Greater Everglades Performance Measure

Tracer of Stormwater Treatment Area Bypass Flows

Last Date Revised: March 2, 2007

Acceptance Status: Accepted

1.0 Desired Restoration Condition

Untreated flows into the Everglades will be minimized. Canal-to-marsh flows of STA bypass-derived water during transit through the Everglades will also be minimized. In the absence of a water quality model for the Everglades, an analysis was done of how CERP affects the performance of STAs built under the authority of the Everglades Construction Project. This STA performance analysis looked at the results of the South Florida Water Management Model (SFWWM) to see how increased flow and hydroperiods should affect the ability of the treatment areas to clean water from the EAA. Not all of the Everglades Construction Project treatment areas did better under full D13R implementation. However, during CERP implementation less water is routed around the STAs, which means that a greater percentage of the water is at least partially cleaned by traveling through a STA (RECOVER 2005).

1.1 Predictive Metric and Target

The target is to approach 0.0 metric tons per year load of conservative tracer load into the Everglades, and approach 0.0 mg/m2/yr tracer load into marshes from canals when bypasses occur.

1.2 Assessment Parameter and Target

Periphyton also is very sensitive to water quality, as higher levels of nutrients change the composition of species that make up the mat and therefore change the periphyton function in terms of marl soil formation and food web importance. These characteristics make it a good indicator of changes in the amount and quality of water in the system (RECOVER 2005).

2.0 Justification

To minimize inflows of water with high P concentrations into the Everglades, it is important to optimize (minimize) stormwater treatment area (STA)-bypass flows. Under the Everglades Forever Act and the CERP, it is allowable to route untreated water from Lake Okeechobee and the Everglades Agricultural Area (EAA) into (and/or through) the Everglades for flood control in upstream areas and/or water supply releases to the Lower East Coast region. In water supply conveyance plans, this nutrient-rich water is generally assumed to stay in the canals, but it can flow into marshes when canal stages are over-bank. A conservative tracer can be used in simulations to track the transport and fate of all stormwater treatment area (STA) bypass flows as they move into and within the Everglades.

Currently, significant flows of Lake Okeechobee and/or EAA water (e.g., simulated tracer) occur at variable times into spatially-variable locations in the marshes.

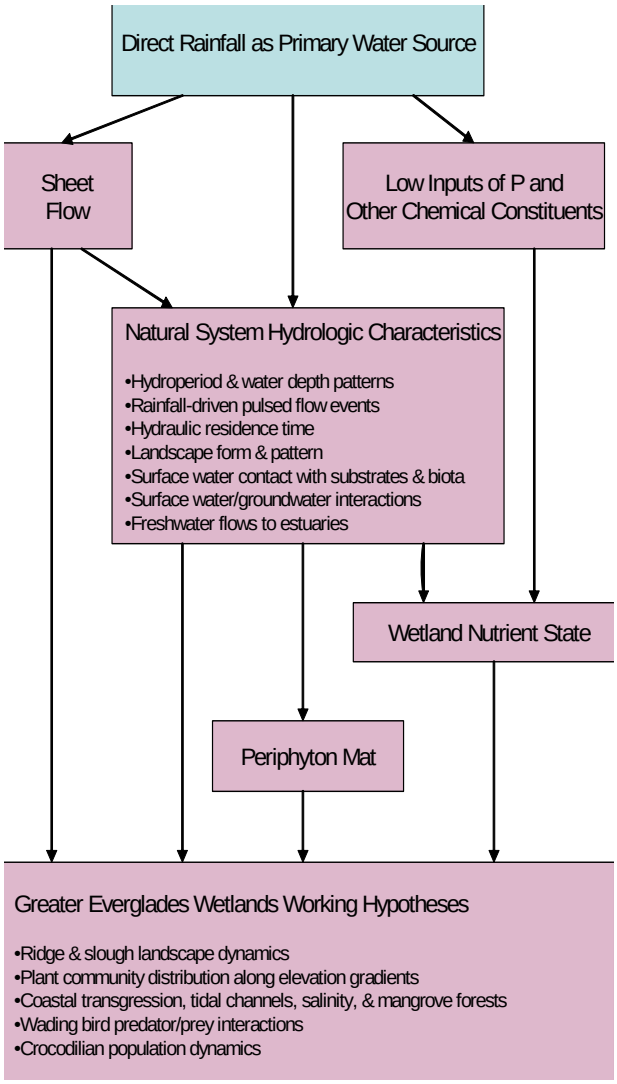
3.0 Scientific Basis

3.1 Relationship to Conceptual Ecological Models

The indicator for this performance measure is a stressor in the following Conceptual Ecological Models:

