
SOUTH FLORIDA WADING BIRD REPORT

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Dale E. Gawlik, Editor

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Summary

Onset of the seasonal drydown began about a month earlier in the Water Conservation Areas (WCAs) than in Everglades National Park, and in all areas it began several months earlier than in 1998. At the beginning of the dry season, water depths at each of 4 gauges in the Everglades interior all were greater than the 29-year average. However, by the end of the dry season, water depths were either above, below, or near the long-term average, depending on the region.

The estimated number of wading bird nests (excluding Cattle Egrets, which are not dependent on wetlands) in south Florida in 1999 was 27,105. That number is a 142% increase over 1998, which was similar to 1997 but down 17% from 1996. The number of nests in 1999 is similar to that of 1992, which was the best nesting year in the past 14. The large nesting effort in 1992 was consistent with the historic pattern of increased nesting following a multi-year drought. However, the increased nesting in 1999 followed several very wet years, suggesting that good nesting conditions can result from very different hydrologic regimes.

The increase in numbers of nests from 1998 was evident throughout the Everglades interior (note that despite an increase from 1998, the number of nests in ENP is still extremely low), but not so for the coastal regions (i.e., Florida Bay, Southwest coast, and Caloosahatchee Estuary). This is the second consecutive year in which an increase or decrease in the number of nests in the Everglades interior was the opposite of the trend in coastal areas. It was suggested in last year's report that nesting conditions in coastal regions may not have been impacted as severely as the interior marshes by the 1998 high water. Thus, coastal marshes may serve as a buffer to extreme hydrologic conditions. The 1999 pattern suggests

that conversely, nesting conditions in coastal areas may not improve as much during good hydrologic conditions. If this pattern is apparent in subsequent years it will be a powerful example of a multi-year linkage between coastal and interior Everglades marshes for long-lived species.

This was the first year since 1992 that a survey designed to quantify Roseate Spoonbill nesting was conducted in Florida Bay. The number of nesting pairs was similar to that of 1992. More dramatic was a shift in the location of colonies from the NE part of the Bay to the NW region. The last large-scale change in colony site locations occurred in the 1960s, when they shifted from the SE to the NE part of the Bay.

Aerial wading bird distribution surveys in the WCAs indicate that peak bird abundance before and during the breeding season in 1999 was roughly 3 times that of 1998. This year, not only were there more birds in the WCAs in winter, there was no movement of birds out of the system just prior to the nesting season as there was in 1998. Although 1998 and 1999 in the WCAs were very different in terms of the numbers of birds that nested, they were similar in terms of the percentage of birds that nested (87% of birds estimated from SRF flights in April nested in 1998 versus 89% in 1999). This pattern supports last year's observation that the primary response by birds to unfavorable hydrologic conditions is to simply leave the system.

Despite the overall good nesting effort in 1999, the only species that met numeric nesting targets proposed by the South Florida Ecosystem Restoration Task Force was the Great Egret. There was improvement in the timing of nesting for White Ibises and Great Egrets (nested 1 month earlier than in 1998) but not for Wood Storks.

As was true last year, our knowledge of wading bird nesting patterns is still hampered by inconsistencies in survey methods, effort, and geographic coverage, such as the lack of surveys in Big Cypress National Preserve. These problems emerge any time a system-wide synthesis is attempted. A solution will require an improvement in both the support for wading bird research and in the rigor of the science.

Dale E. Gawlik
Everglades Systems Research Division
South Florida Water Management District
3301 Gun Club Road
West Palm Beach, FL 33406
(561) 682-6712
dale.gawlik@sfwmd.gov

INSIDE THIS ISSUE

- | | |
|----|-----------------------------------|
| 2 | 1999 Hydrology |
| 3 | Regional Nesting Reports |
| 15 | Systematic Reconnaissance Flights |
| 16 | Population Recovery Status 1999 |

1999 Hydrology

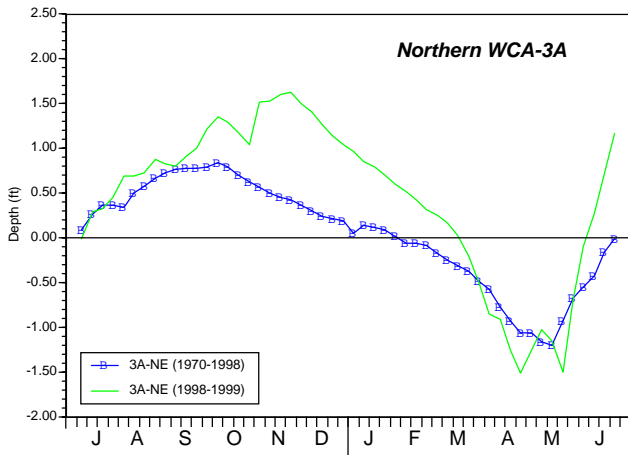
Water depths in the WCAs and ENP were generally above average for the 1999 water-year. This should not be a

