Central Everglades Planning Project
Big Picture Synthesis
Use of Models
Telling the System-Wide Story

General Topics:

Ongoing Synthesis Efforts

NSM Pre-Drainage Modeling

Regional System Perspectives

CEPP Performance Measures

Big Picture
Ongoing Syntheses

Key Sources:

NRC/CISRERP Biennial Reviews

WG/SCG Ecological Indicators/

New Science Information Brief

RECOVER System Status Reports/

Scientific Knowledge Gained

Synthesis of Everglades Research

and Ecosystem Services

Everglades Landscapes/Geomorphology and Paleo-Environmental History

- The mosaic of linear sawgrass ridges, deeper water sloughs, and tree islands provides the foundation for the biological components of the Everglades Ecosystem (NRC/CISRERP 2010).

- Research has demonstrated a conclusive connection between the flow of water through the Everglades and the morphology and distribution of these features. The ridge and slough topography is the product of varying water levels, so that successful restoration efforts will include variable water depths (NRC/CISRERP 2010).

- Sediment transport and storage are the key processes in the origin and maintenance of ridge and slough topography. Floc (aggregations of organic particles) is transported downstream through sloughs during high flow events, where it is deposited and then remobilized in subsequent flow events (NRC/CISRERP 2010).

- Flow velocities in the impounded areas of today's system are not sufficient to support these physical and biological processes and maintain the characteristic landforms of the historic Everglades (WG/SCG 2010).

Everglades Fish and Wildlife

- Freshwater fish and macro-invertebrate abundance and diversity are linked to marsh water depths/flooding durations as well as periphyton standing stock and composition. Aquatic species abundance in WCA-3A/3B is currently stable, but lower than expected in Shark River Slough due to persistent drier conditions (SCG Ecological Indicators 2010).

- Wading bird nesting/foraging success is tied to marsh water depths/durations/recession rates and prey availability. Longer hydroperiods prior to nesting (such as in 2009) build up the standing stock of fish and invertebrates, while slow recessions make prey available throughout the nesting season. Under near-ideal conditions (2009), nesting success was high throughout the Everglades, wood storks nested earlier, and nesting began to return to the historic southern mangrove ecotone (SCG Ecological Indicators 2010).

- Alligators have shown a negative trend over the last decade in overall abundance and juvenile survival throughout much of the Everglades. This trend is generally related to decreased marsh water depths and flooding durations, and is most evident in Shark River Slough (SCG Ecological Indicators 2010).

Everglades Tree Islands, Vegetation, Soils

- Tree islands are a critical features in the Everglades landscape because they represent biodiversity hotspots of native plants and animals, and they serve as refuge for terrestrial species during periods of high water. Tree islands accumulate and sequester large amounts of phosphorus and nitrogen in the soil, which could be released into marsh waters upon degradation (NRC/CISRERP 2010, and RECOVER/SKG 2010).

- To slow and potentially reverse the degradation of Everglades tree islands and the ridge and slough landscape, it is necessary to restore sheet flow and allow the naturally occurring, rainfall-driven fluctuation of water levels to pulse across the landscape. Multi-decadal alternation between wetter and dryer conditions is key for tree island initiation, maturation and conservation (RECOVER/SSR 2009, 2011).

- Everglades soil formation is driven by hydrology, vegetative communities, and nutrients. Water management has altered water depths/durations and nutrient inputs degrading Everglades soils. The greatest impact has been soil oxidation and compaction of organic/peat soils, and from a practical standpoint is irreversible (EPA/REMAP 2007, SERES 2011).

Southern Estuaries: Florida Bay

- Paleo-environmental studies indicate that Florida Bay was much less saline than the current system, where hypersalinity (>40 ppt) is now common, particularly in central Florida Bay (WG/SCG Info. Brief 2010).
- Reduced freshwater flows into Taylor Slough are believed to have contributed to a widespread collapse of the seagrasses in Florida Bay in the fall of 1987, and the potential exists for a similar collapse event in the future (RECOVER/SKG 2010).
- Increased nutrients from external sources and internal cycling have caused widespread algal blooms that have persisted for several years (RECOVER/SSR 2009, 2011).
- The amount of freshwater needed to achieve the more historic lower salinities is 2-3 times the current average year flows and generally exceeds the pre-drainage simulation model estimates (WG/SCG Info. Brief 2010).
- Moving larger volumes of freshwater into the southern Everglades and estuaries will build resilience and help sustain these ecosystems in the face of climate change/sea level rise (NRC/CISRERP 2006).

Lake Okeechobee

- Pre-drainage water levels in Lake Okeechobee cannot be restored because the lake is constrained by the Herbert Hoover dike, and the lake has lost its historic marsh connections (RECOVER/SKG 2010).

- Submerged aquatic vegetation in the Lake is damaged by extreme high and low water levels, while SAV growth and recovery is rapid during periods of more stable water levels (SCG Ecological Indicators 2010).

- Lake Okeechobee functions more like three semi-independent regions. The central pelagic region is highly turbid and does not support submerged or emergent vegetation. The nearshore zone is shallower, clearer and supports submerged and emergent vegetation. While the littoral zone is more isolated, is dominated by emergent vegetation, and functions much like a low nutrient Everglades marsh (RECOVER/SKG 2010).

- The Lake is at the nexus of competing upstream and downstream water supply, flood control, and ecological needs, while modern Lake water levels are unstable because lake inflows can greatly exceed outflows (RECOVER/SKG 2010).

Northern Estuaries: Caloosahatchee and Saint Lucie Estuaries

- Clear relationships have been established between freshwater flows, salinities and oyster health in the northern estuaries. Restoring more natural salinity regimes would foster greater recruitment, higher juvenile growth rates, and reduced incidence of disease (RECOVER/SKG 2010).
- Reduced freshwater flows in the wet season would improve reproduction, larval recruitment and survival, while more freshwater in the dry season reduces incidence of disease (SCG Ecological Indicators 2010).
- Redirecting excess Lake Okeechobee regulatory releases to the Everglades would improve salinity conditions in the northern estuaries (RECOVER/SSR 2009, 2011).