SOUTH FLORIDA WADING BIRD REPORT

Volume 15 Mark I. Cook and Mac Kobza, Editors November 2009

SYSTEM-WIDE SUMMARY

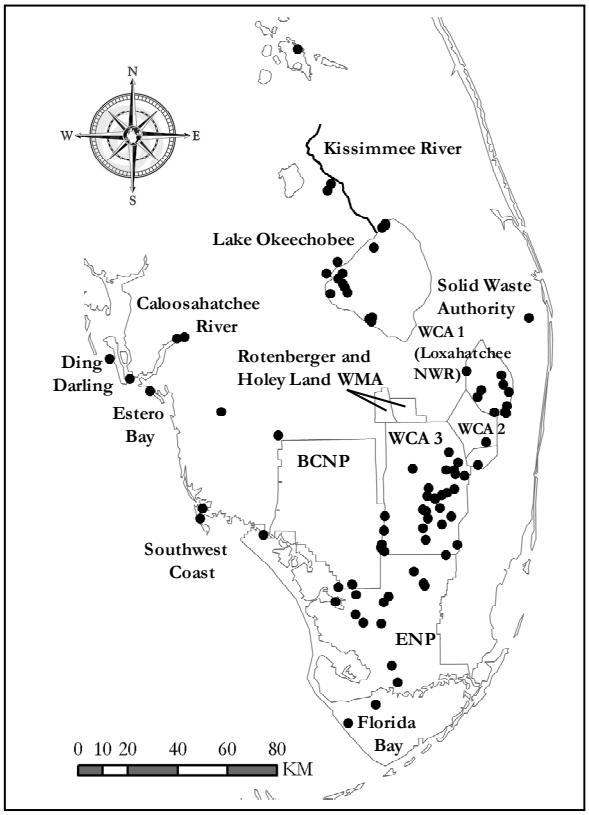
Hydrologic conditions leading into the 2009 dry season varied by region; Water Conservation Areas (WCAs) 1, 2 and 3 were generally characterized by above average hydroperiods and stages during both the 2008 dry season and 2009 wet season, while Everglades National Park (ENP) was considerably dryer and remained so until July 2009 when stage increased rapidly. By the start of the 2008-2009 dry season (November 2008) stages were generally average or above average for all regions and the subsequent below average dry-season rainfall allowed for appropriate water level recessions necessary for optimal wading bird foraging.

The estimated number of wading bird nests in South Florida in 2009 was approximately 77,505. This is the largest nesting effort recorded in south Florida since the 1940s and represents a 320% increase relative to last year's breeding season, a 83% increase over the average of the last nine seasons and surpasses the previous banner year, 2002, by over 8,000 nests. The White Ibis and the federally endangered Wood Stork, which has generally exhibited very low nesting effort over the past decade, both produced numbers of nests that have not been observed since the pre-drainage period. The Wood Stork produced approximately 6,452 nests in south Florida in 2009, which is a 203% increase over the average of the past decade and 1776% greater than last year! Numbers of White Ibis nests were 419% higher than last year and 101% greater than the average of the past nine years. Numbers of Snowy Egret and Tricolored Heron nests increased relative to the past two years but remained lower than the nine year average. Roseate Spoonbill nest numbers in Florida Bay were lower than average, but this was possibly due to lack of recruitment rather than inappropriate foraging conditions.

The Greater Everglades is the primary nesting region for wading birds in south Florida. Hydrologic conditions in the Greater Everglades during 2009 were particularly conducive for wading bird reproduction and an estimated record high of 73,096 nests was recorded in this region (64,093 was recorded in 2002). This included record counts of Wood Stork (4,063) and White Ibis (43,415) nests. Wood Storks also nested in record numbers at the Solid Waste Authority of Palm Beach colony and nested in good numbers at Corkscrew Swamp Sanctuary after a two-year hiatus. In contrast to the inland colonies, the west coast colonies appeared to produce below average numbers of wading bird nests.

Spatial coverage of system-wide nest surveys was recently expanded to include Lake Okeechobee and Kissimmee River floodplain in 2005, and Estero Bay Aquatic Preserve in 2008. As with other regions in 2009, Lake Okeechobee experienced 'good' recession rates and wading birds responded by producing the fourth highest nest count (8,169) since aerial surveys started in 1957. This is a marked improvement on last year when only 39 nests were recorded around the lake. Wading birds now appear to be increasing nesting activity on the recently restored section of the Kissimmee River floodplain. This year, 1,574 nests were recorded, which is considerably greater than the 6 nests recorded last year and greatly surpasses the previous high count in 2006 of 637 nests. Note that for comparative purposes with prior years nest counts for these three regions are not included in the system-wide total.

Locations of wading bird colonies with ≥ 50 nests in South Florida, 2009.



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Nesting effort in the Greater Everglades is generally distributed unevenly among regions. In 2009, WCA-3 supported the most nests (60%), with WCA-1 (19%) and ENP supporting a similar proportion of nests (21%). This spatial distribution of nests reverses the trend during recent years of an annual increase in the proportion of birds nesting in WCA-1 at the expense of nesting in WCA-3. ENP historically supported the largest number of nests in the system. CERP's goal is to restore hydrologic conditions to re-establish aquatic prey densities and concentrations across the landscape that, in turn, will support the return of large, successful wading bird nesting colonies to the Southern Everglades. Nesting effort in the estuaries was low in WY2008 but this year ENP was relatively more attractive to nesting birds (15,432 nests). Indeed, this level of nesting effort has not been observed in ENP since 1941. Another nesting pattern over the past 10 years has been for a large proportion of nests to be concentrated in a single large colony (Alley North) located in northeast WCA-3A. For the past two breeding seasons, Alley North and the adjacent marsh dried prior to breeding and nesting was not initiated at the colony. This year Alley North was once again the largest colony in south Florida with 25,102 nests.

Generally, nesting in 2009 was very successful for most species. Of 237 White Ibis and Great Egrets nests whose fates were followed in the WCAs, between 63 and 95 percent of nests per colony fledged young. Average numbers of fledglings per nest were high and ranged between 1.7 and 2.4 nestlings per successful nest. However, a District study in WCA-1 revealed that mammalian and alligator predation of White Ibis nests can be significant during low water stages, and suggests that hydrologically mediated predation may be an important additional limitation on wading bird reproduction. Wood Stork production was exceptionally high and most pairs reared an average of 2-3 large nestlings to the branchling stage. Unfortunately, the early onset of the rainy season in mid-May (May rainfall equaled the record high district-wide) flooded key stork foraging areas in the Everglades and many nestlings only a week or two from fledging were abandoned and succumbed to starvation. Despite these losses, thousands of early-hatched nestlings managed to fledge before the rain events and in general Wood Stork nesting was considered relatively successful.

Two of four species groups (Great Egrets and White Ibis) met the numeric nesting targets proposed by the South Florida Ecosystem Restoration Task Force. Two other performance measures for the Everglades restoration are an increase in the number of nesting wading birds in the coastal Everglades and a shift in the timing of wood stork nesting to earlier in the breeding season (Ogden, 1994). Wood Storks initiated breeding earlier in the season relative to recent years (late January in the Everglades, early December in Corkscrew), there was a slight shift in the distribution of nests towards the coastal zone, and nest numbers fell only a fraction short of the numeric target.

In accordance with the high nesting effort, Systematic Reconnaissance Flight surveys revealed that the Everglades supported very large numbers of foraging birds throughout the 2009 nesting season in both ENP and the WCAs.

The annual nesting response of wading birds improves scientific understanding of the Everglades ecosystem functions. Exceptional wading bird nesting events as observed in 2009 are hypothesized to occur one or two years after extensive drought conditions as a consequence of aquatic predator reduction (the 'predator release hypothesis'; Frederick and Ogden 2001). The basic idea is that drought reduces predatory fish densities (Chick et al. 2004) which allows crayfish and small fish populations to recruit successfully (Dorn 2008) and achieve higher biomass in subsequent dry seasons. The 2009 nesting season was first preceded by two-years of official drought (2006-2007), that potentially reduced predatory fish populations, and then by a relatively wet year (2008) that promoted high prey production. Also necessary for successful nesting are the appropriate hydrologic conditions during the current nesting season for this increased prey biomass to become concentrated and available to birds. During the 2009 nesting season water levels declined at appropriate rates, there were no major water level reversals and stages were generally ideal for effective wading bird foraging (see *Hydrologic Patterns for WY2009* section). These patterns provide some support for the 'predator release hypothesis' and suggest that both prey production and their availability were highly conducive to wading bird foraging. The District and FAU are currently testing the 'predator release hypothesis' in LILA.

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Literature Cited

Chick, J.H., C.R. Ruetz III, J.C. Trexler. 2004. Spatial scale and abundance patterns of large fish communities in the freshwater marshes of the Florida Everglades. Wetlands 24(3): 652-664.

Dorn, N.J. 2008. Colonization and reproduction of large macroinvertebrates are enhanced by drought-related fish reductions. Hydrobiologia 605: 209-218.

Frederick, P.C. and J.C. Ogden 2001. Pulsed breeding of long-legged wading birds and the importance of infrequent severe drought conditions in the Florida Everglades. Wetlands 21(4): 484-491.

Ogden, J.C. 1994. Status of Wading Bird Recovery. D.E. Gawlik, ed. In: *South Florida Wading Bird Report. Vol. 3*, South Florida Water Management District, West Palm Beach, FL.

HYDROLOGIC PATTERNS FOR WATER YEAR 2009

The amount of rain in the Everglades Protection Area (EPA) for Water Year 2009 (WY09; May 1, 2008 through April 30, 2009) was substantially less than last year; a year that brought the Everglades Protection Area (EPA) out of the 2006-2007 droughts. This year (WY09) rainfall amounts varied from 28.3 inches less than last year in Everglades National Park (ENP), to 8.1 inches less than last year in Water Conservation Area (WCA) -1. Most of the difference between the two years can be found during the dry season (Nov. – April), which in WY08 was some 5-10 inches above average, and in WY09 was some 4-8 inches below average. The lack of dry season rainfall in WY09 was accompanied by a lack of reversals, giving WY09 another significant distinction from WY08, especially in regards to wading bird foraging behavior and nesting success. The rainfall and associated stage readings for WY2009 are shown in Table 1 below. Water Conservation Areas 1 and 2 saw a 9% decrease in historic rainfall amounts and a 15% decrease over WY08. Similarly, Water Conservation Area 3 saw a 14% decrease in historic rainfall amounts, but only an 8% decrease from WY08. The largest deviations from the historical average and WY08 were found in ENP, where a 31% decrease and 23% decrease were recorded, respectively. It is interesting to note that over the last three years there was first a severe drought, followed by above-average rainfall (with many reversals during the dry season), followed this year by below average rainfall with no reversals. This kind of hydrology may account for the high wading bird (esp. Wood Stork) nesting success in WY09.

In WY09 the monthly rainfall seasonality did not deviate much from what is considered typical for this semitropical region. June and July each saw around eight inches of precipitation. Maximum rainfall of 10-12 inches occurred in August. September brought 6 inches everywhere. October had 6 inches in WCA-1 and only 4 inches in the southern regions. The start of the dry season in November was abrupt everywhere. Monthly rainfall stayed below 0.5 inches for the next 4 months, but was interrupted shortly in March with approx. 2 inches of rain and a significant potential for a hydrologic reversal. The dry season returned in April with only 0.5 inches of rain. What followed in May and considered part of WY2010 is mentioned here because of its tremendous deviation from the norm and its significance to the fledging of wading birds at the end of the 2009 nesting season.

Table 2 below is the statistics for rainfall just in May for the last 46-67years. Notice that May is typically a transition month (from the dry to wet season) and has a very high mean range. Despite this deviation, or maybe because of it, May 2009 had one of the highest precipitation of any May on record for the WCA's and tied the overall record for the entire District, and it came at a time when some 3,000-4,000 Wood Stork chicks were about to fledge.

The following hydropattern figures (Fig. 1) highlight the average stage changes in each of the WCAs for the last 2 years in relation to the recent historic averages, flooding tolerances for tree islands, drought tolerances for wetland peat, and recession rates and depths that support both nesting initiation and foraging success by wading birds. These indices were used by the District to facilitate weekly operational discussions and decisions. Tree island flooding tolerances are considered exceeded when depths on the islands are greater than 1 foot for more than 120 days. Drought tolerances are considered exceeded when water levels are greater than 1 foot below ground for more than 30 days, i.e., the criteria for Minimum Flows and Levels in the Everglades. Figures 1A-G show the ground elevations in the WCAs as being essentially the same as the threshold for peat conservation. The wading bird nesting period is divided into three simple categories (red, yellow, and green) based upon foraging observations in the Everglades. A red label indicates poor conditions due to recession rates that are too fast (greater than 0.6 foot per week) or too slow (less than 0.04 foot for more than two weeks). A red label is also given when the average depth change for the week is positive rather than negative. A yellow label indicates fair conditions due to a slow recession rate of 0.04 foot for a week or a rapid recession between 0.17 foot and 0.6 foot per week. A green/good label is assigned when water depth decreased between 0.05 foot and 0.16 foot per week. Although these labels are not indicative of an appropriate depth for foraging, they have been useful during high water conditions to highlight recession rates that can lead to good foraging depths toward the end of the dry season (i.e., April and May).

WCA-1

The 2009 Water-Year for WCA-1 started as an average year with a little over a 0.5 ft of water on the marsh (Figure 1A), after an above average dry season with numerous reversals that made foraging in WY08 difficult. Water depths rose to depths of 2.5 ft over the next four months, but remained above average for only a month and never posed a flooding problem for tree islands. Except for a short reversal in March, the recession rates from November to May were exceptionally smooth and steady, fostering widespread foraging and earlier, more appropriate nesting by Wood Storks. Last year, optimum foraging depths for wading birds were not reached until June. However, June turned out to be an excellent foraging month because April and May had good recession rates. Unfortunately, by July the optimum depths were once again exceeded. This year, optimum foraging depths started in March and would have lasted a full three months if it wasn't for the high rainfall during the second half of May. For the fourth year in a row, WCA-1 had the longest duration of good nesting and foraging periods of any region in the EPA.

WCA-2A and 2B

For the last four years in WCA-2A, the stage levels during the wet season have exceeded the upper flood tolerance for tree islands. However, each year it exceed this level for only 1-2 months, which is not considered enough time to cause any tree island damage. And, the few islands that remain in this region are not likely to be impacted due to their NW location and their relatively high elevations. However, future efforts to restore WCA-2A islands will require a closer examination (i.e., frequency analysis) of this kind of exceedance. In WCA-2A, the WY06, WY07 and now WY09 dry seasons had very good recession rates, and all three times the region completely dried out. In

WY06, WCA-2A exhibited excellent foraging conditions and many flocks of wading birds were observed. However, this year was more like WY07, when hydroperiod was very short and stage was below average for most of the year and as a result, reports of large or many flocks were greatly reduced **(**Figure 1B**)**.

WCA-2B has always been used by wading birds during droughts because it tends to stay deeper for longer periods than the rest of the EPA. This was particularly true in WY2006 when dry season water levels went below ground in WCA-2A and the wading birds moved to WCA-2B. In WY2007, the drought was so severe that even WCA-2B became too dry to support any foraging from May through July. The opposite occurred in WY2008 when water levels increased instead of receding during peak months (March, April, and May) and never dropped low enough to support foraging. However, large flocks of wading birds were observed foraging in WCA-2B in April–May 2009 to compensate for the heavy May rainfall and because recession rates were excellent and depths were near optimum **(**Figure 1C**)**.

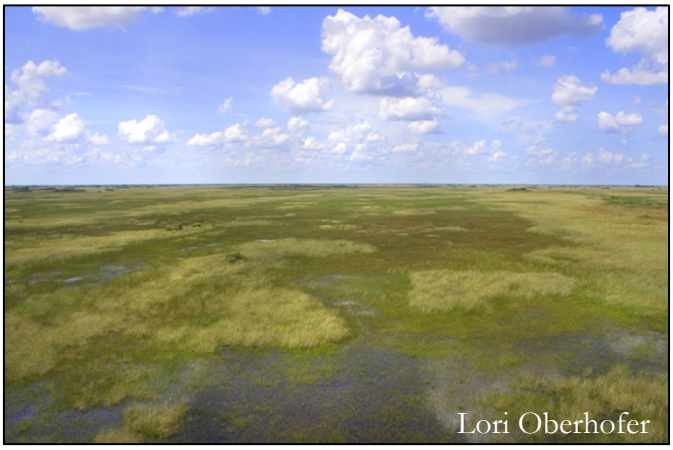


Table 1. Average, minimum and maximum stage (feet National Geodetic Vertical Datum (ft NGVD)] and total rainfall (inches) for Water Year 2009 (WY09) in comparison to historic stage and rainfall. (Average depths calculated by subtracting elevation from stage.)

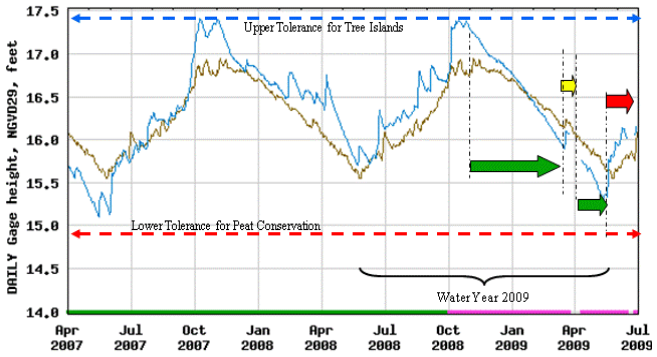
Area	WY2009 Rainfall	Historic Rainfall	WY2009 Stage Mean (min; max)	Historic Stage Mean (min; max)	Elevation
WCA-1	47.4	51.96	16.26 (14.45; 17.38)	15.61 (10.0; 18.16)	15.1
WCA-2	47.4	51.96	12.26 (9.77; 14.46)	12.53 (9.33; 15.64)	11.2
WCA-3	44.3	51.37	10.28 (8.57; 11.99)	9.55 (4.78; 12.79)	8.2
ENP	42.6	55.22	6.29 (4.57; 7.29)	5.98 (2.01; 8.08)	5.1

Table 2. Average, minimum and maximum total monthly rainfall (inches) for the Everglades Protection Area in comparison to May 2009.

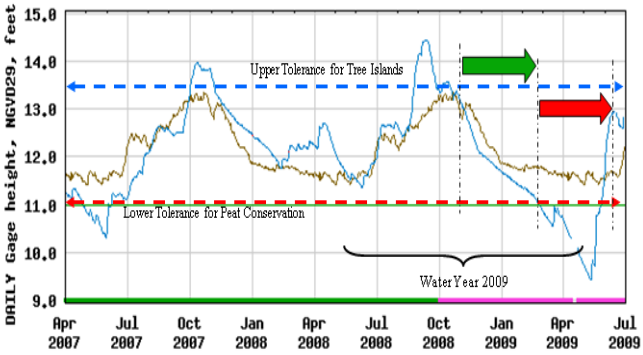
Area	May 2009 Rainfall	Average May Rainfall	Historic May Rainfall (min; max)	Historic Time Period (n)
WCA-1&2	9.15”	4.60”	(0.38” ; 14.60”)	1957-2009
WCA-3	9.00”	4.42”	(0.94” ; 10.90”)	1963-2009
Entire SFWMD	9.04”	4.19”	(1.26” ; 9.04”)	1932-2009

Figure 1. Hydrology in the WCAs and ENP in relation to recent average water depths (A: 14yr ave, B: 14 yr ave, C: 14 yr ave, D: 15 yr ave, E: 15 yr ave, F: 12 yr ave, G: 25 yr ave) and indices for tree islands, peat conservation, and wading bird foraging depths.

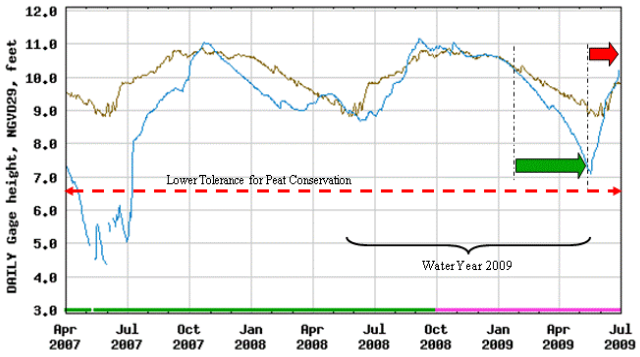
A WCA 1 – Site 9



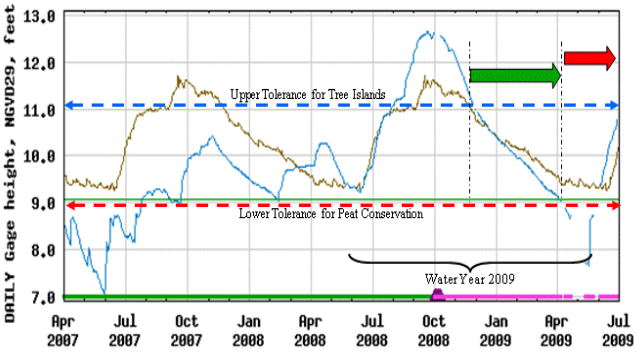
B WCA 2A – Site 17



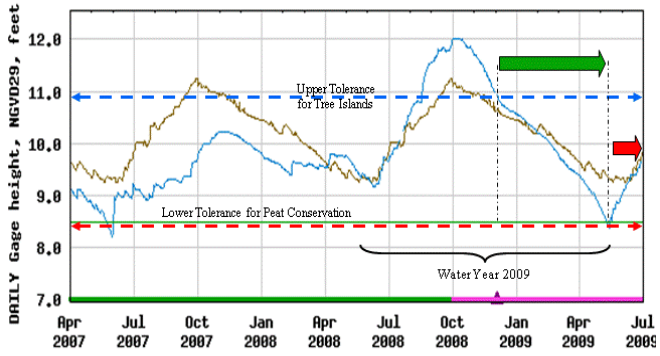
C WCA 2B – Site 99



D WCA 3A – Site 63

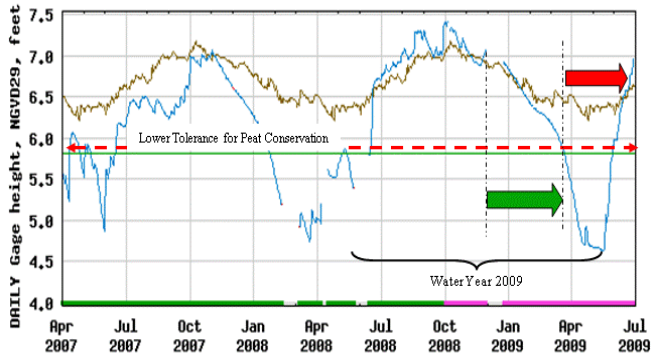


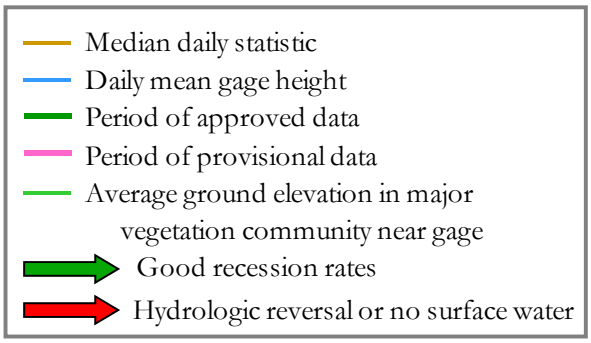
E WCA 3A – Site 64



F WCA 3B – Site 71

G NE Shark River Slough





WCA-3A

In the northeastern region of WCA-3A (Gage-63) the WY07 drought extended well into WY08 **(**Figure 1D**)**. This set-up for WY09 was not one conducive for wading bird foraging and was made worse by the extensive amount of WY08 dry season reversals and a very short wet period. However, WY09 began relatively well in June 2008 with steady rehydration rates and a long wet season with a hydroperiod capable of rejuvenating the prey-base for the region's largest wading bird rookery (Alley North) where annual nesting during the past decade has frequently exceeded 20,000 nests. Water depths rose to depths of 3.5 ft over the next five months, and remained above the upper tolerance for tree islands in this area for about 120 days, which is the amount of time considered to be stressful and potentially lethal to island vegetation if repeated year after year. There are few islands left in this area and those that are left are dominated by *Salix americana* (willow), the most flood tolerant species found in the Everglades. Therefore, there was no immediate danger to islands in this region.

Optimum recession rates in this important NE section of WCA-3A began around December 2008 and continued uninterrupted until water levels went below ground in April 2009. Soil moisture during the month of April got critically low and posed a muck fire threat to the Alley North colony. Fortunately, there were no muck fires and the May downpours of rain very quickly removed any forest fire hazard in the region. In the last four years this region has gone completely dry three times, and each time the Alley North Tree Island was lucky it did not burn. The sensitivity of the wading birds was reflected by the fact that this year the Alley North island was heavily used for nesting, while last year and the year before, the wading birds did not use Alley North.

The hydrologic pattern in Central WCA-3A (Gage-64) has never suffered the full impacts of the droughts experienced by the rest of the EPA these last four years (Figure 1E). In WY08, there was instead a greatly reduced wet-season stage. Water depths last year did not go above 1 ft until October and never went over 2 ft the entire water year. What should have been a great wading bird foraging environment starting in March was instead disrupted by increasing water levels rather than decreasing water levels for almost the entire nesting (dry) season. This year, it was just the opposite. During the wet season starting in May 2008, water depths in this central region of WCA-3A rose to depths of 3.5 ft over the next six months, and remained above the upper tolerance for tree islands in this area for about 90 days, which is below the amount of time considered to be stressful and potentially lethal to tree islands. Good recession rates that supported maximum foraging behavior and nesting lasted for a full five months beginning in December 2008 and ended abruptly in May 2009 (see Table 2). Note: This is a quote from last year's (WY08) Hydrology Section Report: "This year, the lack of foraging and the longer hydroperiod may well translate into a banner prey-base for next year (WY09)."

WCA-3B

Last year the recession rates in 3B were poor at best. This year, rising water levels during the wet season followed the average almost exactly and the upper tolerance for tree islands was barely reached. Then, in November water levels fell at an almost steady perfect 0.10 ft per week until April when water levels dropped abruptly, followed by a large-scale May reversal (Figure 1F). The set-up for optimum March and April foraging by wading birds could not have been better. Unfortunately, it appears that foraging in 3B was minimal and may have been due to an ineffective fish and crayfish recruitment in WY08. For WY06, 07 and 08, this region's hydrology did not support wading bird nesting or foraging. For WY09, this region's hydrology should have supported a high amount of foraging. The fact that it did not will need to be investigated.

Northeast Shark River Slough

The uniqueness of the hydrology and drought in the Everglades during WY07, WY08 and now WY09 is captured by the Northeast Shark River Slough (NESRS) hydrograph **(**Figure 1G**)**. For four years in a row this region of Everglades National Park experienced violations of the MFL standard. After what was a reasonable return to average wet season conditions in July 2008, water levels began dropping in December and good recession rates in support of wading bird foraging and nesting remained until April 2009. These good recession rates and water depths ended in April when there was a rapid stage decline and water levels went 1.5 ft below ground. For peak nesting period, this could not have been good. Like everywhere else, the May rainfall created a dramatic beginning to WY10 because in two months (May and June) the stage increased by 2.5 ft.

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REGIONAL NESTING REPORTS

WATER CONSERVATION AREAS 2 AND 3, AND A.R.M. LOXAHATCHEE NATIONAL WILDLIFE REFUGE

In 2009, the University of Florida Wading Bird Project continued its monitoring of wading bird nests in WCAs 2 and 3 and Loxahatchee NWR, concentrating our efforts on documenting numbers of Great Egrets, White Ibises, Snowy Egrets and Wood Storks. We also conducted the first operational field tests of an unmanned aerial system (small unmanned aircraft) to aid in wading bird surveys of various kinds.

