Wading Bird Colony Location, Size, and Timing on Lake Okeechobee

2010 Annual Report

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By

Richard A. Botta
Dale E. Gawlik

Department of Biological Sciences
Florida Atlantic University
777 Glades Road
Boca Raton, FL 33431-0991
561-297-3333
rbotta@fau.edu
dgawlik@fau.edu

INTRODUCTION

Wading Bird Nest Effort at Lake Okeechobee

The first aerial surveys conducted on wading bird colonies on Lake Okeechobee (hereafter referred to as the Lake) commenced in 1957 and proceeded until 1976 (David 1994a). Through these surveys, nest counts ranged from 10,400 nests in 1974 to 130 nests in 1971. These aerial surveys, although beneficial, may have underestimated nest efforts since they were only performed once during the nesting season. In 1977, aerial surveys shifted to a systematic technique where monthly surveys were conducted to more accurately depict the effects of water management on wading bird populations (David 1994b, Smith and Collopy 1995). The five wading bird species historically surveyed were White Ibis (*Eudocimus albus*), Glossy Ibis (*Plegadis falcinellus*), Great Egret (*Ardea alba*), Great Blue Heron (*Ardea herodias*), and Snowy Egret (*Egretta thula*). These species were surveyed annually, providing evidence of responses of wading birds to water level changes on the Lake.

Current Monitoring Effort

In May of 2005, Florida Atlantic University (FAU) received funding to document the timing, size and location of wading bird colonies at Lake Okeechobee as part of CERP monitoring for the GEW. On June 3, 2005, we conducted a single aerial survey just as the rainy season was beginning and lake levels were rising. From 2006–2010, FAU conducted monthly aerial surveys of breeding wading birds to enhance the historical dataset. To our knowledge, these efforts represent the first systematic aerial surveys at the Lake since 1992. Herein, we report results from the 2010 colony surveys.

METHODS

Colony Surveys

As part of the CERP Monitoring and Assessment Plan, FAU surveyed wading bird nesting to determine both location and size of colonies on the Lake. There was very little wading bird activity on the lake early in 2010, so during the months of January and February, weekly airboat visits were utilized to determine whether wading bird nesting had been initiated. In March, formal aerial surveys were conducted with two dedicated observers surveying wading bird nests along aerial transects flying at an altitude of 244 m and a speed of 185 km/hr. One transect paralleled the eastern rim of the Lake from Eagle Bay Island to the Clewiston Lock. Remaining transects were oriented East-West, spaced at an interval of 3 km and traversed the littoral zone (Fig. 1). Fisheating Creek and Lake Hicpochee were included since these were also monitored during previous efforts (Smith and Collopy 1995, David 1994). A small alligator farm on the west side of the lake by Highway 721 was also included, since the site was known to support nesting Wood Storks since 2007.

During surveys, two observers searched for groups of large white wading birds, one from each side of a Cessna 182. Once a colony was confirmed, it was circled by helicopter at a lower altitude of 122 m to enable researchers to count number of nests of each species present within the colony as well as to record photographs and geographic coordinates of the colony. These were then mapped to specific stands of vegetation or islands onto 1-m resolution digital ortho quarter quadrangles (DOQQ). Ground visits were performed to improve colony counts and species composition. Small dark colored wading birds were exceedingly difficult to survey so the focus here is on the white colored wading birds. Colonies were defined post-hoc as any assemblage of ≥ 2 nests that were separated by ≥200 m (Erwin et al 1981, Smith and Collopy 1995). Distances were calculated between colonies using ArcGIS.

