RECOVER Evaluation Team: Greater Everglades Performance Measure Synthesis

Andrew Gottlieb[1], Jed Redwine[2], Shawn Komlos[3], Doug Donalson[4], Dan Nehler[5], Gregg Reynolds[4], and Gwen Burzycki[6]

[1]South Florida Water Management District, Everglades Restoration Planning Offices, West Palm Beach, FL, USA
[2]EPJV, Jacksonville, FL, USA
[3]US Army Corps of Engineers/IMC, West Palm Beach, FL, USA
[4]Everglades National Park, Homestead, FL, USA
[5]U.S. Fish and Wildlife Service South Florida Field Office, Vero Beach, FL, USA
[6]Miami-Dade County Department of Environmental Resources Management, Miami, FL, USA

Abstract/background:

The RECOVER Evaluation Team, Greater Everglades (GE) sub-team is responsible for developing performance measures (PMs) to forecast the effects of implementation of specific project alternatives on progress toward achieving Comprehensive Everglades Restoration Plan (CERP) goals. The domain of the Greater Everglades sub-team runs from just south of Lake Okeechobee to the Coastal gradients abutting Florida Bay and Biscayne Bay. Similar to the other RECOVER regional sub-teams, Greater Everglades developed a suite of hydrologic, water quality, and ecological/biological performance measures to evaluate the contribution of specific project alternatives to the system-wide goals of the Plan. The following synthesis poster provides an overview of the existing suite of PMs used to evaluate the GE; and provides an overview of the team's proposed updates, and identifies existing needs and gaps. Details of newly accepted or newly proposed metrics for the Greater Everglades are highlighted in the remaining GE posters in this session.

Geographic domain:

Figures 1a) GE domain & 1b) South Florida Water Management Model grid with GE indicator regions

Hydrology PMs:

- Dry Down duration- number, duration and percent period of record of dry events (applied in indicator regions 129-132 Shark River Slough/ENP)
- Inundation duration- number, duration, and percent period of record of inundation events (applied in all indicator regions)
- Extreme High and Low water depths- new methods for calculating extreme lows and proposed target updates for extreme highs are under review (see related poster for details) This PM is applied in all indicator regions.
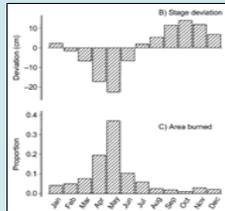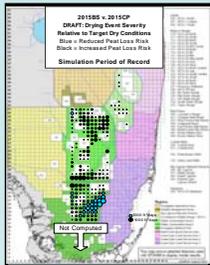
Figure 2a) Updated methods for calculating extreme lows based on cumulative drought intensity differences between project alternatives. Black circles indicate a condition drier than the first alternative (2015BS), blue circles indicate wetter conditions than the first alternative and movement toward target, and no circle indicates that conditions are as wet as or wetter than the target condition. The size of the dot is proportional to the magnitude of difference between alternatives relative to target & 2b) Relationship between area burned and stage (modified from Beckage et al. 2003).

- Flow: Goal- The right volume at the right location at the right time

  Timing- PM measures shifts in timing relative to target
  Distribution- PM measures shifts in distribution relative to target
  Continuity- measures shifts in continuity of flows (using coefficient of variation) between paired transects relative to target
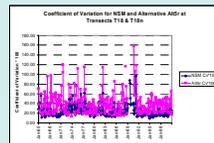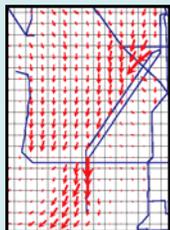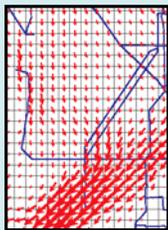
Figures 3a) Natural Systems Model (target) flow vectors where vector size is proportional to flow volume. 3b) Alt5r flow vectors (Note- distribution of NSM flows is concentrated on the Eastern portion of Tamiami Trail relative to Alt5R. 3c) The Flow continuity metric compares the project alternative Coefficient of Variation (CV) across paired transects to the target flow CV.

Water Quality PMs:

There is currently no predictive model available for evaluation of WQ parameters. Therefore, a series of proxies, including dry down duration and intensity, storm water treatment area (STA) bypass, and phosphorus (P) concentration/loading reduction estimates, are used as surrogates. There is also potential to use the flow distribution metric in order to minimize point source distributions and maximize natural treatment through sheetflow. Periphyton nutrient concentrations are currently planned to be used for WQ assessment (Figure 4B) (Gaiser et al 2004).