Average water depths (ft) during the 1999 Water-Year (July 1998 – June 1999) in comparison to the long-term (1970-1998) average water depths (ft). Based on weekly means.

Location (Gauge)	Average 1970 – 1998	Average 1998 – 1999
WCA-1 (1A-7)	0.74	1.13
WCA-2 (2A-17)	1.37	0.94
WCA-3 (3A-NE)	0.04	0.44
Shark Slough (P33)	0.98	1.44

surprise because rainfall and structure inflows were also above average (see the 1999 Consolidated Report to the Florida Governor). In all regions, water levels were higher than normal at the start of the dry season. However, by the end of the dry season, they differed considerably among regions relative to the 29-year averages.

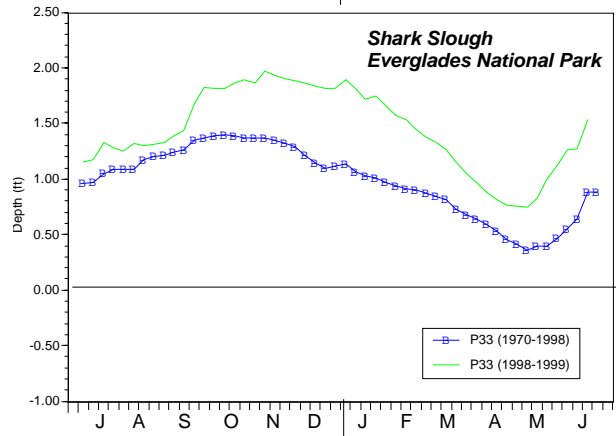
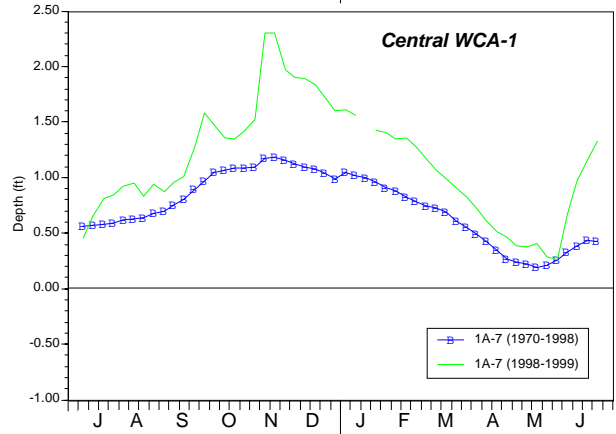
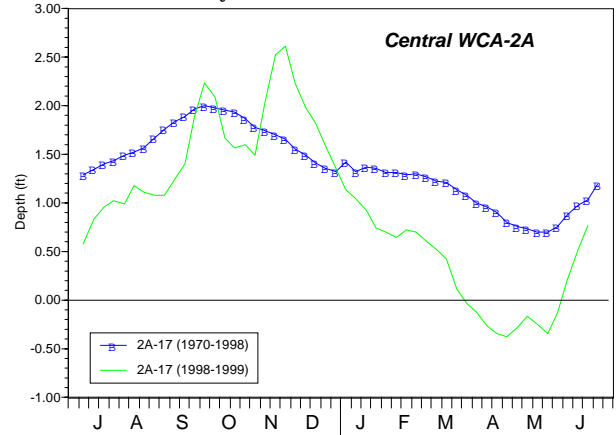
There were large differences between the 29-year average and the 1999 average seen at the 3A-NE gauge in the northeast section of WCA-3 and the 2A-17 gauge in central WCA-2A. In the 1998 Everglades Interim Report the 3A-NE site was identified as very hydrologically modified due to subsidence and a lack of overland flow. The SFWMD's Natural Systems Model v4.5 indicated that during the last 30 years this station was significantly deprived of water due to water management. It seems that for the 1999 water-year there was a significant turn-around in the quantity of water in northern WCA-3A.



