1.0 Performance Measure Title

Wetland Trophic Relationships – Wading Bird Nesting Patterns

Last Date Revised: December 2006

2.0 Justification

Over the past several decades, wading bird reproduction in the Everglades has declined dramatically, although the area is still an important feeding ground (Ogden, 1994). Changing water management strategies for South Florida, which have coincided with decreases in colonial wading bird populations, affect many of the processes implicated in these declines. The historic numbers and locations of wading bird breeding colonies are a defining characteristic of the Everglades ecosystem and restoration of these colonies and numbers is one of the primary objectives of the CERP (Weaver and Brown, 1993).

Numbers of nesting birds have in most years since the 1970s ranged between 10 to 50% of the numbers that nested during the 1930s and 1940s. The initiation of nesting by Wood Storks has shifted from November through December to January through March, increasing the mortality of nestlings that have not fledged prior to the onset of the wet season. The major nesting colonies that were once located in coastal areas and the headwaters ecotone of Florida Bay and the Gulf of Mexico have completely collapsed and have been replaced by smaller colonies in the Water Conservation Areas, where nesting sometimes fails due to structural and operational conditions. The frequency and size of wading bird super colonies have declined. The collapse of wading bird nesting colonies in the southern Everglades is attributed to declines in population densities and seasonal concentrations of marsh fishes and other aquatic prey organisms.

3.0 Relationship to CEMs and Adaptive Assessment Hypotheses

Everglades Ridge and Slough, Southern Marl Prairies, Everglades Mangrove Estuaries, and Big Cypress Regional Ecosystem Conceptual Ecological Models attribute (RECOVER 2004b)

Ecological Premise: Reproduction of higher vertebrates that are dependent on aquatic food webs is food limited due to altered hydrologic and water quality conditions in the Greater Everglades Wetlands. As a result, the foraging distributions and nesting patterns of wading birds have been altered due to the redistribution of high concentrations of prey organisms.

Greater Everglades Wetlands Module Predator-Prey Interactions of Wading Birds and Aquatic Fauna Forage Base hypotheses:

Hypothesis 1:
The wet-season density, size structure, and relative abundance of marsh fishes and other aquatic wading bird prey are directly related to the time since the last dry-down and the length of time the marsh was dry. Aquatic prey populations are further affected by salinity in coastal ecotones and by site nutrient status.

Rationale. Persistent pools of fresh water, with multi-year hydroperiods and gradual water recession rates, occurred in ridge and slough landscapes and adjacent coastal ecotones of the southern Everglades under pre-drainage conditions. Expansive, naturally occurring pools in the southern Everglades have been replaced by artificial impoundments in the lower ends of Water Conservation Areas. As a result, population densities of aquatic fauna are low in much of the southern Everglades, while densities have increased in the artificial pools of the Water Conservation Areas, which now favor larger, longer-lived species.

Hypothesis 2:

The concentration of marsh fishes and other wading bird prey into high-density patches where wading birds can feed effectively is controlled by the rate of dry-season water-level recession and local topography/habitat heterogeneity.

Rationale. Erratic water-level fluctuation in the remaining managed system, particularly in the Water Conservation Areas, commonly cause drying pattern interruptions, ultimately leading to ill-timed, fewer or less dense concentrations of aquatic fauna that serve as wading bird prey.

4.0 Restoration Expectation

Resumption of natural volume, timing, and distribution of freshwater flow will restore historical hydroperiods and salinity distributions to the southern Everglades. These changes are expected to increase wet-season density and size structure of wading bird prey in the southern Everglades. Therefore, the restoration of historic spatio-temporal patterns of prey production and concentration is expected to reestablish wading bird nesting colonies in the coastal and tributary regions of the southern Everglades and Roseate Spoonbill nesting colonies in northeast Florida Bay.

4.1 Predictive Metric and Target

The number of weeks for which landscape-level suitability is less than or equal to 0.5 during the months of March and April does not exceed the number of weeks predicted by the NSM.

4.2 Assessment Parameter and Target

Specific restoration targets for mainland nesting patterns by the general population of wading birds were first proposed by Ogden, Bancroft and Frederick (1997), and for Wood Storks by Ogden et al. (1997). These include the following:

- Increase and maintain the total number of pairs of nesting birds in mainland colonies to minima of 4,000 pairs of Great Egrets, 10,000 to 20,000 combined pairs of Snowy Egrets and Tricolored Herons, 10,000 to 25,000 pairs of White Ibis, and 1,500 to 2,500/3,000 pairs of Wood Storks.
- Shift the timing of nesting in mainland colonies to more closely match pre-project conditions. Specific recovery objectives would be for storks to initiate nesting no later than January in most years (as early as December in some years), and for ibis, egrets and herons to initiate nesting in February - March in most years (especially in ecotone colony locations).
- The return of major Wood Stork, Great Egret and ibis/small egrets and herons nesting colonies from the Everglades to the coastal areas and the headwaters ecotone of the mangrove estuary of Florida Bay and the Gulf of Mexico.
- The reestablishment of historical distribution patterns of Wood Stork nesting colonies in the Big Cypress basin (including Corkscrew Swamp) and in the region of mainland mangrove forests downstream from the Shark Slough and Taylor Slough basins. Increase the proportion of birds that nest in the southern ridge and slough marsh-mangrove ecotone (headwaters) to greater than 50% of the total for the entire Everglades basin.
- For storks, an annual reproductive productivity for all colonies combined of greater than 1.5 chicks per active nest

In addition, Ogden (1994) and Frederick and Ogden (2001) have shown the pattern of periodic super colonies that once occurred in the Everglades. A restoration expectation is the recovery of these large nesting events as follows:

- An increase in the return, frequency, and size of wading bird super colonies consisting primarily of White Ibis in response to interannual variation in rainfall in the tributary headwaters of Shark River Slough and other Gulf of Mexico mangrove estuaries at a frequency of 1 to 2 events per decade. (The specific locations of the above tributary and coastal nesting colonies will be controlled by sea level and estuarine geomorphology in addition to the functionality of food webs.)

The restoration expectations for wading bird nesting patterns presented above were developed in 1996 (Science Sub-Group 1997). In response to the substantial increase in information on wading bird nesting and foraging patterns that has been acquired since 1996, it is currently planned that these restoration objectives will be reviewed

and revised as appropriate.

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 3.1.3.13 - 3.1.3.14 (RECOVER 2004a))

See *The RECOVER Team's Recommendations for Interim Goals and Interim Targets for the Comprehensive Everglades Restoration Plan* – Interim Goal 3.11 System-wide Wading Bird Nesting Patterns (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

Considerable effort has been spent conducting field research, discussing conceptual models, and developing ecological models to define linkages between water and ecosystem structure and function for specific regions within the Everglades. An HSI was developed by a multi-agency interdisciplinary team, but further calibration and validation is needed before it is used for evaluation purposes. Therefore, 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-21 Wetland Trophic Relationships – Wading Bird Nesting Patterns (Last Date Revised: November 03, 2005).

9.0 Working Group Members

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10.0 Acceptance Status

GE Working Group November 3, 2005

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AT
Public Review
Final Acceptance Date

11.0 References

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