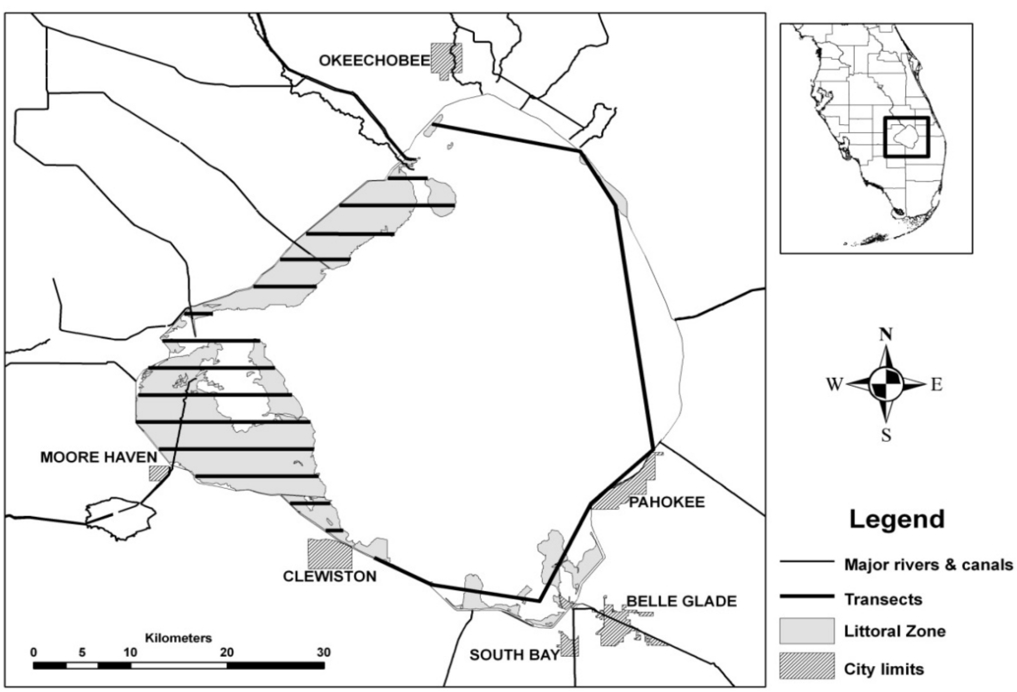

Figure 1. Map of systematic aerial transects flown over Lake Okeechobee during 2010.

Hydrology

Rainfall and hydrology data were obtained from the South Florida Water Management District's DBHydro database. Lake stage is the mean of stage readings from the 4 gauges located in the limnetic zone of the Lake (L001, L005, L006, and LZ40). Lake stages, reported as feet, were converted to meters.

