

Indicator 3.10 - American Alligator

What is the desired restoration condition?

The desired restoration condition for American alligators is more natural numbers and distribution patterns for alligators across South Florida's major freshwater and estuarine wetland landscapes.

Why is the indicator important and why is it a good indicator of CERP restoration?

Alligators are a keystone species in the South Florida wetlands. They play a major role in influencing the overall health and ecological patterns of the region. Regionally, overall numbers of alligators have substantially declined and distribution patterns have greatly altered, as a result of water and land management practices. Overdrained wetlands and reductions in numbers of alligators have caused the loss of many small ponds ("holes") that were essential for the survival of small aquatic animals during dry seasons. It is expected that the CERP will result in the recovery of more natural hydropatterns regionally, which in turn will promote the recovery of healthy alligator patterns. Due to the alligator's ecological importance and sensitivity to hydrology, salinity, habitat, and system productivity, the species was chosen as an indicator of restoration success. A number of biological attributes (relative density, relative body condition, nesting effort, and nesting success) can be measured, standard methods for monitoring have been developed, and historical information exists for alligator populations in the Everglades (Rice et al. 2005). These attributes can be used as success criteria at different spatial and temporal scales.

How is the interim goal for this indicator predicted?

To predict interim goals for alligators, specific model forecasts were used from the Across Trophic Level System Simulation (ATLSS) Alligator Population Model (Slone et al. 2003), which has a resolution of 500 x 500 meters and can be used to look at relative abundance across the landscape and along discrete survey routes that are sampled in the field. For this iteration, we have assessed the model's forecasts only for scenarios D13R (full CERP implementation) and 1995 base from the 1999 scenarios. We did not have available specific model scenarios of effects of restoration for other interim segments. In the absence of a specific 2010 model scenario, trends were based on best professional judgment of the South Florida Crocodylian Research Team, which is an informal multi-agency group of researchers working on crocodylians primarily in South Florida. In all cases, the best available data were used to make the predictions.

Trends in alligator densities, body condition, nesting, and alligator hole occupancy, all components of the *CERP Monitoring and Assessment Plan: Part 1, Monitoring and Supporting Research* (RECOVER 2004), were chosen as interim goals based on comparisons of model runs for D13R and 1995 base. Alligator hole occupancy is not monitored in several areas under this plan and body condition is not monitored in the rocky glades and marl prairies of Everglades National Park so projections were not made. The interim goals are significant

trends of greater than or equal to 6 years in the parameter at $\alpha = 0.05$ through 2010. In most cases, the power to detect trends will result in detection of an approximately 5 percent change per year in the parameter or greater than 20 percent over the time period.

Also, projections were made of similar trends in clutch size based on improvement in alligator population parameters from the model. For example, if the Alligator Population Model simulation of D13R predicted an increase in alligator density in an area over 1995 base and that area should be affected by restoration projects prior to 2010, an increasing trend in alligator density was projected and set as an interim goal for that area in 2010.

The actual size that alligators in the Everglades become adults (start to breed) is uncertain. Observations in Everglades National Park (O. Bass) indicate that animals may be breeding at 1.5 meters. Additional captures at nests throughout the system will be conducted to evaluate this observation and modify the expression of the metric if needed. The relationship between clutch size and hydrology is parameterized in the model but needs validation. The model has been calibrated using data collected on alligator populations prior to 1996. However, for validation of the model, we require simulations post-1996 when system-wide data collection began.

What are the predictions for five-year increments?

Following are interim goals for 2010. Without specific model simulations of projects completed at each increment, only one estimate was attempted at this point. Goals are represented as trends in population parameters (Table 3.10.1) and overall comparison of scenario performance is graphically represented (Figure 3.10.1).

Table 3.10.1. Interim Goals for 2010 for alligator populations in the Everglades

Area	Density	Body Condition	Hole Occupancy	Nesting	Clutch Size
Arthur M. Marshall Loxahatchee National Wildlife Refuge	Stable	Stable	Not applicable	Stable	Stable
Water Conservation Area 2	Stable	Increasing	Not applicable	Stable	Stable
Water Conservation Area 3 North	Increasing	Increasing	Not applicable	Stable	Increasing
Water Conservation Area 3 South	Increasing	Increasing	Not applicable	Stable	Increasing
Shark Slough	Stable	Stable	Not applicable	Stable	Stable
Rocky Glades/Marl Prairies	Increasing	Not applicable	Increasing	Stable	Stable

Figure can be viewed by clicking on the following link:

[alligator figure.gif](#)

Figure 3.10.1. Comparison of the ATLSS Alligator Population Model simulations of D13R versus 1995 base. Green areas represent higher densities of alligators under D13R and red/grey areas represent no difference or slightly lower densities under D13R. The intensity of colors do not represent intensity of differences but have been enhanced for presentation.

How will we track whether the interim goals established for this indicator have been achieved?

The alligator components of the *CERP Monitoring and Assessment Plan: Part 1, Monitoring and Supporting Research* (RECOVER 2004) will assess changes in alligator density (system-wide), body condition (system-wide), nesting (Water Conservation Areas 2 and 3), and alligator hole occupancy (rocky glades and marl prairies). Everglades National Park has a The satellite reconnaissance flight program that monitors alligator nesting. The Florida Fish and Wildlife Conservation Commission monitors alligator density and nesting primarily along canals in Water Conservation Areas 2 and 3.

What additional work is needed to improve this interim goal?

Specific model simulations of each interim goal increment must be conducted prior to improvement of the goal forecasts. These must be updated for each change in the CERP that is made as a result of the adaptive management process.

Validation of the Alligator Population Model requires updated hydrologic data for the period 1995-2000 at 500 meters x 500 meters. In the past, this information has been obtained from the ATLSS pseudo-topography modeling. In addition, data from the Alligator Production Index from the ATLSS are required for the same time period. These simulations have been completed and validation is scheduled to be completed in 2005.

Updating and improving the model will require field work that addresses the uncertainties within the model especially in relation to size at reproduction, changes in clutch size, and juvenile movements and survival. This field work and data analysis is currently being funded through the U.S. Army Corps of Engineers and Cooperative Ecosystem Studies Initiative (CESI). The model will be updated with this new information on an ongoing basis.

References

- RECOVER. 2004. CERP Monitoring and Assessment Plan: Part 1, Monitoring and Supporting Research. Restoration Coordination and Verification, c/o United States Army Corps of Engineers, Jacksonville District, Jacksonville, FL, and South Florida Water Management District, West Palm Beach, FL.
- Rice, K.G., F.J. Mazzotti, and L.A. Brandt. 2005. Status of the American alligator (*Alligator mississippiensis*) in southern Florida and its role in measuring restoration success in the Everglades. In W.E. Meshaka and Babbitt, K.J. (eds). Status and Conservation of Florida Amphibians and Reptiles. Krieger Publishers, Melbourne, FL.
- Slone, D.H., K.G. Rice, and J.C. Allen. 2003. Model evaluates influence of Everglades restoration plan alternatives on alligator populations (Florida). *Ecological Restoration*. 21(2): 141-142.