Role of American Alligator (Alligator mississippiensis) in Measuring Restoration Success in the Florida Everglades

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ABSTRACT

The American alligator (Alligator mississippiensis) was abundant in the pre-drainage Everglades in Southern Florida, USA. The largest populations occurred in broad marshy areas near the east and west of the southern ridge and slough, and the freshwater mangrove zone (Figure 1). Development and water management practices have reduced the spatial extent and changed the hydrologic patterns of these habitats. As a result of these activities, alligator populations have decreased. Currently, restoration of hydrologic pattern and ecological function is beginning in the Everglades. 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. These attributes can be used as success criteria at different spatial and temporal scales to construct ecological models used for predicting restoration efforts. Here, we discuss alligator population status and its role in evaluating restoration success of the Southern Everglades.

INDEX OF CONDITION

Developing an index of alligator condition

Historically, condition factors have been calculated as a function of:

- Weight and Length
- Additional measurements including head length, hind foot length, chest girth, and tail girth have been taken. Using condition factors, we can:
  - estimate alligator health in the Everglades
  - estimate alligator health in different areas of the Everglades (see bottom center)
  - estimate which measurements are most relevant to the least error?  
  - measure alligator weight differences within areas
  - head length mass ratio and ratio of head to snout length mass are best for comparison populations over time.

Ultimately, we will be able to relate alligator condition to other measures of population health, such as growth and survival parameters (see top right) and relative density (see middle right).

ECOLOGICAL IMPORANCE

- Alligators have always been of significant ecological and economic importance in the Everglades ecosystem
- Alligators have a significant role in evaluating Everglades restoration.

ALLIGATORS EVERYWHERE – HOW DO THEY COMPARE?

The Everglades are a nutrient-poor environment, and it is possible that alligator numbers have always been limited to those of other regions. We are concerned that human disturbance has affected this trend.

ALLIGATORS AS INDICATORS OF RESTORATION SUCCESS

- An identified challenge in determining restoration success will be the selection of biological indicators that can be used to measure success. An indicator should have some relation to the management question, be able to show trends, provide reliable results, rate the scale of the question, and have some baseline data to which future data can be compared.
- Alligators meet these requirements and therefore can be used as indicators of restoration success. They are sensitive to hydrology, salinity, habitat, and system productivity. There are a number of biological attributes of alligators and alligator populations that can be used as success criteria at different temporal scales and there is existing data for population densities and nesting in some areas that can provide baseline data for assessing changes.

EVERGLADES ALLIGATORS: A CLOSER LOOK

Everglades alligators are smaller compared to other geographical areas, but what about within different areas of the Everglades?

- Alligators from different Everglades wetlands have been captured during the past three years.
- There is little difference in the condition of alligators from different parts of the Everglades ecosystem.

ECOLOGICAL CORRELATES

What else do we know about the health of alligator populations in the Everglades?

In addition to being thinner, alligators in the Everglades grow more slowly, take longer to reach sexual maturity, have smaller clutch size, and exhibit higher body condition than alligators from northern Florida.

ALLIGATOR SURVEY DATA

Relative density is an excellent indicator of health of alligator populations. Any change in alligator survey network is one of the most important indicators for Everglades restoration analysis. Stanard survey routes have been established at A.P. Loxahatchee National Wildlife Refuge (APL-NWR), Water Conservation Area 2 (WCA2), and Everglades National Park (ENP). Preliminary data is currently available for these areas.

SUMMARY OF PERFORMANCE MEASURES

Spatial and temporal patterns in alligator populations can be used to develop performance measures:

- Population size - relative abundance
- Nesting effort and success
- Growth and survival
- Health and condition

To help develop protocols for performance measures, USGS and UF have begun a series of studies on alligators in the Everglades ecosystem such as:

- American alligator distribution, thermal ecology, and biotic potential relative to hydrodynamics in the Everglades
- Relative distribution abundance and demographic structure of the American alligator in relation to habitat, water level and salinity
- Compilation of alligator data sets in South Florida for restoration needs
- Parameter estimation and population-based modeling of American alligator populations in support of ATSS

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