Methods

We performed two types of systematic surveys in 2009: aerial and ground surveys. The primary objective of both kinds of surveys is to systematically encounter and document nesting colonies. On or about the 15th of each month between February and May we performed systematic aerial surveys for colonies, with observers on both sides of a Cessna 182. A flight altitude of 800 feet AGL and east-west oriented flight transects spaced 1.6 nautical miles apart have been used continuously since 1986 and shown to result in overlapping coverage under a variety of weather and visibility conditions. In addition to contemporaneous visual estimates of nesting birds, we took aerial digital photos of all colonies. We made subsequent detailed counts of nesting birds observed in these digital photos. The reported numbers of nest starts are usually "peak" counts, in which the highest count for the season is used as the estimate of nests for each species with each colony. In some cases we adjusted total aerial photo counts based on observations of subcanopy nests seen during ground checks.

ABBREVIATIONS

Species: Great Egret (GREG), Snowy Egret (SNEG), Reddish Egret (REEG), Cattle Egret (CAEG), Great Blue Heron (GBHE), Great White Heron (GWHE), Little Blue Heron (LBHE), Tricolored Heron (TRHE), Green Heron (GRHE), Black-crowned Night-Heron (BCNH), Yellow-crowned Night-Heron (YCNH), Roseate Spoonbill (ROSP), Wood Stork (WOST), White Ibis (WHIB), Glossy Ibis (GLIB), Anhinga (ANHI), Double-crested Cormorant (DCCO), Brown Pelican (BRPE), Osprey (OSPR), Bald Eagle (BAEA), Magnificent Frigatebird (MAFR), Fish Crow (FICR), small dark herons (SML DRK), and small white herons (SML WHT).

Regions, Agencies, and Miscellaneous: Water Conservation Area (WCA), Everglades National Park (ENP), Wildlife Management Area (WMA), A.R.M. Loxahatchee National Wildlife Refuge (LNWR), Lake Worth Drainage District (LWDD), Solid Waste Authority (SWA), South Florida Water Management District (SFWMD), U.S. Army Corp of Engineers (USACOE), Systematic Reconnaissance Flights (SRF), Comprehensive Everglades Restoration Plan (CERP), and Natural Systems Model (NSM).

Since 2005, we have performed systematic ground surveys in parts of WCA 3 that give an index of abundance for small colonies and dark-colored species not easily located during aerial surveys. In the case of ground surveys, all tree islands within sixteen 500m-wide belt transects were approached closely enough to flush nesting birds, and nests were either counted directly, or estimated from flushed birds. These totals were added to the totals reported in Table 1. Note that because ground surveys were not 100% of the area, they should be considered gross underestimates of small dark herons and species that are not seen well from aircraft.

Results

Total counts in the WCAs and Loxahatchee NWR

Nesting Effort: Combining all species at all colonies in LNWR, WCA 2, and WCA 3, we estimated a grand total of 57,564 nests of wading birds (Cattle Egrets, Anhingas and cormorants excluded) were initiated between January and June 30, 2009 (Table 1 and Table 2). This was the second highest number of nests recorded in the WCAs both since systematic surveys began in the late 1980s, and since 1975. The only other year with higher numbers was 2002, with only 6% more than in 2009.

Table 1. Number of nesting pairs found in Loxahatchee NWR during systematic surveys, February through May of 2009.

Latitude	Longitude	WCA	Colony	GREG	WHIB	WOST	ROSP	SNEG	GBHE	LBHE	TRHE	GLIB	BCNH	Unid. Large Wht.	Unid. Small Wht.	Unid. Small Dark.	ANHI	Colony Total*
26.53280	-80.27620	1	Lox NC-4	591	4,190	21			2			21				16	28	4,841
26.43822	-80.39053	1	Lox 99	430	2,198		4										14	2,632
26.55014	-80.44268	1	Lox West	131	1,082		3		1						837			2,054
26.39895	-80.24992	1	Venus	131	1,488										163	18		1,800
26.45857	-80.24032	1	Lox NC-2	765	348										315			1,428
26.46838	-80.37229	1	Welt	383											23			406
26.51169	-80.35949	1	Wist												121			121
26.46266	-80.37251	1	Wonton							120								120
26.36849	-80.25431	1	Tyche	69					4						28			101
26.49117	-80.26712	1	Weldon	99														99
26.37217	-80.26020	1	Lox 73	70														70
26.37197	-80.31035	1	Utu	55														55
Air Surveys > 50				2,724	9,306	21	7	0	7	120	0	21	0	0	1,487	34	42	13,727
Air Surveys < 50				123	0	0	0	0	6	0	0	0	0	0	16	0	7	145
Totals By Species				2,847	9,306	21	7	0	13	120	0	21	0	0	1,503	34	49	13,872

* Excludes ANHI

Table 2. Number of nesting pairs found in WCAs 2 and 3 during systematic surveys, February through May of 2009.

Latitude	Longitude	WCA	Colony	GREG	WHIB	WOST	ROSP	SNEG	GBHE	LBHE	TRHE	GLIB	BCNH	Unid. Large Wht.	Unid. Small Wht.	Unid. Small Dark.	ANHI	Colony Total*
26.24335	-80.35072	2	Shiva	112					16	1					54			183
26.14478	-80.39014	2	Opus	46				3	4								46	53
26.20132	-80.52873	3	Alley North**	1,379	17,200		13	2,200	10	800	800		2,700					25,102
25.77353	-80.83722	3	Hidden**	710	8,573													9,283
25.86302	-80.83874	3	Jetport	10		1,167	3											1,180
26.12428	-80.54148	3	6th Bridge	281			5		12						430		2	728
26.01230	-80.63233	3	Joule	254											295			549
26.12408	-80.50438	3	Cypress City	350			5		19						71			445
26.04602	-80.62586	3	Big Melaleuca	205					8						210			423
26.10064	-80.45485	3	Nammu	383														383
25.80133	-80.49000	3	3B Mud East	324		7												331
25.80510	-80.84902	3	Jetport South	51		238								6	2			297
25.96052	-80.57207	3	L-67 (Horus)	293					1									294
25.91565	-80.63022	3	Vacation	273					18								30	291
26.01557	-80.56272	3	Jupiter	278					2									280
26.02563	-80.53917	3	Vulture	204											51			255
25.78654	-80.84958	3	Brodin	64	171													235
26.10715	-80.49802	3	Nanse	232														232
26.00377	-80.59762	3	Jerrod	158														158
25.88937	-80.56263	3	Freya	146					4									150
26.13125	-80.70168	3	Odin	135					7									142
25.92347	-80.51858	3	Ganga	128	9													137
26.00012	-80.59513	3	Janus	90											47			137
25.87413	-80.65365	3	Enlil	56					5						26			87
25.94672	-80.63782	3	Starter Mel	76					3									79
25.79073	-80.85390	3	Budda	78														78
25.95365	-80.65352	3	Hermes	75					2									77
26.04250	-80.50308	3	Kinich	60					1									61
26.15734	-80.48511	3	Potter	26					15	10					10		9	61
25.82346	-80.64074	3	Chac	56					1									57
25.92517	-80.83500	3	Crossover	26		28			3									57
25.92517	-80.78003	3	Garuda												49	6		55
Air Surveys > 50				6,559	25,953	1,440	26	2,203	131	811	800	0	2,700	6	1,245	6	87	41,880
Air and Ground < 50 ***				823	6	0	0	32	259	201	44	0	338	0	78	31	386	1,812
Totals by Species				7,382	25,959	1,440	26	2,235	390	1,012	844	0	3,038	6	1,323	37	473	43,692

* Excludes ANHI

** Estimates of subcanopy nests adjusted based on ground visits

*** Includes 832 wading bird nesting pairs from ground surveys

The size of the nesting aggregation in 2009 within in the WCAs and LNWR combined was approximately 88% greater than average of similar counts during the previous five years, 75% above the average for past ten years, and only 6% less than the banner year of 2002. Numbers of Great Egret nests were twice the average of the last five years, and 76% greater than the average of the last ten. In 2009, Wood Stork nest numbers were exceptionally high, with a 14.5-fold increase over the previous 5-year average and a four-fold increase above the 10-year average. Indeed, this year's numbers of stork nests were the highest recorded since 1975. White Ibis nests were approximately 90% (nearly double) above both the previous 5-year and 10-year averages, and 12% higher than any estimates during the previous 40 years. Snowy Egret nests were 74% of the previous five years average and 61% of the last ten. However, we did have an atypically high number of unidentified small white wader nests this season (2,826) which could have doubled the Snowy Egret count had they all been Snowies. Although difficult to see from the air, ground checks on Alley North (as well as at Tamiami West) suggest Black-crowned Night Herons nests were markedly more numerous than in recent years (3,038 nests, more than four times the number in any other season).

Reproductive Success. Nest success appeared high for all species in 2009 with no significant abandonment events observed within our study area. We followed the fates of marked nests in four colonies in WCA 3: Alley North, Hidden, Cypress City, and Vacation. Ground access to Alley North ended in late March due to low water; however, of the 43 mixed-species nests whose fate we could determine, a raw minimum of 63% were successful. If we include the 50 nests still active at our last check, the raw success rate approximates 75%. At Hidden, raw nest success (N = 141, predominantly ibis) was extremely high at 95% with an average of 2.4 fledglings/successful nest. Cypress City (N = 77) and Vacation (N = 53), populated mostly with GREGs, both showed relatively good success at about 80%, and averaged 1.7 and 2.0 fledglings/successful nest, respectively. We could not perform nest checks at the WOST colonies of Jetport and Jetport South as nests were located high in cypress canopies. Based on our aerial observations and photos, and on ground checks of marked WOST nests at nearby Tamiami West (ENP, N = 40), we can estimate an exceptional raw nest success rate (probability of fledging at least one young) of 90% with an average of at least 2.5 fledglings/successful nest. All nest success rates are uncorrected for exposure days, and are used only to illustrate the generally high success. Corrected rates will be published as soon as analysis is completed.

This year we were able to conduct further tests of the suitability of a small unmanned aircraft (UAS) for monitoring wading bird colonies. While it seems unlikely that unmanned flights will replace area-wide surveys anytime soon, there is a specific need for using the UAS to repeatedly check on the condition of large numbers of nests that are individually identifiable by location, in order to estimate nest turnover and therefore the total number of nest starts. The UAS, developed at University of Florida is an approximately 5.4 kg (12 lb) aircraft run on electric power and controlled with onboard GPS and autopilot, with override capability from a ground control station. The UAS is capable of taking photographs of high quality from 50 – 500m altitude that are GPS-labeled. Positions of photos are then corrected for pitch, roll and yaw at the time of the photo, and mosaicked together with an accuracy of within 2 m. Individual nest locations can be assigned positions using a cursor, and overlays conducted of the same nests on different survey dates using a density function approach. Due to FAA restrictions, we were only able to work in LNWR this year, and conducted two successful test flights. Both took place over Lox New Colony 4, the first on 20 March and the second on 11 April. The aircraft autonomously followed a predetermined flight path, took straight-down photos approximately every second, and gathered associated geo-referencing data. Overall, the flights were a success, especially since they were conducted in windy conditions, and required water landings every time. We are currently working on programs to automatically stitch photos together into a mosaic, to streamline the nest ID process, and to obtain clearance to fly in the fringes of the Miami Traffic Control Area (most of WCA 3 and ENP).

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EVERGLADES NATIONAL PARK (MAINLAND)

Status of Wading Bird Colonies in Everglades National Park, 2009 Nesting Season

We survey wading bird nesting colonies in Everglades National Park (ENP) as part of a regional monitoring program to track wading bird nesting effort and success throughout the greater Everglades ecosystem. Data collected during our colony survey and monitoring flights help guide ongoing ecosystem restoration projects. This summary report addresses colony monitoring within the mainland slough and estuarine areas of Everglades National Park using data collected during the 2009 wading bird breeding season.

The long-term monitoring objectives for wading bird nesting colonies in ENP are:

- Collect data on wading bird nesting effort, locations, numbers of colonies, and timing of colony nesting.
- Compile and share data with other agencies monitoring wading birds in South Florida with the ultimate goal of restoring and sustaining wading bird populations in the Florida Everglades.

Methods

ENP personnel conducted aerial surveys of all known colony sites on a monthly basis. We started our survey flights of known colonies in October 2008 in order to detect the earlier nesting of Roseate Spoonbills. We also conducted additional flights this season to monitor the increase in Wood Stork nest numbers and nesting sites observed throughout the park. One or two observers checked all known colony locations using a Cessna 182 fixed-wing aircraft. Altitude was maintained at about 800 feet above ground level. Flights started on 22 October and ended on 1 July. During each survey, visual estimates of nest numbers by species were made and photos were taken of colonies using a digital SLR camera with a 70-300mm image-stabilized lens. Photos were later compared to visual estimates to assist with determining nest numbers, nesting stage, and species composition.

We also conducted a systematic colony survey on 23 and 24 March of grassland habitats in Shark Slough and Taylor Slough. This survey was conducted by 2 observers, with 1 observer sitting on each side of a Cessna 182 fixed-wing aircraft. We searched for colonies along 20 established transects oriented east to west and spaced 1.6 nautical miles apart. Flight altitude was maintained at 800 feet above ground level throughout the survey.

Species monitored include the Great Egret (*Ardea alba)*, Wood Stork (*Mycteria americana*), White Ibis (*Eudocimus albus*), Snowy Egret (*Egretta thula)*, Roseate Spoonbill (*Ajaia ajaja*), Tri-colored Heron (*Egretta tricolor*), Little Blue Heron (*Egretta caerulea*), Cattle Egret (*Bubulcus ibis*), and Black-Crowned Night Heron (*Nycticorax nycticorax*). Other birds found nesting in colonies such as the Great White and Great Blue Heron (*Ardea herodias*), Anhinga (*Anhinga anhinga*), Brown Pelican (*Pelecanus occidentalis*) and Double-Crested Cormorant (*Phalacrocorax auritus*) are noted as well.

Results

We observed a considerable increase in nesting activity within the mainland colonies of Everglades National Park (ENP) this season compared to previous seasons. We estimated a total of 15,432 combined wading bird species nests found in 48 colonies (Table 1). Pooled species nest numbers this season were 52% higher compared to the exceptional nesting season of 2006. Compared to the average of the last 5 and 10 years respectively, we observed a large increase in 2009 nest numbers by Wood Storks (442% and 253%), Great Egrets (136% and 165%), White Ibis (398% and 742%), and Snowy Egrets (4% and 57%).

Despite a reversal of water levels in May and early June, Wood Storks appeared to pull off a successful nesting season in ENP. This appears to be a result of earlier colony formation than has been recorded in recent years as well as an increase in nesting pairs of storks. We observed adult storks standing on nest starts during our 26 January survey at the major nesting colonies of Cuthbert Lake, Paurotis Pond, Rodgers River and Tamiami West. We also counted more stork nests in several of these known stork-nesting colonies and discovered additional storks nesting at several new sites as well.

Most Wood Stork nests we observed contained 2 or 3 young that survived to large nestling and branchling stages. However the number of young that actually survived to complete fledging is not known. After several rain events in May that continued into June, we observed some dead stork chicks in all colonies. Even though the rain events occurred before all stork chicks were able to fledge, we speculate that at least the largest of the chicks in most nests were able to leave the colonies. During several survey flights, fledged storks were seen standing in nearby marshes adjacent to the colony.

This season also appeared to be successful for all major colonial nesting species in ENP. Many fledged Great Egrets, White Ibis, Snowy Egrets, Roseate Spoonbills, and Tri-colored Herons were observed (and/or seen in photographs) in all colonies.

Overall, the 2009 nesting season appeared to be a productive one for all wading bird species that we monitored. Estimated numbers of nests were higher than in all recent years, the initiation of nesting (most notably Wood Storks) was earlier, and most nests appeared to be successful.

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Table 1. Peak numbers of wading bird nests found in Everglades National Park colonies through July 1, 2009.

Colony name	Latitude NAD83	Longitude NAD83	GREG	WOST	WHIB	SNEG	ROSP	TRHE	LBHE	GBHE	BCNH	*Total*
Tamiami West (UF estimates used)	25.75784	-80.54484	500	1,300	5,000	+		300	+	+	800	7,900
Cabbage Bay (New 2009)	25.62000	-81.05612	125	100	750	+	+					975
Paurotis Pond	25.28150	-80.80300	200	400	300	+	50	+	+			950
Lostmans Creek (New 2009)	25.58723	-80.97204	100	130	600	+		+	+			830
Rookery Branch	25.46356	-80.85256	150	20	500	100						770
Rodgers River Bay Peninsula	25.55975	-81.07026	300	400								700
Broad River	25.50293	-80.97440	200	50	300		50	+	+			600
Grossman Ridge Willowhead	25.62613	-80.64582	150		400	+						550
Otter Creek	25.46781	-80.93772	175		300	50		+	+			525
Cuthbert Lake	25.20933	-80.77500	150	100		+						250
2009 unnamed 005	25.68741	-80.69687	110			125	+					235
Grossman Ridge West	25.63511	-80.65130	75	60		+						135
2009 unnamed 007	25.63232	-80.99163	25			75						100
Alligator Bay	25.67099	-81.14714	40			40						80
2009 unnamed 012	25.57841	-80.81785	65									65
UF-T	25.63083	-80.98917	35			25						60
2009 unnamed 013	25.55396	-80.84039	55									55
Tamiami East1	25.75762	-80.50801	35	10								45
2009 unnamed 004	25.67021	-80.68914	5			35				1		41
Col-4	25.53353	-80.77955	40									40
Lower Taylor Slough	25.22697	-80.68428	35	5		+		+	+			40
2009 unnamed 006	25.67424	-80.93298				35						35
Tamiami East2	25.75935	-80.52457	15	20								35
UF-WP438	25.67487	-80.93170	30			5						35
2009 unnamed 014b	25.54647	-80.77589	30									30
Rodgers River Bay Island	25.55571	-81.07000	25	5								30
2009 unnamed 002	25.70207	-80.69039	25							2		27
2009 unnamed 003	25.67944	-80.68581	25									25
East River Rookery	25.26860	-80.86785	25									25
UF2	25.56114	-80.79475	25									25
2009 unnamed 019	25.51992	-80.84582	20									20
Col-10	25.52150	-80.80508	15			5						20
Col-20	25.51700	-80.77480	20									20
UF6	25.55584	-80.84078	20									20
2009 unnamed 010	25.59773	-80.90941	15									15
2009 unnamed 014a	25.54365	-80.78334	15									15
Col-2	25.57062	-80.81442	15									15
UF5	25.60960	-80.70095	15									15
UF3	25.68643	-80.68227	12									12
2009 unnamed 016	25.52317	-80.80657	10									10
2009 unnamed 017	25.52281	-80.83132	10									10
2009 unnamed 018	25.51738	-80.82617	10									10
UF1	25.47988	-80.80352	10									10
UF4	25.68911	-80.69517	10									10
2009 unnamed 001	25.74010	-80.91616	4	2								6
2009 unnamed 015	25.51838	-80.77737	5									5
2009 unnamed 021	25.52633	-80.84383	3									3
UF-WP496	25.53790	-80.75435	3									3
Total			2,982	2,602	8,150	495	100	300	0	3	800	15,432

+ Indicates species present and nesting, but unable to determine numbers

EVERGLADES NATIONAL PARK

23 February – 1 July 2009

Frank Key (Florida Bay)
Colony Location: 25.10243, -80.90667 (NAD83)
The colony on Frank Key was active through the season with birds still on nests when last checked on 1 July. We observed approximately 100 Great Egret and 85 Brown Pelican nests when first checked on 23 February. Some egrets and pelicans were incubating but most birds were standing on newly finished nests. When checked again in April, egrets had small to half-sized young and on 27 May, large egret young were seen flapping on nests. The pelican nests contained downy chicks with adults tending young or roosting in the colony. On 9 June, most of the egret nests had fledged young but others apparently had nested later and still had large young on nests. On 1 July, egrets were mostly finished with only a few fledged young remaining in the colony. Pelican nests were still active with some large downy chicks, but most contained large feathered young. White Ibis and Snowy Egrets were not seen nesting in the colony this season.

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2009 WOOD STORK NESTING IN SOUTHWEST FLORIDA

In addition to monitoring the Wood Stork colony at Corkscrew Swamp Sanctuary (Corkscrew), Audubon of Florida gathered nesting data on four other wood stork colonies in 2009, three of which were active. While Wood Storks were the primary focus of the monitoring effort, we were able to gather data on other wading birds at some of the colonies.

Methods
Audubon's survey effort began in October of 2008 at Corkscrew Swamp Sanctuary. The Corkscrew colony was visited by monthly from October through May. The remaining colony locations were surveyed with much less frequency. Surveys were conducted in a fixed wing Cessna 172. Nesting effort was recorded by taking digital aerial photographs of the colonies for later analysis. We used a Canon 30D equipped with a 70-300mm zoom lens with an image stabilizer. An altitude of between 800'-1000' was maintained during the survey. Wood Stork nesting images were examined to quantify the number of nest starts, number of chicks per nest, and the number of successful nests. Notes were also taken on the stages represented during a survey, and record data on other waders nesting at the time. In each survey set there were a varying number of image features which we were unable to identify. While some of these features may have been active nests, they were not included in the analysis. As a result the results of the analysis are conservative, as only verifiable nests were counted.

Results
Wood Storks began arriving in large numbers in Collier County in early October. The first initiation of nesting in Southwest Florida occurred at Corkscrew on December 12th. The flight Table 1 contained the numeric summary of the nesting data. Specific nesting results for each colony location are explained in the sub-sections below.

Hydrology
Water levels at Corkscrew remained below average until Tropical Storm Fay hit the region on August 19th 2008 depositing heavy rainfall across the region and bring water levels at Corkscrew Swamp to their 4th highest total since we began keeping records in 1960. Very little rain fell during the ensuing dry-season. During the 6 month period from November 1st through April 30th, Corkscrew received only 2.71" of rainfall, well below the 12.92" average for the period of record. This very dry period caused a fast pronounced drop in water levels. The B-staff gauge at Corkscrew's Lettuce Lakes went from a peak of 4.06' on August 25th to ground level (0') by April 1st. Since 1960, there have been only three years where the Lettuce Lakes dropped to zero faster than that. Heavy rains in late May brought the months total to 5.08" but did not result in any visible abandonment.

Corkscrew Swamp Sanctuary
The Corkscrew colony is located in the expanse of old growth bald cypress at the Audubon of Florida, Corkscrew Swamp Sanctuary. Six sub-colonies were formed throughout the 400acres of remaining old growth cypress.

The overall nesting effort at Corkscrew Swamp Sanctuary yielded a total of 1120 nests with no noticeable abandonment. An estimated 2570 chicks fledged from the colony, for an overall average of 2.3 chicks per nest attempt. Considerable asynchrony was apparent in the nesting this year as the first to nest initiated on December 12th 2008 while the last wave initiated 12 weeks later in early March of 2009. Nest productivity did vary when comparing early to late nesters. Early nesters, those initiating before January 15th, produced an average of 2.7 chicks per nest, whereas those initiating after January 15th produced an average of 2.1 chicks per nest.

When the cypress leaf-out in the spring it makes it difficult to get accurate counts on the numerous other birds that nest along with the Wood Storks. We were able to verify dozens of nesting great egrets and at least a dozen Roseate Spoonbills over the course of the survey effort, but do not have confidence that we could accurately quantify the nesting effort for any species other than wood storks for this location.

Lenore Island
This colony is located on a mangrove island in the Caloosahatchee River. It has also been called Caloosahatchee West in past reports. Stork nesting is believed to have begun in mid-January. The wood stork effort was estimated at 500 nests. Nesting success is uncertain as the chicks were too young to determine success at the time of the latest survey. Given the success at the nearby Corkscrew Colony, we have no reason to suspect any significant nest failure. An analysis of the earliest nests to hatch revealed an average of 2.6 chicks per nest at this location. It was very difficult to ascertain the contents of the later nesting birds to determine if there was a difference between early and later nesting birds. Twenty-one great Blue Heron nests and 170 Great Egrets nests were identified at this colony along with 10 nests of small dark birds too small to identify to species.

Caloosahatchee East
This colony is located on a mangrove island in the Caloosahatchee River. Stork nesting is believed to have begun in late January to early February. The colony contained an estimated 120 Wood Stork nests, two Great Blue heron nests, 50 great egrets, and one small dark wading bird. Nest contents at the time of the latest survey were too small to distinguish individual birds, therefore it was not possible to determine nest productivity or success with any certainty.

Collier/Hendry Line
Audubon staff visited this site 3 times throughout the nesting season. This colony was not active this year.

Barron Collier 29
The Barron Collier 29 colony is a spoil island in a manmade lake. Nesting occurred on Brazilian pepper. This colony was found fairly late in the nesting cycle, so the initiation date is not known. One-hundred ten Wood Stork nests were indentified averaging 2.1 chicks per nest. The nesting snapshot did not reveal any evidence of nest failure. We estimate that approximately 230 Wood Storks fledged from this colony. Various other white waders were nesting along with the Wood Storks, but given the assorted stages of development there was considerable uncertainty in identifying the breakdown of non-Wood Stork nesting.

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Table 1. Wading bird nesting effort recorded in Southwest Florida, 2009.

Latitude	Longitude	Colony		WOST		GBHE	GREG	SML WT	SML DRK	Total
deg decimal min.			Nests	Succesful	Fledged					
26 22.502	-81 36.985	Corkscrew	1,120	1,120	2,570	NA	NA	NA	NA	1,120
26 41.332	-81 49.809	Lenore Isl (Caloosahatchee West)	500	NA	NA	21	170	NA	10	700
26 41.795	-81 47.697	Caloosahatchee East	120	NA	NA	2	50	NA	1	170
26 22.223	-81 16.363	Collier/Hendry Line	0	0	0	0	0	0	0	0
26 16.383	-81 20.633	Barron Collier 29	110	110	230	NA	NA	NA	NA	110
		Totals	1,850							2,100

SOLID WASTE AUTHORITY OF PALM BEACH COUNTY ROOKERY

Methods

Typically, Breeding Bird Censuses (BBCs) are conducted from February – July in the SWA roost by two observers every 8-10 weeks, representing approximately 12 man-hours. During the BBC, all islands from three abandoned shell pits are systematically surveyed from a small boat, and the identified bird species and nest numbers are recorded. Surveys are conducted during the morning hours so as to minimize any burden caused by the presence of observers. The peak nest numbers are a compilation of early season boat counts and visual counts from the observation towers.

Location & Study Area

The SWA roost is located on spoil islands in abandoned shell pits that were mined in the early 1960's in Palm Beach County, Florida (Lat. 26°46'42.22"N: Long. 80°08'31.15"W NAD83). The spoil islands consist of overburden material and range from 5 to 367 m in length, with an average width of 5 m. Islands are separated by 5-6.5 m with vegetation touching among close islands. The borrow pits are flooded with fresh water to a depth of 3 m. Dominant vegetation is Brazilian pepper (*Schinus terebinthifolius*), Australian pine (*Casurina spp.*), and Melaleuca (*Melaleuca quinquenervia*), all non-native species. Local features influencing the roost include: 1) the North County Resource Recovery Facility and landfill and 2) the City of West Palm Beach's Grassy Waters (=Water Catchment Area), a 44 km² remnant of the Loxahatchee Slough.

Results

This report presents preliminary data for the 2009 breeding season. Typically, nesting activities have been observed at this colony through September, and these surveys being reported are only through the end of July. Only the peak nest numbers are being reported for each of the bird species.

Table 1. Peak number of wading bird nests in SWA Rookery from February to July 2009.

GREG	SNEG	CAEG	GBHE	LBHE	WOST	WHIB	ANHI	TRHE	Un-identified	Total Nests
124	28	235	1	39	509	582	438	34	51	2,041

The estimated peak number of wading bird nests for the SWA Colony is 2041 which is the same as the previous 2008 season (2042 nests)(Table 1). Despite the drought, there were nests of the following bird species: Great Egrets, Snowy Egrets, Cattle Egrets, Wood Storks, White Ibis, Little Blue Herons, Tricolor Herons, and Anhinga. The Wood Stork nest numbers were much higher this year, peaking at 509 nests (record high for this colony). It should also be noted that there was at least 1-2 Roseate Spoonbill nests with a few fledglings observed from the boat.