Water Conservation Area 2A was the only region that did not see above average water depths. In WCA-2A water levels were almost 1/2 foot below the 29-year average. This may benefit the system because the 29-yr average water management trends in WCA-2A are thought to have resulted in the drowning of tree islands.

The 1998 weekly water depths, in comparison to the 1970-1998 weekly averages, indicate that the 1998-1999 seasonal hydrologic pattern improved at each gauge station. An improved seasonal hydrologic pattern means that drawdowns

were uninterrupted during the dry season and that periods of dry conditions were relatively short-lived. It also means that areas such as Shark Slough and northern WCA-3A were deeper than average. These areas have been identified in the Restudy as requiring more water. The hydropattern for central WCA-2A improved because it dried out for 2 months during the dry season whereas in recent years it remained flooded continuously.



Fred H. Sklar
 Everglades Systems Research Division
 South Florida Water Management District
 3301 Gun Club Road
 West Palm Beach, FL 33406
 (561) 682-6504
 fsklar@sfwmd.gov

Regional Nesting Reports

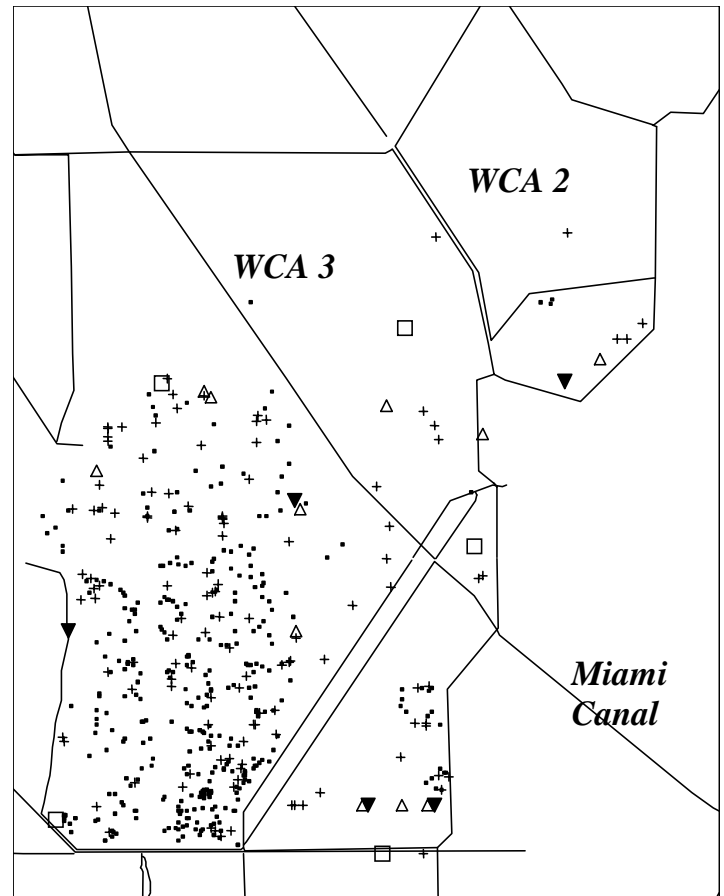
WATER CONSERVATION AREAS 2 AND 3

Methods: During 1999, we monitored nesting by wading birds in WCAs 2 and 3 using monthly aerial surveys and systematic ground surveys in April–June.

Results: During the period January–June, we documented a total of 15,273 wading bird nesting attempts (not including Cattle Egrets), which suggests that the 1999 season was a considerable increase over most years. This was the second highest count on record for the WCAs, and 2.5 times the average of annual counts (1986–1998).

It seems likely that this increase is attributable in part to drying patterns. The WCAs began the season with relatively high water, and experienced a relatively uninterrupted drying pattern almost throughout the spring season. Unlike many years with strong drying, there was still plenty of foraging habitat remaining by the beginning of the rainy season in late May. The 1999 hydropattern represents a significant break in the consecutive series of high water/high rainfall years that arguably began in 1994.

