Past water patterns drive present wading bird numbers

June 25 2015

Wading bird numbers in the Florida Everglades are driven by water patterns that play out over multiple years according to a new study by the U.S. Geological Survey and Florida Atlantic University. Previously, existing water conditions were seen as the primary driving factor affecting numbers of birds, but this research shows that the preceding years' water conditions and availability are equally important.

"We've known for some time that changes in water levels trigger a significant response by wading birds in the Everglades," said James Beerens, the study's lead author and an ecologist at USGS. "But what we discovered in this study is the importance of history. What happened last year can tell you what to expect this year."

From 2000 to 2009, scientists examined foraging distribution and abundance data for wading bird populations, including Great Egrets, White Ibises, and threatened Wood Storks. To do the research, they conducted reconnaissance flights across the Greater Everglades system, an area that includes Big Cypress National Preserve and Everglades National Park. They found climate and water management conditions going as far back as three years influenced current bird population numbers and distribution.

"We know wading birds depend on small fish and invertebrates for food," said Dale Gawlik, director of FAU's Environmental Science Program and study coauthor. "What is interesting is the 'lag effect'; wet conditions that build up invertebrate and fish numbers may not

immediately result in increased bird numbers until after several more wet years."

This new information has allowed scientists to improve existing wading bird distribution models providing a more accurate tool to estimate wading bird numbers under climate change scenarios and hydrological restoration scenarios proposed for the Everglades.

In the Everglades, food items such as small fish and crayfish are concentrated from across the landscape into pools as water levels recede throughout the dry season. It does not always work that way anymore due to a lack of water and loss of habitat in Everglades marshes. This new research shows that under the right dry season conditions following a water pulse in previous years, wading bird food is even further concentrated in near-perfect water depths, setting off a boom in the numbers of young wading birds that add to the population.

Beerens and computer scientists from the USGS have also developed publically available software as an extension to this work that predicts wading bird numbers in the Everglades based on real-time, current conditions, in addition to historical settings. This new model allows managers to simulate the effect of various management strategies that can have an impact on future bird numbers. The number and distribution of wading birds serve as an important indicator of ecosystem health in the Everglades. Beerens further explained that "increased seasonal water availability in drier areas of the Everglades stimulates the entire ecosystem, as reflected in the wading birds."

Altered water patterns resulting from land-use and water management changes have reduced wading bird numbers throughout the Everglades by about 90 percent since the turn of the 20th Century. This research shows that current management and use of water is equally important.

"Our findings also suggest that we can continue to improve the Everglades and its wading bird community by restoring water availability to areas that are over drained," said Beerens. "There is increasing understanding that water availability and proper management make this entire ecological and economic engine work."

Florida generates more than $3 billion in annual revenue from resident and nonresident wildlife watchers according to estimates from the U.S. Fish and Wildlife Service. Of the 1.9 million people who view wildlife in Florida while 'away-from-home' each year, more than 1.3 million watch wading birds and other water-dependent birds.

More information: The study, "Linking Dynamic Habitat Selection with Wading Bird Foraging Distributions across Resource Gradients," was published in the journal *PLOS ONE* and can be found online. dx.plos.org/10.1371/journal.pone.0128182

Provided by United States Geological Survey