RESULTS

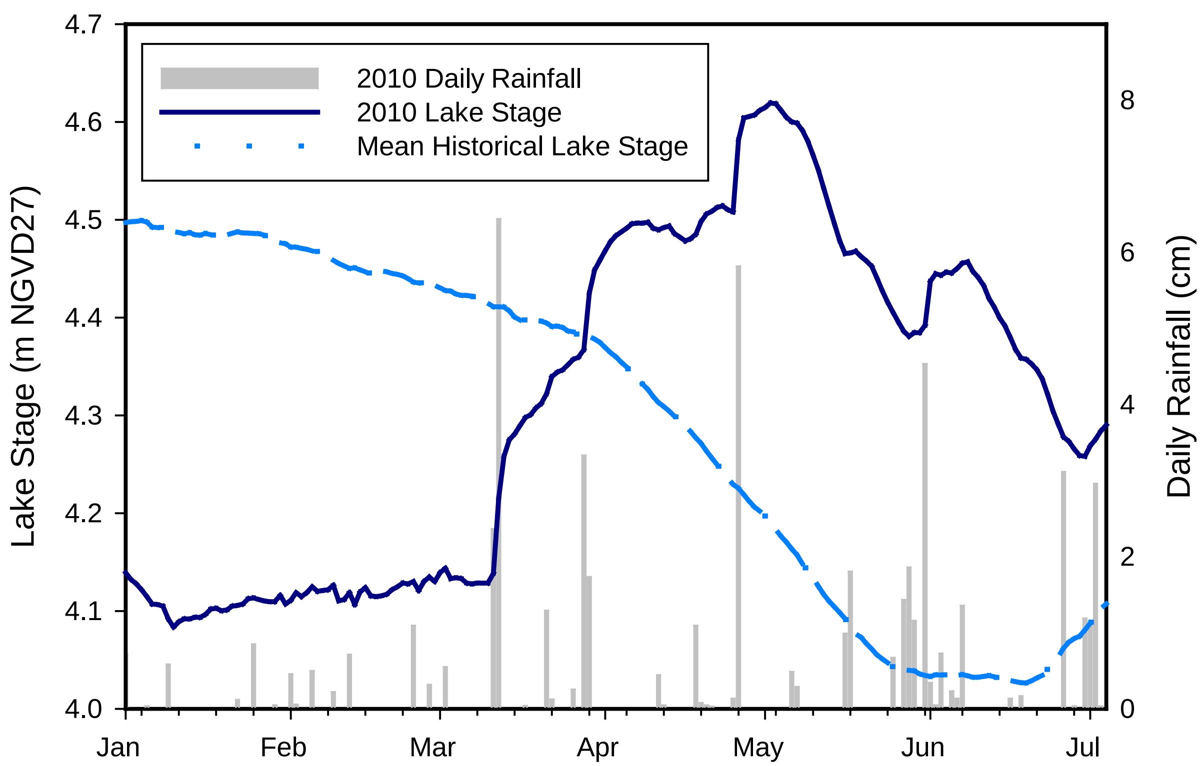

Figure 2. Hydrograph depicting average daily rain and average lake stage for 2010 in comparison of 30 year average.

Environmental Conditions

Water levels in the 2010 dry season were highly atypical (Fig. 2). During a normal dry season, Lake Stage is usually high in January with a recession lowering lake levels through the following months until the start of the wet season. In 2010, lake levels were maintained at approximately 4.1 m from approximately January through March, with no sign of the typical seasonal dry down. In mid-March rains occurred throughout the system and lake stage rose to approximately 4.5 m, peaking at approximately 4.6 m on 2 May, 2010. Thereafter water levels receded, with one more major reversal at the end of May when water levels rose 7 cm. This pattern created higher than average water levels later in the dry season than is typical.

Receding water levels concentrate prey for wading bird foraging, along with providing shallower water for prey accessibility (Kushlan 1976, Gawlik 2002). While wading bird foraging was observed by South Florida Water Management District scientists before the increase in lake stage, these numbers decreased dramatically after the reversals. By March, almost the entire littoral zone was too deep for foraging. But even as foraging areas were being reduced on the Lake, nest initiations by small ardeids, which tend to initiate in mid-March and April (Smith and Collopy 1995, Frederick and Collopy 1989), were increasing. Visual observations of colonies showed that egrets and ibises were flying to foraging sites west and northwest of the levee, illustrating the importance of wetlands outside the Lake. On 2 May 2010, after the peak in Lake Stage, a steady recession, with the exception of one reversal, improved the foraging habitat within the Lake through the end of the season.

Location and Size

Twelve colonies were detected (Fig. 3); ten on-lake and two off-lake with an estimated total of 6,737 nests. This number was derived by summing the peak nesting month for each species except for the Anhinga and Cattle Egret (Table 1). For historical comparisons, the cumulative total for Great Egrets, Great Blue Herons, White Ibises, and Snowy Egrets was 5600 nests, making 2010 the fifth largest nesting year of the 22 years monitored since 1977, and the seventh largest of the 30 years monitored since 1957. All colony locations were at established sites, and were detected the previous year, except for Indian Prairie South. However, this colony was small, having only 4 Great Blue Heron and 1 Anhinga nests.

The majority of nests (68% excluding Anhingas and Cattle Egrets), were detected at the Moore Haven colony (Table 2). This colony contained all the focal species. Another 25% of nests were at the two Eagle Bay colonies, with strong nesting effort by small ardeids (Snowy Egret, Tricolored Heron, and Little Blue Heron) and several additional Great Blue Heron nests. These three colonies contained 93% of all nesting at Lake Okeechobee. These colonies are comprised of willow surrounded by water, which is the typical structure favored by wading birds for nesting on the Lake (David 1994).