All nesting species studied showed increases, ranging from Little Blue Herons (1.4 times the 1986-98 average) to Wood Storks (3.7 times the 1986-98 average). Wood Storks nested at 3 colonies: Tamiami West, Crossover, and a new colony discovered in WCA 2B. Storks were largely successful at each of these colonies, even though they started in February. This kind of nesting success and effort by Wood Storks has not been documented in the WCAs since 1992. White Ibises nested in large numbers (>4,000 pairs) at the Alley North colony, as well as at Tamiami West, Hidden, Big Melaleuca, and 1 location in WCA 3B. Although there was some abandonment by late



Map of WCAs 2 and 3, showing locations of wading bird colonies active in 1999. Large squares indicate >500 pairs, solid triangles are 250–500 pairs, open triangles are 100–249 pairs, crosses are 10–99 pairs, and dots are 1–9 pairs.

nesters after the onset of the rainy season, the vast majority of the nesting attempts appeared to have been successful.

During April, a series of fires burned significant portions of WCA 3, and threatened the colonies Alley North, Mosquito Lagoon, and Mud Canal. In all instances, however, the fires burned out at the edge of nesting habitat, presumably because the nesting vegetation was greener or wetter than the surrounding vegetation. This suggests that there could be some adaptive advantage to nesting in willow-heads. We did discover a group of about 20 adult ibises at a location well away from the colony whose carcasses were burned. It was unclear if they died from some aspect of the fire and smoke, or from other causes (lightning strike, for instance).

**Peter Frederick
and Patricia Fontaine**
*Department of Wildlife Ecology and Conservation
University of Florida
Gainesville, FL 32611-0430
(352) 846-0565
pcf@gnv.ifas.fl.edu*

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), small dark herons (SMDH), and small light herons (SMLH).

Regions: Water Conservation Area (WCA), Everglades National Park (ENP), Wildlife Management Area (WMA), and A.R.M. Loxahatchee National Wildlife Refuge (LNWR).

Number of wading bird nest initiations in Water Conservation Area 2 and 3 from January to June 1999.

Colony	Latitude	Longitude	GBHE	ANHI	LBHE	TRHE	DCCOBCNH	CAEG	GREG	SNEG	WEST	WHIB	ROSP	Colony total	
Alley North	26.189167	80.525833	6			150			750	300		4,000	35	5,241	
Hidden	25.758617	80.545933		18	3	427			300	246		97		1,091	
JW new	26.143517	80.747633	4						560					564	
Mud Canal	26.010000	80.461667	3	76	20	50	16	300	85					550	
2B-20	26.144583	80.379800	5	80	20	25	4	190	80	30				434	
Crossover	25.940000	80.832500							260		180			440	
Anhinga alley	25.797267	80.498317	4	300	5	25	24		35			4		397	
Heron alley	25.797317	80.559300	1	70	17	50	10		3	20		180		351	
Big Mel	26.047100	80.626700		3			1		125			150		279	
2B stork	26.163383	80.347700	2	15					55		70		12	154	
Starter Mel.	25.940717	80.624433	32	45			4		70					151	
3B MUD East	80.494500	25.797000	6	10					130					146	
	26.040000	80.621667							140					140	
Buffer Zone	26.102283	80.454483							80					80	
Cypress City	26.125000	80.541667	4						120					124	
	26.071050	80.807467			40	20					62			122	
N-S canal 3B	25.797267	80.528333	8	33	1	5	24		20					91	
	26.136283	80.708417							110					110	
N-S canal 3B	25.797267	80.564817	2	60		3	19							84	
East Central Ag ca	25.797200	80.505200	3	20	9	12	25		5			25		99	
	26.131617	80.702117		20					80					100	
L-67	25.961400	80.572833	2	25					70					97	
	25.967317	80.808550		2	45	27					20			94	
	26.015517	80.794250	1		65	27								93	
West Ag Canal	25.797267	80.629283	2	25	4	10	28		4			4		77	
	25.965633	80.820683	1		65	10					10			86	
	26.032867	80.692367	5						75					80	
	25.935000	80.625000							80					80	
	26.018067	80.692167							75					75	
West Cent. Ag	25.797267	80.618033		24	4	11	13					13		65	
	26.053983	80.756167	1	1	25	10	1		25	10				73	
2B 2nd colony	26.191667	80.308333							60		10			70	
	25.853233	80.838717		10	3	4	4		45			1		67	
2B	26.178900	80.322650							65					65	
	26.116433	80.659733		2	5	5			50					62	
	26.111667	80.661667							58					58	
l-67 canal	25.976217	80.538533	7	10	5	18								40	
	25.850217	80.673050	2	50					1					53	
	26.091950	80.712117			22	10					20			52	
	25.771800	80.692933	2	30					12					44	
	25.987550	80.706667	1	15	8	15					5			44	
	26.146933	80.743083							44					44	
	25.916867	80.598500	3	25			10		5					43	
	26.108100	80.797417	1	18		1			20					40	
	26.040867	80.801767		2	15	13	4		7					41	
JW1	26.110883	80.752467	4	1					35					40	
	25.915667	80.630683	2	38										40	
Colonies of under 40 pairs			414	1,153	122	298	11	68	0	634	2	0	0	2,702	
Total nesting pairs			528	2,181	503	1,226	25	241	490	4,373	725	260	4,474	47	15,073