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ROSEATE SPOONBILL NESTING IN FLORIDA BAY ANNUAL REPORT 2008-2009

Methods

Spoonbill Colony Surveys.

Forty of the Keys in Florida Bay have been used by Roseate Spoonbills as nesting colonies (Table 1). These colonies have been divided into five distinct nesting regions based on the primary foraging locations utilized by the birds nesting in each region (Figure 1, Lorenz et al. 2002). During the 2008-09 nesting season (Nov 2008-May 2009), complete nest counts were performed in all five regions of the bay by entering the colonies and thoroughly searching for nests. Nesting success was estimated for four of the five regions through mark and revisit surveys at the most active colony or colonies within each region (hereafter referred to as focal colonies). These surveys entailed marking up to 50 nests shortly after full clutches had been laid, and then revisiting the colonies on a seven to ten-day cycle. Nests were monitored until failure or until all surviving chicks reached at least 21 days of age, the age at which chicks begin branching and can no longer be assigned to a nest. In some instances, chicks were observed alive at 18 to 20 days of age, but were no longer in their nests by our next visit. Because there was no indication of colony-wide failure, these chicks were assumed to have survived to the 21-day mark. A colony was considered successful if it averaged at least one chick to 21 days per nesting attempt (c/n). Nest initiation dates are provided in Table 4. We present our results in the context of spoonbill nesting activities in Florida Bay since 1984, the year that the South Dade Conveyance System (SDCS), which has direct water management implications on Florida Bay, was completed (Lorenz 2000, Lorenz et al. 2002).

Banding Program.

The purpose of the banding program is to further our understanding of the movements and population dynamics of the spoonbill population in Florida. Specifically, we are interested in determining where breeding birds disperse to during the non-breeding season, the possibility of breeding bird exchanges between Florida Bay and other breeding locations around the state, and state-wide regional movements of the entire population. We also use re-sights of chicks banded this season, prior to abandoning their natal colonies, as a metric to

support our survival estimates from our nesting surveys. The survival estimates from the banding program tend to be lower than the nesting survey estimates due to the dense foliage in which the birds often hide after leaving their nests. Because of this bias, we use the nesting surveys to assess nesting success. However, the re-sight data does provide qualitative, supporting evidence as to whether nest production was high, moderate or poor. Please refer anyone with information on banded spoonbills to the senior author or our website: (www.audubonofflorida.org/who_tavernier_reportspoonbills.html).

In Florida Bay, spoonbill nestlings were banded at 14 of the 24 colonies that were active this season (Table 3). These 14 colonies were distributed among four of the five regions as follows: Northwest (n = 1), Northeast (n = 5), Southeast (n = 3), and Central (n = 5). Three of the colonies in the Northwest region can experience heavy predation by American Crows when disturbed by humans, and have therefore been omitted from the banding program. Details of our banding procedures are described in the Roseate Spoonbill section of the 2007 South Florida Wading Bird Report, with the one exception that, starting this season, we have changed to a new type of alphanumeric band. The new bands come in a variety of colors, and it is therefore no longer necessary to use the colored celluloid bands to designate the region in which the bird was banded.

Table 1. Number of Roseate Spoonbill nests in Florida Bay November 2008 through March 2009. An asterisk indicates a colony where nesting success surveys were conducted. Second nesting attempts are not included.

			Summary since 1984-85		
Sub-Region	Colony	2008-09	Min	Mean	Max
Northwest	Clive	6	11	27.00	52
	Frank	1	0	53.06	125
	Oyster	1	0	6.06	45
	Palm	62	9	24.00	55
	Sandy*	93	62	154.09	250
	Subtotal	163	65	211.22	325
Northeast	Deer	7	2	6.67	15
	Duck	9	0	1.94	13
	Little Betsy*	21	4	4.00	4
	N. Nest	8	0	0.25	2
	North Park	0	0	18.00	50
	Pass*	7	0	0.50	4
	Porjoe	3	0	28.55	118
	South Nest*	8	0	18.22	59
	Tern	0	0	104.57	184
	Subtotal	63	44	178.00	333
Southeast	Bottle*	5	0	11.41	40
	Cotton	0	0	0.00	0
	Cowpens	0	0	5.88	15
	Crab	0	0	2.13	8
	Crane	0	1	12.81	27
	East	0	0	3.35	13
	East Butternut	3	0	5.87	27
	Low	0	0	0.00	0
	Middle Butternut	4	1	20.67	66
	Pigeon*	23	0	9.38	56
	Stake*	8	0	5.44	19
	West	0	0	2.93	9
	Subtotal	43	39	79.80	117
Central	Calusa*	6	0	12.38	21
	Captain	3	1	5.00	9
	East Bob Allen	0	0	13.89	35
	First Mate	15	1	1.00	1
	Jimmie Channel*	13	6	19.67	47
	Little Jimmie	0	0	6.00	12
	Manatee	0	0	0.19	3
	North Jimmie	2			
	Little Pollock	0	0	2.44	13
	South Park	5	0	10.61	39
	Subtotal	44	15	52.47	96
Southwest	Barnes	0	0	0.27	3
	East Buchanan	0	0	6.13	27
	Twin	3	0	1.67	8
	West Buchanan	0	0	3.40	9
	Subtotal	3	0	10.13	35
	Florida Bay Total	316	332	543.38	880

Spoonbill Monitoring Results

Northwestern Region: Sandy Key

All five colonies within the Northwest region were surveyed in 2008-09. We counted a total of 163 nests, which is well below the average of 211 nests over the last 24 years (Table 1). The number of nests found at the Northwest focal colony, Sandy Key (n=93), was well below the mean of 154 since 1984-85 (Table 1). We marked 50 nests for revisitation at Sandy, but were able to follow the outcome of only 37 nests due to the composition of the colony. Of these 37, 87% were successful, producing an average of 2.11 c/n (Table 2). Total production for Sandy Key was estimated at 196 young (Table 4).

A small second nesting event (n=5) occurred at Palm Key in March. The fate of these nests is not known.

Thirty-four nestlings from 14 nests were banded at the Sandy Key colony (Table 3). Twenty-three (68%) of the banded chicks were re-sighted as fledglings before abandoning their natal colony, providing a minimum production estimate of 1.64 c/n (23 chicks from 14 nests), which supports the high production estimate of 2.11 c/n from the nesting surveys.

Spoonbills nesting in the Northwest region forage primarily on Cape Sable, which is relatively isolated from direct water management practices associated with the SDCS, allowing the Northwest colonies to be used as a control for comparison with the other regions. If the Northwest colonies perform well while the other four regions perform poorly, then water management practices may be implicated as a possible cause of the poor nesting success in the other regions (Lorenz and Frezza, 2007). This season, the Northwest region experienced extremely high production rates when compared to the productivity in the region since 1984-85 (mean = 1.27; Table 2). Therefore we would expect that, in the absence of anthropogenic impacts, the other regions would also experience high productivity.

Table 2. Mean number of chicks to 21 days per nesting attempt and the percentage of nests that were successful. Success is defined as a mean of at least one chick to 21 days per nesting attempt. Summary figures refer to the focal colony or colonies surveyed in each year. Numbers in parentheses indicate how many years each region has been surveyed since 1984-85. Second nesting attempts are not included.

		2008-09		Summary since 1984-85			
Region	Colony	Nesting Season		Min	Mean	Max	% Years Successful
Northwest	Sandy	2.11	87%	0.00	1.27	2.50	67% (n=21)
Northeast	Pass	1.43	71%				
	South Nest	2.13	75%				
	Little Betsy	1.73	82%				
	Region Total	1.77	77%	0.00	0.85	2.20	48% (n=21)
Southeast	Stake	2.25	88%				
	Pigeon	2.05	77%				
	Bottle	1.80	60%				
	Region Total	2.06	77%	0.14	0.97	2.09	45% (n=11)
Central	Calusa	1.33	67%				
	Jimmie Channel	2.25	100%				
	Region Total	1.86	86%	0.00	0.83	1.71	36% (n=11)

Northeast Region: Pass, South Nest and Little Betsy Keys

All nine spoonbill nesting colonies were surveyed in the Northeast region. As in recent years, the nesting effort in the Northeast region was alarmingly small. All seven active colonies in the region combined had only 63 nests in 2008-09, compared to over 300 nests 17 years ago and almost 700 nests 30 years ago. The nest count of 63 was well below the average of 178 nests since 1984-85, and is the second-lowest nest count for the region during that period (lowest count of 44 nests was in 2007-08; Table 1).

Until recently, spoonbills had nested on Tern Key every year since 1984-85 (no surveys were conducted in 1993-94), but nesting was absent here during the 2007-08 and 2008-09 breeding seasons. The lowest previous nesting effort on Tern Key (n=60) was in the 1998-99 nesting season. Pass, South Nest, and Little Betsy Keys, the focal colonies for the Northeast region this season, together constituted 57% of the nests initiated in the region.

Prior to this season, Pass Key had not been used by spoonbills as a nesting colony since the mid-1980s. This season the Pass Key colony contained seven nests, the largest nesting effort on the island ever recorded (Table 1). The colony was successful, producing an average of 1.43 c/n (Table 2). Seventy-one percent of the nest attempts were successful, and total production for the colony was estimated at 10 fledglings (Table 4). Eight nests were initiated at South Nest Key, which was below the mean of 18 nests since 1984-85 (Table 1). However, the island produced a successful 2.13 c/n, and 75% of the nests on the island were successful (Table 2). Total production for the colony was estimated at 17 fledglings (Table 4). Little Betsy Key was first discovered in the 2007-08 season. This year it was the largest nesting colony in the region, with 21 nests (Table 1). We were able to determine nest fate for 11 of those 21 nests. Of those 11, 82% were successful, producing an average of 1.73 c/n and an estimated 36 fledglings (Table 4). For the region as a whole, productivity was estimated at 1.77 c/n with a success rate of 77% (Table 2).

A very small second nesting event (n=1) occurred at Little Betsy Key in mid-February. That nest contained two chicks of approximately 19 days of age when last checked on Mar 31.

In the Northeast region, 46 nestlings were banded from 18 nests within five colonies (Deer, South Nest, North Nest, Pass, and Little Betsy Keys; Table 3). Twenty-eight (61%) of the banded chicks were observed as fledglings before abandoning their natal colony, providing a minimum production estimate of 1.56 c/n (28 chicks from 18 nests), which supports the high production estimate of 1.77 c/n from the nesting surveys.

From the late 1960s through the early 1990s, the Northeast region was the most productive region of the bay (Lorenz et al. 2002). Starting with construction of the SDCS in 1982, the Northeast region became heavily impacted by major water control structures that lie immediately upstream from the foraging grounds utilized by birds nesting there (Lorenz 2000). Since completion of the SDCS in 1984, spoonbills nesting in the Northeast region have only been successful in drought years and in years following a drought year (Lorenz and Frezza, 2007).

This phenomenon has been well documented for other wading bird species nesting in the Everglades (Frederick and Ogden, 2001). This season was neither a drought year nor a year following a drought year, yet spoonbills had one of the highest production rates since 1984-85. Furthermore, this is the second consecutive year in which spoonbills were successful in all four regions where nesting surveys were conducted, and the fourth consecutive year in which both the Northwest and Northeast regions were successful (provided that the production rate of 0.96 c/n in the Northeast region in 2006-07 is placed in the category of a successful year). Out of these four years, only one (2005-06) was a year following a drought year, and none was a drought year. This period of unprecedented success is likely due to weather patterns favorable to both water managers and spoonbills, characterized by wet seasons with slightly higher than normal rainfall and dry seasons with slightly lower than normal rainfall. These conditions resulted in relatively few conflicts for water managers when managing for flood control of urban and agricultural lands, while still providing proper conditions for the natural environment. Although these conditions are likely the primary reason for spoonbill nesting success in recent years, during this same time period there also was a change in the way that water management decisions were made at the South Florida Water Management District (SFWMD). Beginning with the 2005-06 nesting season, water managers consulted with spoonbill biologists (namely Audubon staff) prior to making any decisions that might affect conditions on the spoonbill foraging grounds. These consultations resulted in the avoidance of decisions that could adversely affect spoonbill nesting success.

Southeast Region: Stake, Pigeon, and Bottle Keys

All 12 of the Southeast colonies were surveyed for nesting activity in 2008-09, only five of which were active (Table 1). Forty-three nests were initiated in the region, well below the mean of 80 nests since 1984-85 (Table 2). Stake, Pigeon, and Bottle Keys, the focal colonies for the Southeast region this season, together made up 84% of the nests initiated in the region.

Eight nests were initiated on Stake Key this season, compared with a mean of five since 1984-85 (Table 1). Eighty-eight percent of the nests were successful, producing a mean of 2.25 c/n (Table 2) and an estimated 18 fledglings (Table 4). We were able to determine the fate of 22 of the 23 nests initiated on Pigeon Key, 77% of which were successful, producing a mean of 2.05 c/n (Table 2) and an estimated 47 fledglings (Table 4). Five nests were initiated on Bottle Key this season, which is well below the mean of 11 since 1984-85 (Table 1). Sixty percent of the nests were successful, producing an average of 1.80 c/n (Table 2) and an estimated nine fledglings (Table 4). For the region as a whole, productivity was estimated at 2.06 c/n with a success rate of 77%.

Forty-three nestlings were banded from 16 nests within three colonies (Stake, Pigeon, and Bottle Keys; Table 3). Three (7%) of these chicks were found dead prior to fledging and 32 (74%) were observed as fledglings before they abandoned their natal colony, providing a minimum production estimate of 2.00 c/n (32 chicks from 16 nests) which supports the high production estimate of 2.06 c/n from the nesting surveys.

Historically, birds nesting in the Southeast colonies foraged primarily in the mangrove wetlands on the mainline Florida Keys. Although most of these wetlands were filled by 1972 as part of a Keys development boom, we presume (based on anecdotal evidence) that the few remaining Keys wetlands still serve as important foraging grounds for these birds. Since 1972, nesting attempts in the Southeast region have fared poorly, with only seven successful years in the 18 years surveyed (39%). In addition, the Southeast region is also directly impacted by the SDCS, although not to the same extent as the Northeast region. This season's success rate of 2.06 c/n for the region was well above the average of 0.97 c/n since 1984-85 (Table 2). Based on previous studies, however, it appears that the quality of the Southeast region for nesting spoonbills is marginal at best, thereby explaining the low overall effort. Prior to the Keys land boom, spoonbills nesting in the southern regions of the bay

Table 3. Roseate Spoonbill chicks banded in Florida Bay between December 2008 and April 2009.

Region	Colony	# nests banded	# chicks banded	# resighted as fledglings	% resighted as fledglings	# found dead	% found dead	# unknown fate	% unknown fate
Northwest	Sandy	14	34	23	68%	0	0%	11	32%
Northeast	Deer	3	9	0	0%	0	0%	9	100%
	South Nest	5	14	8	57%	0	0%	6	43%
	North Nest	2	5	5	100%	0	0%	0	0%
	Pass	4	9	6	67%	0	0%	3	33%
	Little Betsy	4	9	9	100%	0	0%	0	0%
	Subtotal	18	46	28	61%	0	0%	18	39%
Southeast	Stake	3	8	8	100%	0	0%	0	0%
	Pigeon	11	29	23	79%	3	10%	3	10%
	Bottle	2	6	1	17%	0	0%	5	83%
	Subtotal	16	43	32	74%	3	7%	8	19%
Central	Calusa	1	1	1	100%	0	0%	0	0%
	Jimmie Channel	10	23	6	26%	0	0%	17	74%
	Captain	2	4	1	25%	0	0%	3	75%
	First Mate	2	3	1	33%	0	0%	2	67%
	South Park	2	2	0	0%	0	0%	2	100%
	Subtotal	17	33	9	27%	0	0%	24	73%
Florida Bay Total		65	156	92	59%	3	2%	61	39%

averaged more than two fledglings per nest and were successful in all 17 years in which surveys were conducted (Lorenz et al. 2002).

Central Region: Calusa and Jimmie Channel Keys

A new nesting colony was discovered this year in the Central region. It is located just to the North of Jimmie Channel Key, and is therefore named North Jimmie Key. All ten of the Central colonies were surveyed for nesting activity in 2008-09, six of which were active. Forty-four nests were initiated, low when compared to the mean of 53 nests since 1984-85 (Table 1). Calusa and Jimmie Channel Keys, the focal colonies for the Southeast region this season, together made up 43% of the nests initiated in the region.

A total of six nests were initiated on Calusa Key, 67% of which were successful, producing a mean of 1.33 c/n (Table 2) and an estimated eight fledglings (Table 4). A total of 13 nests were initiated on Jimmie Channel Key. We were able to determine the fate of eight of the 13 nests, 100% of which were successful, producing an average of 2.25 c/n (Table 2) and an estimated 29 fledglings (Table 4). For the region as a whole, productivity was estimated at 1.86 c/n with a success rate of 86%.

A small second nesting event occurred at two of the colonies in the Central region. In the first half of March, five nests were initiated on First Mate Key. Nest fate was determined for three of these five nests, 67% of which were successful, producing a mean of 1.33 c/n and an estimated seven fledglings. Between early February and mid-March, four nests were initiated on Calusa Key. Nest fate was determined for three of these four nests, 100% of which were successful, producing an average of 1.67 c/n and an estimated seven fledglings.

Thirty-three nestlings from 17 nests within five colonies (Calusa, Jimmie Channel, Captain, First Mate, and South Park Keys; Table 3) were banded in the Central region. Nine (27%) of the banded chicks were re-sighted as fledglings before they abandoned their natal colony, providing a minimum production estimate of 0.53 c/n (9 chicks from 17 nests). While this figure does not support the high production estimate of 1.86 c/n from the nesting surveys, 23 of the 33 nestlings (70%) banded in the Central region this season were banded at Jimmie Channel Key (Table 3), where re-sights of fledged young tend to be lower than on most other islands.

Significant nesting in the Central region is a relatively new phenomenon, having started in the mid-1980s. Little data has been collected on where these birds forage, but the central location suggests that they may be opportunistically exploiting the primary resources utilized by birds nesting in the other four regions (Figure 1). This foraging strategy may cost more energetically, due to longer flights to foraging areas, but the increased likelihood of finding suitable foraging habitat may counterbalance that cost. Based on flight-line counts and fixed-wing aircraft observations, it appears that at least some of the birds from the Central region are flying over the Russell and Black Betsy Keys to the Taylor Slough area to forage. The average distance from the Central colonies to the mouth of Taylor River (closest point on the mainland) is 16 km, a distance greater than the mean foraging flight distance of 12.4 km calculated for spoonbills nesting in Florida Bay (Lorenz et al. 2002).

Southwestern Region: Twin Keys

All four colonies in the Southwest region were surveyed in 2008-09 but only one, Twin Key, was active (Table 1). Two of the three nests initiated on Twin Key were successful, while the fate of the third nest is unknown. The chicks were not banded.

A very small second nesting event (n=1) occurred at Twin Key in mid-February. That nest contained one chick of approximately 16 days of age when last checked on Apr 1.

Table 4. Estimated dates of nesting events for focal colonies surveyed in the 2008-09 nesting season. All dates refer to the first egg laid in each clutch or the first egg to hatch in each clutch. The estimated number of chicks fledged from each focal colony is also presented.

		Nest Initiation Dates				
Region	Colony	Earliest Nest	Latest Nest	Mean Lay	Mean Hatch	Est. # of chicks fledged
Northwest	Sandy	6-Nov-08	19-Nov-08	11-Nov-08	4-Dec-08	196
Northeast	Pass	26-Nov-08	16-Dec-08	3-Dec-08	26-Dec-08	10
	South Nest	24-Nov-08	30-Nov-08	27-Nov-08	20-Dec-08	17
	Little Betsy	28-Nov-08	16-Jan-09	20-Dec-08	12-Jan-09	36
	Region Means			11-Dec-08	3-Jan-09	
Southeast	Stake	8-Nov-08	26-Nov-08	14-Nov-08	7-Dec-08	18
	Pigeon	28-Nov-08	26-Dec-08	9-Dec-08	1-Jan-09	47
	Bottle	23-Nov-08	29-Nov-08	27-Nov-08	20-Dec-08	9
	Region Means			26-Nov-08	19-Dec-08	
Central	Calusa	16-Nov-08	16-Dec-08	30-Nov-08	23-Dec-08	8
	Jimmie Channel	7-Nov-08	30-Nov-08	17-Nov-08	10-Dec-08	29
	Region Means			21-Nov-08	14-Dec-08	

Bay-wide Synthesis

In all, 156 chicks were banded from 65 nests across Florida Bay. Of these, three (2%) were found dead, and 92 (59%) were observed as fledglings before leaving their natal colony (Table 3). As of July 27, 2009, three of those birds have been re-sighted away from their natal colony.

Florida Bay birds have been re-sighted in Brevard, Collier, Hendry, Hillsborough, Lee, Miami-Dade, Monroe, Nassau, Palm Beach, Pasco, Pinellas, Polk, Seminole, St. Johns, and Wakullah Counties. Between March 2003 and January 2008, 1522 nestlings were banded with a colored, alphanumeric band in Florida Bay. As of July 27, 2009, 93 (6%) of those 1522 banded birds have been re-sighted. Of those 93, 32 (34%) have been re-sighted on two or more occasions. In comparison, between April 2003 and May 2008, 986 spoonbill nestlings were banded with a colored, alphanumeric band within nesting colonies in the Tampa Bay region. As of July 27, 2009, 226 (23%) of those 986 banded birds have been re-sighted. Of those 226, 99 (44%) individuals have been re-sighted on two or more occasions, including one individual reported over 12 times. Of a total of 323 re-sightings reported from across the state (includes three re-sights of nestlings banded in 2008-09) as of July 27, 2009, 226 (70%) were birds banded in Tampa Bay while only 96 (30%) were birds banded in Florida Bay. This further suggests that Florida Bay's productivity has been greatly diminished. Migrations from Florida Bay southward to Cuba and the Yucatan Peninsula, however, cannot be discounted as a cause for the low re-sightings from Florida Bay.

These data continue to demonstrate that Florida Bay is no longer the principal source location for spoonbill recruitment into Florida's breeding population. Bay-wide, the Roseate Spoonbill nesting effort in 2008-09 was the lowest year on record since the completion of the SDCS in 1984 (n=316 nests; Table 1), indicating a continued downward trend.

Based on our banding and tracking studies of Roseate Spoonbills, we estimate that the average age at mortality in the wild is probably close to 25 years. Based on this assumption, most of the spoonbills hatched in Florida Bay prior to completion of the SDCS are no longer alive. Because there were only seven successful nesting years (provided that the production rate of 0.94 c/n in 2000-01 is placed in the category of a successful year) between 1982-83 and 2003-04 in the Northeast region (Lorenz and Frezza 2007), the most productive region of the bay for much of this time period, it is highly unlikely that the breeding adults from the pre-SDCS period were being replaced in the population at the same historical rate that occurred from 1935 to 1978 (Lorenz et al. 2002). In addition, we have found that the vast majority of spoonbills return to the area of their natal colonies to nest, indicating that the Florida Bay population is largely closed to immigration. Thus, the number of chicks reaching sexual maturity has been lower than the number of adults lost to mortality, resulting in a reduction in breeding-age birds in the bay and an associated decline in nesting effort. We predict that the two consecutive years of bay-wide nesting success in 2007-08 and 2008-09, combined with the prior two consecutive years of successful reproduction in the Northwest and Northeast colonies, will result in a reversal of this decline in nesting activity over the next few years, as the chicks hatched over the last four years should reach sexual maturity and return to the bay to nest. If these preliminary results hold true, then the actions of the SFWMD in considering spoonbills in water management decisions (which, at least in part, led to those years of success) may have prevented this iconic species of Florida Bay from becoming locally extirpated. Although these efforts are much appreciated for the time being, ultimately the goal of the Comprehensive Everglades Restoration Plan is to restore the system such that spoonbills (and the other species for which they serve as an umbrella indicator species) successfully reproduce without the intervention of water managers. In the short term, completion of Phase 1 of the C-111 Spreader Canal Project will be the first productive step toward achieving that goal.

Corrections to the 2007-08 South Florida Wading Bird Report

While compiling this report for the 2008-09 Roseate Spoonbill nesting season, we discovered multiple discrepancies between the data that was collected in the 2007-08 field season, and what was reported in the 2007-08 South Florida Wading Bird Report. It appears that the report was written from an earlier version of the database that did not contain the complete set of field observations. In addition, there were also errors made in the calculations. These mistakes were minor and resulted in no significant changes in the results and conclusions of last year's report. However, we feel that the erroneous numbers need to be corrected. Tables 5-8 present the corrected data and indicate where mistakes were made in the 2007-08 South Florida Wading Bird Report. A corrected version of the entire 2007-08 report can be requested from the senior author.

Table 5. Number of Roseate Spoonbill nests in Florida Bay November 2007 through March 2008. Numbers in parentheses are the incorrect figures reported in the 2007-08 South Florida Wading Bird Report. An asterisk indicates a colony where nesting success surveys were conducted. Second nesting attempts are not included.

			Summary since 1984		
Region	Colony	2007-08	Min	Mean	Max
Northwest	Sandy*	80	62	157.45	250
	Frank	42	0	53.75	125
	Clive	27	11	27.00	52
	Oyster	0	0	6.44	45
	Palm	55	9	16.25	21
	Subtotal	204	65	211.55	325
Northeast	Tern	0	60	109.32	184
	North Nest	2	0	0.13	1
	South Nest*	12 (13)	0	18.59	59
	Porjoe	10	0	29.53	118
	North Park	0	0	19.06	50
	Duck	1	0	2.00	13
	Pass	0	0	0.53	4
	Deer*	15	2	2.50	3
	Little Betsy	4			
	Subtotal	44 (41)	101	185.88	333
Southeast	Middle Butternut	3	1	21.71	66
	Bottle	11	0	11.44	40
	Stake*	11	0	5.07	19
	Cowpens	2	0	6.13	15
	Cotton	0	0	0.00	0
	West	1	0	3.07	9
	Low	0	0	0.00	0
	Pigeon	17	0	8.87	56
	Crab	0	0	2.29	8
	East	0	0	3.56	13
	Crane	1	2	13.60	27
	East Butternut*	9	0	5.64	27
	Subtotal	55	39	81.57	117
Central	East Bob Allen	0	0	14.71	35
	Manatee	3	0	0.00	0
	Jimmie Channel*	11 (14)	6	20.18	47
	Calusa*	12 (13)	0	12.43	21
	Little Pollock	0	0	2.75	13
	S. Park	0	0	11.24	39
	Little Jimmie	0	12	12.00	12
	First Mate	1	1	1.00	1
	Captain	1	9	9.00	9
	Subtotal	28 (36)	15	54.00	96
Southwest	East Buchanan	0	0	6.53	27
	West Buchanan	0	0	3.64	9
	Barnes	0	0	0.29	3
	Twin	1	0	1.71	8
	Subtotal	1	0	10.79	35
	Florida Bay Total	332 (341)	429	557.47	880

Table 6. Mean number of chicks to 21 days per nesting attempt and the percentage of nests that were successful. Success is defined as a mean of at least one chick to 21 days per nesting attempt. Summary figures refer to the focal colony or colonies surveyed in each year. Numbers in parentheses for 2007-08 are the incorrect figures reported in the 2007-08 South Florida Wading Bird Report. Numbers in parentheses for the summary figures indicate how many years each region has been surveyed since 1984-85. Second nesting attempts are not included.

				Summary since 1984			
							% Years
Region	Colony	2007-08 Nesting Season		Min	Mean	Max	Successful
Northwest	Sandy	1.30 (1.76)	70% (90%)	0.00	1.27	2.50	65% (n=20)
Northeast	Deer	1.69 (1.77)	100% (87%)				
	South Nest	1.67	92%				
	Region Total	1.68	96%	0.00	0.80	2.20	45% (n=20)
Southeast	Stake	1.20	80%				
	East Butternut	1.11	67%				
	Region Total	1.16	74%	0.14	0.95	2.09	40% (n=10)
Central	Calusa	1.00 (.92)	58% (50%)				
	Jimmie Channel	1.00	73%				
	Region Total	1.00	65%	0.00	0.81	1.71	30% (n=10)

Table 7. Roseate Spoonbill chicks banded in Florida Bay and Tampa Bay between December 2007 and May 2008. Numbers in parentheses are the incorrect figures reported in the 2007-08 South Florida Wading Bird Report.

