1.0 Performance Measure Title

Wetland Trophic Relationships - Mangrove Forest Production/Soil Accretion

Last Date Revised: December 2006

2.0 Justification

A CERP working hypothesis is that reduced freshwater flow and increased salinity in the mangrove ecotones has diminished the primary production of the mangrove forests and has thereby contributed to reduced populations of fishes and the collapse of wading bird nesting colonies in coastal areas. Mangrove forest production, as measured by soil accretion rate, is considered to be a regional indicator of the functional base of food webs in the mangrove ecotones of the Greater Everglades Wetlands. The primary production of mangrove forests supports the aquatic fauna that ultimately sustains reproduction by higher vertebrates.

3.0 Relationship to CEMs and Adaptive Assessment Hypotheses

Everglades Mangrove ecotones Conceptual Ecological Model attribute (RECOVER 2004b)

Ecological Premise: Two major societal drivers on this system are water management activities and global climate change. These drivers lead to two major ecosystem stressors: reduced freshwater flow volume and duration, and sea level rise. Major ecological attributes include estuarine geomorphology, mangrove forests and associated plant communities, resident mangrove fish communities, wood stork (Mycteria Americana Linnaeus) and roseate spoonbill (Platelea ajaja Linnaeus) nesting colonies, and estuarine crocodilian populations. Estuarine geomorphology is affected by accretion or erosion of coastal storm embankments and mangrove soils, and by loss of tidal creek patterns, both in relationship to sea level and freshwater flow. Mangrove forests and associated plant communities are affected by nutrient mixing and mangrove forest productivity in relation to freshwater flow and sea level. Resilience of the mangrove forests of the coastal Everglades after disturbance is dependent on hydrologic flushing by either fresh or saline water, which is driven by sea level and sheet flow from the Everglades. Resilience also varies with soil fertility.

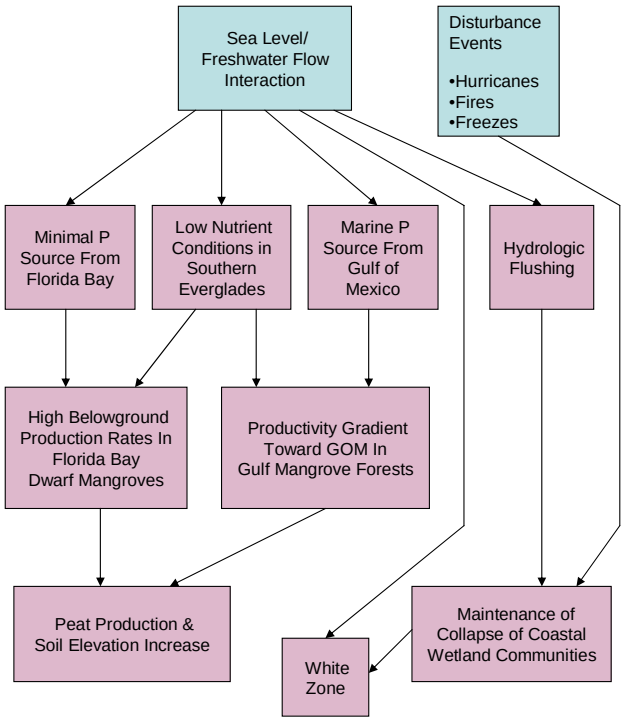
Greater Everglades Wetlands Module Coastal Transgression, Tidal Channel Characteristics, Salinity Gradients, and Mangrove Forest Productivity hypotheses:

Hypothesis 4:

Production and organic soil accretion in the mangrove forests of the coastal Everglades are controlled by phosphorus availability, with relatively high inputs from marine sources and low inputs from freshwater sources. Phosphorus availability, mangrove production, and soil elevation are thus driven by the opposing influences of sea level and sheet flow from the Everglades

Rationale. Increased freshwater sheet flow caused by implementation of CERP projects is expected to maintain low nutrient conditions in the southern Everglades mangrove estuaries and in the oligohaline ecotone forests of the western mangrove estuaries. These low nutrient conditions are expected to enhance belowground productivity by mangroves, which will maintain peat production and soil elevation increases—ultimately enhancing the ability of these low salinity forests to maintain themselves against sea level rise.