A.R.M. LOXAHATCHEE NATIONAL WILDLIFE REFUGE

Methods: In 1999, a total of 37 hours of airboat survey effort were conducted by refuge staff between April 5 and April 22 covering over 600 kilometers. A brief helicopter observation of 3 colonies inaccessible by airboat took place on April 12 and 13, for approximately 30 minutes. Nest estimates for each species were derived by counting the number of flushed, tending adults, or in the case of Great Blue Herons, by counting actual nests. Trish Fontaine (working with Peter Frederick, Univ. of FL), assisted with aerial counts from fixed-wing aircraft. Survey time was approximately 1 hour on April 24. Only 1 ground survey effort was undertaken this season due to extremely low water levels.

While recent survey efforts (1994 - 1998) focused on returning to traditional colony sites, a more intensive survey effort was undertaken by refuge staff in 1999. Both north-south and east-west transects were performed by airboat where conditions permitted. Low water levels coupled with thick vegetation limited access to many areas. It is estimated that 60% to 65% of the refuge was covered using this method.

Results: The location of nesting colonies did not follow past patterns closely. Some previously known colonies were abandoned. Other historic colonies increased greatly in number and in species diversity. Approximately 200 colonies, including individual Great Blue Heron nests, were located during survey efforts. Four to 5 new colonies (> 100 birds) were located during the survey and probably would have been missed if not for the intensive transect effort. Nineteen colonies of 100 or more birds were located during survey efforts. Two colonies of 2,000 or more nests were located. The observed (1993-present) trend of colony establishment in more widespread locations, especially in the northern half of the refuge, was not seen during the 1999 season. The extremely low water levels in the north probably did not permit the establishment of new colonies due to the lack of suitable foraging sites.

The 1999 nesting season started approximately a month earlier than in 1998 due to the low water levels. Great Blue Herons and Great Egrets started nesting in January and February, respectively. Their longer legs permitted them to effectively forage in areas too deep for the smaller wading birds. Smaller waders, such as Little Blue and Tricolored Herons, and Snowy Egrets, initiated nest building in mid-March and were incubating, or had nestlings as of the first or second week of April. White Ibises and Cattle Egrets were incubating or nest-building as of 22 April. Additional recruitment of White Ibises and Cattle Egrets will likely occur because they are late nesters at LNWR.

Survey estimates showed increased nesting activity for all species with the exception of Cattle Egrets, which experienced a 51% decrease in nesting. Cattle Egrets are late nesters at LNWR, so these estimates are probably conservative as additional colonies will most likely become established. Little Blue and Tricolored Heron nesting increased from 1998 by 54% and 39%, respectively. Great Blue Heron nesting increased 76%. This dramatic increase was most likely the result of the intensified



transect effort. In the past, the locations of Great Blue Heron nests were documented during other field activities, or were located when in route to historical nesting locations.

The Snowy Egret, White Ibis, and Great Egret increased dramatically in nesting activity since 1999. Snowy Egret nesting increased from 1998 by 3,033%. This was most likely due to the low water levels making it possible for these birds to forage efficiently. Approximately 300 Snowy Egrets were nesting in a complex of 4 to 5 small tree islands (bayheads) in the central interior. White Ibis nesting increased by 562%. White Ibis continued their annual tradition of nesting in different locations of the refuge interior. Two colonies of 2,000 or more White Ibis nests were located during survey efforts. One colony, in a complex of small willow and myrtle islands, was established at the south end of the refuge (26E22.06N, 80E18.32W) and contained approximately 2,800 birds. Some ibis were nesting on sawgrass, which had been flattened by the weight of the adult birds. Another large colony, located in the central interior (26E 30.87N, 80E 15.87W), grew from 450 birds on 6 April to approximately 2,000 birds by 22 April. Great Egret nesting activity increased from 1998 by 146%. The discovery of some of the smaller Great Egret colonies (25-50 birds) was probably a direct result of the intensified transect effort.