Estuary	Region	Colony	# nests banded	# chicks banded	# resighted as fledglings	% resighted as fledglings	# found dead	% found dead	# unknown fate	% unknown fate
Florida Bay	Northwest	Sandy	13	30	6	20%	2	7%	22	73%
	Northeast	Deer	11	20	0 (15)	0% (75%)	0	0%	20 (5)	100% (25%)
		South Nest	6	14	0 (8)	0% (57%)	0	0%	14 (6)	100% (43%)
		North Nest	1	2	0 (1)	0% (50%)	0	0%	2 (1)	100% (50%)
		Subtotal	18	36	0	0%	0	0%	36	100%
	Southeast	Stake	6	11	1 (8)	9% (73%)	2	18%	8 (1)	73% (9%)
		East Butternut	2	2	1	50%	0	0%	1	50%
		Pigeon	6	10	0 (4)	0% (40%)	0	0%	10 (6)	100% (60%)
		Bottle	5	12	5	42%	1	8%	6	50%
		Subtotal	19	35	7	20%	3	9%	25	71%
	Central	Calusa	9	16	5 (7)	31% (11%)	1	6%	10 (8)	63% (50%)
		Jimmie Channel	10	18	3	17%	5	28%	10	56%
		Subtotal	19	34	8	24%	6	18%	20	59%
		Florida Bay Total	69	135	21 (58)	16% (43%)	11	8%	103 (66)	76% (49%)
Tampa Bay		Alafia Bank	34	62	52	84%	0	0%	10	16%

Table 8. Estimated dates of nesting events for focal colonies surveyed in the 2007-08 nesting season. All dates refer to the first egg laid in each clutch or the first egg to hatch in each clutch. The estimated number of chicks fledged from each focal colony is also presented.

		Nest Initiation Dates				
Region	Colony	Earliest Nest	Latest Nest	Mean Lay	Mean Hatch	Est. # of chicks fledged
Northwest	Sandy	15-Nov-07	2-Dec-07	22-Nov-07	15-Dec-07	104
Northeast	Deer	28-Nov-07	14-Dec-07	7-Dec-07	30-Dec-07	25
	South Nest	30-Nov-07	10-Dec-07	4-Dec-07	27-Dec-07	20
	Region Means			6-Dec-07	29-Dec-07	
Southeast	Stake	25-Nov-07	14-Dec-07	6-Dec-07	29-Dec-07	13
	East Butternut	25-Nov-07	20-Dec-07	6-Dec-07	29-Dec-07	10
	Region Means			6-Dec-07	29-Dec-07	
Central	Calusa	17-Nov-07	4-Dec-07	25-Nov-07	18-Dec-07	12
	Jimmie Channel	12-Nov-07	12-Dec-07	27-Nov-07	20-Dec-07	11
	Region Means			26-Nov-07	19-Dec-07	

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Literature Cited

Frederick, P.E. and J.C. Ogden. 2001. Pulsed breeding of long legged wading birds and the importance of infrequent severe drought conditions in the Florida Everglades. Wetlands 21:484-491.

Lorenz, J.J. 2000. Impacts of water management on Roseate Spoonbills and their piscine prey in the coastal wetlands of Florida Bay. Dissertation, University of Miami, Coral Gables, FL, USA.

Lorenz, J.J., J.C. Ogden, R.D. Bjork, and G.V.N. Powell. 2002. Nesting patterns of Roseate Spoonbills in Florida Bay 1935-1999: Implications of landscape scale anthropogenic impacts. Pp. 563-606 *in* J.W. Porter and K.G. Porter (eds.). The Everglades, Florida Bay, and coral reefs of the Florida Keys: An ecosystem sourcebook. CRC Press, Boca Raton, FL.

Lorenz J.J. and P.E. Frezza. 2007. Development of hydrologic criteria for the Southern Everglades and South Dade Conveyance System to benefit Roseate Spoonbill colonies of Northeastern Florida Bay. Final Report to the South Florida Water Management District.

HOLEY LAND AND ROTENBERGER WMAS

Systematic wading bird surveys were not conducted this year in Holey Land or Rotenberger WMAs. No wading bird nests were observed during aerial white-tailed deer surveys in May 2009.

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2009 WADING BIRD REPORT FOR BIG CYPRESS NATIONAL PRESERVE

In January 2009, Big Cypress staff surveyed a sample of historic Wood Stork rookeries in the Loop, Stairsteps, and Corn Dance Units of the Preserve. No nesting activity was observed. Between April 23 and May 14, 3 small Wood Stork rookeries were located, ranging from 8 to 27 nests. One rookery failed and the other 2 likely fledged the majority of their young. In addition, 4 Great Egret rookeries were located in mid-May, all with young near fledging age.

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WADER NESTING COASTAL SOUTH SOUTHWEST FLORIDA 2009

The nesting season started on time with GBHE nesting in mid December, and GREGs were also on schedule building nests at Marco Colony in March. Small waders got going late and in low numbers by mid April. Rainfall was minimal during the beginning of the year for the fourth year in a row and water levels were low both inland and on the coast (see hydrology). Wader nesting this year was similar to, but not the same as, the last three years which were very dry also. It may be appropriate to blame the differences among years on the weather but the existing trends have been going on considerably longer than the extremes in weather we have experienced over the last few years. The large waders had a fair year with moderate numbers of nests and fledglings. The small waders produced only limited numbers of nests but seem to be bringing off reasonable numbers of fledglings at the time of this writing.

Hydrology

As with the last two years, the coastal ponds at Rookery Bay dried down completely this year. This is the first time in the 27 years I have been monitoring pond water levels in Rookery Bay Research Reserve that these ponds have dried completely for three years in a row. 2009 is also the first year that the ponds remained dry for almost three months. The Lettuce Lakes in Corkscrew Swamp Sanctuary were dry for the fourth year in a row, this has never happened in the 46 continuous years of record keeping. At least along this part of the Florida coast the last four years have been a very unusual period.

Location and Methods

Note: Again this year there was a change in nest censusing methods due to the amount of debris left in the understory of the colonies by hurricane Wilma and the exceptional growth of the live mangrove left on the islands that has become very dense (see each colony description for details).

Rookery Bay (RB): 26°01'51"N 81°44'43"W. This year one red mangrove island, 0.14 ha. Nest census conducted 7/8, boat, 2 observers for 0.5 hour.

Marco Colony (ABC): (named ABC Islands by State of Florida): 25°57'24"N 81°42'13"W. Three Red Mangrove islands, 2.08 ha., nest census conducted 6/12, one observer, walk through for three hours.

Smokehouse Key: (SK): (This colony formerly named Henry Key, now named for the closest body of water) 25°54'51"(.476)N-81°42'52"(.838)W. One island in Caxambas Pass, 0.8579 hectares, red mangrove; a little terrestrial vegetation on sand ridge in center, censused on 6/13, by boat, for one hour, one observer.

East River (ER): 25°55'39"N 81°26'35"W. Three Red Mangrove islands, 0.25 ha. Three Red Mangrove islands, approx. 0.25 ha. Nest census conducted 7/2, by canoe, complete coverage, two observers, for one hour.

Chokoloskee Bay (CHOK): 25°50'43"N 81°24'46"W. Four red mangrove islands, approx. 0.2 ha. This year the waders used all four islands, boat census, 6/20, two people, one hour.

Note: All of the censuses are conducted during peak nesting and this varies according to species and timing.

Sundown Censusing

For two of the colonies above, birds coming in to roost for the night are censused at sundown; the goal of this project is to get an index of the numbers and species in the area, year round. References below as to the use of the area by the different species are derived from these projects.

Marco Colony (ABCSD)

Was censused monthly with two boats and various numbers of volunteers (4-8). Boats were anchored in the two major flyways (North and East), and we recorded species and numbers of birds flying in (and out during the nesting season) one hour before sunset to one half hour after sunset. This project is ongoing and started in 1979.

Rookery Bay (RBSD)

Was censused every two weeks with one boat and two observers (one a volunteer). The boat was anchored so that most of the birds were observed flying in one hour before sunset to one half hour after sunset. We recorded, species and numbers of birds flying in (and out during the nesting season). This project is ongoing and started in 1977.

Species Accounts

Great Egret

Nothing unusual about their nesting this year. There were two waves of nesting which apparently produced fair numbers of fledglings. These fledglings were seen feeding in the general area. Numbers of nests of this species have increased from 1983-1998, but since then appear to have leveled off.

Snowy Egret, Little Blue Heron, Tricolored Heron and Cattle Egret

With slight variations all of these species have had a similar nesting pattern. Nesting started late and in smaller numbers than usual, but appeared to be producing good numbers of chicks per nest (Table 1).

Reddish Egret

Produced the third highest number of nests recorded in the area in 2009 but they did not appear to fledge as many young as in previous years.

Table 1. Peak Wader Nests Counts in Coastal Southwest Florida 2009.

Colony	GBHE	GREG	SNEG	LBHE	TRHE	REEG	CAEG	WHIB	GLIB	Total
Rookery Bay		22	4		6		2			34
Marco (ABC)	22	152	27		77	10	34			322
Smokehouse Key		30	25		19	1				75
East River			3	1	30					34
Chokoloskee Bay	1	102	1							104
Total	23	306	60	1	132	11	36	0	0	569
Mean (27 years)	12	208	254	51	412	5	359	38	43	1382

White Ibis
This species did not attempt to nest at Marco or Smokehouse this year but reports suggest they attempted nesting at East River.

Glossy Ibis
No nesting attempts this year.

Sundown Censusing
For the herons and egrets the numbers coming in at the Marco colony (ABCSD) to roost at night reflect the nesting trends. White Ibis are another matter; they either do not nest or nest is such small numbers in the colonies studied that there is no way to compare nesting to sundown roosting. In this year's censusing fledgling WHIB started back a little late and are slightly lower than usual, most likely indicating lower productivity this year.

Same conclusion as last year "What is most impressive about all this is that no matter what (storms, people or environmental change) coastal waterbirds keep using the same colonies in whatever condition. It would be easy to believe that with so much change going on, the birds would try to find somewhere else to live. That they keep trying at the same old places; really is a testament to the value of those islands."

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UPCOMING MEETINGS

American Ornithologists' Union, 128th Stated Meeting.
Cooper Ornithological Society Annual Meeting.
Society for Canadian Ornithologists Annual Meeting.
Jointly meeting, 7-11 Feb 2010. San Diego, California.
- www.birdmeetings.org/cosaousco2010/

The Wildlife Society Annual Conference.
3-7 Oct 2010. Snowbird, Utah.
- www.wildlife.org/

WADING BIRD NESTING AT LAKE OKEECHOBEE

Introduction
The first aerial Surveys of nesting wading bird colonies began on Lake Okeechobee in 1957 (David 1994, Smith and Collopy 1995, Zaffke 1984). These surveys were conducted from 1957-1959, 1961, and 1970-1976 with nest counts ranging from a high of 10,400 in 1974 to a low of 130 nests in 1971 (David 1994) These surveys were usually done once during the breeding season and could have underestimated peak nest effort. From 1977- 1992 more systematic monthly surveys were conducted by the South Florida Water Management District to assess the effects of water management on wading bird populations (David 1994, Smith and Collopy 1995).

In 2005, Florida Atlantic University continued the wading bird nesting surveys to determine location and size of colonies as a part of the CERP Monitoring and Assessment Plan. We saw a high nesting effort in 2006 with 11,310 nests, and a low nesting effort in 2007 and 2008, with 774 and 38 nests, respectively. The year 2008 had the lowest reported nesting effort since surveys began in the 1957. Herein we report our findings for 2009.

Methods
During the dry season of 2009, Florida Atlantic University conducted wading bird nesting surveys to determine timing and location of breeding populations as a part of the CERP Monitoring and Assessment Plan. Once a month, two observers, one on each side of a Bell Jet Ranger 206, surveyed wading bird nests along aerial transects at an altitude of 244 m (800 ft) at a speed of 185 km/h (100 knots). One transect was flown from Eagle Bay Island and followed the eastern rim of the Lake to Ritta Island. The remainder of transects were East-West and spaced at a distance of 3 km (1.6 nautical miles). When a group of large white wading birds were detected, the helicopter lowered to an elevation of 122 m (400 ft) and circled the location to verify if birds were nesting. If it was determined to be a colony, nests counts were made and species composition was recorded. Colonies were defined as any assemblage of at least two nests that were separated by greater than 200 meters (Erwin et al 1981, Smith and Collopy 1995). We also recorded photographs and geographic location. The colonies accessible by airboat were visited to improve count accuracy.

Rainfall and hydrology data was obtained from the South Florida Water Management District's DBHYDRO database. The lake stage is calculated as the mean of four principle gages in the pelagic zone of Lake Okeechobee (L001, L005, L006, and LZ40). All elevation data is presented in National Geodetic Vertical Datum 1929 (NGVD 1929) and locations are in North American Datum 1983 (NAD 1983).

Hydrology
This year was a year of extremes in terms of hydrology. It began with Tropical Storm Fay raising the lake level almost two feet. And according to SFWMD, this was the driest dry season and wettest May since records began. On 1 Jan 2009, the lake was at 4.3 m (14 ft). This dropped to a low of 3.2 m (10.6 ft) on May 18 and then rose to 3.5 m (11.3 ft) by May 31 (Fig. 1).

Throughout the dry season, suitable habitat for foraging wading birds shifted across the littoral zone toward the limnetic zone. By the end of this season, only the edge by the limnetic zone provided foraging habitat. In June, many flight lines of wading birds from the Eagle Bay East Colony were heading NW over the levee toward pocket marshes in more upland habitat (Marx and Gawlik 2006).

Results and Discussion

Locations and Size

Eighteen colonies were located (Fig. 2), sixteen on-lake and two off-lake, with a total of 9185 estimated nests. This number was derived by summing the peak nesting month for all species except for Anhingas and Cattle Egrets (Table 1). For historical comparisons, one nest total was tallied for Great Egrets (GREG), Great Blue Herons (GBHE), White Ibises (WHIB), and Snowy Egrets (SNEG), and one for those species plus Glossy Ibises (GLIB). These totals were 8169 and 6154 respectively. These nest counts ranked as the fourth highest since first aerial surveys began in 1957 by the Florida Audubon Society (David 1994). However, we counted only 329 GREG nests, which was 48% of the historic mean for all survey years. This was not surprising because GREG numbers tend to be low when the January stage is <4 m. Given that this year's January stage was 4.16 m, the numbers of GREG nests we observed matched what we expected (Fig 3).

Both traditional and novel colony sites were established this year (Table 2). With stage levels at 4.1 m by March 1, colonies located in traditional littoral areas were avoided or abandoned. By the March flights, no colony within the Moore Haven marsh was active. In contrast, the deeper Moonshine Bay contained the largest multi-species colony, with an estimated 4229 nests. Rock Island, Clewiston Spit, and the Clewiston Channel colonies were all active through the end of the dry season, presumably because of deeper water surrounding these colonies. Colonies outside the levee, Lakeport and Gator Farm, were located on a canal and pond, respectively, thereby providing permanent water around the colony regardless of drying patterns.

Timing and Success

By the first survey on January 28, Great Egrets and Great Blue Herons were found nesting in the Moore Haven area, Eagle Bay Island, and two off lake locations at Lakeport and Gator Farm. By the February survey, most of the Moore Haven marsh was dry and the GREG within the colony had abandoned. Nests of Great Egrets did not increase during the following months, but there was a large influx of small ardeids and ibis that began nesting on the lake by mid March.

On February 26, 3 GBHE and 3 GREG nests were found by airboat at Indian Prairie. By March, small ardeids and ibis began courting and building nests. Of note was the discovery of 3 Roseate Spoonbills nests within this colony. These nests later failed. The high failure rate of all nests at the colony was probably due a low water level that left almost all the Indian Prairie area dry with no aquatic prey and no protection from terrestrial predators. In contrary, lower elevation locations in Moonshine Bay had increased activity. These colonies consisted of GREG, SNEG, WHIB, GBHE, and GLIB. Small ardeids greatly outnumbered the larger birds. The largest colony, Moonshine Bay, still had large numbers of fledglings on our last survey in June.

Nesting east of Eagle Bay was detected on March 25. Continued ground visits showed that most nests were still in the incubation stage as of March 28. These colonies were predominately occupied by smaller ardeids and ibis. This colony remained active through the last surveys.

Wood Storks and Roseate Spoonbills

Since 2007, a small colony of Wood Storks has developed at an alligator farm about 4 km N of Harney Pond along Highway 21. Storks were present but not nesting on the Jan 28 survey; however 30 nests were evident by the 18 February survey. A maximum of 35 nests were seen during March Surveys. By May, approximately 55 older young were seen in the vicinity. By the June surveys, only 7 were left within the colony.

Another interesting development this year was Roseate Spoonbill nests at the Indian Prairie colony. Although Roseate Spoonbills were reported nesting at the Lake in 1874 (Oder 1874), we are not aware of any modern records of Roseate Spoonbills nests on Lake Okeechobee. Ground visits on April 7, showed that one nest on the NW edge of the colony contained one nestling and two eggs. The following week three young were present, but by April 21 the nest had been abandoned. We did not track in detail the status of the other two ROSP nests because of accessibility issues, but on April 23 they were no longer present and were assumed to have failed.

Environmental Conditions

Receding water levels have shown to be beneficial for concentration of prey for wading bird foraging (Kushlan 1976, Gawlik 2002), but initial lake levels are also important for submersion of the littoral zone for initial prey production (Havens and Gawlik 2005).

The location and timing of colonies seemed to be related to stage at the onset of the dry season and subsequent drying rate. Although nesting occurred at colonies located across most of the hydrologic gradient in the littoral zone, the most successful colonies were those at the lower elevations that were surrounded by deeper water.

Figure 1. Daily precipitation totals (cm) and average stage levels (m NGVD29) for Lake Okeechobee for the 2009 wading bird breeding season.

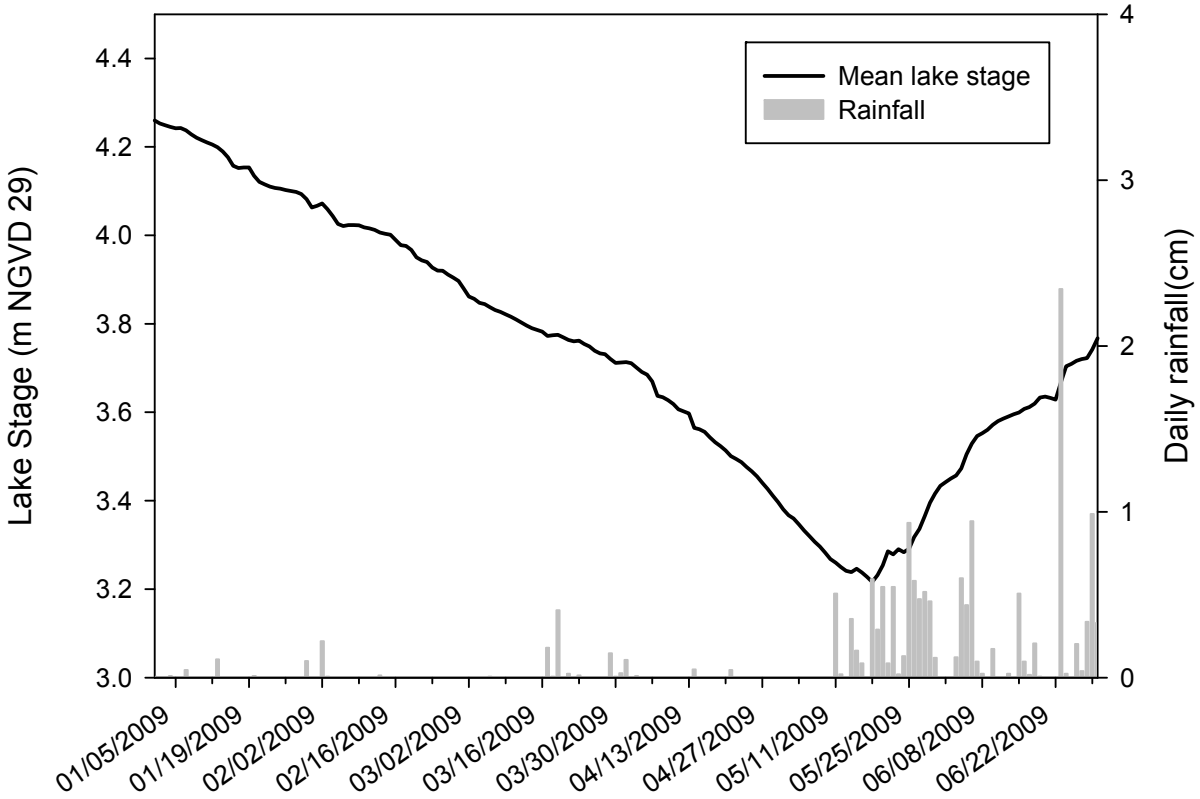


Table 1. Timing and nest effort for species breeding in wading bird colonies during 2009 at Lake Okeechobee. Italics denote peak nest effort for species included in grand total.

Month	GREG	GBHE	WHIB	SNEG	LBHE	TRHE	WOST	GLIB	ROSP	CAEG	ANHI	Peak nest effort[1]
January	233	*38*	---[2]	---	---	---	---	---	---	---	15	271
February	*329*	10	---	---	---	---	30	---	---	---	10	369
March	325	5	500	1,025	10	440	*35*	26	*3*	---	32	2,369
April	228	18	*2,820*	*2,967*	*17*	*961*	25	*2,015*	---	170	31	9,051
May	166	1	1,470	984	3	109	14	500	---	1,198	13	3,247
June	69	6	300	54	1	---	---	---	---	750	---	430

[1] Does not include CAEG or ANHI

[2] Species not detected during monthly survey

Figure 2. Map of wading bird colonies observed at Lake Okeechobee from January to June 2009. See Table 2 for colony names.

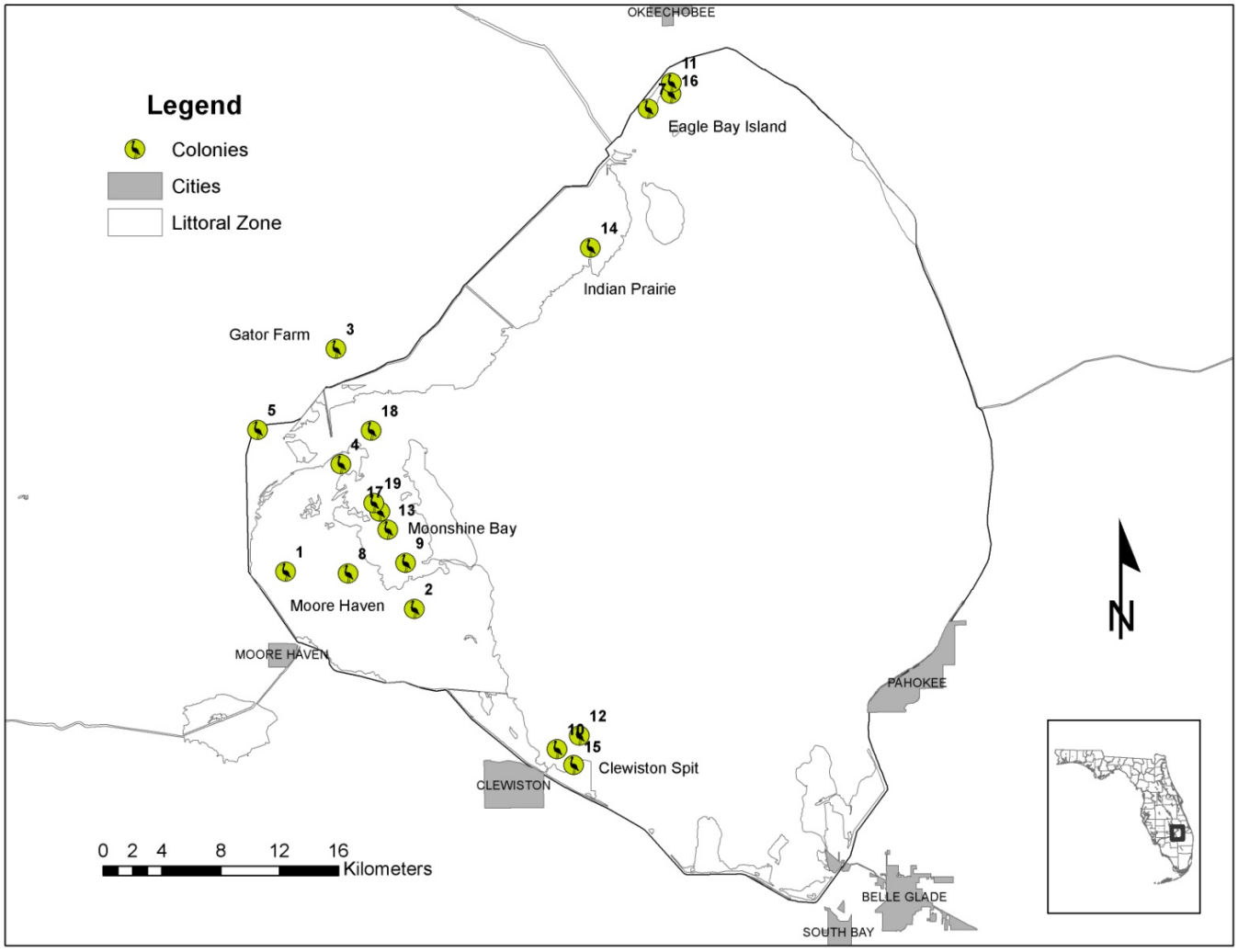
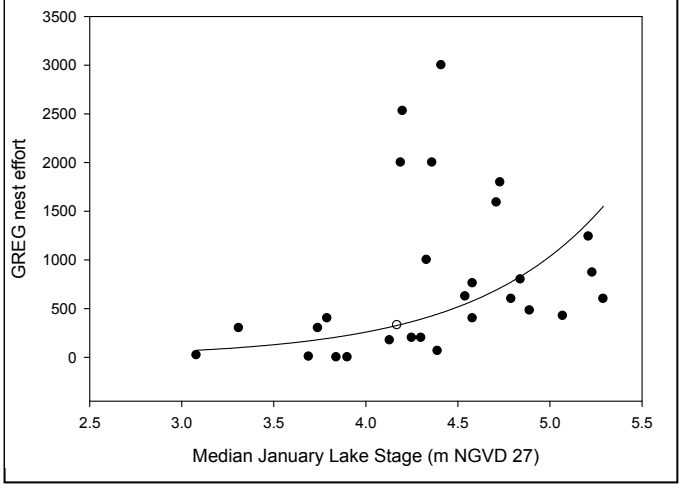


Table 2. Geographic coordinates (NAD 83) and species-specific peak nest efforts in detected colonies during the 2009 breeding season at Lake Okeechobee.

