1.0 Performance Measure Title

TS-1 Snail Kite Foraging Conditions

Last Date Revised: December 15, 2005

2.0 Justification

Snail kites exhibited a period of substantial decline during the early to mid-1990s, which coincided with a period of large-scale Everglades drainage projects. Correlative evidence suggests that changes in vegetation, nutrient loadings, and the availability of apple snails also contribute to the observed spatial and temporal patterns of snail kite populations (Bennetts et al. 1994). Davis et al. (1999) document a community shift in Everglades' wetlands from wet prairie and slough to sawgrass during 15-21 years of recent water and fire management practices. Sustainable snail kite habitat in the Greater Everglades/Kissimmee/Lake Okeechobee region requires hydrologic conditions that support: 1) sustained densities of apple snails and 2) a mosaic of woody vegetation (for nesting) adjacent to sparsely distributed emergent wetland vegetation, e.g., wet prairies (for foraging). This combination can be best achieved in areas that dry every 3-5 years (Bennetts et al. 1994).

Reporting of snail kites in Florida from the 1800s through the 1930s indicate that they were considerably more widespread than today (Sykes 1984). Snail kites have exhibited long-term shifts in distribution in South Florida as well as annual and seasonal shifts between and within areas of the Everglades wetlands (Bennetts et al. 1999). Snail kites use supporting foraging and nesting habitats in regions of the Big Cypress National Preserve, the St. Johns River marshes, the Lake Okeechobee littoral zone, and the areas of the Caloosahatchee River as well as Everglades wetlands. Central & Southern Florida Project operations have disrupted natural hydrologic patterns, reducing hydroperiods in some areas and increasing them in others (Weaver et al. 1993). These hydrologic changes are identified as a stressor on the snail kite in the CERP Total System Conceptual Ecological Model (Odgen et al. 2005b).

The implementation of CERP should help to reverse these trends and support increasing areas of snail kite foraging habitat, thereby increasing foraging success and ultimately snail kite productivity. In addition, expected improvements to water quality improvements as a result of CERP should help promote the maintenance of a more natural, oligotrophic system and support more suitable foraging habitat. Nest site characteristics and environmental conditions may provide relatively easy measures of evaluating reproductive success. However, the number of young produced per female is the primary parameter for measuring nesting success.

Because snail kites feed almost exclusively on one species of aquatic snail (the apple snail, Pomacea paludosa), their survival depends directly on the hydrologic functioning of these watersheds (Bennetts et al. 1998). Apple snail populations, and therefore, snail kite habitat suitability, are particularly affected by severe and untimely drydowns (Darby et al. 1997). Apple snails require water levels above ground surface in order to produce egg clusters, and newly hatched snails are less able to survive dry periods than are adult-sized snails (Darby 1997 and 2003). Darby (1997 and 2003) has documented a peak in apple snail egg cluster production in March – April and has suggested that dryouts below ground level prior to or during this peak can substantially reduce apple snail populations through reduced egg cluster production and reduced hatchling survival. The Everglades watershed has experienced, and continues to experience, substantial degradation including increased number and severity of drydowns in many areas (Weaver et al. 1993). These hydrologic changes are identified as a stressor on the snail kite as an attribute of the CERP Total System Conceptual Model. CERP implementation should help to reverse these trends and support increasing abundance of apple snails and snail kites. The Endangered Species Act requires the Corps to evaluate the effects of CERP on listed species.

Apple snails are more common in wet prairies that include emergent vegetation such as Rhynchospora spp. and Eleocharis sp. than in adjacent sloughs with sparse, floating and submerged vegetation such as Utricularia spp. and Nymphaea sp. (Darby 2003). Emergent vegetation allows the snails to easily access the water surface for respiration, where they are visible and accessible to foraging snail kites. Based on Bennetts et al. (1998) and Bennetts pers. comm. (2003), optimal snail kite foraging habitat supporting emergent wet prairie vegetation is

