1.0 Performance Measure Title

American Crocodile - Juvenile Growth and Survival

Last Date Revised: December 2006

2.0 Justification

The American crocodile is an endangered species that inhabits mangrove lined creeks, bays and ponds in Broward, Miami-Dade and Monroe Counties on the east coast of Florida and Collier and Lee Counties on the west coast. Adult crocodiles are tolerant of a wide range of salinity conditions; however, juvenile crocodiles are not, and they exhibit lower growth and lower survival rates in areas where salinities are greater than 20 parts per thousand (ppt). The mangrove lined creeks, bays and ponds along the fringes of Biscayne and Florida Bays historically received more freshwater from upstream and, therefore, provided better habitat for juvenile crocodiles. Changes in freshwater flows are believed to have contributed to the lower growth rates of crocodiles in northeastern Florida Bay compared to those on North Key Largo and Turkey Point.

3.0 Relationship to CEMs and Adaptive Assessment Hypothesis

Everglades Mangrove Estuaries and Biscayne Bay Conceptual Ecological Models attribute (RECOVER 2004b)

Ecological Premise: Availability of freshwater limits the distribution and abundance of reptiles in estuaries. American crocodile relative density and juvenile crocodile growth, survival, and condition increase when salinity fluctuates below 20 ppt in shoreline, pond, and creek habitats in Everglades mangrove estuaries.

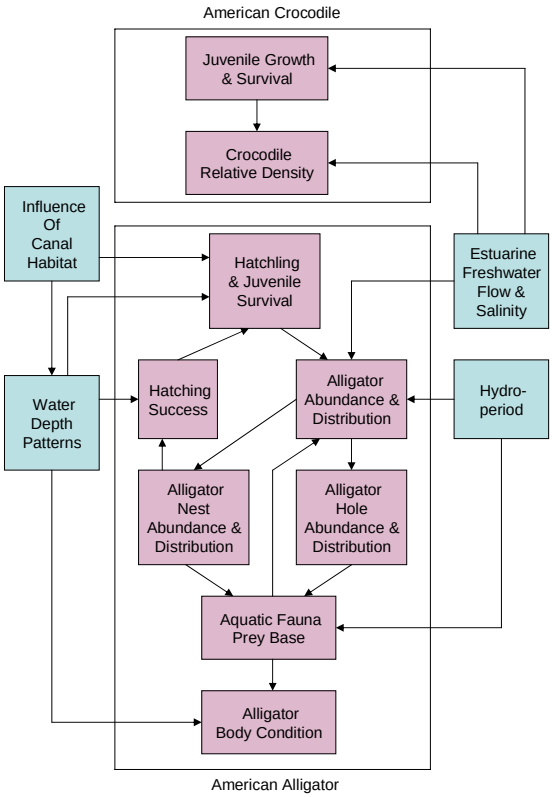
Greater Everglades Wetlands Module Everglades Crocodilian Population Hypothesis:

Hypothesis 2:

American Crocodile Relative Density and Juvenile Growth, Survival, and Condition in Relation to Salinity in Everglades Mangrove Estuaries.

Rationale: Availability of freshwater limits the distribution and abundance of reptiles in estuaries. In estuaries, crocodilians of all species orient towards areas of low salinity and sources of freshwater. The American crocodile is a flagship endangered species that charismatically represents this relationship. In northeastern Florida Bay, diversion of freshwater flow, crocodiles have poorer growth rates and higher mortality than elsewhere in Florida.

Everglades Alligator Populations Conceptual Ecological Model



4.0 Restoration Expectation

Restoration of location of freshwater flow will result in an increase in relative density of crocodiles in areas of restored flow, such as Taylor Slough/Taylor River drainage. Reestablishing the salinity gradient in the estuary will increase growth and survival of juvenile crocodiles throughout the estuary.

4.1 Predictive Metric and Target

Efforts to refine and update a predictive model are in development with an expected completion date beyond 2008.

4.2 Assessment Parameter and Target

Increase yearly survival for animals age zero to three years as compared to the current value of 1.5% for animals in Florida Bay and increase growth rates for animals age zero to three years from 0.10 centimeters (cm) per day) to values approaching those observed at North Key Largo and Turkey Point (0.137-0.146 cm per day).

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 section 3.1.3.16 (RECOVER 2004a)

See *The RECOVER Team's Recommendations for Interim Goals and Interim Targets for the Comprehensive Everglades Restoration Plan* – Interim Goal 4.4 American Crocodile (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

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-24 American Crocodile - Juvenile Growth and Survival (Last Date Revised: October 20, 2005).

9.0 Working Group Members

Jana Newman, SFWMD; Patty Goodman, SFWMD; Andy Gottlieb, EPJV

10.0 Acceptance Status

GE Working Group	October 20, 2005
ET	
AT	
Public Review	
Final Acceptance Date	

11.0 References

RECOVER 2002. Model Uncertainty Workshop Report: Quantifying and Communicating Model Uncertainty for Decision Making in the Everglades, Restoration Coordination and Verification Program (RECOVER), United States Army Corps of Engineers, Jacksonville District, Jacksonville, Florida, and South Florida Water

Management District, West Palm Beach, Florida.

RECOVER. 2004a. CERP Monitoring and Assessment Plan: Part 1 Monitoring and Supporting Research. Restoration Coordination and Verification Program, c/o United States Army Corps of Engineers, Jacksonville District, Jacksonville, Florida, and South Florida Water Management District, West Palm

RECOVER. 2004b. Draft Conceptual Ecological Models. In: RECOVER. CERP Monitoring and Assessment Plan: Part 1 Monitoring and Supporting Research, Restoration Coordination and Verification Program, c/o United States Army Corps of Engineers, Jacksonville District, Jacksonville, Florida, and South Florida Water Management District, West Palm Beach, Florida, Appendix A.

RECOVER. 2005. The RECOVER Team's Recommendations for Interim Goals and Interim Targets for the Comprehensive Everglades Restoration Plan, c/o United States Army Corps of Engineers, Jacksonville District, Jacksonville, Florida, and South Florida Water Management District, West Palm Beach, Florida.

RECOVER. 2006. 2006 Assessment Strategy for the Monitoring and Assessment Plan. Final Draft. c/o United States Army Corps of Engineers, Jacksonville District, Jacksonville, Florida, and South Florida Water Management District, West Palm Beach, Florida.