- Total Phosphorus loading and flow weighted mean
- TP concentration
- Soil TP (Newman et al 2000)

Ecological PMs: (include related assessment metrics for each PM)

- Wet Prairie Vegetation
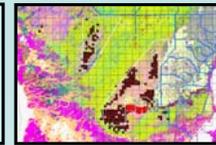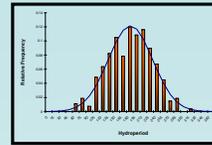
Figures 5a) The Ross-Sah frequency distribution of hydroperiod of wet prairies. The blue line indicates the normalized frequency distribution. 5b) The selected areas of wet prairies for the Wet Prairie Vegetation Performance Measure (white polygons).   The red dots are the assessed indicator sites.

Figures 4a) Integrated hydrology and water quality conceptual ecological model and 4b) Krieged periphyton nutrient status map

Relationship of Interim Goals and Total System PMs to Greater Everglades PMs

Interim goals are a means by which restoration success of the Comprehensive Everglades Restoration Plan may be evaluated at specific points by agency managers, the State of Florida, and Congress throughout the overall planning and implementation process. As part of the interim goals reporting process, RECOVER is developing Total System (TS) PMs that link related metrics across regional modules. Total system PMs provide a system wide overview of performance while detailed performance within a regional domain is highlighted by the regional metrics. The list of proposed TS PMs is provided below, along with the related GE metric (in parenthesis).

- System-wide flows (sheet flow and water budget including flows to coast)
- Nutrient Patterns (Surface water P loading and concentrations & Soil P)
- Landscape/Community Mosaics (Slough vegetation, wet prairie vegetation, & tree island vegetation)
- Crocodilians (alligator, crocodile)
- Aquatic fauna (crayfish and marsh fish)
- Wading birds (Ibis, storks, spoonbills)

Next steps: Gaps/needs and current efforts

- Hydrology- continued refinement of methods to address seasonality, sensitivity and uncertainty, continued development of empirical targets, and review of high resolution water depth methods.
- Water Quality – implementation of predictive tools (such as ELM) or develop further guidance on proxy application
- Ecology- once a high resolution hydrology methods is accepted, hydrosequences can be applied to ecological models at spatial scales more relevant to the organism in question.

  Slough vegetation- continued development of empirical targets based on vegetation optima and tolerance
  Alligators/Crocodiles
  Fish
  Wading birds
  Periphyton

Formal integration of Greater Everglades Assessment and Evaluation Teams in 2008-2009. The monitoring and assessment program will continue to support model refinement and empirical target development. Ecological models developed by assessment team principal investigators will be linked with hydrology sequences to predict change (supports evaluations and assessments)

References:

Beckage, B., W.J. Platt, M.G. Slocum, and B. Panko. 2003. Influence of the El Niño-Southern Oscillation on fire regimes in the Florida Everglades. Ecology 84:3124-3130.
Gaiser, E. E., L. J. Scinto, J. H. Richards, K. Jayachandran, D. L. Childers, J. C. Trexler, and R. D. Jones. 2004. Phosphorus in periphyton mats provides the best metric for detecting low-level P enrichment in an oligotrophic wetland. Water Research 38:507-516.
Gregory L. Bruland, Sabine Grunwald, Todd Z. Osborne, K. Ramesh Reddy and Susan Newman. 2006. Spatial Distribution of Soil Properties in Water Conservation Area 3 of the Everglades. Soil Science Society America Journal 70:1662-1676.
RECOVER 2006. CERP Monitoring and Assessment Plan: Part 2, 2006 Assessment Strategy for the MAP, Restoration Coordination and Verification. C/O U.S. Army Corps of Engineers, Jacksonville District, Jacksonville, FL and South Florida Water Management District, West Palm Beach FL.
Ross, M. S., J. P. Sah, P. L. Ruiz, D. T. Jones, H. Cooley, R. Travieso, F. Tobias, J. R. Snyder, and D. Hagyaru. 2006. Effect of hydrological restoration on the habitat of Cape Sable seaside–sparrow. Annual Report of 2004-2005 for Everglades National Park. 46 pp.