Colony	ID	Peak Month[1]	Lattitude	Longitude	GREG	GBHE	WHIB	SNEG	LBHE	TRHE	WOST	GLIB	ROSP	CAEG	ANHI	Total[1]
Clewiston Channel	12	APR	26.78420	-80.89423	50	---[2]	---	60	---	20	---	5	---	---	---	135
Clewiston Marsh	15	MAR	26.76599	-80.89796	30	---	---	320	---	20	---		---	---	2	370
Clewiston Spit	10	APR	26.77591	-80.90939	60	---	---	80	1	80	---	10	---	---	---	231
Cochran's Hole	9	APR	26.89073	-81.01295	40	---	500	---	---	---	---	500	---	---	---	1,040
Eagle Bay East	16	MAY	27.17987	-80.83080	5	3	1,200	800	10	80	---	300	---	---	---	2,398
Eagle Bay South	7	JAN	27.17064	-80.84643	85	25	---	---	---	---	---	---	---	---	20	110
Eagle Bay Trail	11	APR	27.18659	-80.83056	10	2	20	90	10	10	---	---	---	50	5	142
Gator Farm	3	MAR	27.02278	-81.06084	130	---	---	40	---		35	---	---	200	---	205
Indian Prairie	14	MAR	27.08482	-80.88620	50	---	150	400	---	400	---	---	3	---	30	1,003
Lakeport Marina	5	APR	26.97260	-81.11440	12	---	---	70	---	10	---	---	---	350	---	92
Moonshine 2	17	APR	26.92233	-81.03053	2	4	---	18	---	4	---	---	---	---	6	28
Moonshine 3	19	APR	26.92755	-81.03479	9	---	---	320	---	40	---	500	---	---	8	869
Moonshine Bay	13	APR	26.91117	-81.02514	25	4	1,300	1,200	---	700	---	1,000	---	---	---	4,229
Moore Haven	1	FEB	26.88525	-81.09517	53	8	---	---	---	---	---	---	---	---	---	61
Moore Haven	8	JUN	26.88410	-81.05237	30	---	---	---	---	---	---	---	---	---	---	30
Moore Haven	2	JAN	26.86238	-81.00704	---	4	---	---	---	---	---	---	---	---	---	4
Moore Haven NW	4	FEB	26.95153	-81.05730	50	8	---	---	---	---	---	---	---	---	---	58
Rock Island 4	18	APR	26.97227	-81.03672	12	3	---	38		2	---		---	---	5	55

[1] Does not indude CAEG or ANHI
[2] Species undetected during monthly survey effort

Figure 3. Comparison of median January lake stage with annual GREG peak nest effort. Hollow marker is 2009 effort of 329 nests.



A number of nests this year were not in the typical willow vegetation, largely because willow was absent from many colony locations. The smaller ardeids nested in *phragmites* at the Rock Island, Clewiston Spit, and the Clewiston Channel colonies. Some of this vegetation was in areas that would normally be unusable for nesting during higher lake stages. Cochran's Hole, a colony initiated by Great Egrets and later colonized by White Ibis, formed in substrate comprised of only cattails. Small ardeids (2398 nests) nested in willow and bulrush east of the traditional Eagle Bay Island colony site. Locations in Eagle Bay and Moore Haven, which had willow vegetation, were dry by the end of February. Rock Islands and Clewiston Spit were missing woody vegetation due to previous storms. Normally, years with drier conditions can help regenerate and expand the willows that are most suiting for nesting on the Lake (David 1994); however, severe fires during the recent dry years may have reversed this expansion, at least temporarily.

Acknowledgments

Funding for this research was provided by the National Park Service. We appreciate the support from our technician Justin Bredlau for his long days in the field and the rest of the Gawlik Lab for all their input.

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Literature Cited

David, P.G. 1994. Wading bird nesting at Lake Okeechobee, Florida: An historic perspective. Colonial Waterbirds 17:69-77.

Erwin, R.M., J. Galli and J. Burger. 1981. Colony site dynamics and habitat use in Atlantic Coast seabirds. Auk 98:550-561.

Gawlik, D.E. 2002. The effects of prey availability on the numerical response of wading birds. Ecological Monographs 72:329-346.

Kushlan, J.A. 1976. Wading bird predation in a seasonally fluctuating pond. Auk 93:464-476.

Havens, K.E. and D.E. Gawlik. 2005. Lake Okeechobee conceptual model. Wetlands 25:908-925.

Marx, D.E., and D.E. Gawlik. 2006. Wading bird colony location and size at Lake Okeechobee. Pp. 24-28 *in* M. I. Cook and H.K. Herring (Eds.). South Florida Wading Bird Report, Vol 12. South Florida Water Management District, West Palm Beach, Florida.

Oder, F.A. 1874. Natural History: Birds of Lake Okeechobee. Forest and Stream; A Journal of Outdoor Life, Travel, Nature Study, Shooting, Fishing, Yachting (1873-1930) 2:162.

Smith, J.P. and M.W/ Collopy. 1995. Colony turnover, nest success and productivity, and causes of nest failure among wading birds (Ciconiformes) at Lake Okeechobee, Florida (1989-1992). Archiv fur Hydrobiologie, Advances in Limnology 45:287-316.

Zaffke, M. 1984. Wading bird utilization of Lake Okeechobee marshes 1977-1981. Technical Publication 84-9. South Florida Water Management District, Environmental Sciences Division, West Palm Beach, Florida, USA.

KISSIMMEE RIVER

Introduction/Background

Prior to its channelization, the Kissimmee River, its 1 – 3 km wide floodplain, and surrounding wetland/upland complex supported substantial numbers of foraging and nesting wading birds (National Audubon Society, 1936 – 1959). Between 1962 and 1971, the Kissimmee River was channelized and its headwater lakes regulated, resulting in the drainage of the majority of its floodplain wetlands and a substantial reduction in the number of wading birds (excluding cattle egrets) using the system (Williams and Melvin, 2005). The Kissimmee River Restoration Project, which was authorized in 1992, seeks to restore ecological integrity to the middle portion of the original river system via 1) reconstruction of the physical form of the river (i.e., canal backfilling, removal of water control structures, and recarving/reconnecting river channels); and 2) reestablishment of historical (pre-channelization) hydrologic (i.e., discharge and stage) characteristics through modifications to regulation schedules of headwater lakes. When completed, the project will restore approximately 104 km² of river-floodplain ecosystem, including 70 km of continuous river channel. The restored area is expected to experience seasonal flood pulses and recessions that are favorable for wading bird reproduction. To date, approximately one third of project construction has been completed. All construction is scheduled for completion by the end of 2013; new regulation schedules for headwater lakes will be implemented in 2010. Wading bird responses to the restoration project will be monitored through 2018.

Methods

As part of the Kissimmee River Restoration Project evaluation program, we performed systematic aerial surveys (Feb 18, Mar 17, Apr 28) to search for wading bird nesting colonies within the floodplain and surrounding wetland/upland complex of the Kissimmee River. Surveys began at Rabbit Island in Lake Kissimmee and proceeded southward along the river to the S65-D structure (Figure 1). Observers were placed on both sides of a helicopter flying at an altitude of 244 m along east-west transects spaced 2 km apart. Each transect spanned the 100 yr flood line of the river plus an additional 3 km east and west of the flood line. Nesting colonies were also monitored, when encountered, during separate aerial surveys of foraging wading birds (Jan 13, Feb 10, Mar 10, Apr 14, May 12, Jun 16). These surveys were flown at a lower altitude (30 m) and were limited to the area within the 100 yr flood line of the river between S65 and S65-D. Once a colony was located, nesting species and the number of active nests were visually estimated by both observers. Nest counts were also obtained later from digital aerial photos taken at each colony to improve the accuracy of initial counts made from the air. The number of nests reported for each colony represents the maximum number of nests for each species. Nesting success was not monitored, but ground surveys were conducted at the Pool C boat ramp (May 20) and Rabbit Island (Jun 3) colonies to obtain more accurate nest counts and determine the presence of less visible dark-colored species (i.e. little blue heron (*Egretta caerulea*) and tricolored heron (*Egretta tricolor*).

Results

Four colonies formed within the survey area during 2009 (Table 1). The largest, comprised 740 cattle egret (*Bubulcus ibis*), 150 great egret (*Ardea alba*), 87 tricolored heron, 75 white ibis (*Eudocimus albus*), 50 great blue heron (*Ardea herodias*), 42 little blue heron, 10 snowy egret (*Egretta thula*), 10 glossy ibis (*Plegadis falcinellus*), and 3 black-crowned night heron (*Nycticorax nycticorax*), was first observed on Feb 18 on Rabbit Island in Lake Kissimmee (Fig. 1). The largest to form along the Kissimmee River was first observed on May 20, in the southern reach of MacArthur Run near the Pool C boat ramp. This colony was comprised of 240 cattle egret (*Bubulcus ibis*), 11 little blue heron (*Egretta caerulea*), and 3 tricolored heron nests. The other two colonies formed southwest of the Pool D floodplain on private property (Lykes Brothers, Inc.) and were comprised of 126 great egret (*Ardea alba*) and 27 great blue heron (*Ardea herodias*) nests. These nests were first observed on Feb 18; however, by Mar 17 approximately 50 great egret and 7 great blue heron nests were abandoned between the two colonies. The remaining nests (96) appeared to have been abandoned between the Mar 17 survey and Apr 28, during which time a minor reversal in stage occurred within the restored portion of the floodplain due to several small (<1") rainfall events and increased outflow from Lake Kissimmee (S-65). Rainfall events recorded at the S-65C lock on March 30 (0.32") and April 1 (0.45") may have caused water level reversals in isolated wetlands in Pool D and adjacent areas where many of these birds were likely foraging. Reversal of water levels during the dry season is thought to decrease prey availability for wading birds by redistributing prey over a larger surface area and decreasing prey density, thereby leading to nest abandonment.

Figure 1. Aerial surveys transect routes and locations of nesting colonies within the Kissimmee River floodplain and surrounding wetland/upland complex during 2009.

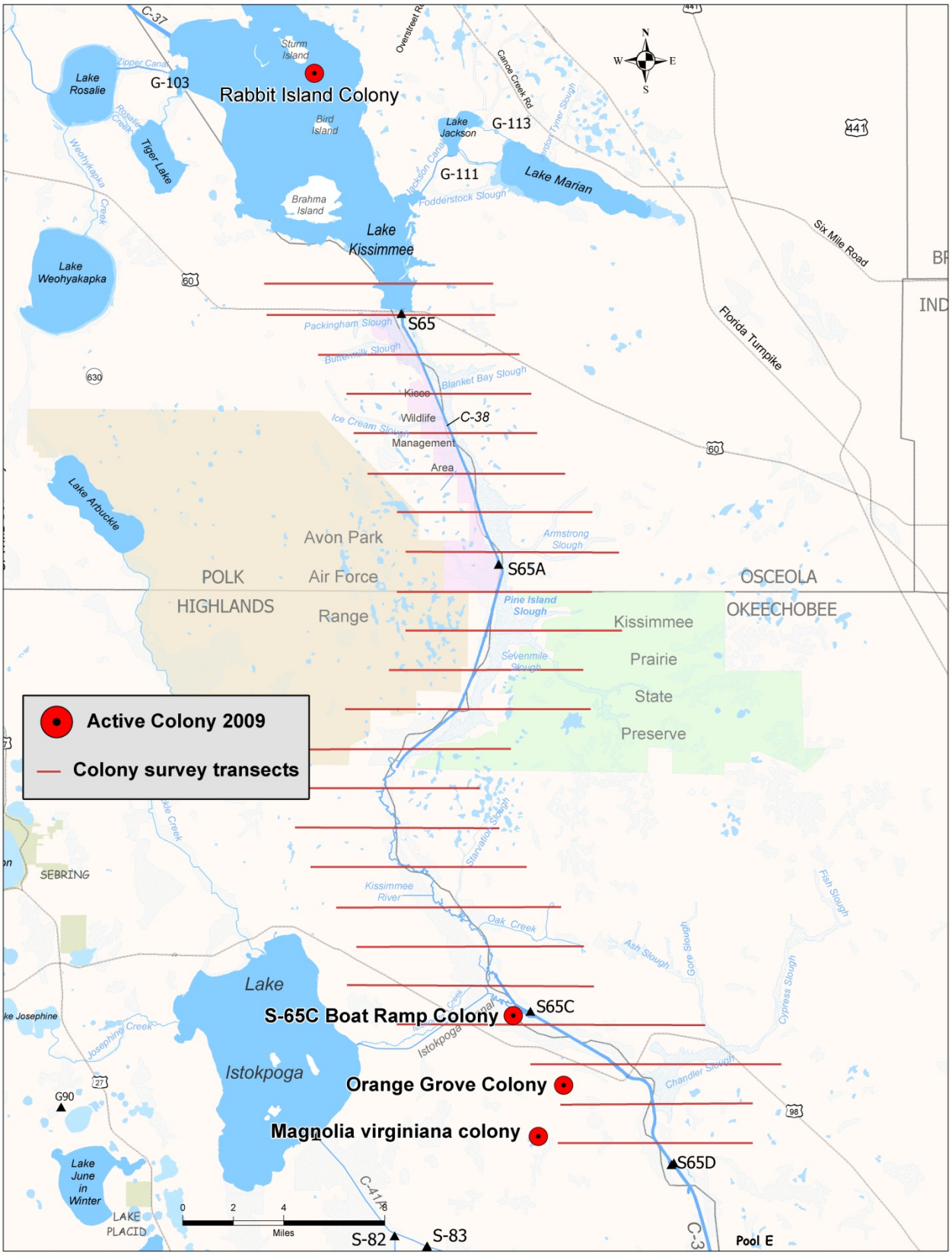


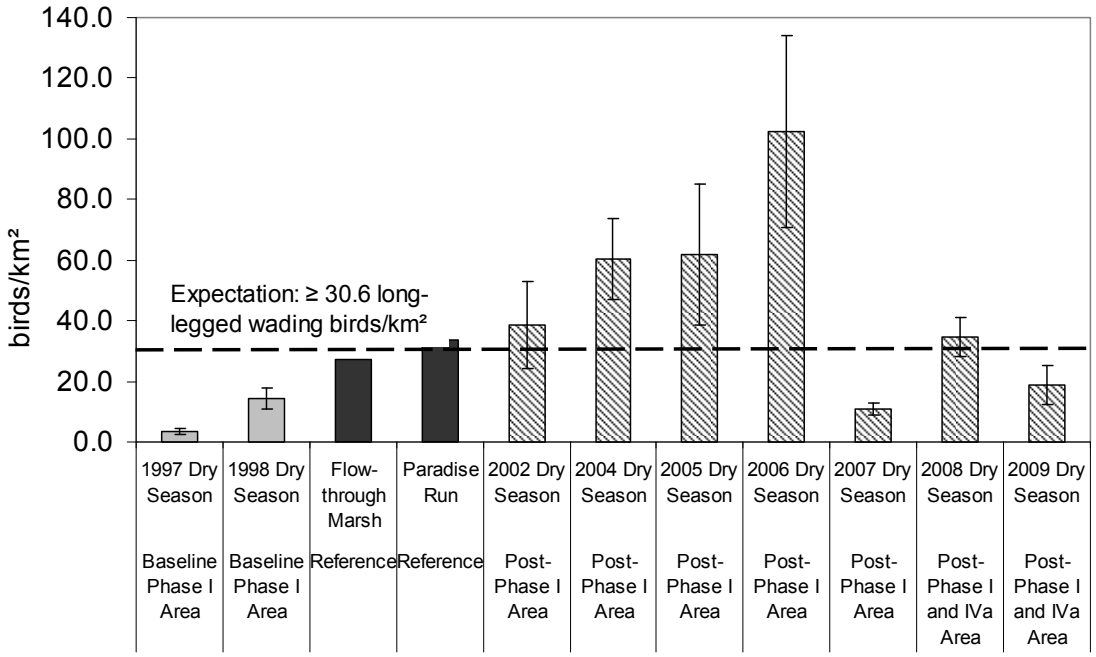
Table 1. Peak numbers of wading bird nesting colonies inside or within 3 km of the Kissimmee River 100 yr flood line between Lake Kissimmee and S65-D structures during 2009 (Feb-Apr).

Lat, Long	Colony Name (Location)	CAEG	GREG	WHIB	SNEG	GBHE	LBHE	TRHE	GLIB	BCNH	Total
27.3299, -81.1096	Orange Grove (3.2 mile SW of Pool D floodplain)	-	50	-	-	2	-	-	-	-	52
27.3595, -81.093	Orange Grove (1.0 mile SW of Pool D floodplain)	-	76	-	-	25	-	-	-	-	101
27.3176, -81.0305	S-65C boat ramp (Approx. 0.6 mile SW of ramp)	240	-	-	-	-	11	3	-	-	254
27.9391, -81.2543	Rabbit Island (Lake Kissimmee)	740	150	75	10	50	42	87	10	3	1,167

Table 2. Peak numbers of wading bird nesting colonies inside or within 3 km of the Kissimmee River 100 yr flood line between S-65 and S65-D structures. Surveys were conducted Mar-Jun, 2004; Mar-Jun, 2005; Feb-Jun, 2006; May-Jul 2007; Jan-May 2008; Feb-Apr 2009. Only 2009 data includes Lake Kissimmee (Rabbit Island Colony).

Year	CAEG	GREG	WHIB	SNEG	GBHE	LBHE	TRHE	GLIB	BCNH	Total
2004	-	-	-	-	-	-	-	-	-	-
2005	400	81	-	-	5	-	-	-	-	486
2006	500	133	-	-	4	-	-	-	-	637
2007	226	-	-	-	-	-	1	-	-	227
2008	-	2	-	-	4	-	-	-	-	6
2009	980	276	75	10	77	53	90	10	3	1,574
Total	2,106	492	75	10	90	53	91	10	3	2,930

Figure 2. Baseline, reference, and post-Phases I and IVa densities (± SE) of long-legged wading birds (excluding cattle egrets) during the dry season (Dec-May) within the 100-year flood line of the Kissimmee River. Baseline densities were measured in the Phase I area prior to restoration. Post-restoration densities were measured beginning approximately 10 months following completion of Phase I.



Although this year's nesting effort was an increase over last year (see Table 2), the abandonment of most nests by aquatic species (esp. Great egrets and great blue herons) nesting within approximately 3 km of the river indicates that prey availability on the floodplain was not sufficient to support the completion of breeding for these wetland dependent species. The rabbit island colony in Lake Kissimmee is over 40 kilometers from the nearest portion of restored Kissimmee River floodplain and nest success is not considered here. Aquatic prey populations within the river may still need more time to recover to sufficient size to support more aquatic wading bird breeding after the drought years of 2006-2007, when much of the floodplain was completely dry. Most nests at the Pool C boat ramp colony were of the terrestrial cattle egret, which is indicative of the unrestored upland pasture habitat that dominates the phase ii/iii area adjacent to the colony. Additionally, the timing and magnitude of floodplain inundation and recession is not yet optimal for rookery formation due to operational constraints. Implementation of the regulation schedule for the headwaters revitalization project in 2010 will allow water managers to more closely mimic the historical stage and discharge characteristics of the river, presumably leading to suitable hydrologic conditions for wading bird nesting colonies.

Kissimmee River Foraging Densities

Aerial surveys were used to measure the densities of foraging wading birds within the Kissimmee River floodplain. Surveys were conducted approximately monthly during the baseline period (pre-restoration; 1996–1998) and have continued after Phases I and IVa of the restoration project were completed in 2001 and 2007, respectively. Restoration is expected to bring increased use of the floodplain by long-legged wading birds (excluding cattle egrets). Furthermore, mixed species wading bird rookeries are anticipated to regularly form on and near the floodplain and tributary sloughs once abundant food resources and appropriate hydrology have been reestablished.

East-west aerial transects (n = 218) were established at 200 m intervals beginning at the S-65 structure and ending at the S-65D structure (see Figure 1 for structure locations). Each month, transects were randomly selected for counts until a minimum of 20 percent of the 100-year floodplain was surveyed in both the restored and unrestored portions of the river/floodplain. Surveys were conducted via helicopter flying at an altitude of 30.5 m and a speed of 80 km/hr. A single observer counted all wading birds and waterfowl within 200 m of one side of the transect line. Because it is not always possible to distinguish tricolored herons (*Egretta tricolor*) from adult little blue herons (*E. caerulea*) during aerial surveys (Bancroft et al. 1990), the two are lumped into the category, small dark herons. Likewise, snowy egrets (*E. thula*) and immature little blue herons were classified as small white herons (Bancroft et al. 1990). Densities of wading birds were calculated separately for restored and unrestored areas.

Because no quantitative data are available for densities or relative abundances of long-legged wading birds of the pre-channelized Kissimmee River, restoration expectations for responses by wading birds to the KRRP are based on reference data from aerial surveys of a flow-through marsh in Pool B that was built as part of the Kissimmee River Demonstration Project and for floodplain areas along Paradise Run, a portion of the Kissimmee River near Lake Okeechobee that still retains some channel flow and periodic floodplain inundation (Toland 1990; Perrin et al. 1982). The 3.5 km² flow-through marsh was constructed just south of the S65-A tieback levee during 1984–1985 and was manipulated to simulate inundation and overland flow that were typical of the pre-channelized Kissimmee River floodplain (Toth 1991). Based on these reference data, it is expected that annual dry season (December–May) densities of long-legged wading bird (excluding cattle egrets) will be ≥ 30.6 birds/km².

Prior to Phase I construction (baseline period), mean annual dry season densities of long-legged wading birds in the Phase I area averaged (± SE) 3.6 (±0.9) birds/km² in 1997 and 14.3 (±3.4) birds/km² in 1998. Since completion of Phases I and IVa, densities of long-legged wading birds have exceeded the restoration expectation of 30.6 birds/km² each year except 2007 and 2009, averaging 37.8 (±15.4), 61.7 (±14.5), 59.6 (±24.4), 103.0 (±31.5), 11.0 (±2.1), 34.7 (±6.4), and 18.6 (±6.4) birds/km² in the dry seasons of 2002, 2004, 2005, 2006, 2007, 2008, and 2009, respectively (2003 data were not collected; Fig. 2). Furthermore, the lower limit of the 95 percent confidence interval (95% C.I.) has exceeded the expectation in three of seven years.

Wading bird numbers within the restored portions of the river were roughly half of last year's mean of 34.7 birds/km². However, large numbers of wading birds (61.7 ±26.8 birds/km²) were observed within the Phase IVb construction area immediately north of Phases I and IVa. This area was under construction during the time of the surveys and was not yet considered fully restored, thus it was excluded from the data analysis. However, water levels were being held significantly higher than average in portions of the construction area and large foraging flocks were being attracted to newly available habitats. It is likely that the large number of birds observed within the active construction area would otherwise have been foraging in the areas of Phase I and IVa in the absence of newly inundated floodplain in Phase IVb, and thus density estimates within these areas would likely have surpassed the restoration expectation of 30.6 birds/km².

White ibis (*Eudocimus albus*) and great egrets dominated numerically, followed in order of abundance by great blue heron, small white heron (snowy egrets (*Egretta thula*) and juvenile little blue herons), small dark heron (tricolored herons and adult little blue herons), nearly equal numbers of wood stork (*Mycteria americana*), glossy ibis (*Plegadis falcinellus)*, and cattle egret, and several yellow-crowned night herons (*Nyctanassa violacea)*.

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Literature Cited

Bancroft, G.T., S.D. Jewell, and A.M. Strong. 1990. Foraging and nesting ecology of herons in the lower Everglades relative to water conditions. Final report to South Florida Water Management District, West Palm Beach, Florida, USA.

National Audubon Society. 1936-1959. Audubon warden field reports. Everglades National Park, South Florida Research Center, Homestead, FL.

Perrin, L.S., M.J. Allen, L.A. Rowse, F. Montalbano, K.J. Foote, and M.W. Olinde. 1982. A report on fish and wildlife studies in the Kissimmee River basin and recommendations for restoration. Florida Game and Freshwater Fish Commission, Okeechobee, Florida, USA.

Toland, B.R. 1990. Effects of the Kissimmee River Pool B Restoration Demonstration Project on Ciconiiformes and Anseriformes. Pages 83-91 *in* M.K. Loftin, L.A. Toth, and J.T.B. Obeysekera, eds. Proceedings of the Kissimmee River Restoration Symposium, South Florida Water Management District, West Palm Beach, Florida, USA.

Toth, L.A. 1991. Environmental responses to the Kissimmee River demonstration project. Technical Publication 91-02, South Florida Water Management District, West Palm Beach, Florida, USA.

Williams, G.E. and S.L. Melvin. 2005. Studies of Bird Assemblages and Federally Listed Bird Species of the Channelized Kissimmee River, Florida. In: S.G. Bousquin, D.H. Anderson, G.E. Williams and D.J. Colangelo (eds) *Establishing a Baseline: Pre-Restoration Studies of the Kissimmee River*. Technical Publication ERA 432, South Florida Water Management District, West Palm Beach, FL.


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ESTERO BAY AQUATIC PRESERVE COLONIAL WADING BIRD NEST MONITORING AND PROTECTION PROGRAM

Introduction

Estero Bay Aquatic Preserve (EBAP) was designated Florida's first aquatic preserve in 1966. EBAP consists of 11,000 acres of sovereign submerged lands and is located in southwest Florida, extending from Fort Myers Beach to Bonita Springs. The shallow estuary is fed by five fresh water tributaries and four passes connecting to the Gulf of Mexico. Designated as Outstanding Florida Waters because of its exceptional ecological significance, Estero Bay contains islands that are used as breeding colonies by a variety of bird species. Estero Bay Aquatic Preserve started monitoring colonial nesting birds in 1998. Surveys were conducted in April of 1998, 2001 and 2007. The program was expanded to include monthly surveys in 2008.

Methods

Islands within the aquatic preserve and state owned islands bordering the aquatic preserve were monitored for nesting birds once a month, starting in February and continuing through the end of nesting season. Fifteen historical nesting sites were surveyed along with one new nesting island documented this nesting season. Surveys were conducted on February 12, 18 and 24; March 12 and 16; April 10 and 14; May 8 and 12 and June 10 and 15.

A 17 foot Boston Whaler was used to conduct surveys. Each island was circled at a constant speed while keeping a distance of approximately 100 feet from the island. Two observers conducted counts including the number of nesting pairs and nests by species. Nests were recorded as empty, unknown, incubating or chicks. Survey data collected between February and June was analyzed; however surveys will continue through the end of the nesting season.

Results

A total of 16 islands were surveyed including 15 islands surveyed in 2008 and one new colony that was established this season. Fourteen of the 16 islands contained active nests during the 2009 nesting season (Table 1); Big Carlos Pass S of M-48 and North Coconut M-4 were inactive. The remaining islands contained a peak of 423 nests and an average of 14.3 nests per island between February and June. April was the peak month for nesting in Estero Bay with 281 active nests. In June 166 nests were still active in 10 colonies.

Colony Summaries

Big Carlos Pass M-43

February through April counts showed GREG, GBHE, DCCO and BRPE nesting. March was the peak of the nesting season for Big Carlos Pass M-43 with a total of 29 active nests. Counts for May and June showed two active nests each month; one GREG and one DCCO.

Big Carlos Pass M-50&52
From February through May no nesting activity was documented on Big Carlos Pass M-50&52. One YCNH nest was observed in June.

Big Carlos Pass W of M-46
No activity was documented in February and April. One BCNH was observed in March. May was the peak of nesting season with two YCNH and one BCNH nests. In June there was one GBHE nesting and one YCNH.

Big Carlos Pass W of M-52
One GBHE nest was documented in February and March. In April five active nests were documented and in May seven nests were documented. Nesting peaked in June with 35 active nests including: one TRHE, 12 GREG, 10 DCCO, 11 BRPE and one ANHI.

Big Hickory E of M-85
Sixteen nests were documented in February and in April. A peak number of 23 nests were recorded in March with 12 GBHE, three GREG and eight DCCO nesting. In June no active nests were documented.

Big Hickory M-83
In February, March, April and May there were four, five, nine and 12 active nests, respectively. A peak number of nests were recorded in June, with 15 active nests including three GBHE, one YCNH, two BCNH and nine DCCO nesting on the island.

Coconut Point East
Six GBHE and one OSPR nested in February and in March. Nest counts peaked on the island in April with 11 active nests; eight GBHE, one LBHE, one OSPR and one YCNH. Nine nests were documented in May and five GBHE nests were still active in June.

Coconut Point West
February surveys documented 11 nests; two GBHE and nine GREG. In March, 25 active nests were documented; four GBHE, four GREG, eight DCCO and nine BRPE. Forty-one nests were documented in April. In May nesting peaked with 47 nests; five GBHE, five GREG, 13 DCCO and 24 BRPE. Thirty-six nests were still active in June.

Hogue Channel M-78
There was no nesting documented in February or March and in April five nests were observed. Seven nests were recorded in both May and June with GBHE, YCNH, BCNH, GRHE and DCCO actively nesting.