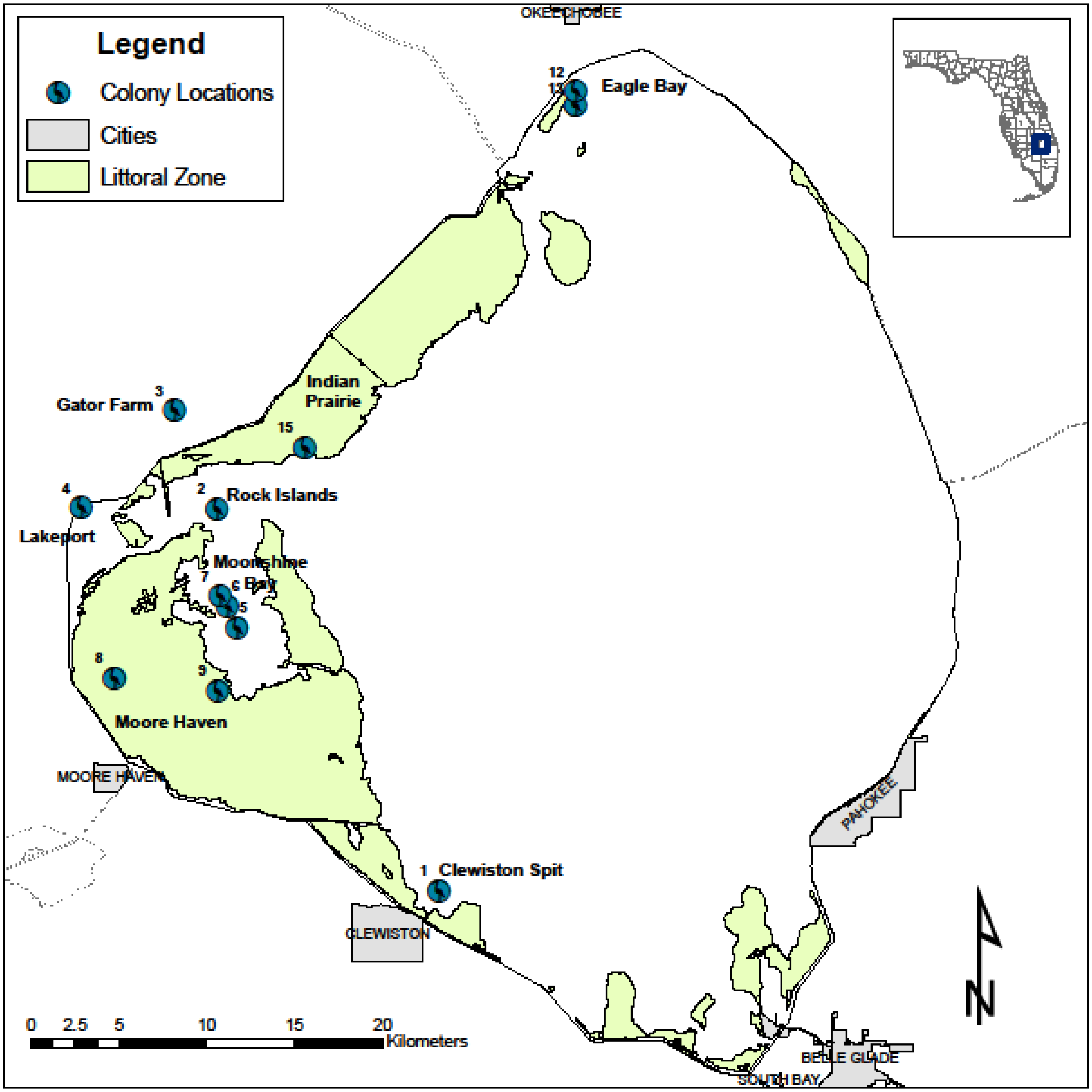

Figure 3. Map of wading bird colonies observed at Lake Okeechobee from January to June 2010.

Timing

With lake stage at 4.1 m during January and February, most of the traditional colony locations, excluding spoil island colonies, had little water surrounding them. Airboat surveys during January detected only Great Blue Heron nests. In February there were 15 Great Egret nests at Clewiston Spit, Rock Islands and Moonshine Bay. Both Clewiston Spit and Rock Islands are spoil islands with minimal vegetation surrounded by water. Moonshine Bay is a willow head at a lower elevation than the rest of the surrounding marsh so it typically remains inundated for some time after the marsh has dried. High precipitation raised lake stage in March and even with increasing lake levels colony activity increased. During aerial surveys on 7 April, Moore Haven and the Eagle Bay colonies contained active nests. Additional ground visits corroborated the initiation of nesting by all focal species in these colonies. Nest numbers at the colonies in Moonshine Bay which had deep water, were low and contained no small ardeids and ibis.