maintained in areas where water levels fall below ground surface between 1 in 3 and 1 in 5 years (156-260 weeks average flood duration). Marginal habitat is maintained in slightly drier and slightly wetter areas with 1 in 2 to 1 in 3 year drydowns (104-156 weeks average flood duration) and 1 in 5 to 1 in 6 drydowns (260-312 weeks average flood duration). These hydroperiod classes correspond with the hydrologic requirements of emergent marsh vegetation reported in the scientific literature as reviewed in two recent publications (Wetzel 2001 and SFWMD 1995). C&SF project operations have disrupted natural hydrologic patterns, reducing hydroperiods in some areas, and increasing them in others (Weaver et al. 1993). These hydrologic changes are identified as a stressor on the snail kite as an attribute of the CERP Total System Conceptual Model. CERP implementation should help to reverse these trends and support increasing areas of snail kite foraging habitat. The Endangered Species Act requires the Corps to evaluate the effects of CERP on listed species. CERP

3.0 Relationship to CEMs and Adaptive Assessment Hypotheses

CERP Total System Conceptual Ecological Model (Ogden et al. 2005b)

4.0 Restoration Expectation

The implementation of CERP should help to reverse a recent declining trend in the number of successful snail kite nests throughout the Greater Everglades wetlands and other supporting habitats.

4.1 Predictive Metric and Target

Apple Snail Reproduction
No more years in which water levels fall below ground surface prior to May 1 than NSM.

Foraging Habitat Vegetation Structure
Proportionally, at least as much area providing suitable snail kite foraging habitat as NSM. Areas providing optimal habitat are most desirable.

4.2 Assessment Parameter and Target

5.0 Evaluation Application

5.1 Evaluation Protocol

Apple Snail Reproduction
This performance measure uses SFWMM 2x2 output to evaluate the number of years in which water levels fall below ground surface prior to May 1. Predicted water levels for April 30 of each year of the 36 year record will be averaged across each indicator region and compared to the average ground surface for each indicator region. For the Lake Okeechobee littoral zone, the number of years in which predicted lake levels fall below 11 ft (approximately 95% of the littoral zone dry) will be counted. A table will list each indicator region and the littoral zone and the number of years for each in which water levels were below ground surface on April 30 – prior to May 1 for NSM, the base cases, and the evaluated alternative(s). The goal is to reduce the number of drydowns before May 1 to match the NSM frequency. Fewer drydowns before May 1 than predicted by NSM are desirable when this does not conflict with other performance measures. Twelve or more drydowns (one every three years on average, precluding recovery of snail populations) will indicate unsuitable conditions in an indicator regions, regardless of the NSM prediction.

This performance measure is applied to the Lake Okeechobee littoral zone and the following Indicator Regions: 100-102, 110-133, 160, and 170.

Foraging Habitat Vegetation Structure
This performance measure uses SFWMM 2x2 output to evaluate the average duration of flooding events over the 36 year period of record. Evaluations will be based on the second column (Avg Flood Dur(Wks/Event) in the existing Inundation Duration Summary for Indicator Regions table. Indicator regions with average flood durations from 156

to 260 weeks will be considered optimal, indicators regions with average flood durations from 104 to 155 weeks or 261 to 312 weeks will be considered marginal.

This performance measure is applied to the following Indicator Regions: 100-102, 110-133, 160 and 170.

Note: For snail kite foraging habitat in the Lake Okeechobee littoral zone, the existing Lake Okeechobee littoral zone performance measures provide an evaluation of habitat suitability.

5.2 Normalized Performance Output

5.3 Model Output (example attached)

5.4 Uncertainty

6.0 Monitoring and Assessment Approach

See *The RECOVER Team's Recommendations for Interim Goals and Interim Targets for the Comprehensive Everglades Restoration Plan* – Interim Goal 3.12 Snail Kite (RECOVER 2004)

7.0 Future Tool Development Needed to Support Performance Measure

7.1 Evaluation Tools Needed

7.2 Assessment Tools Needed

8.0 Notes

9.0 Working Group Members

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10.0 Acceptance Status

GE Working Group

ET

AT

Public Review

Final Acceptance Date

11.0 References

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