Matanzas Pass
February surveys were not conducted at Matanzas Pass. March surveys documented 109 active nests. Peak nest numbers were recorded for the island in April with a total of 140 nests; 11 GBHE, one TRHE, one LBHE, six SNEG, 35 GREG, five REEG, two YCNH, two BCNH, 26 DCCO and 51 BRPE. In May 94 nests were documented and in June 49 were still active.

New Pass M-21
New Pass M-21 was monitored February through June, with five GBHE nests documented in May.

New Pass M-9
Six GBHE nests were recorded in February and four GBHE nests were recorded in April. No active nests were observed in March, May or June.

Table 1. Peak numbers of nests found in Estero Bay Aquatic Preserve colonies between February and June 2009.

Colony	Latitude	Longitude	DCCO	ANHI	BRPE	GBHE	GREG	SNEG	LBHE	TRHE	REEG	BCNH	YCNH	GRHE	OSPR	Total
Big Carlos Pass M-43	26.43155	-81.90066	5	0	15	8	10	0	0	0	0	0	0	0	0	38
Big Carlos Pass M-48	26.42771	-81.90050	0	0	0	1	0	0	0	0	0	1	0	0	0	2
Big Carlos Pass M-	26.42244	-81.89527	0	0	0	0	0	0	0	0	0	0	1	0	0	1
Big Carlos Pass S of M-	26.42672	-81.89852	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Big Carlos Pass W of	26.42926	-81.90137	0	0	0	1	0	0	0	0	0	1	2	0	0	4
Big Carlos Pass W of	26.42469	-81.89359	10	1	11	1	12	0	0	1	0	2	0	0	0	38
Big Hickory E of M-85	26.35315	-81.84164	9	0	1	12	3	0	0	0	0	0	0	0	0	25
Big Hickory M-83	26.35057	-81.84388	9	0	0	4	0	0	1	0	0	2	8	0	0	24
Coconut Point East	26.38411	-81.84905	0	0	0	8	0	0	0	0	0	0	1	0	1	10
Coconut Point West	26.38111	-81.84976	13	0	26	5	9	0	0	0	0	0	0	0	0	53
Hogue Channel M-78	26.34988	-81.84644	0	0	0	2	0	0	0	0	0	2	3	2	0	9
Matanzas Pass*	26.46092	-81.95717	26	0	55	11	35	13	9	7	5	3	2	0	0	166
New Pass M-21	26.38865	-81.85925	0	0	0	5	0	0	0	0	0	0	0	0	0	5
New Pass M-9	26.40465	-81.86816	0	0	0	6	0	0	0	0	0	0	0	0	0	6
North Coconut E of M-	26.41131	-81.85486	12	0	0	12	15	2	0	0	0	1	0	0	0	42
North Coconut M-4	26.40737	-81.85998	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total			84	1	108	76	84	15	10	8	5	12	17	2	1	423

*surveys were not conducted at Matanzas Pass in February

North Coconut E of M-3
GBHE and GREG nests were documented during February and March surveys. BCNH and SNEG started nesting in April. A peak number of active nests were counted in May; thirty-nine nests including nine GBHE, 15 GREG, 1 BCNH, two SNEG and 12 DCCO. Fourteen nests were still active in June.

Fishing-line fatalities
Thirty bird fatalities were documented on nesting islands during the six month study period and one BRPE was rehabilitated and released by the Clinic for the Rehabilitation of Wildlife, Inc (CROW). Species entangled and killed by fishing line included one BCNH, 17 BRPE, four DCCO, four FICR, two GBHE, one MAFR and one unidentified bird.

Acknowledgments
Special thanks to Judy Von-Eiff, June Franklin, Ruth Woodall and to all of the volunteers who dedicated countless hours to this project. Thank you to Lovers Key State Park and Fish-Tale Marina for graciously provided launching facilities for surveys and to CROW for supplying veterinary care to all injured birds found during surveys.

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CHARLOTTE HARBOR AQUATIC PRESERVES & J.N. "DING" DARLING NATIONAL WILDLIFE REFUGE COMPLEX COLONIAL WADING BIRD NEST MONITORING AND PROTECTION PROGRAM

Introduction
The Charlotte Harbor Aquatic Preserves (CHAP) are five contiguous aquatic preserves within the greater Charlotte Harbor estuary complex designated by the Florida Legislature for inclusion in the aquatic preserve system under the Florida Aquatic Preserve Act of 1975 and are managed by the Florida Department of Environmental Protection (FDEP). The preserves are the Lemon Bay Aquatic Preserve in the north, to Cape Haze Aquatic Preserve and Gasparilla Sound - Charlotte Harbor Aquatic Preserve, to Matlacha Pass Aquatic Preserve and Pine Island Sound Aquatic Preserve in the south. The Charlotte Harbor Aquatic Preserves stretch from Sarasota County through Charlotte County into Lee County. The total acreage for the aquatic preserves is over 182,000 which include approximately 14,700 acres of islands. In addition to state designations as aquatic preserves these waters are also Outstanding Florida Waterways, and Class II and Class III waters. The aquatic preserves are also designated as an EPA Gulf of Mexico Ecological Management Site (GEMS) and included within a National Estuary Program (NEP).

The J.N. "Ding" Darling National Wildlife Refuge Complex was created in 1945 to protect the pristine wildlife habitat of Sanibel Island and was renamed in 1967 in honor of Jay Norwood "Ding" Darling who was a pioneer conservationist. The refuge has over 6,400 acres of mangrove forests, submerged seagrass beds, marshes and hardwood hammocks. Congress designated approximately 2,800 acres of the refuge as Wilderness Areas. The refuge is part of a larger complex that includes the Caloosahatchee NWR, Matlacha Pass NWR, Pine Island NWR and Island Bay NWR. The entire complex is approximately 8,000 acres. Both the Charlotte Harbor Aquatic Preserves and J.N. "Ding" Darling National Wildlife Refuge Complex provide important feeding, nesting and roosting habitat for over 200 bird species.

Methods
Colonial wading bird nest monitoring at CHAP was conducted in cooperation with "Ding" Darling this nesting season as well as the 2008 nesting season. Surveys were conducted within the Pine Island Sound, Matlacha Pass, Cape Haze, and Lemon Bay Aquatic Preserves on mangrove islands used for nesting. Monitoring started in February and continued through the end of the nesting season. Historical nesting islands were surveyed along with newly discovered nesting islands this survey season. Surveys were conducted by CHAP staff on February 26th, February 27th, March 6th, March 19th, March 20th, March 26th, March 27th, April 15th, April 28th, April 29th, April 30th, May 15th, May 26th, June 4th, June 23rd, June 24th, June 25th and July 17th. Surveys were conducted by "Ding" Darling staff on February 13th, March 23rd, March 31st, April 23rd, May 12th, and June 22nd.

Surveys were conducted by CHAP staff using a 17ft Mako and "Ding" Darling used a 14 ft McKee Craft boat. Surveys were conducted by circling each island while an observer counted the number of nesting pairs with nests by species (two observers conducted the counts when available) and recorded the data. Nests were recorded as empty, unknown, incubating or chicks (empty nests were not used in the data analysis). Survey data was analyzed from February through July although surveys will continue through the end of the nesting season into early fall.

Results

Both wading birds (herons, egrets and ibis) and diving birds (Brown Pelicans, Double-Crested Cormorants and Anhingas) were observed in this year's nesting surveys. Total nests are derived from the maximum number of nest tending birds observed for all species during the survey period for each colony. The peak estimate for 14 species of colonial nesting birds surveyed from 28 islands was 1,132 in 2009 (Table 1) compared to 11 islands with 1,626 nests during 2008. This was a decrease of approximately 30% from last year. Table 2 represents the maximum number of pairs of adults with nests by species during 2009 which were reported in past years and do not include any newly added islands. Out of the 11 islands there were a total of 857 nests compared with last year's count of 1,626. This was a decrease of 42%. Out of the many islands monitored within the aquatic preserves 28 were found to have nesting birds, 9 of them were monitored and active last year and 19 of them were added this year. The addition of so many more islands this year was due to increased efforts to locate new nesting islands this season.

This nesting season only 9 of the 11 islands monitored last year had nests. The islands include Broken Islands North, Broken Islands South, Broken Islands East, Hemp Key, Givney Key, Skimmer Island, Lumpkin Island, Upper Bird Island and Tarpon Bay Keys with a total of 857 nests. Among the 19 newly documented islands there were a total of 275 nests. The species found nesting included Great Blue Herons, Tricolored Herons, Snowy Egrets, Great Egrets, Reddish Egrets, Black-crowned Night-Herons, Green Herons, White Ibises, Brown Pelicans and Double-crested Cormorants. White Pelican Island in Cape Haze Aquatic Preserve and the Island north of Regla Island in Pine Island Sound were among the newly added islands. White Pelican Island was a historic rookery island. This year there was a peak of 39 nests and a single American Oystercatcher nest was documented with a successful fledging of one chick. The island north of Regla Island had a peak of 41 nests.

Of the total number of nests documented 365 were wading birds and 767 were diving birds. This ratio compares to last year's numbers with 503 wading birds and 1,123 diving birds. Double-crested Cormorants and Brown Pelicans were by far the most abundant species overall with 764 nests comparing to 1,103 last year. White Ibises ranked third overall with 109 nests this year compared to 215 last year. The White Ibises were mostly found on Givney Key in Matlacha Pass Aquatic Preserves this year as well as last year.

Hemp Island

Nesting on this island was initiated in February and had its peak activity of 237 nests for all species, making it the most productive nest monitored this year as well as last year. In February and March Great Blue Herons, Great Egrets, Brown Pelicans and Double-crested Cormorants started nesting on the island and in April, May, June and July Tricolored Herons, Black-crowned Night-Herons and Cattle Egrets were also observed nesting. Hemp's colony had approximately a 44% decrease in total nests this year compared with last year's data.

Broken Islands North

Nesting was initiated in March with Great Blue Herons, Great Egrets, and Double-crested Cormorants. By April and through June Snowy Egrets, Reddish Egrets, Tricolored Herons and Yellow-crowned Night-Herons were also nesting. The colony had approximately a 43% decrease in total nests this year compared with last year's data.

Broken Islands South

Nesting was initiated by Great Blue Herons in February followed by more Great Blue Herons, Brown Pelicans and Double-crested Cormorants in March and April. Additionally Tricolored Herons and Snowy Egrets followed in May and June. Broken Islands South colony had approximately a 37% decrease in total nests this year compared with last year's data.

Broken Islands East

Nesting was initiated in April and continued through June. Great Blue Herons, Brown Pelicans, and Double-crested Cormorants were among the species observed. The colony had approximately an 83% decrease in total nests this year compared with last year's data.

Crescent Island

There was no nesting attempts documented so far in the 2009 nesting season on Crescent compared to last year with a peak of 27 documented nests for all species; a decrease of a 100%. Species last year included Brown Pelicans, Double-crested Cormorants and Great Blue Herons. Nests last year were initiated in March and by April all were abandoned.

Givney Key

Nesting was initiated in March and continued through June. Great Blue Herons, Great Egrets, Double-crested Cormorants, Brown Pelicans, White Ibises and American Oystercatchers were among the species observed. The peak nest count was 135 compared to 267 from last year. This island like last year was dominated by White Ibis with 108 nests counted in June and in June of last year there were 133 nests counted, a decrease of approximately 18% for this year for ibis nests, although the White Ibises didn't reach their peak numbers until the end of July last year with 201 nests.

Table 1. Colonial nesting bird survey peak estimates for Pine Island Sound, Matlacha Pass, Lemon Bay, and Cape Haze Aquatic Preserves colonies between February and July 2009. Counts reflect the maximum number of pairs of adults with nests by species.

COLONY (ISLAND)	Lat	Long	GBHE	TRHE	LBHE	SNEG	GREG	REEG	CAEG	YCNH	BCNH	GRHE	WHIB	BRPE	DCCO	ANHI	Total
Broken Isl. N	26.6768	-82.1940	3	1	0	1	4	1	0	1	0	0	0	10	84	0	105
Broken Isl. S.	26.6742	-82.1944	3	2	0	1	0	0	0	0	0	0	0	60	74	0	140
Broken Isl. E.	26.6777	-82.1920	1	0	0	0	0	0	0	0	0	0	0	1	11	0	13
Hemp Key	26.6004	-82.1525	14	5	0	0	32	0	2	0	1	0	0	56	127	0	237
Useppa Oyster Bar	26.6522	-82.2144	3	1	0	0	1	0	0	0	0	0	0	0	50	0	55
Captiva Rocks	26.6173	-82.1672	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
N. W. of Pumpkin Key	26.5660	-82.1279	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
S. W. of Pumpkin Key	26.5640	-82.1275	5	0	0	0	0	0	0	0	0	0	0	0	0	0	5
N. of Mason Island	26.5582	-82.1220	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
NW of Mason Island	26.5545	-82.1252	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
SW of Mason Island	26.5534	-82.1250	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
N. of Regla Island	26.5464	-82.1245	4	1	0	1	4	0	0	0	0	0	0	0	31	0	41
Bodiford Island	26.4977	-82.1124	0	0	0	0	0	0	0	0	0	0	0	6	10	0	16
N. of York Island	26.4945	-82.1043	5	3	0	3	2	1	0	0	1	0	1	0	18	0	34
N. E. of York Island	26.4940	-82.1021	4	0	0	0	0	0	0	0	1	1	0	0	0	0	6
Tarpon Bay Keys	26.4577	-82.0744	5	7	5	8	14	5	0	0	4	0	0	40	20	0	108
Skimmer Island	26.5104	-82.0250	14	0	1	0	8	1	0	0	0	0	0	44	26	0	94
Lumpkin Island	26.5661	-82.0754	4	2	1	1	0	0	2	0	1	0	0	1	10	2	24
Upper Bird Island	26.5592	-82.0714	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Givney Key	26.5145	-82.0553	3	0	0	0	1	0	0	0	0	0	108	2	20	1	135
South of Indian Field	26.6526	-82.1043	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
N of Big Smokehouse Key	26.6998	-82.1226	0	0	0	0	0	0	0	0	0	0	0	0	14	0	14
Isl. off Chadwick Cove	26.9290	-82.3509	11	0	0	0	0	0	0	0	0	0	0	0	0	0	11
Isl. W Oyster Creek (S one)	26.9181	-82.3361	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2
1st Isl. E. of Boca Grande Cswy	26.8285	-82.2653	6	0	0	0	0	0	0	0	0	0	0	0	0	0	6
3rd Isl. E. of Boca Grande Cswy	26.8262	-82.2613	0	0	0	0	0	0	0	0	0	0	0	0	38	0	38
White Pelican Island	26.7905	-82.2462	4	0	0	7	11	4	0	0	2	0	0	0	11	0	39
Isl. farthest NE of White Pelican	26.7967	-82.2296	0	1	0	0	0	0	0	0	0	1	0	0	0	0	2
TOTAL			97	23	7	22	77	12	4	1	10	3	109	220	544	3	1,132

Table 2. Colonial nesting bird survey peak estimates for Pine Island Sound and Matlacha Pass Aquatic Preserves colonies between March and July 2009. Counts reflect the maximum number of pairs of adults with nests by species. Islands listed are those that have been reported in past years and do not include any newly added islands.

COLONY (ISLAND)	GBHE	TRHE	LBHE	SNEG	GREG	REEG	CAEG	YCNH	BCNH	GRHE	WHIB	BRPE	DCCO	ANHI	Total
Crescent Island	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Givney Key	3	0	0	0	1	0	0	0	0	0	108	2	20	1	135
Lower Bird Island	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lumpkin Island	4	2	1	1	0	0	2	0	1	0	0	1	10	2	24
Skimmer Island	14	0	1	0	8	1	0	0	0	0	0	44	26	0	94
Upper Bird Island	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Broken Islands, E	1	0	0	0	0	0	0	0	0	0	0	1	11	0	13
Broken Islands, N	3	1	0	1	4	1	0	1	0	0	0	10	84	0	105
Broken Islands, S	3	2	0	1	0	0	0	0	0	0	0	60	74	0	140
Hemp Island	14	5	0	0	32	0	2	0	1	0	0	56	127	0	237
Tarpon Bay Keys	5	7	5	8	14	5	0	0	4	0	0	40	20	0	108
TOTAL	48	17	7	11	59	7	4	1	6	0	108	214	372	3	857

Lower Bird Island
There was no nesting attempts documented so far in the 2009 nesting season on Lower Bird Island compared to last year with a peak of 44 documented nests; a decrease of 100%. Species last year included Brown Pelicans and Double-crested Cormorants. Nesting didn't initiate last year until the middle of June and went on through July.

Limpkin Island
Nesting was initiated in March and continued through June. Species included Great Blue Herons, Tricolored Herons, Little Blue Herons, Snowy Egrets, Cattle Egrets, Black-crowned Night-Herons, Double-crested Cormorants, Brown Pelicans and American Oystercatchers. Their peak nesting efforts were in April this year compared to last year's peak nesting efforts in June and nesting continued last year through July. The maximum number of adults with nests for all species this year was 24 compared to 101 last year, approximately a 76% decrease.

Skimmer Island
Nesting was initiated in February and continued through June. Species included Great Blue Herons, Little Blue Herons, Great Egrets, Reddish Egrets, Double-crested Cormorants, Brown Pelicans and American Oystercatchers. Its highest nest count was in April and last year the highest nest count was in June (last year nesting continued into July). The maximum number of adults with nests for all species this year was 94 compared to 94 last year.

Upper Bird Island
Nesting was initiated in February with only one Great Blue Heron nest and ended in March. Last year there were a total of four Great Blue Heron nests in March. This is a 75% decrease for nests on this island compared to last year.

Tarpon Bay Keys
Nesting was initiated in February and continued through June. Species included Great Blue Herons, Tricolored Herons, Little Blue Herons, Snowy Egrets, Great Egrets, Reddish Egrets, Black-crowned night-Herons, Double-crested Cormorants and Brown Pelicans. The maximum number of adults with nests for all species this year was 108 compared to 178 last year, approximately a 39% decrease.

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REGIONAL WADING BIRD ABUNDANCE

ABUNDANCE AND DISTRIBUTION OF WADING BIRDS IN EVERGLADES NATIONAL PARK DURING THE 2009 NESTING SEASON INCLUDING POPULATION TRENDS FROM 1985 TO 2009

Abstract
Standard aerial transect counting techniques in conjunction with a systematic sampling design, better known as a Systematic Reconnaissance Flights (SRF) has been used since 1985 to document wading bird abundance, distribution and changes in hydrologic patterns in Everglades National Park. SRF is the only way to survey the entire Everglades area within a reasonable amount of time and with the frequency needed for this study. The successful increase in wading bird populations has been identified as a major component in the Everglades restoration (Gawlik & Sklar 2000). Data over a 25-year period suggests that wading bird populations are slowly increasing in Everglades National Park (ENP), perhaps as a consequence of the ongoing Everglades restoration efforts. Long and short term data analysis also supports the importance of hydrological conditions in the abundance and distribution of wading birds.

Introduction
Wading birds, defined as any of the many long-legged and usually long-necked birds in the order Ciconiiformes that wade in water in search of food, are a critical component of the Florida Everglades. Sixteen different species of wading birds have been identified in the Florida Everglades. Those species are: white ibis (*Eudocimus albus*), wood stork (*Mycteria americana*), great blue heron (*Ardea herodias*) and it's white morph the great white heron (*Ardea herodias occidentalis*), great egret (*Ardea alba*), snowy egret (*Egretta thula*), tri-colored heron (*Egretta tricolor*), little blue heron (*Egretta caerulea*), green heron (*Butorides virescens*), cattle egret (*Bubulcus ibis*), reddish egret (*Egretta rufescens*), black-crowned night heron (*Nycticorax nycticorax*), yellow-crowned night heron (*Nyctanassa violacea*), American bittern (*Botaurus lentiginosus*), least bittern (*Ixobrychus exilis*), glossy ibis (*Plegadis falcinellus*) and roseate spoonbill (*Ajaia ajaja*).

In the 1800's, wading birds were so abundant in south Florida that the naturalist and artist, John James Audubon, wrote, "We observed great flocks of wading birds flying overhead toward their evening roosts .... They appeared in such numbers to actually block out the light from the sun for some time." Unfortunately, in the late 19th and early 20th centuries, wearing bird's feathers on hats became very fashionable. As a consequence thousands of birds were killed reducing drastically the numbers of wading birds. In 1901 the state of Florida passed the "Bird Protection Act" and Dade County also passed during the same year the "Wildlife Protection Act" that prohibited the killing, capturing or shooting of deer, crocodile, and any wild bird. Despite the state and county efforts to protect wading birds, poaching continued. To deteriorate the situation more, in 1906 dredging of the Everglades began.

Wading birds are especially sensitive to changes in the seasonal cycles of wet and dry surface conditions (Bancroft & Jewell 1987, Kushlan *et al.* 1975, Russell *et al.* 2002). Seasonal surface water flows from upstream interior wetlands of the Everglades and adjacent cypress swamps, to downstream estuaries along the Gulf coast and Florida Bay regions, throughout 4 major drainages: Big Cypress, Shark Slough, Taylor Slough and Eastern Panhandle. The wet season in south Florida typically goes from May to October. It is at the end of this season when the higher water levels are expected. During the dry season, typically from November to April, water level under natural conditions gradually recedes, making prey more vulnerable to capture. This is why changes in hydropattern have a profound effect on prey availability (Frederick & Spalding 1994) and thus in wading bird abundance (Gawlik & Sklar 2000). Wading birds have been used as indicator species and in the evaluation of human impact and restoration efforts in the Everglades ecosystem (DeAngelis *et al* 1996). Data obtained during each SRF, not only provides information on the status and trends of wading birds in Everglades National Park, but also provide information needed for modeling evaluations to select the best management options.

Methods
Standard aerial transect counting techniques in combination with systematic sampling design, better known as a Systematic Reconnaissance Flights (SRF) has been used since 1985 to documented wading bird abundance, distribution and changes in hydro pattern in Everglades National Park. This methodology has been used successfully in wildlife surveys for assessing the distribution and abundance of wild animals (Norton-Griffiths 1978). This technique was adopted by the Everglades National Park because it is highly cost-effective in achieving the main objectives of the program. The SRF survey was conceived as a means of recording numbers and spatial distribution of wading birds over time, and to provide some understanding of the underlying causes of these dynamics by linking them to surface water conditions. Analysis of SRF data can provide very valuable information for natural resources managers and restoration planners.

Basic SRF procedure involves a fixed-wing aircraft with two observers (left and right) and a pilot, following predetermined parallel flight lines (transects) oriented east-to-west across dominant topographical contours of the study area and spaced systematically from north to south across the study region. A 2 km spacing was used with each transect divided into 2 km sections (cells) for analysis and mapping purposes (Caughley 1977, Norton-Griffths 1978, Russell *et al.* 2001)

This report includes information from monthly SRF's collected, between Dec 2008 and May 2009 (SRF 2009). Flights were conducted over 3 to 4 consecutive days using a fixed-wing Cessna 182 at an altitude of 60 m., at a speed between 80 to 90 knots and using a 150m strip width counting area for each observer. Flights are conducted during the dry season, December to May, where wading birds concentrate reproductive activity. The area covered included mainland Everglades National Park and adjacent southeast lands and southern Big

Cypress National Preserve (Figure 1). The area was surveyed using transects oriented E to W and separated by 2Km. Originally, from 1985 to 1988, transects 76 to 83 east limits extended to highway US 1. After 1988, those transects were lengthened to the east coast shoreline. Estimations of bird numbers accounted for these changes in the study area. Wading birds were counted, identified and geographically located using GPS units. The birds observed were classified in nine groups: white ibis, wood stork, great white heron, great blue heron, great egret, roseate spoonbill, glossy ibis, small white herons (snowy egret and cattle egret) and small dark herons (tri-colored heron, little blue heron, green heron, reddish egret, black-crowned night heron, yellow-crowned night heron, American and least bitterns). Pooled data were available for small dark and small white herons without individual species identification.

During the monthly bird counts, each study cell was qualitatively classified into a surface water condition category based on the amount of the cell area covered by surface water. From 1985 through 1987, surface water conditions were classified into one of three categories: dry (absence of surface water), transitional, (a mixture of wet and dry) or wet (continuous surface water). From August, 1988 to the present, a five category classification scheme has been used, consisting of dry/dry (DD-absence of surface water and no groundwater visible in solution holes or ponds), dry/wet (DW-absence of surface water but groundwater present in solution holes or ponds), dry transitional (DT-ground surface area mostly dry but small, scattered pools of surface water present and groundwater visible in solution holes or ponds), wet transitional (WT-ground surface area mostly wet but small, scattered dry areas present and groundwater visible in solution holes or ponds) and wet (WW-continuous surface water over the area). The five categories system was used for this report. Data from those five categories were used to produce Kriging interpolations using a 100X100m grid cell for every month to create maps of water conditions and birds abundance.

Based on hydrological patterns the study area has been divided into 12 distinctive drainage basins (Fleming, 1991): Southern Big Cypress South of US 41 (SBC), Big Cypress Mangrove Estuary South of US 41 (BCME), Shark Slough (SS), Northeast Shark Slough (NESS), East Slough (ES), Shark Slough Mangrove Estuary (SSME), Northern Taylor Slough (NTS), Long Pine Key / South Taylor Slough (LPK/STS), Eastern Panhandle (EP), Cape Sable (CS), Long Pine Key / South Taylor Slough Mangrove Estuary (LPK/STSM) and Eastern Panhandle Mangrove Estuary (EPME); see Figure 1. Temporal and spatial distribution of birds among these basins will also be analyzed.

Data obtained during each SRF survey are compiled in the long term database. SRF surveys were not conducted during December 1984, December 1987 and January 1998. Missing data for those months were estimated using years with complete sets of data. In some years, due to personnel constraints, only one observer was used to collect data. This situation occurred during the surveys of April 1990, May 1990 and from January 1991 to May 1991. Finally, some transects were missing for one observer during April 2004 and May 2005. Densities of birds are estimated using a 2 x 2 km grid. The numbers of birds counted within the 300 m strip are extrapolated to the rest of the 2 km^2 cell dividing the number of birds observed by 0.15 for surveys where data from two observers are available. In cases where only data from one observer was available the number of birds inside the 150m strip was extrapolated to the rest of the cell by dividing the birds observed by 0.075.

For simplicity, linear regression models are used in this paper to analyze trends in the number of birds over time (year). The regression equation is in the form $y = bx + a$, where b is the slope or regression coefficient and a *is* the intercept or regression constant. Average stage values at NP-203, from December to May, were calculated for each survey year and plotted against the estimated number of birds for that particular year. To test for a relationship between stage and wading bird abundance, a non-linear regression model (quadratic function) was used. The regression equation is in the form $y = ax^2 + bx + c$, where a, b and c are the quadratic, the linear and the constant coefficients respectively. NP-203 hydro station data was selected because it's strategic location, long term period of records and correlation with the S12's structures discharges (Ugarte 2006).

Results

Total wading bird abundance and the abundance of most wading bird species were higher in 2009 than in the 2008 survey. The estimated abundance for all the species combined increased by 17% from the 2008 to the 2009 survey (Figure 2). Since 1985, there has been an overall significant increase in the total wading bird abundance of all the species combined (R^2=0.277, P=0.007; Figure 2). Six of the nine species of birds increased in numbers from the 2008 to 2009 survey (Figure 3). Those species are: glossy ibis (GLIB) 50%, great egret (GREG) 43%, white ibis (WHIB) 13%, wood stork (WOST) 9%, small dark herons (SMDH) and small white heron (SMWH) with 1% increase each one. Three species showed a decreased in abundance; great white heron (GWHE) 28%, roseate spoonbill (ROSP) 24% and great blue herons (GBHE) 3%.

Despite the annual fluctuations observed for each species over time, an overall significant increase was observed in three of the nine species. Those species are: GREG (R^2=0.457, P<0.001), GBHE (R^2=0.211, P=0.021) and SMWH (R^2=0.160, P=0.048). Two species, WOST (R^2=0.143, P=0.062) and WHIB (R^2=0.094, P=0.155), also showed increasing trends, however those trends were not significant at α=0.05. Three species, GLIB (R^2=0.005, P=0.734), ROSP (R^2=0.003, P=0.388) and SMDH (R^2=0.004, P=0.758), have remained stable in the number of individuals with no significant increases or decreases. Finally, GWHE is the only species that displayed an overall significant decline in the number of individuals observed since 1985 (R^2=0.371, P=0.001).