Table 1. Timing and nest effort for species breeding in wading bird colonies during 2010 at Lake Okeechobee. Italics denote peak nest effort for species included in grand total. Airboat monitoring only was conducted during January and February. Please see Appendix I for abbreviations.

Month	GREG	GBHE	WHIB	SNEG	LBHE	TRHE	WOST	GLIB	CAEG	ANHI	Nest effort[1]
January	---[2]	4	---	---	---	---	---	---	---	1	4
February	15	*23*	---	---	---	---	---	---	---	25	38
March	62	17	---	---	---	---	*7*	---	---	70	86
April	269	20	600	1,010	115	390	6	2	5	110	2,412
May	*667*	17	*2,000*	*2,910*	*230*	*750*	3	*150*	500	110	6,727
June	324	6	2,000	1,268	225	260	2	100	1,970	105	4,185

[1] Does not include CAEG or ANHI

[2] Species not detected during monthly survey

Wood Storks and Roseate Spoonbills Reproductive Success

Since 2007, a small colony of Wood Storks has developed at an alligator farm about 4 km N of Harney Pond along Highway 721. A peak of 7 stork nests was detected during 2010 March Surveys as opposed to a high of 35 in 2009. By May, approximately 12 total young storks were seen in the vicinity and represent the number of fledged young. By the June surveys, only 2 nests were still active. This 80% reduction in nests coincided with an 81% decrease in Wood Stork nests in the Greater Everglades from 2009. According to the 2010 South Florida Wading Bird Report, there were no nests found in the Water Conservation Areas, but about 1000 nests were detected in Everglades National Park (1000 nests).

Last year, Roseate Spoonbills were detected nesting on the Lake for the first time since the late 1800s (Oder 1874). Although a consistent roost of 200 spoonbills developed in northern Indian Prairie in 2010, there were no nesting attempts by this species.

Table 2. Geographic coordinates (NAD 83) and species-specific peak nest efforts in detected colonies during the 2010 breeding season at Lake Okeechobee. Airboat monitoring only was conducted during January and February. Please see Appendix I for abbreviations.

Colony	ID	Peak Month[1]	Lattitude	Longitude	GREG	GBHE	WHIB	SNEG	LBHE	TRHE	WOST	GLIB	CAEG	ANHI	Total[1]
Clewiston Spit	1	APR	26.77591	-80.90939	30	---[2]	---	---	---	---	---	---	---	---	30
Eagle Bay East	13	MAY	27.17987	-80.83080	---	1	---	1,000	10	250	---	---	100		1,261
Eagle Bay Trail	12	MAY	27.18659	-80.83056	---	3	---	200	20	200	---	---	300	15	423
Gator Farm	3	MAY	27.02278	-81.06084	80	---	---	115	---	---	7	---	250	---	202
Indian Prairie South	15	FEB	27.00386	-80.98625	---	4	---	---	---	---	---	---	---	5	4
Lakeport Marina	4	MAY	26.97260	-81.11440	25		---	50	---	10	---	---	500	---	85
Moonshine Bay	5	APR	26.91117	-81.02514	40	15	---	---	---	---	---	---	---	30	55
Moonshine 2	6	MAR	26.92233	-81.03053	6	6	---	---	---	---	---	---	---	10	12
Moonshine 3	7	APR	26.92755	-81.03479	8	2	---	---	---	---	---	---	---	20	10
Moore Haven	8	FEB	26.88525	-81.09517	500	10	2,000	1,500	200	300	---	150	1,000	100	4,660
Moore Haven East1	9	APR	26.87882	-81.03612	9	2	---	---	---	---	---	---	---	---	11
Rock Island 4	2	APR	26.97227	-81.03672	41	3	---	45	---	---	---	---	---	---	89

