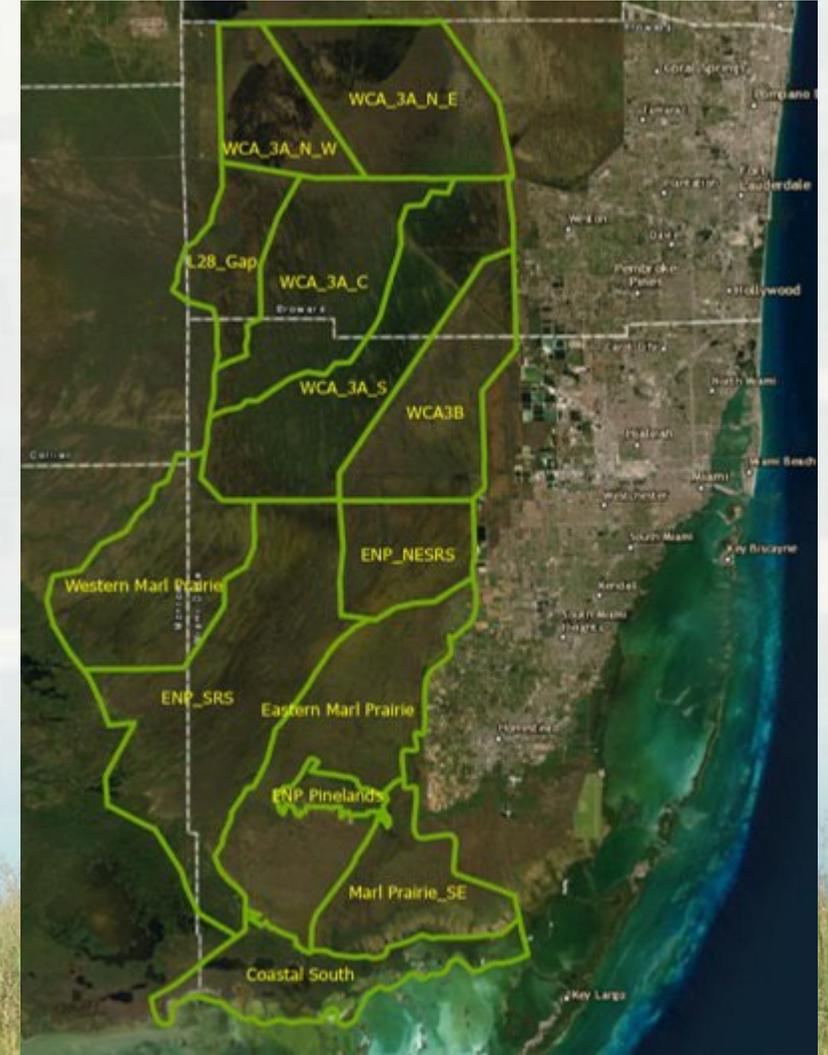


So, what are we doing about it?

✓ Tree island performance measure development through workshop series

(Session 23)

- Refine hydrologic metrics for evaluation by considering inundation duration **and depth**
- Develop evaluation targets based on tree island location and elevation



Identify ecologically-relevant thresholds to determine indicator status

- Applies to several Greater Everglades indicators
- Example:
 - Soil Oxidation
 - Hydroperiod and Water Depth
 - Water Volume and Sheetflow

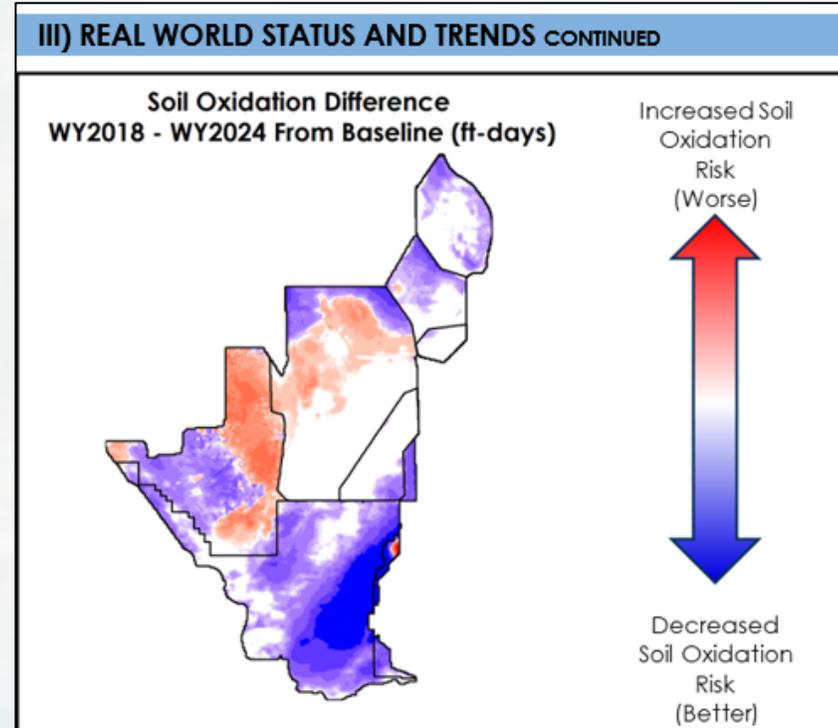


Table 3. Soil oxidation status during the Baseline Period (Water Year (WY) 2005-WY2017), Reporting Period (WY2018-WY2024), and WY2024. The last column shows the change in status from the Baseline Period to the Reporting Period.