During the 2009 survey, the maximum number of wading birds, regardless of the species, occurred between January and March (Table 1); the highest number of wading birds was recorded during January. During this month, the highest numbers of GREG, WOST and GLIB were observed. Other species such as GBHE, SMDH and SMWH reached their peak numbers in March, while WHIB peaked in the month of February. ROSP and GWHE were observed more frequently in December. The fewest number of wading birds for all the species combined, as well as for individual species, were recorded in May.

The most abundant species this year was WHIB which represented approximately forty five percent of the total number of birds, followed by GREG (34.6%). These two species combined accounted for almost 80% of the total number of birds observed; the remaining 20% in order of abundance were SMWH (7.9%), WOST (4.8%), GBHE (2.9%), SMDH (2.7%), ROSP (1.0%), GLIB (0.9%), and GWHE (0.05%).

Differences in the distribution and abundance of wading birds were observed among the different drainage basins (Table 2). Shark Slough (SS) contained the highest number of wading birds (22%), followed by Shark Slough Mangrove Estuary (SSME) and Northeast Shark Slough (NESS) with 14% each. These three basins contained 50% of the total number of birds recorded during the survey period. The remain birds were distributed in the remaining basins: East Slough (ES) with 12%, Big Cypress Mangrove Estuary (BCME) and Cape Sable (CS) with 8% each, Southern Big Cypress (SBC) with 7%, Long Pine Key/South Taylor Slough Mangrove Estuary (LPK/STSM) with 6%, Northern Taylor Slough (NTS) with 3%, Eastern Panhandle (EP) and Long Pine Key/South Taylor Slough (LPK/STS) with 2% each and finally Eastern Panhandle Mangrove Estuary (EPME) with only 1%. Differences in the use of the various drainage basins were also observed as the 2009 survey progressed from December 2008 to May 2009 (Figure 4). At the beginning of the season, the highest numbers of birds were found in the estuarine basins of CS, LPK/STSME, EPME and BCME), as well as in areas with higher elevation and shorter hydroperiod (SBC, EP and NTS). By the middle of the season, as water receded, foraging birds concentrated within the slough basins adjacent to SS (ES, NESS, NTS and LPK/STS) and some of the estuarine basins (BCME, SSME and LPK/STSME). The few birds that remained at the end of the season were found foraging mostly the central sloughs (ES, SS and NESS) which maintained some surface water and coastal estuaries (LPK/STSM, BCME and SSME).


James Beerens

Changes in hydro-patterns and bird distribution (Figure 5) were more pronounced this year than in the previous year (see Alvarado & Bass, 2008). The greatest changes in the area covered by the different hydro-patterns during the 2009 survey took place at the extreme categories (WW or DD). From December to May, the extent of area covered by WW was reduced from 47% to 4% (2,068 km^2 reduction), while DD area experienced an increase from 2% at the beginning of the season to 50% at the end of the season (2,340 km^2 increase). Intermediate categories such as WT and WD showed moderate changes throughout the season. The areal extend for WT decreased from 36% to 14% (1,076 km^2), while WD increased from 2% to 17% (740 km^2). Finally, very slight changes occurred in the middle category, DT, with only 1% reduction (64 km^2). During December the highest densities of birds were mainly located in the DT hydro-pattern. By January, as water receded, birds began to concentrate in WT, DT and WW areas respectively. As water depth continued to decrease during the following months, WW, WT and DT areas continued holding the higher densities. By May, most birds were located at DT and WD. It was obvious, during this month, that great numbers of birds were leaving the study area. Overall, the hydropattern and bird density changes throughout the season clearly showed that as water receded, low water levels turned some areas into new territories accessible to foraging birds. Figure 6 shows the results of Kriging's interpolations generated with the hydropatterns obtained for each individual 2x2Km cells, as well as the bird abundance and distribution for each month. The effect of surface water conditions on distribution of foraging wading birds is clearly shown. During December and January, birds were widely distributed across the entire area with several zones of higher concentrations. From February to April, as water recedes, bird begin to concentrate in areas with more suitable water surface condition for foraging; especially in the Shark Slough and East Slough areas. By May, when the driest conditions occurred, the few remaining birds were found in the lower reaches of Shark Slough and lower portions of several basins located at the central portion of the park. Very few birds were recorded at coastal estuarine basins since February and in the Whitewater Bay area during the entire survey.

Figure 1. Map of ENP and southern Big Cypress National Preserve with sampling transects and drainage basins.

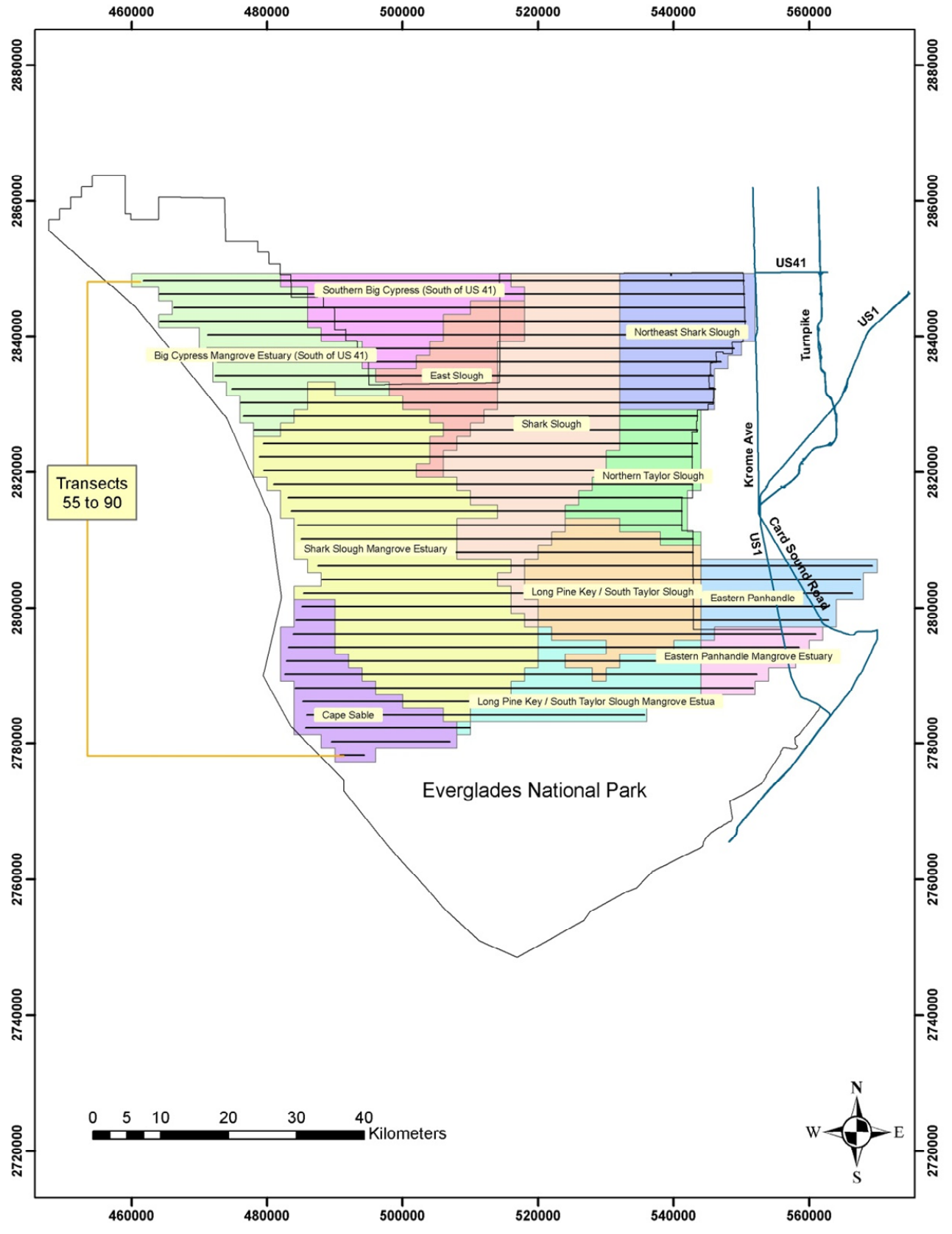


Figure 2. Estimated number of wading birds (all species pooled) observed from the months of December to May from 1985 to 2009. Red marks represent years with estimated missing data for one month.

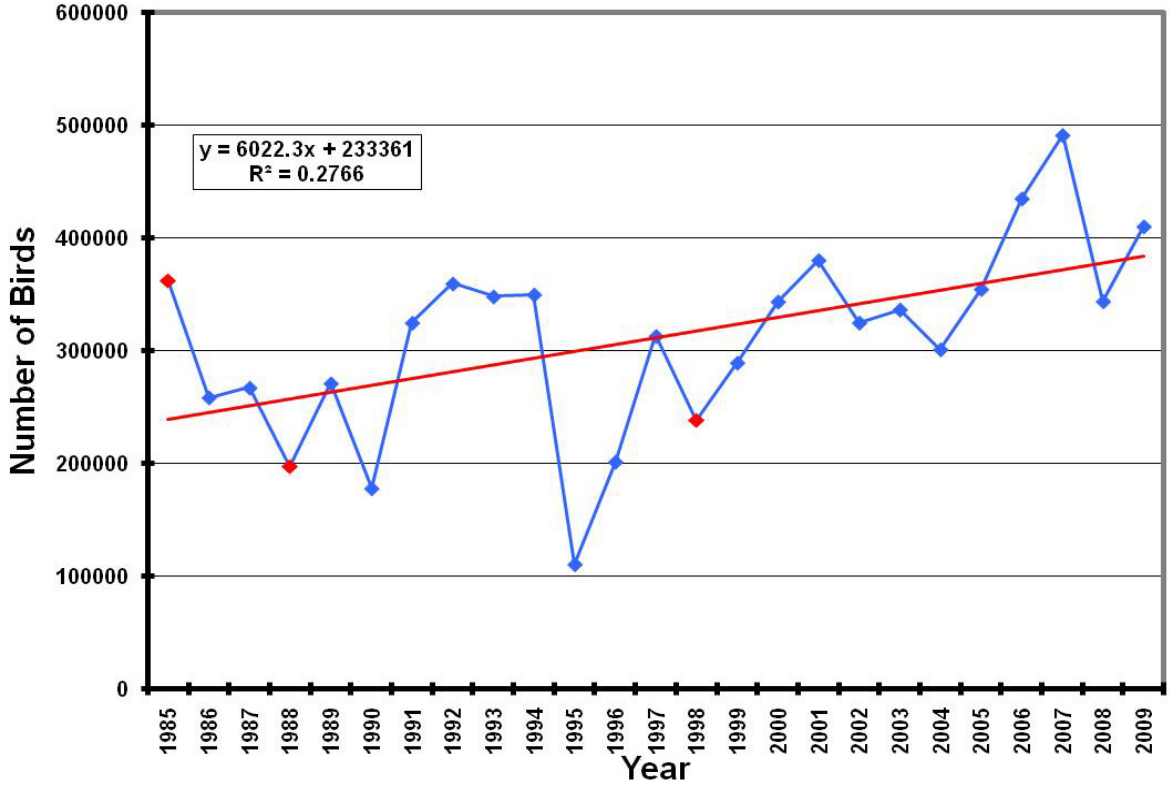
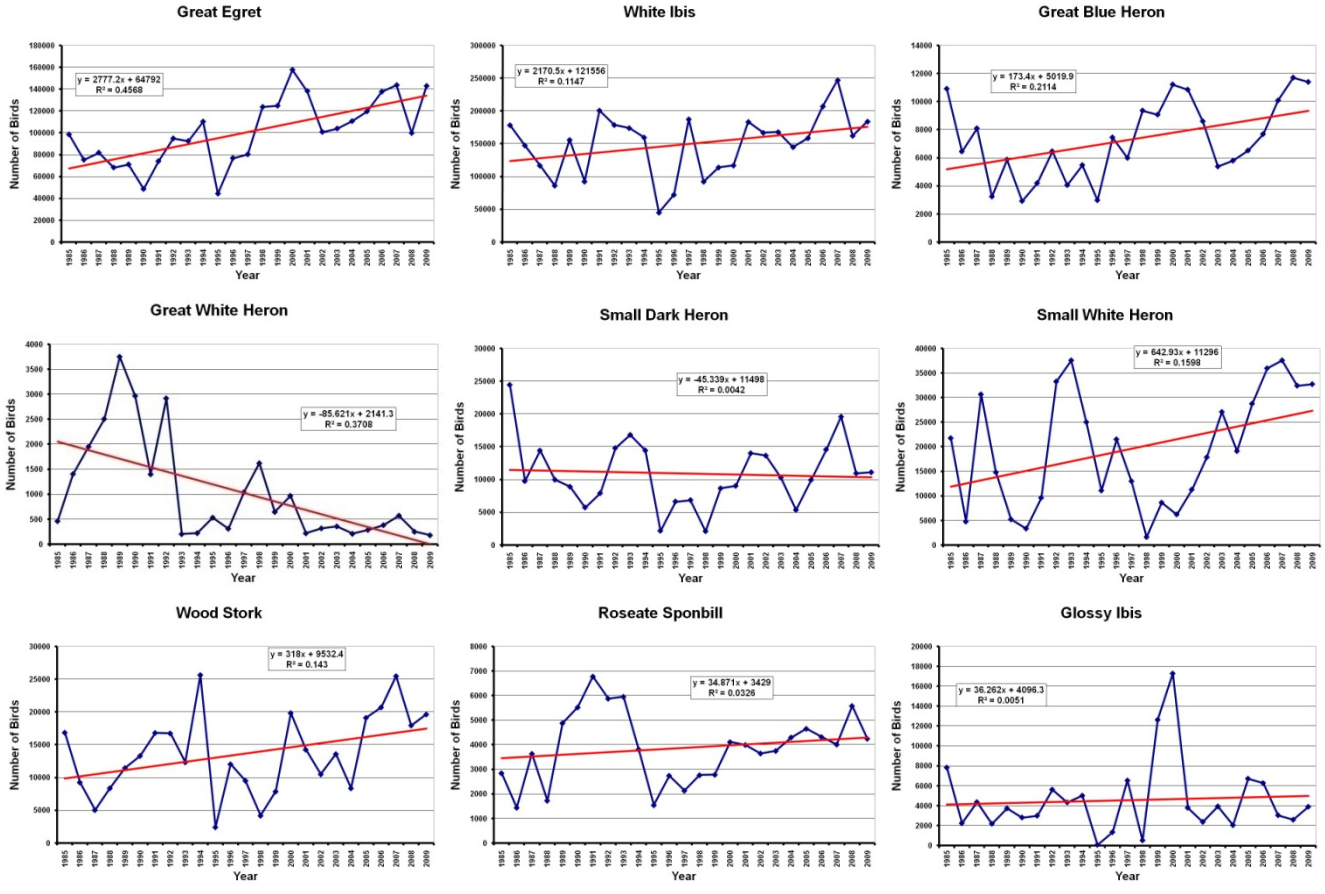


Figure 3. General trends in wading bird populations based on the total number of birds estimated during the surveys performed each year in the Everglades National Park from 1985 to the present.



The spatial use of ENP by wading birds decreased as the 2009 survey progressed. Birds were found foraging in 67% of the study area during the month of December and in 63% during January (Figure 7). Wading birds were more widely distributed during these months. By February, birds utilized only 56% of the total available area. This decrease continued from March to May. By May, wading birds were concentrated in only 23% of the total available area.

Stage values and numbers of estimated birds showed clearly that wading birds are less abundant during extreme water conditions (Figure 8). During 1995, a particularly wet year, the number of wading birds was the lowest for the period of record. In 1990, a very dry year, the number of birds was also low. A quadratic function model (Figure 9) was used to analyze this type of behavior where too much or too little water in the system can lead to drastic changes in wading bird abundance. A significant relationship was found between the number of birds observed and the average stage at the NP-203 (R^2=0.459, P=0.001). The curve also suggests an optimal stage value for wading bird abundance somewhere around 1.77 m, using NP-203 station as a reference.

Table 1. Estimated abundance of wading birds in the Everglades National Park and adjacent areas, December 2008 to May 2009.

Species	Dec-08	Jan-09	Feb-09	Mar-09	Apr-09	May-09	Total
GREG	21,204	33,771	27,767	27,962	27,202	6,061	143,967
GBHE	1,289	2,636	1,489	4,409	1,653	458	11,934
SMDH	1,216	2,406	2,512	2,995	1,348	732	11,209
SMWH	6,198	6,414	5,981	7,298	5,136	1,997	33,024
WHIB	20,998	38,146	41,873	40,254	38,982	7432	187,685
GLIB	341	1,414	699	801	641	0	3,896
WOST	1,984	5,179	3,163	4,067	3,963	1,624	19,980
ROSP	960	867	514	632	696	580	4,249
GWHE	56	42	35	28	21	21	203
TOTAL	54,246	90,875	84,033	88,446	79,642	18,905	416,147

Table 2. Estimated abundance of wading birds (all species combined) for the different drainage basins in the Everglades National Park, December 2008 to May 2009.

Month	SBC	BCME	SS	NESS	ES	SSME	NTS	LPK/STS	EP	CS	LPK/STSM	EPME	Total
Dec-08	8,231	4,783	4,493	2,102	4,644	8,062	2,455	805	1,879	11,120	4,232	1,440	54,246
Jan-09	6,186	7,733	12,121	7,353	10,117	16,755	4,362	678	3,379	16,146	4,533	1,512	90,875
Feb-09	3,823	5,719	15,100	17,945	12,175	14,047	4,015	1,622	838	2,953	4,272	1,524	84,033
Mar-09	2,936	6,617	19,246	21,801	13,084	13,144	67	2,950	1,929	1,820	4,402	450	88,446
Apr-09	7,969	7,752	36,019	8,663	8,394	3,089	0	1,849	282	404	5,201	20	79,642
May-09	534	2,585	4,298	1,252	2,086	5,394	0	114	88	591	1,622	341	18,905
TOTAL	29,679	35,189	91,277	59,116	50,500	60,491	10,899	8,018	8,395	33,034	24,262	5,287	416,147

Figure 4. Spatial and temporal changes in wading bird density among the different drainage basins between Dec-08 and May-09.

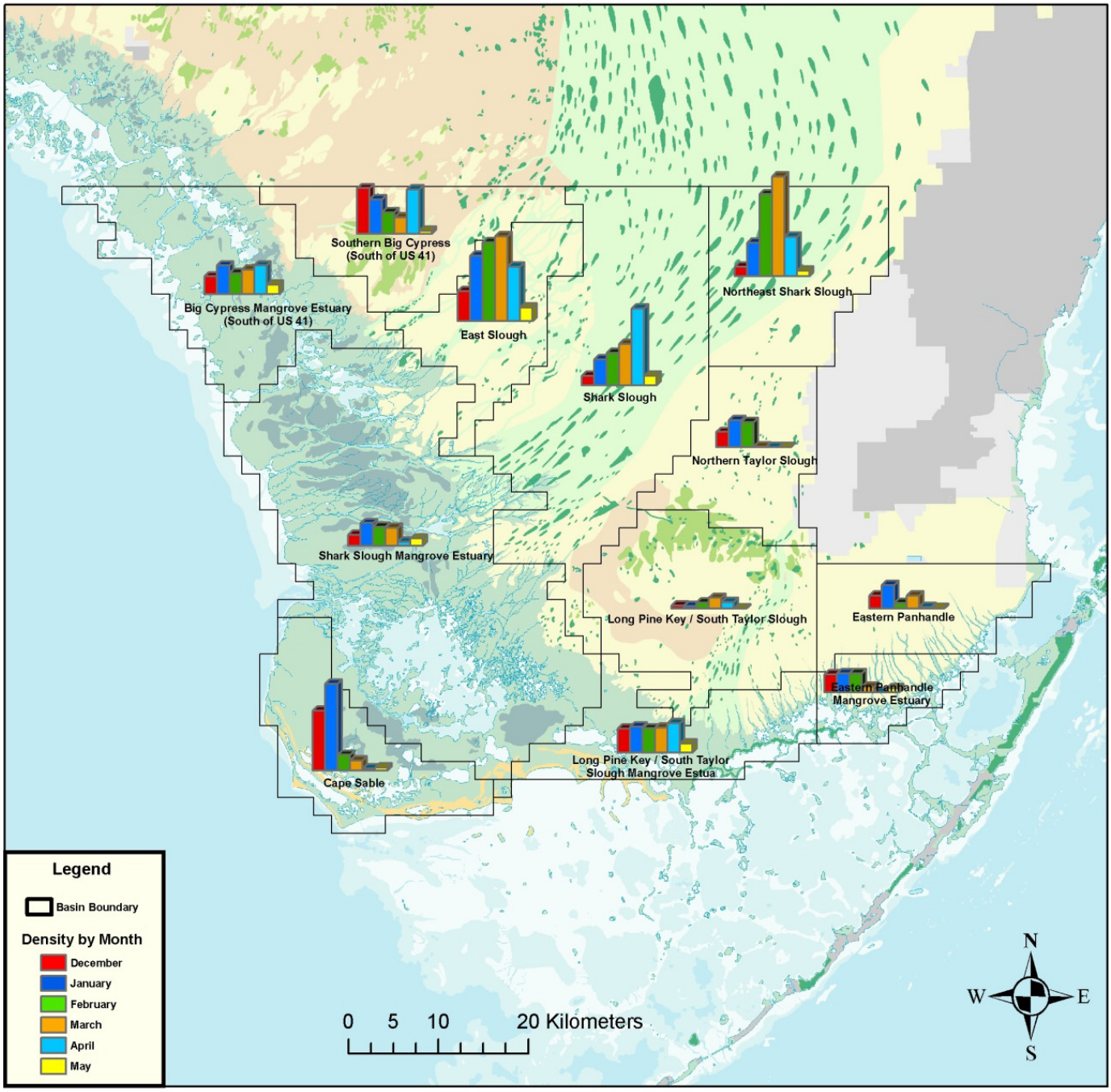


Figure 5. The 2009 areal extent and density of wading birds (all species pooled) in each surface water category: WW = continuous surface water; WT = mostly wet with scattered dry areas; DT = mostly dry with small scattered pools of water; WD = dry with water only in solution holes; DD = dry surface.

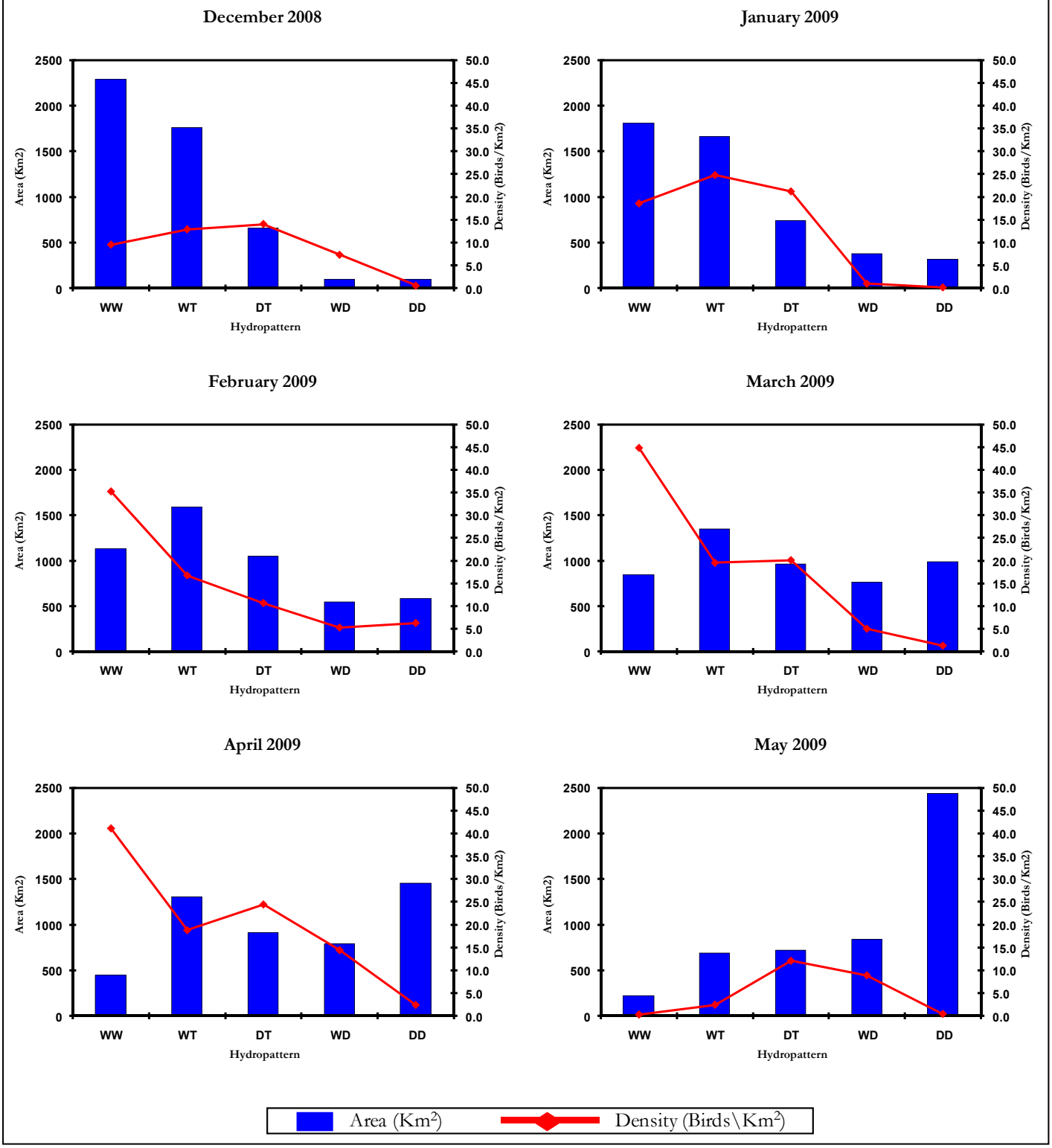
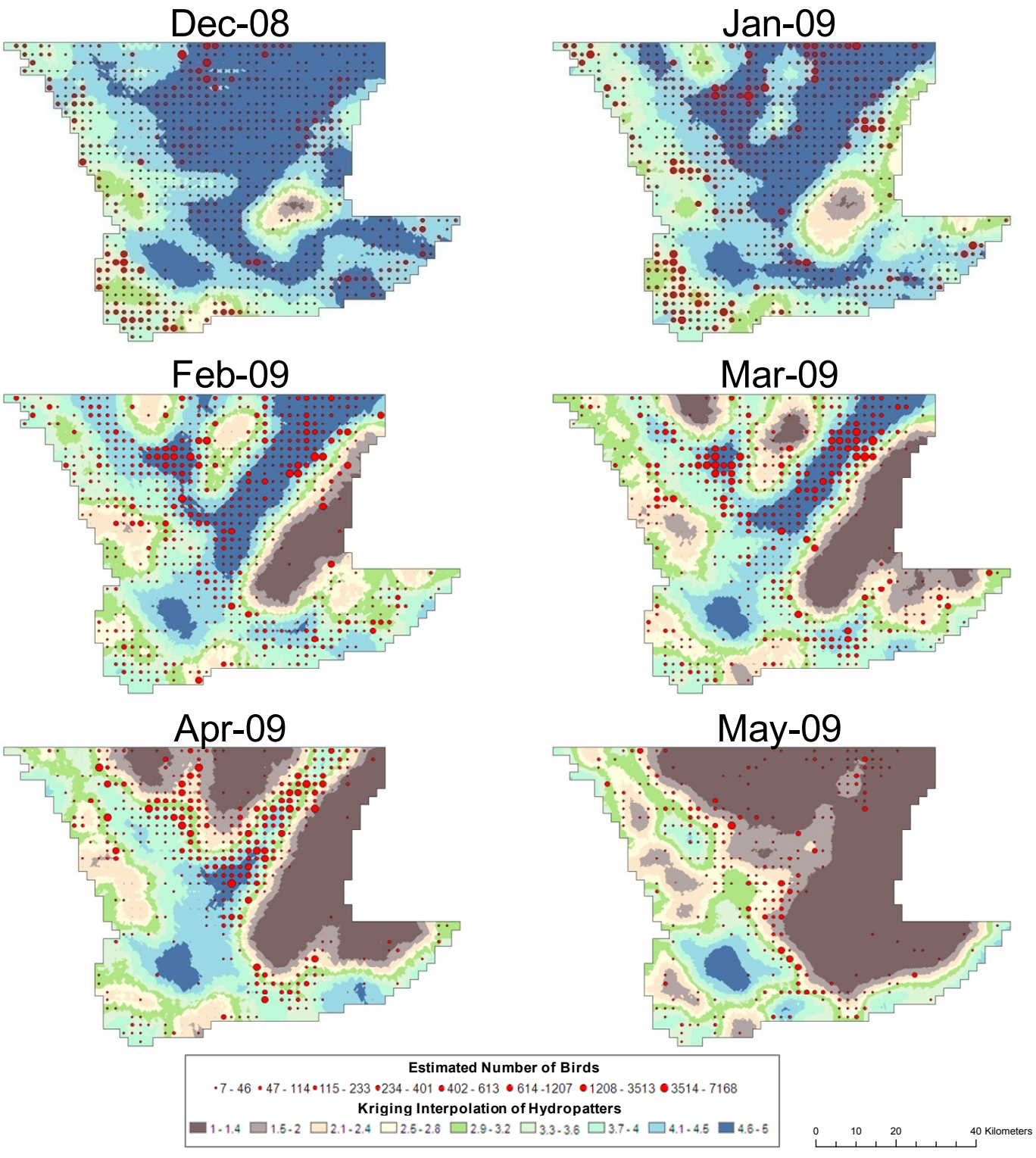


Figure 6. Kriging's interpolation of changes in hydropatterns observed between December 2008 and May 2009 and correspondent wading bird distribution.