[1] Does not include CAEG or ANHI

[2] Species undetected during monthly survey effort

DISCUSSION

In an attempt to create links between factors affecting wading bird nest effort, Marx and Gawlik (2007a) analyzed the relationship between the effects of initial dry season lake stage, dry season recession, and their interaction. Results showed that a moderate initial stage with an extended recession was associated with high nesting effort. Initial lake stage was defined as the median lake stage during the month of January. Based on historic averages, the interquartile stage for "moderate" was between 4.14 m and 4.73 m. Nesting during the subsequent two years, 2008 and 2009, fit model predictions but nesting in 2010 was higher than predicted. In 2008, there was a low initial lake stage of 3.06 m and no extended recession. Only 30 nests were detected that year. In 2009, initial lake stage was 4.16 m (moderate), and was followed by an extended recession that lasted until the middle of May. Nesting effort was the fourth highest recorded. However, in 2010 initial lake stage was low (4.11 m) with rising water levels for over a month, peaking in early May. Although the pattern of changing lake levels was nearly opposite of what the Marx and Gawlik model predicted would produce good nesting, there were still moderate numbers of nesting wading birds on the lake. During the period of rising water birds initiated nests in the historic colony locations, which were inundated; however, egrets and ibis were flying outside of the lake perimeter to forage. Coincidentally, during the second half of the nesting period water levels peaked and receded, providing available foraging habitat within the Lake (figure 4).

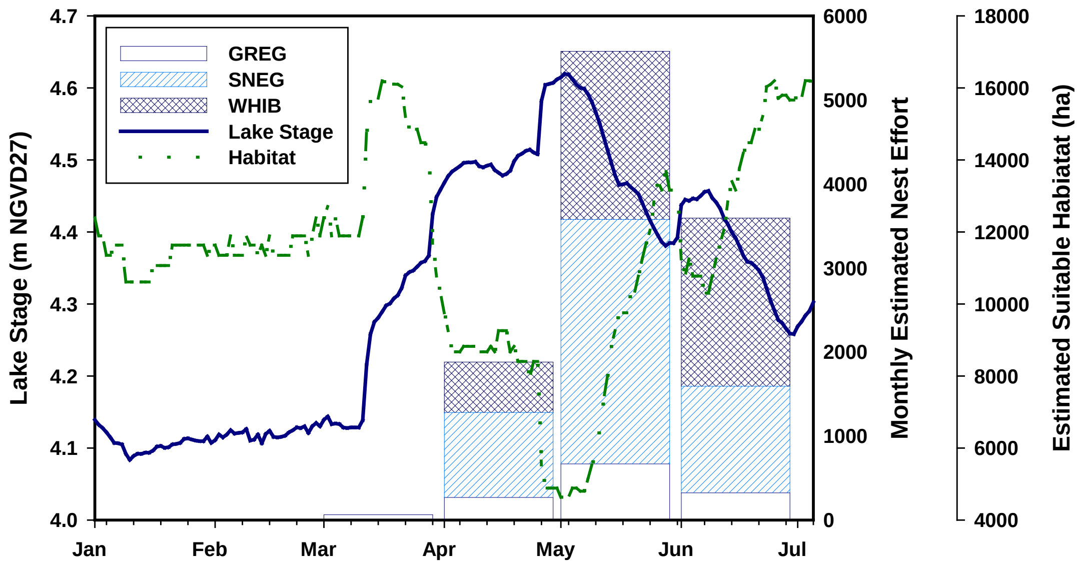

Figure 4. Comparison of monthly species nest effort, Lake Stage, and estimated available habitat defined as water depths 0-28 cm.

We speculate that although rising water in March reduced foraging habitat within the Lake, there were suitable nesting sites available, and the increasing water would have undoubtedly made the short hydroperiod wetlands outside the levee more suitable for foragingForaging habitat within the Lake became available as water levels receded and more of the littoral zone was accessible (Figure 5).