	Baseline Period	Reporting Period	Current Status (WY2024)	Change from Baseline Period
Soil Oxidation	Poor	Fair	Good	↑



So, what are doing about it?

✓ RECOVER Greater Everglades Team currently undertaking review and update of six hydrologic performance measures

- Soil Oxidation
- Dry Events in Shark River Slough
- Slough Vegetation
- Inundation Patterns
- Sheetflow
- Fire Risk

CERP System-Wide Performance Measure Documentation Sheet
Inundation Pattern in Greater Everglades Wetlands

Greater Everglades Performance Measure Inundation Pattern in Greater Everglades Wetlands

Revision Date & Acceptance Status
Draft 2/25/2025;

Final Accepted 3/1/2007

Type of Performance Measure:(if applicable, select both)
 Evaluation Assessment

1 INTRODUCTION

1.1 Overview

The purpose of the Inundation Pattern performance measure is to provide a tool to evaluate and assess inundation patterns in the Greater Everglades wetlands. Inundation patterns consider duration of time an area experiences water levels above ground surface, providing they exceed 0.2 feet, until the time they fall below ground. Inundation pattern influences several ecological processes throughout the Greater Everglades.

Metrics include percent period of record inundation (PPOR), inundation frequency, and inundation duration.

The desired restoration condition is the recovery of pre-drainage patterns of multi-year hydroperiods by restoring Natural Systems Regional Simulation Model (NSRSM) version 3.5.2 (SFWMD 2013) envelopes throughout the Greater Everglades wetlands, except in areas where deviations from NSRSM have been deemed to be environmentally beneficial or where NSRSM is less accurate.

1.2 Justification

Altered inundation patterns are one of the most critical stressors on the ecology of the Everglades. Ecological consequences of operationally altered hydroperiods are numerous and widespread including flooding of alligator nests (Ugarte et al. 2012; Mazzotti and Brandt 1994) and apple snail egg clusters (Bennetts et al. 1994), the adverse effects of water depth reversals on wading bird nesting and foraging (Bancroft et al. 1994), the adverse effects of dry season water deliveries on cape sable seaside sparrow nesting (Nott et al. 1998), and flooding of tree islands (Brandt et al. 2000).

Hydroperiod is a description of the duration (usually by days within a water year) of continuous flooding based on the presence of water and not its depth. Hydroperiod may also be discontinuous within a water year. Shortened hydroperiod directly affects plant community and habitat structure by enabling the invasion of nuisance native woody plants (e.g., willow) and exotics (e.g., Brazilian pepper and melaleuca) in a naturally herbaceous landscape (Armentano et al. 1995; Jones and Doren 1997), by altering the plant species composition of macrophyte vegetation toward more terrestrial plant species (Hilsenbeck et al. 1979; Hofstetter and Hilsenbeck 1980), and by altering the fire regime, resulting in hotter and more severe fires exacerbated by the prolonged dry season (Gunderson and Snyder 1994) that further alter herbaceous plant species composition and reduce plant community heterogeneity by burning out hardwood hammock tree islands (Loope and Urban 1980). However, longer hydroperiods can result in changes in vegetation shifts,

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Better define the desired restoration condition for each indicator

- Examples
 - Wading birds – nesting in the southern estuaries
 - Water depth – ridge, slough, and marl prairies
 - Soil oxidation

So, what are we doing about it?

- ✓ Wading birds – wading bird workshop series and performance measure
- ✓ Water depth – Working with Central Everglades Planning Project Operations project team to inform targets and incorporating information into performance measures
- ✓ Updating hydrologic performance measures



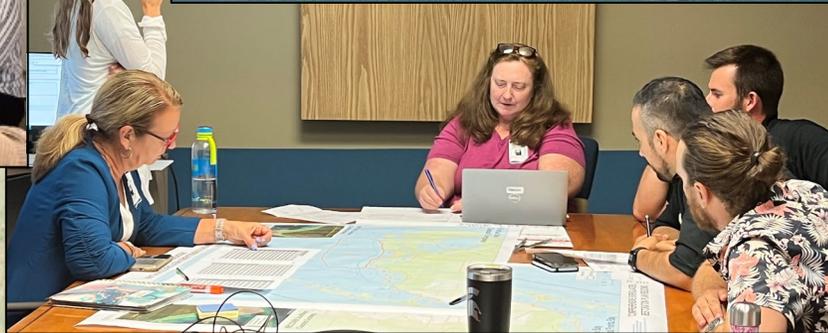
SUMMARY

- The development of the 2024 System Status Report highlighted areas of evaluation and assessment RECOVER can improve upon
- Aligning “model world” and “real-world” approaches and results are necessary for meaningfully assessing CERP and verifying expectations
- RECOVER is continuously working to improve evaluation and assessment methods to provide the best scientific and technical support to CERP



NEXT STEPS AND OPPORTUNITIES TO SUPPORT

- Tree Island Performance Measure (Session 23)
- Wading Bird Workshop
- Water depth targets in the ridge, slough, and marl prairie



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<https://www.saj.usace.army.mil/Missions/Environmental/Ecosystem-Restoration/RECOVER/>

THANK YOU