Discussion

The population of wading birds within the Everglades has decreased between 70 and 90% since the 1930's (Bancroft 1989, Ogden 1994). This reduction in the numbers of wading birds has been directly linked at the beginning to unregulated hunting and illegal poaching and lately to the human alteration of the Everglades original hydrology. Because wading birds are very sensitive to changes in hydrology, they have been used as indicators for the Everglades restoration success.

Everglades populations of wading birds in general, based on SRF data over a 25-year period, indicates an overall significant increase. The 2009 survey represents an increase in the numbers of wading birds observed during the previous year. Most species have shown an increasing trend or overall stable populations. Unfortunately for GEWH, that is not the case. Despite the increases observed during the last two years, the overall trend shows a significant population decrease. Long and short term temporal and spatial data analysis also supports the importance of hydrological conditions in the distributions of wading birds and areal utilization. Even though the recent increase observed in wading bird populations suggest some success in the ongoing restoration efforts, more research is needed in order to fully support this statement.

Wading bird populations in the Everglades are dynamic, changing constantly and are influenced by many other aspects (Russell *et al.* 2002). However, the most influential aspect is perhaps human habitat alteration; particularly those that change the natural hydrological conditions. Food availability is considered the most important factor limiting populations of wading birds in the Everglades (Frederick & Spalding 1994); however hydrology is the factor that ultimately determines the availability of food. Data obtained during each SRF over the years support the important role that hydrological conditions plays on the abundance and distributions of wading bird populations in the lower Everglades. The concept of too much/too little or just the right amount of water and the too late/too early or just at the right time seem to be of particular importance for wading birds. For example, rainfall deficit observed during the rainy season previous to the 2009 survey appears to be the cause of the early widespread distribution throughout the system. Because the SRF data are collected during the dry season (December 2008 to May 2009), the annual precipitation from the previous year best describes the water conditions and thus the birds foraging patterns in the area during the surveys. As water receded, later in the season, birds began to concentrate in those areas that still maintained the right water levels. By the end of the season, great numbers of birds left the system heading towards areas with longer hydroperiod and better foraging conditions such as the Water Conservation Areas (Cook & Herring 2007), while the ones that remained in the system concentrate in areas which probably provided them with the best foraging conditions.

Figure 7. Monthly changes in wading bird areal utilization in the Everglades National Park from December 2008 to May 2009.

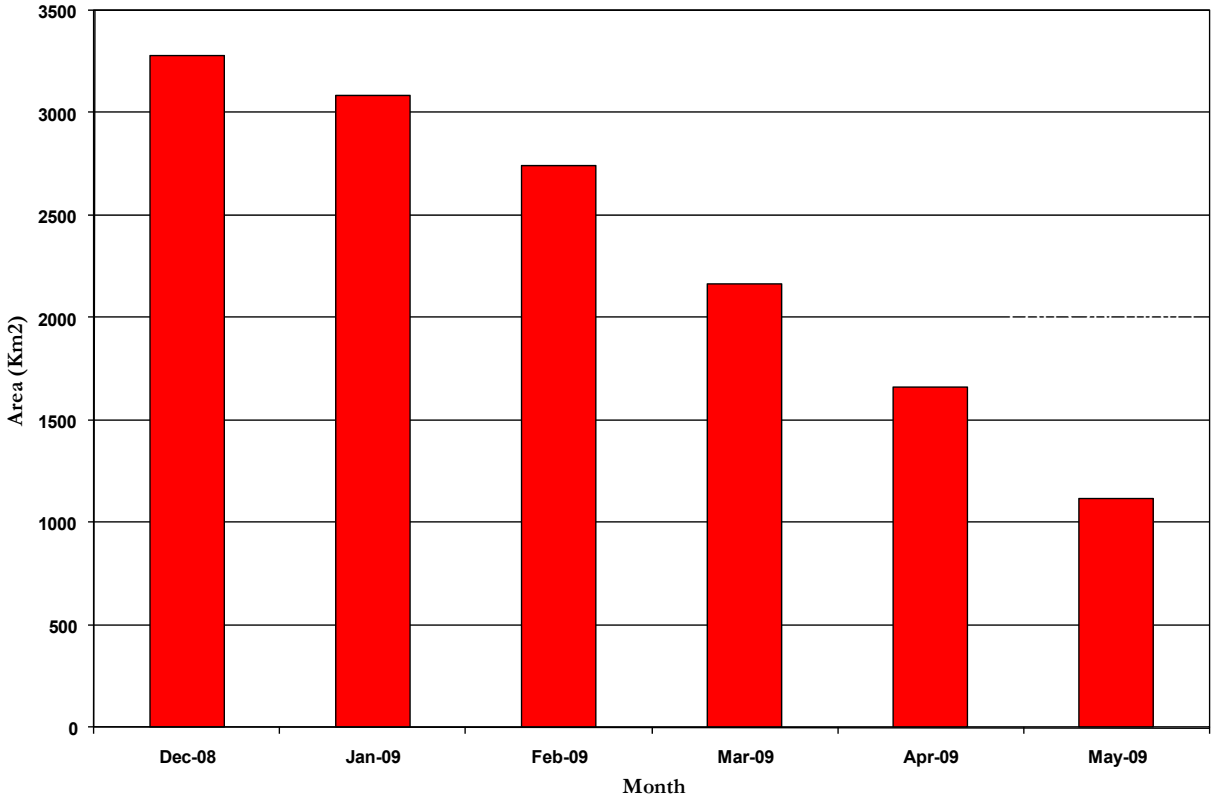


Figure 8. Relationship between numbers of birds observed for every year since 1985 to 2009 and the stage elevation in meters at the NP-203 hydrological station.

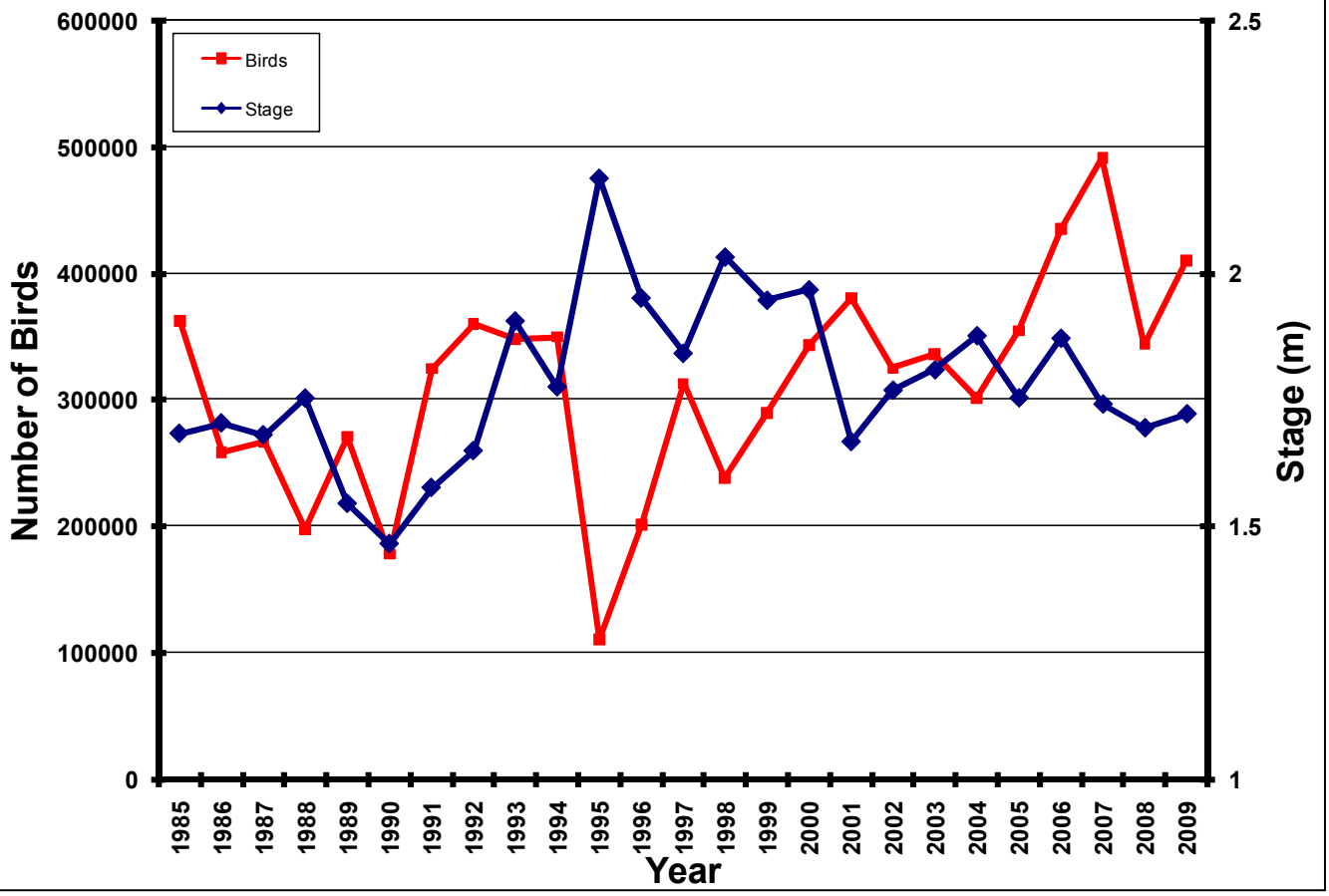
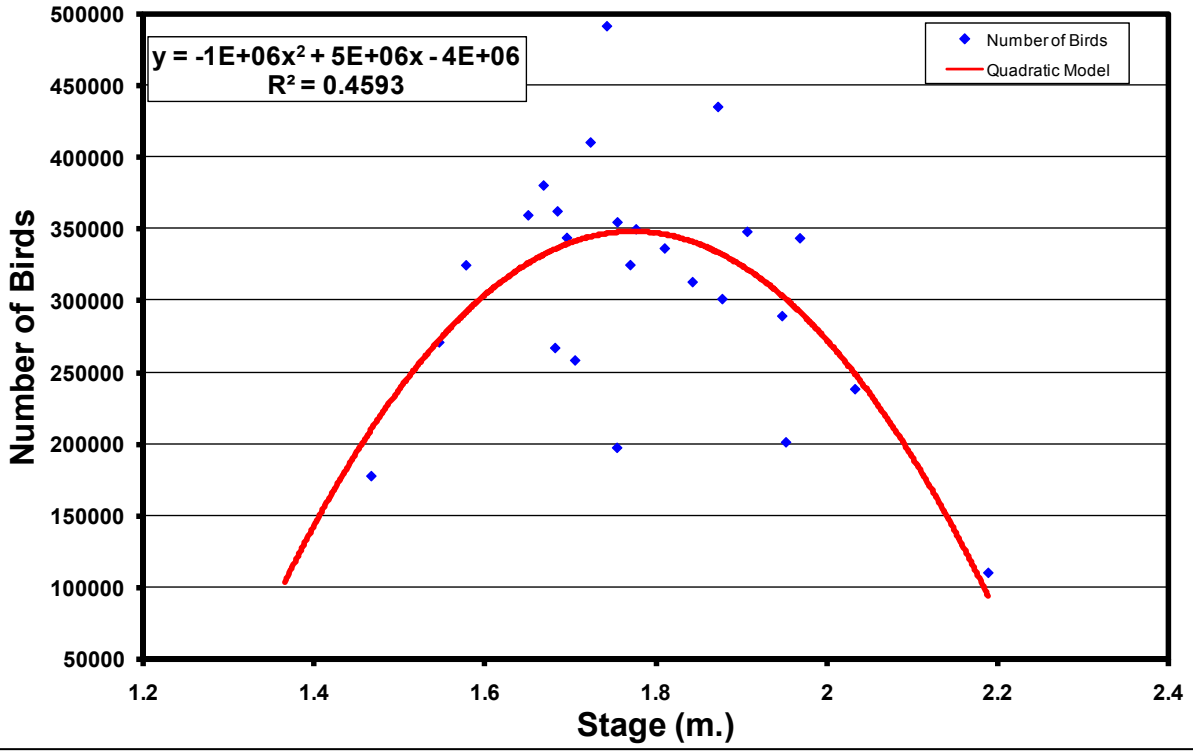


Figure 9. Quadratic function model used to test the relationship between wading bird abundance and average stage height using the NP-203 hydrological station data.



Although this preliminary analysis can provide some general ideas of the trends in the number of individuals observed for each species or groups of birds through the years, additional studies and more data analysis will be necessary in order to evaluate the significance of these observations and its relevance to the wading bird populations occurring in Everglades National Park.

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References

Alvarado, M. A.. and S. Bass. (2008). Wading bird abundance (Foraging and nesting). In: South Florida wading bird report (12): 32-37. Cook, M. I. & Call, E. M. (Eds.). South Florida Water Management District.

Bancroft, G. T. and S. D. Jewell. (1987). Foraging habitat of Egretta herons relative to stage In the nesting cycle and water conditions. (Second Annual Report) West Palm Beach: South Florida Water Management District.

Bancroft, G. T. (1989). Status and conservation of wading birds in the Everglades. Am. Birds 43: 1258-1265.

Bancroft, G. T., A. M. Strong, R. J. Sawicki, W. Hoffman, and S. D. Jewell. (1994). Relationships among wading bird foraging patterns, colony locations, and hydrology in the Everglades. In: Everglades: The ecosystem and its restoration: 615-657. Davis, S. M. & Ogden, J. C. (Eds.). Delray Beach: St. Lucie Press.

Caughley, G. (1977). Sampling in Aerial Survey. J. Wildlife Manage. 41(4): 605-615

Cook, M. I. and H. K. Herring. (2007). South Florida Wading Bird Report. South Florida Water Management District. West Palm Beach, FL Vol. 13 (1)

DeAngelis D., L. J. Gross, S. Hartley, J. Johnston, F. J. Mazzotti, L. Pearlstine and K. G. Rice. (1996). Across Trophic Level System Simulation (ATLSS) Program. Unpublished manuscript.

Frederick, P.C. and M.G. Spalding. (1994). Factors affecting reproductive success of wading birds (Ciconiiformes) in the Everglades ecosystem. Pgs. 659 - 691 in: Everglades: the ecosystem and its restoration. S. Davis and J. C. Ogden (eds.) St. Lucie Press, Delray Beach, Florida.

Gawlik, D.E. and F.H. Sklar. (2000). Effects of Hydrology on Wading Bird Foraging Parameters. In: Higer, A.L. (Ed.). Greater Everglades Ecosystem Restoration (GEER) Conference, December 11-15, 2000, Naples, Florida. Section III p. 95-97.

Kushlan, J. A., J. C. Ogden, and J. L. Tilmant, (1975). Relation of water level and fish availability to wood stork reproduction in the southern Everglades, Florida. (Open File Report 75-434). Tallahassee: US Geological Survey.

Norton-Griffiths, M. (1978). Counting animals. (2nd ed.) African Wildlife Leadership Foundation, Nairobi. 110 pp.

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. In: Everglades: The Ecosystem and Its Restoration, eds. S. M. Davis and J. C. Ogden, 533-70. Delray Beach, FL: St. Lucie Press.

Russell, G. J., K.M. Portier and O.L. Bass. (2001). Report on the Systematic Reconnaissance Flight Wading Bird Survey in Everglades National Park, 1985-1998. Final Report to Everglades National Park under Cooperative Agreement 5280-7-9016. Everglades National Park, Homestead, FL. 116 pp.

Russell, G. J., Bass, O. L. and Pimm, S. L. (2002). The effect of hydrological patterns and breeding-season flooding on the numbers and distribution of wading birds in Everglades National Park. Anim. Conserv. 5: 185-199.

Ugarte, C.A. (2006). Long-Term (1985-2005) Spatial and Temporal Patterns of American Alligator Nesting in Everglades National Park, Florida USA. Everglades National Park Final Report. 72 pp.

WADING BIRD SURVEYS FOR WATER CONSERVATION AREAS AND BIG CYPRESS NATIONAL PRESERVE

Methods

Wading bird surveys were flown with a fixed wing aircraft at an altitude of about 60 meters along parallel transects with 2-km spacing each month from March to June 2009. Wading birds were identified to species when possible, enumerated, their locations recorded, their data entered into a database, and summarized into tables. Densities of each species were separated into 4-km^2 cells and plotted onto maps. Data were recorded using HP720 palm top computers linked to GPS.

Results

In the Water Conservation Areas, monthly wading bird surveys were conducted from March to June 2009. January and February were not surveyed due to administrative delays. In the Water Conservation Areas, the relative abundances increased from March (54,220) to May 2009 (92,620); then decreased to a low in June (11,500) (Table 1). During 2009, water levels in the Water Conservation Areas remained wet but declined from January to May then increased in June. The surface water conditions for the Water Conservation Areas decreased from 68 % wet cells in March 2009 to 54 % wet cells in April 2009. The percent of wet cells increased in May 2009 (60 %) and June 2009 (97 %). The flood conditions in June 2009 were one of the major contributing factors to the decreased numbers of wading birds. In the Big Cypress National Preserve, relative abundances were generally low during 2009. In the Big Cypress National Preserve, monthly wading bird abundance increased from March 2009 (4,893) to April 2009 (5,380), declined in May 2009 (1,160) then increased in June 2009 (7,353) (Table 2). The water conditions in Big Cypress National Preserve during 2009 decreased from 20 % wet cells during March to 8 % wet cells in April then increased to 20 % wet cells in May and 50 % wet cells in June. Final reports from 1996 to 2009 are currently available.

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Table 1. Water Conservation Areas wading bird estimated abundance, 2009.

Species	March	April	May	June
GREG	27,907	33,374	71,294	7,620
GBHE	487	1,180	1,620	487
SMDH	387	600	107	13
SMWH	500	580	1,127	240
WHIB	22,673	27,693	13,347	1,813
GLIB	347	853	93	67
WOST	360	1,460	2,873	107
ROSP	53	213	227	0
GWHE	1,507	1,607	1,933	1,153
Totals	54,220	67,560	92,620	11,500

Table 2. Big Cypress National Preserve wading bird estimated abundance, 2009.

Species	March	April	May	June
GREG	2,647	2,753	473	3,947
GBHE	113	180	0	13
SMDH	33	0	0	7
SMWH	67	47	13	260
WHIB	1,313	1,447	627	2,773
GLIB	0	0	0	0
WOST	500	620	0	47
ROSP	7	7	0	0
GWHE	733	433	213	120
Totals	4,893	5,380	1,160	7,353

STATUS OF WADING BIRD RECOVERY

The sustainability of healthy wading bird populations is a primary goal of CERP and other Everglades restoration programs in south Florida and has been identified as a major ecological indicator of Everglades restoration (RECOVER 2005, Frederick et al 2009). The central prediction of Everglades restoration is that a return to natural flows and hydropatterns will result in the recovery of large, sustainable breeding wading bird populations; a return to natural timing of nesting; and restoration of large nesting colonies in the coastal zone. As the science branch of CERP, RECOVER established Performance Measures (PM) for tracking the ecological progress of these breeding and nesting parameters (http://www.evergladesplan.org/pm/recover). The purpose of this report is to summarize the annual nesting patterns of wading birds in the context of these performance measure indices and those associated goals and targets, while the RECOVER System Status Reports (RECOVER 2006, 2007) presents the analysis of the Greater Everglades Wetlands module predator-prey hypothesis cluster that integrates the hydrology, aquatic prey and wading bird nesting results. The main indicator species are Great Egret, Snowy Egret, Tricolored Heron, White Ibis, and Wood Stork. These data are reported for the three Water Conservation Areas and mainland Everglades National Park. The following results summarize the 2009 colony surveys and an update of a 3-year running average for numbers of nesting pairs (Table 1).

Results

Numbers of Pairs

The 2009 combined total of nesting pairs for the five indicator species was 64,763, divided as follows: 13,411 pairs of Great Egrets, 2,730 pairs of Snowy Egrets, 1,144 pairs of Tricolored Herons, 43,415 pairs of White Ibis, and 4,063 pairs of Wood Storks. The three year running average for 2007-2009 for the four groups are 6,956 for Greater Egrets, 1,723 for Snowy Egrets and Tricolored Herons, 23,953 for White Ibis, and 1,468 for Wood Storks. Ogden et al. (1997) recommends utilizing a 3-year running average for assessing recovery trends. These 2009 values indicate a successful nesting season for the five indicator species and mark the reversal of a three year trend of declining rolling-averages for all groups, excepting the Snowy Egrets and Tricolored Herons.

Colony Locations

About 23% of the combined total for these five indicator species nested in the region of the southern Everglades marsh/mangrove ecotone, including the southern mainland mangrove estuary. This combined value is less than the 90% that was estimated to have occurred in this southern ecotone region during the 1930s and early 1940s, but approached the 26% that was calculated for the baseline period of 1986 – 1995 that was used to establish the performance measures and targets. The Wood Storks were the exception to this trend, with 64% of the nests located in the southern Everglades.

Timing of Nesting

This parameter applies only to the initiation of nesting for Wood Storks, which has shifted from November through December to January through March. This shift increases the risk of mortality of nestlings that have not fledged prior to the onset of the wet season and was the direct cause of the unsuccessful 2008 Wood Stork nesting season. In 2009, the earliest observation of Wood Stork nesting was in January, which is earlier than previous years, but outside the nesting onset target of November to December. This relatively early start, increased number of nesting pairs, and a generally favorable recession rate (despite two reversals in May and early June), resulted in a successful nesting success rate with mean success rate of about 2.5 fledglings per nest, exceeding the target of 1.5 chicks per active nest stated as a performance measure target.

Table 1. Three year running averages of the number of nesting pairs for the five indicator species in the Everglades.

Time Period	GREG	SNEG/ TRHE	WHIB	WOST
Target minima	4,000	10,000 to 20,000	10,000 to 25,000	1,500 to 2,500
1986-88	1,946	2,057	2,974	175
1987-89	1,980	1,680	2,676	255
1988-90	1,640	1,229	3,433	276
1989-91	1,163	903	3,066	276
1990-92	2,112	1,965	8,020	294
1991-93	2,924	2,792	6,162	250
1992-94	3,677	2,939	6,511	277
1993-95	3,843	2,060	2,107	130
1994-96	4,043	1,508	2,172	343
1995-97	4,302	1,488	2,850	283
1996-98	4,017	1,334	2,270	228
1997-99	5,084	1,862	5,100	279
1998-00	5,544	2,788	11,270	863
1999-01	5,996	4,270	16,555	1,538
2000-02	7,276	8,614	23,983	1,868
2001-03	8,460	8,088	20,758	1,596
2002-04	9,656	8,079	24,947	1,191
2003-05	7,829	4,085	20,993	742
2004-06	8,296	6,410	24,926	800
2005-07	6,600	4400*	21,133	633
2006-08	5,869	3,778	17,541	552
2007-09	6,956	1,723	23,953	1,468

* Tricolored Herons are excluded from this total due to incomplete surveys for this species in 2007.

Discussion

The RECOVER Wading Bird Nesting/Aquatic Fauna Forage Base hypotheses in conjunction with Performance Measures GE 20 (Wading Bird Foraging Patterns on Overdrained Wetlands) and GE-21 (Wading Bird Nesting Patterns) specifically address the ecological premise that the collapse of the wading bird nesting colonies in the southern Everglades is attributed to declines in population densities and season concentration of marsh fishes and other aquatic prey organisms as well as annual recession rates that directly affect nesting success rates. It is expected that restoration of natural hydrologic conditions will re-establish distributions of prey densities and concentrations across the landscape, which will in turn support the return of large, successful wading bird nesting colonies to the southern Everglades.

Ogden et al. (1997) first proposed the establishment of specific restoration targets for mainland nesting patterns by the general population of wading birds and specifically for Wood Storks, which included the recommendation of target minima for the number of nesting pairs in mainland colonies of 4,000 pairs of Great Egrets, 10,000 to 20,000 combined pairs of Snowy Egrets and Tricolored Herons, 10,000 to 25,000 pairs of White Ibis, and 1,500 to 3,000 pairs of Wood Storks.

Since 1994 the 3-year running average of the number of Greater Egret nesting pairs has exceeded the 4,000 pair established minima (Table 1) and has generally exhibited an increasing trend. The combined nesting counts for Snowy Egrets and Tricolored Herons have yet to reach the 3-year minima of 10,000 nesting pairs, but have shown increased nesting pairs since the extremely low number 207 nests in 2007. The generally declining trend of Wood Stork nesting pairs over the past three years was reversed this year due to the tremendous number of Wood Stork nests, about 4,063. White Ibis running average nest counts reached and maintained the 10,000 count minima and continue trending toward the upper end of 25,000 nesting pairs, exceeding the banner nesting year of 2006 with more than 43,400 nesting pairs in 2009.

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References

Frederick, P., D.E. Gawlik, J.C. Ogden, M.I. Cook, M. Lusk. 2009. The White Ibis and Wood Stork as indicators for restoration of the Everglades ecosystem. *Ecological Indicators* 9S:S83-S95.

Ogden, J. C., G. T. Bancroft, and P. C. Frederick. 1997. Ecological success indicators: reestablishment of healthy wading bird populations. In, Ecologic and precursor success criteria for south Florida ecosystem restoration. A Science Subgroup report to the South Florida Ecosystem Restoration Working Group.

RECOVER. 2006. 2006 System Status Report. U.S. Army Corps of Engineers Jacksonville District, Jacksonville, FL, and South Florida Water Management District, West Palm Beach, FL.

RECOVER. 2007. 2007 System Status Report. U.S. Army Corps of Engineers Jacksonville District, Jacksonville, FL, and South Florida Water Management District, West Palm Beach, FL.

This document is the result of continued cooperation among a diverse group of ecologists. It is not a peer-reviewed scientific publication; narratives reflect the views of individual authors rather than the collective participants. Photos provided by James Beerens, Michael Cheek, Peter Frederick, Brian Garrett, Dale Gawlik, Rebecca Jenkins, Pat Lynch and Lori Oberhofer. The South Florida Wading Bird Report is available on the web at www.sfwmd.gov.

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