

### **Indicator 3.11 - System-Wide Wading Bird Nesting Patterns**

#### **What is the desired restoration condition?**

The desired restoration condition for system-wide wading bird nesting patterns is to recover healthy populations of wading birds throughout the Greater Everglades. Wading bird population health is determined by system-wide patterns of nesting and includes measurements of four variables: numbers of nesting birds, locations of nesting colonies, timing of nesting, and frequency of “supra-normal” colonies.

Endpoint desired restoration conditions for each species have yet to be refined. In general, however, the desired restoration condition for numbers of nesting pairs is for a substantial increase above the pre-Comprehensive Everglades Restoration Plan (CERP) numbers that have occurred for a period of record between the 1986 and 2005 nesting seasons.

For the locations of nesting colonies, the desired restoration condition is a substantial increase in nesting by egrets, ibis, and storks in the region of the southern Everglades mainland estuaries. An initial desired restoration condition for these species is a return to greater than 50 percent of nesting pairs in the estuarine region compared to less than 10 percent under current conditions. For spoonbills, the desired restoration condition is a realignment of nesting colonies into eastern Florida Bay.

The desired restoration condition for timing of nesting applies primarily to the wood stork. Wood storks should initiate nesting no later than January 31 in most years. Wood storks have been initiating nesting as late as February and March in most recent years.

For supra-normal breeding events, the desired restoration condition is to recover pre-drainage patterns of “super colony” nesting events. The desired restoration condition has yet to be refined, but in general, it is to have about two supra-normal breeding events during each 10-year time period (less than one event per decade since the 1970s).

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

The selection of wading bird indicators, as well as the predictions of responses by wading birds to the implementation of the CERP, is based on a set of working hypotheses presented in the *Greater Everglades Ecosystem Conceptual Ecological Model* (Ogden et al. In prep.). These working hypotheses explain the linkages between changes in hydrological patterns and changes in wading bird nesting patterns.

Wading birds have historically been abundant and widely distributed components of the Everglades wetlands. Because much is known of their habitat requirements and historical nesting patterns, they are excellent indicators of the system-wide health of the Everglades ecosystem. The number of wading birds that nested in the freshwater and estuarine Everglades basin declined by about 90 percent between the early 1930s and the 1980s. Primarily since the 1960s, most wading birds abandoned the traditional colony sites in the estuaries of the

southern Everglades. Roseate spoonbills have relocated colony sites in Florida Bay in response to water management practices on the upstream mainland. Wood storks changed the timing of nesting during this same period of years, delaying nesting 1-3 months compared to the earlier period. The extremely large super colonies that formed on average every 4-5 years during the 1930s-1940s had largely disappeared after the 1960s. These changes in nesting patterns were largely caused by adverse water management and land use practices.

### **How is the interim goal for this indicator predicted?**

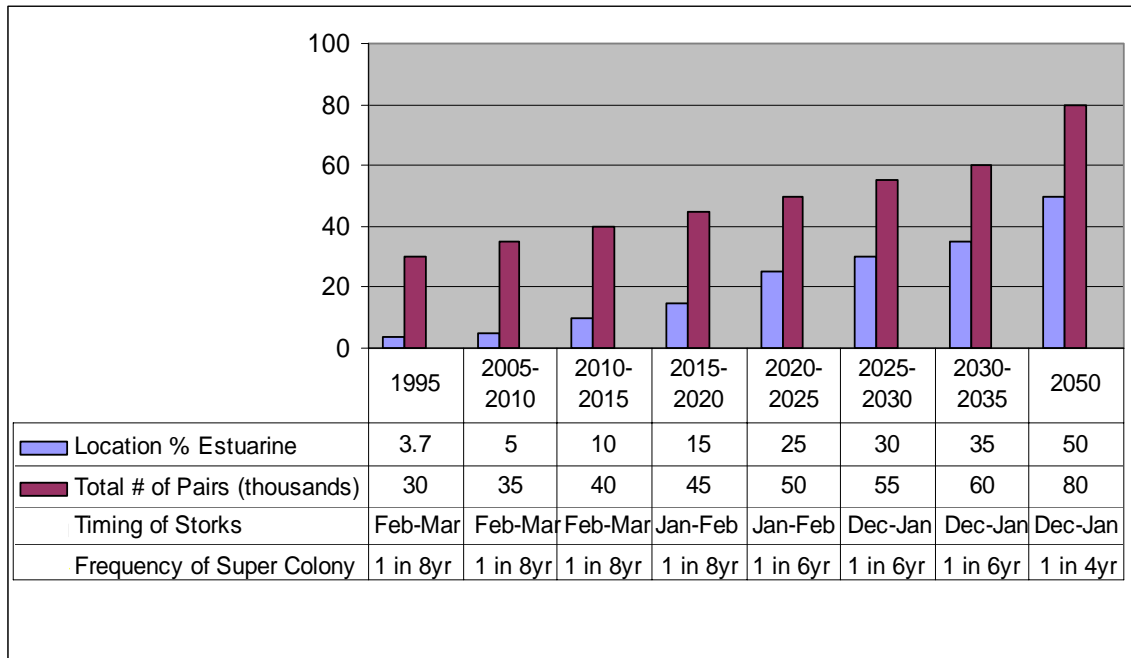
Best professional opinion was used for these initial predictions, based on over 50 years of recorded wading bird nesting patterns under previous hydrological conditions. It is currently assumed that wading bird nesting patterns will not have changed due to any influences by the CERP as early as the first reporting period in 2010. Nesting patterns for the next reporting period will be predicted using 1) the predicted regional hydropatterns developed during the five-year incremental South Florida Water Management Model (SFWMM) modeling of the CERP Master Implementation Sequencing Plan, 2) outputs from habitat suitability indices models for prey abundance and availability, and 3) current hypotheses and understandings of relationships among nesting patterns, prey availability, and regional hydropatterns as a basis for predicting the timing and direction of changes in nesting patterns. These hypotheses suggest that wading birds will recover more historical nesting patterns with the restoration of more historical flows into the southern marl prairies and mainland estuaries, and the removal of unnatural impoundments in the central and northern Everglades. Still to be worked out is how we will determine and report among-year variability in nesting numbers, and whether nesting patterns during the past 1-2 decades have shown trends for the indicator species.