Regional Models
Everglades Ridge and Slough (Ogden 2005)
Everglades Mangrove Estuaries (Davis et al. 2005a)
Big Cypress Regional Ecosystem (Duever 2005)
Southern Marl Prairies (Davis et al. 2005b)
Total System (Ogden et al. 2005)

Conceptual Ecological Models
Integrated Hydrology and Water Quality (RECOVER 2006)



3.2 Relationship to Adaptive Assessment Hypothesis Clusters

Ecological Premise: The pre-drainage Greater Everglades Wetlands system was characterized by hydrologic inputs (primarily from direct rainfall) and by extended hydroperiods. Natural conditions were characterized by oligotrophic conditions with low phosphorus and sulfur concentrations in surface waters having defined zones of low or high conductivity as compared to present conditions. An overriding expectation of CERP is that it will restore hydroperiods by providing freshwater inflows and restored hydropatterns to the Greater Everglades Wetlands without increasing nutrient loads or subjecting more of the system (particularly the more pristine areas) either to elevated concentrations of surface water phosphorus, nitrogen, sulfur or other constituents that alter the natural zones of conductivity in the freshwater regions, thereby improving overall water quality throughout the wetland system (RECOVER 2004).

Integrated Hydrology and Water Quality Hypothesis (RECOVER 2006)

Hypothesis 2: Nutrient Inputs and Sheet Flow as Determinants of Wetland Nutrient State in the Everglades. The dominance of direct rainfall as the primary source of water and phosphorus, in combination with sheet flow and related hydrologic and climatic characteristics, resulted in an oligotrophic, phosphorus-limited nutrient state throughout the Greater Everglades wetlands prior to drainage.

Rationale: Increased phosphorus concentrations and loads in agricultural runoff water, and replacement of sheet flow with canal flows and point-source discharges, have produced phosphorus concentration gradients downstream of canal discharge structures, shifting wetlands from oligotrophic to eutrophic states. Water column total P concentrations are below ~10 ppb under non-enriched conditions in the Everglades. Most harmful ecological responses to P enrichment occur within a range of mean annual water column total P concentrations between ~10-30 ppb.

Reduction of the magnitude of nutrient inputs to the Greater Everglades will lead to reductions in phosphorus in inflow waters to the Greater Everglades and influence the downstream rate of recovery of ecosystem components by decreasing existing gradients of phosphorus, nitrogen and sulfur. Non-impacted areas immediately downstream of impacted areas may be affected by phosphorus currently present in the impacted areas, *i.e.*, presently enriched zones in WCAs will continually move south, especially under sheet flow conditions.

4.0 Evaluation Application

4.1 Evaluation Protocol

The Everglades Landscape Model (ELM) is a potential candidate to evaluate this performance measure. It has just become available for CERP use. Until a protocol can be developed for the ELM, STA bypass flows into the Greater Everglades, as predicted by the SFWMM, are used as a surrogate for nutrient tracer loads. The following SFWMM outputs are used to evaluate water flows into the Greater Everglades.

SFWMM Tag	Description
S5AWC1	STA-1W, Water Supply to Lower East Coast
L101OT	STA-1W , STA-1E, lost flow at S5

S6LCWS	STA-2, Water Supply to Lower East Coast
ST2BYP	STA-2, excess EAA runoff
ST3BYP	STA-3/4, excess EAA runoff

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.

4.2 Normalized Performance Output

4.3 Model Output

4.4 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).

5.0 Monitoring and Assessment Approach

5.1 MAP Module and Section

See CERP Monitoring and Assessment Plan: Part 1 Monitoring and Supporting Research - Greater Everglades Wetlands Module section 3.1.3.8 (RECOVER 2004)

See The RECOVER Team's Recommendations for Interim Goals and Interim Targets for the Comprehensive Everglades Restoration Plan – Interim Goals 3.4 System-wide Spatial Extent of Habitat, 3.5 Everglades Wetlands Total Phosphorus, 3.6 Periphyton Mat Cover, Structure, and Composition (RECOVER 2005)

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

5.2 Assessment Approach

6.0 Future Tool Development Needed to Support Performance Measure

6.1 Evaluation Tools Needed

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

6.2 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

7.0 Notes

This performance measure supersedes and addresses GE-9 Tracer of STA Bypass Flows (Last Date Revised: October 12, 2005).

8.0 Working Group Members

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References

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