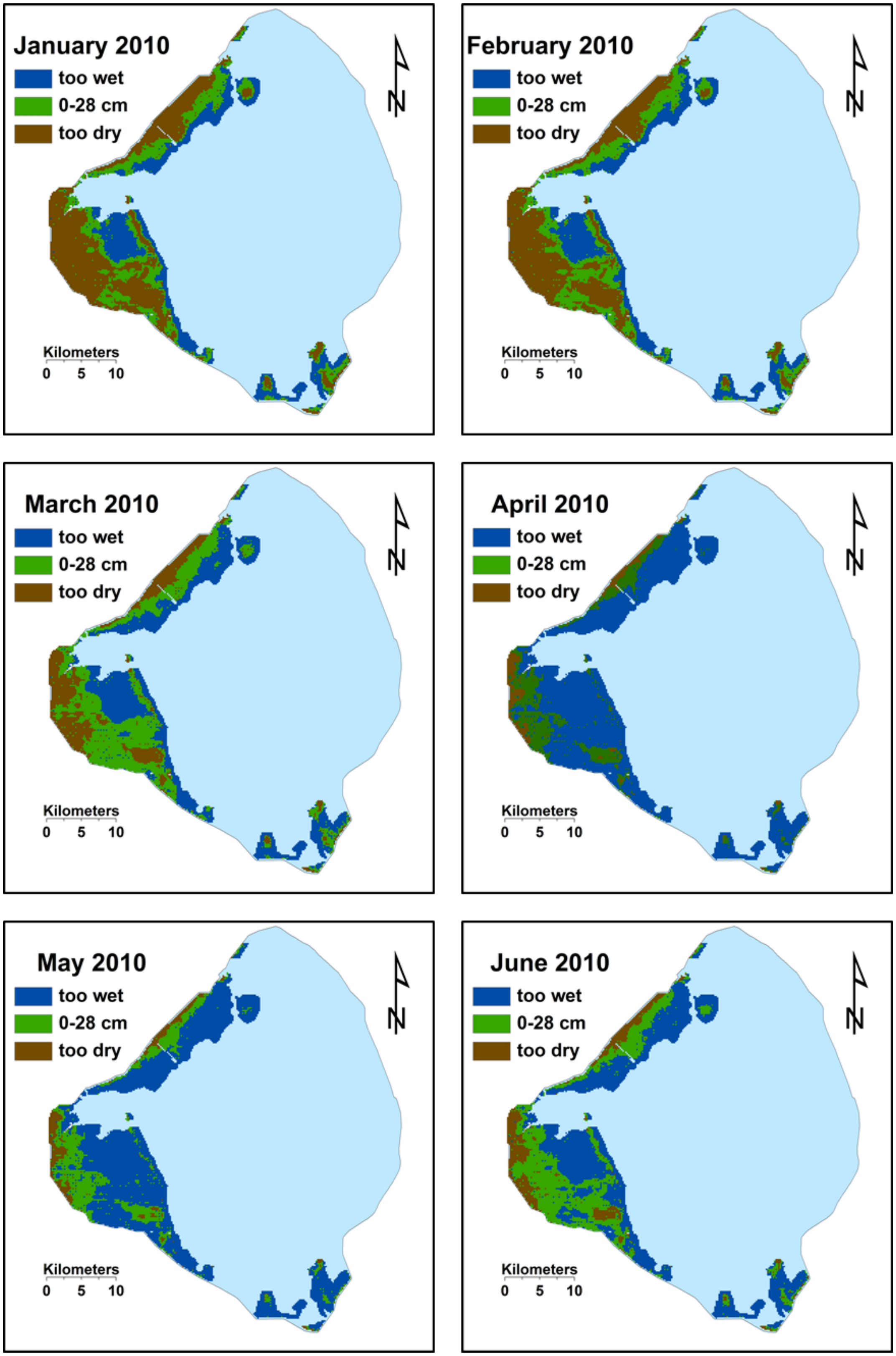

Figure 5. Estimated habitat suitability for wading birds based on estimated water depths of 0-28 cm using interpolated HAED data and gage data (L001, L005. L006, and LZ40) from DBHydro.