Predictions for supra-normal nesting events were also by best professional opinion, although some additional analysis of pre-CERP nesting patterns was required as a basis for making such predictions. For the next reporting period, output from the SFWMM simulation of the CERP Master Implementation Sequencing Plan will be evaluated as a basis for the predictions. Current hypotheses propose that more natural patterns of supra-normal nesting events may reoccur once pre-drainage cycles of multi-year wet-dry surface water patterns and more normal sheet flow patterns are recovered in the regional, freshwater Everglades system.

### **What are the predictions for five-year increments?**

The predictions for system-wide wading bird nesting patterns are presented in Figure 3.11.1. "Location % Estuarine" refers to the percent of total pairs that nested in the traditional southern mainland estuarine region for four species of birds: great egret, snowy egret, white ibis, and wood stork. "Total # Pairs" refer to the total number of nesting pairs for the same four species and are based on the mean of three-year running averages. The pre-CERP (1995) figures for all indicators except for the frequency of super colonies are based on data from 1997-2004. The pre-CERP frequency of super colonies is based on frequency for years 1983-1998, which had a mean super colony size of 24,000. The 2050 (full CERP implementation) total number of nesting pairs is based on population estimates from 1931-1941 and the timing of wood stork nesting is based on nesting patterns from the same period of time. The 2050

frequency of super colonies is based on frequency for years 1931-1946, which had a mean super colony size of 85,000. The percent of total pairs for all four species that nested in the traditional southern mainland estuarine region was greater than 90 percent during the years 1931-1941, but the interim goal for full CERP implementation (2050) is only greater than 50 percent.



**Figure 3.11.1.** Interim goals for wading birds based on predicted D13R performance

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

A comparison will be provided of the number and size of colonies and the percentage of total nesting pairs for each species in each of several subregions: Everglades mainland estuaries (the traditional nesting subregion in southern Everglades National Park), interior Everglades including the Water Conservation Areas, Lake Okeechobee basin, Big Cypress basin, Gulf Coast estuaries, and Florida Bay. Maps will be used to show annual colony locations. Annual, system-wide total numbers of nesting pairs will be reported as three-year running averages for each of five species: great egret, snowy egret, white ibis, roseate spoonbill, and wood stork. The timing of initiation of nesting by wood storks in Everglades and Big Cypress colonies will also be reported annually. The interval of years between regionally scaled, supra-normal breeding events (measured at regional rather than colony scale) will be reported. Supra-normal events are defined as years in which the number of nesting birds (all species) is greater than one standard deviation above the long-term mean of nesting.

**What additional work is needed to improve this interim goal?**

At present, numerical models that can be used to predict nesting pattern responses by wading birds to large-scale manipulations and restoration of regional surface hydro patterns have not been developed. The Across Trophic Level System Simulation (ATLSS) wading bird models will be reviewed to determine if these models will eventually meet these needs. At present, predicting the timing and direction of trends for the selected wading bird indicators is more accurate than can be predicted using numerical responses by wading birds at any given time in the future.

**References**

- Ogden, J.C. 1994. A comparison of wading bird nesting colony dynamics (1931-1946 and 1974-1989) as an indication of ecosystem conditions in the southern Everglades. Pages 533-570 in Davis, S.M. and J.C. Ogden (eds). Everglades. The Ecosystem and Its Restoration. St. Lucie Press, Delray Beach, FL.
- Ogden, J.C., T. Barnes, S.M. Davis, K.J. Jacobs, and J. Gentile. In prep. Greater Everglades Ecosystem Conceptual Ecological Model. South Florida Water Management District. West Palm Beach, FL.