Mangrove forest production/soil accretion conceptual model:



4.0 Restoration Expectation

Improved freshwater flow and flushing through the lower Everglades and coastal wetlands (through both channel and sheet flow) are expected to restore natural patterns of hydrology, salinity and nutrient mixing; thus aiding in recovery of wetlands from catastrophic setbacks (from hurricanes, fire, freeze and salinity changes), resulting in an increase the primary productivity and soil accretion of mangrove forests in coastal areas.

4.1 Predictive Metric and Target

Habitat Suitability Indices within 10% of NSM values was initially proposed, but RECOVER currently does not advocate use of this metric. Efforts to refine and update a predictive model are in development with an expected completion date beyond 2008.

4.2 Assessment Parameter and Target

The assessment parameters are areal extant of mangrove habitat and the salinity gradient. The specific targets will be set once a Natural System Model [NSM] is updated and supporting research is conducted. This parameter is assessed along with the complete hypothesis cluster 9.2.4 (RECOVER 2006)

5.0 Evaluation Application

5.1 Evaluation Protocol

Predictive models to evaluate this performance measure are still under development and refinement. At this time, this performance measure should not be used to conduct evaluations.

5.2 Normalized Performance Output

5.3 Model Output (example attached)

5.4 Uncertainty

Recognition of model uncertainty is needed when interpreting the ecological significance of model output. The Model Uncertainty Workshop Report provides guidance on the potential implications of uncertainty on model output interpretation (RECOVER 2002).

6.0 Monitoring and Assessment Approach

See *CERP Monitoring and Assessment Plan: Part 1 Monitoring and Supporting Research* - Greater Everglades Wetlands Module sections 3.1.3.10 – 3.3.3.11 (RECOVER 2004a)

See RECOVER Team's Recommendations for Interim Goals and Interim Targets for the Comprehensive Everglades Restoration Plan – Interim Goal 3.9 Aquatic Fauna Regional Populations in Everglades Wetlands (RECOVER 2005)

See RECOVER Team's 2006 Assessment Strategy for the Monitoring and Assessment Plan. Final Draft (RECOVER 2006)

7.0 Future Tool Development Needed to Support Performance Measure

7.1 Evaluation Tools Needed

Predictive models to evaluate this performance measure are still under development and refinement.

7.2 Assessment Tools Needed

Accessibility to the various data sources through an integrated database is needed for the complete evaluation of these hypotheses and for parameter refinement.

8.0 Notes

This Performance Measure supersedes and addresses GE-18 Wetland Trophic Relationships - Mangrove Forest Production/Soil Accretion (Last Date Revised: November 22, 2005).

9.0 Working Group Members

Jana Newman, SFWMD; Patty Goodman, SFWMD; Andy Gottlieb, EPJV

10.0 Acceptance Status

GE Working Group	November 22, 2005
ET	
AT	
Public Review	
Final Acceptance Date	

11.0 References

RECOVER 2002. Model Uncertainty Workshop Report: Quantifying and Communicating Model Uncertainty for Decision Making in the Everglades, Restoration Coordination and Verification Program (RECOVER), United States Army Corps of Engineers, Jacksonville District, Jacksonville, Florida, and South Florida Water Management District, West Palm Beach, Florida.

RECOVER. 2004a. CERP Monitoring and Assessment Plan: Part 1 Monitoring and Supporting Research. Restoration Coordination and Verification Program, c/o United States Army Corps of Engineers, Jacksonville District, Jacksonville, Florida, and South Florida Water Management District, West Palm Beach, Florida.

RECOVER. 2004b. Draft Conceptual Ecological Models. In: RECOVER. CERP Monitoring and Assessment Plan: Part 1 Monitoring and Supporting Research, Restoration Coordination and Verification Program, c/o United States Army Corps of Engineers, Jacksonville District, Jacksonville, Florida, and South Florida Water

Management District, West Palm Beach, Florida, Appendix A.

RECOVER. 2006. 2006 Assessment Strategy for the Monitoring and Assessment Plan. Final Draft. c/o United States Army Corps of Engineers, Jacksonville District, Jacksonville, Florida, and South Florida Water Management District, West Palm Beach, Florida.