Although an extreme increase in water levels in March would normally cause nest failure, initial lake stage was so low in 2010 that it is likely that nest effort would have been low regardless of the direction of water level change. Also, it was fortunate that the receding water in May occurred when chicks were leaving their nest and most in need of good foraging conditions. Had the chicks fledged at a time when the closest foraging habitat was kilometers away outside the perimeter levee, it is not clear that they would have survived. Finally, we cannot rule out the possibility that the widespread lack of nesting throughout South Florida (Cook and Kobza 2010) may have played a role in the higher than expected nesting in the Lake. Individual wading birds move between the Lake and the Everglades and the Lake was one of the few places in South Florida that provided foraging habitat for wading birds in 2010. This possibility underscores the importance of the large scale integrated wading bird monitoring effort for CERP.

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APPENDIX 1

ACRONYMS AND ABBREVIATIONS

CAEG – Cattle Egret

CERP – Comprehensive Everglades Restoration Plan

DOQQ – Digital Orthophoto Quarter Quadrangles

FAU – Florida Atlantic University

HAED- High Accuracy Elevation Data

GBHE – Great Blue Heron

GEW – Greater Everglades Wetlands ecosystem, which includes Kissimmee River, Lake Okeechobee, Everglades, and Florida Bay

GLIB – Glossy Ibis

GREG – Great Egret

LBHE – Little Blue Heron

NGVD29 – National Geodetic Vertical Datum 1929

MAP – Monitoring and Assessment Program

RECOVER – Restoration, Coordination and Verification program

SFWMD – South Florida Water Management District

SNEG – Snowy Egret

TRHE – Tricolored Heron

USACE – United States Army Corps of Engineers

WHIB – White Ibis

WOST – Wood Stork

APPENDIX II

Historic Nest Effort at Lake Okeechobee 1957-2010

Year	GBHE	GREG	SNEG	GLIB	WHIB	WOST	LBHE	ROSP	TRHE	CAEG	Nest Effort[1]	Source
1957	0	0	0	500	700	---	---	---	---	200	1200	David
1958	10	800	500	300	600	---	---	---	---	300	2210	David
1959	30	2000	1000	500	1000	---	---	---	---	1000	4530	David
1960	200	625	1350	800	1000	---	---	---	---	3000	3975	David
1971	0	0	30	0	100	---	---	---	---	10000	130	David
1972	1000	2530	200	50	5500	---	---	---	---	100	9280	David
1974	0	200	200	0	10000	---	---	---	---	10100	10400	David
1975	8	65	80	0	3000	---	---	---	---	4000	3153	David
1977	40	2000	750	200	3000	---	---	---	---	7600	5990	David
1978	50	3000	50	0	3100	---	---	---	---	10400	6200	David
1979	25	870	525	200	2100	---	---	---	---	7000	3720	David
1980	146	600	400	0	1500	---	---	---	---	2555	2646	David
1981	0	175	145	0	200	---	---	---	---	2500	520	David
1982	200	300	1500	0	2000	---	---	---	---	6000	4000	David
1983	25	1240	750	0	0	---	---	---	---	3900	2015	David
1984	25	425	225	0	0	---	---	---	---	3505	675	David
1985	90	400	340	200	500	---	---	---	---	3950	1530	David
1986	76	200	250	0	800	---	---	---	---	2700	1326	David
1987	325	760	115	0	250	---	---	---	---	930	1450	David
1988	192	480	430	0	200	---	---	---	---	4000	1302	David
1989	238	982	570	---	565	---	685	---	207	---	3247	Smith and Collopy
1990	189	265	664	---	1000	---	202	---	590	---	2910	Smith and Collopy
1991	181	459	586	---	425	---	62	---	359	---	2072	Smith and Collopy
1992	225	649	430	---	925	---	124	---	144	---	2497	Smith and Collopy
2005	0	1590	0	0	0	0	9	---	28	3005	1627	FAU
2006	98	1796	2580	620	5800	0	82	---	83	1530	11059	FAU
2007	3	7	543	41	0	12	4	---	157	1260	767	FAU
2008	---	20	---	---	---	8	5	---	5	6000	38	FAU
2009	38	329	2967	2015	2820	35	17	3	961	1198	9185	FAU
2010	23	667	2910	150	2000	7	230	0	750	1970	6737	FAU

[1]Does not include CAEG