During an aerial survey on 24 April, Trish Fontaine reported a group of 40 Wood Storks as well as several nests in an historic colony site located at 26E 33.14N, 80E 15.13W. Refuge biologists reported seeing Wood Storks perched in the cypress trees in this vicinity during a migratory bird survey on 16 April. Wood Storks nested successfully in the refuge only in 1990. In 1993, several Wood Stork nest structures were constructed in *Melaleuca* snags in a Great Egret colony and in another treated *Melaleuca* head nearby, but their nesting attempts failed.

Approximately 9-12 Wood Stork nests were confirmed during an 18 May helicopter flight, but refuge staff were unable to confirm eggs or young present in nests. John Ogden suggested that nesting may have started too late to be successful (Mark Musaus, pers. comm.). Refuge biologists conducted an airboat survey of the cypress dome on 18 June. No adults or young were present and only 7 nest structures were present. Several nests may have been

Estimated numbers of wading bird nests at A.R.M. Loxahatchee National Wildlife Refuge 1992-99.

SPECIES	1992	1993	1994	1995	1996	1997	1998	1999	DEV*
LBHE	938	673	1333	1153	1372	1311	1036	1592	± 100
TRHE	520	173	103	343	197	254	352	489	± 50
GBHE	87	73	73	82	118	95	123	217	± 20
GREG	239	328	396	610	837	516	828	2,037	± 150
SNEG	97	4	21	59	28	73	15	470	± 100
CAEG	1408	728	1051	729	2403	1028	1682	831	± 75
WHIB	2761	218	1849	2249	800	1095	873	5,780	± 500
USW**	0	378	0	0	0	0	37	0	
TOTAL NESTS	6050	2575	4826	5225	5755	4372	4946	11,416	
TOTAL NESTS w/o Cattle Egrets	4642	1847	3775	4496	3352	3344	3264	10,585	

*Deviation applies only to 1999 nesting season.

**USW = Unknown small wading birds.

damaged, or blown away by recent severe thunderstorms. The rapid increase in interior water levels may have caused the Wood Storks to finally abandon their nesting attempts. High water levels probably limited the ability of the storks to effectively forage, as prey items could disperse more easily throughout the marsh.

Black-crowned (411) and Yellow-crowned (7) Night-Herons were also found to be nesting on the refuge. Forty-nine Glossy Ibises were observed in mixed colonies and were presumably nesting, although this was not confirmed. A member of the biology staff later confirmed the presence of Glossy Ibis young in a colony next to an airboat trail.



An additional bonus was the discovery of a single Sandhill Crane nest (26E 27.22N, 80E 19.15W) in the south-central interior. An adult was flushed from a nest containing 2 eggs. The nest was constructed on a small floating peat island located in the middle of a wet prairie. The adult feigned injury and gave several distress calls before flying some distance away. Historically, most crane nests were documented in the northern interior of the refuge.

Conclusion: Overall, the 1999 nesting season at LNWR was extremely successful and most likely exceeded the previous high nesting year (since accurate records were kept) of 1988, which was a low water year prior to a severe drought. Wading bird nesting, excluding Cattle Egrets, increased by 224%. Mild weather conditions coupled with lower than normal water levels early in the year likely contributed to a record nesting year. Intensive transect surveys this year led to the discovery of several new colonies, and were likely responsible for locating additional Great Blue Heron nests. The most discouraging event of the 1999 nesting season was the failure of the Wood Stork nesting attempt. Although they traditionally begin nesting in December, the successful nesting attempt in 1990 began at a much later date.

Special thanks to LNWR volunteers Laura Allishaw, Ted Asche, Jennifer Verdolin, and Refuge Manager Mark Musaus whose assistance made gathering the data for this year's report possible. Also thanks to Trish Fontaine who assisted with aerial and ground surveys.

Bill Thomas, Laura Brandt, and Marian Bailey

A.R.M. Loxahatchee National Wildlife Refuge

10216 Lee Road

Boynton Beach, FL 33437-4796

(407) 732-3684

r4rw_fl.lxh@fws.gov

EVERGLADES NATIONAL PARK

Methods: Park biologists flew 3 colony surveys during the 1999 nesting season. Both traditional colony sites as well as new colonies discovered during Systematic Reconnaissance Flights were surveyed. Flights were conducted using a Cessna 182 fixed-wing aircraft on 5 March, 10 April, and 2 June, 1999. As a result of a more typical dry-down, initiation of nesting began in early March, more than a month earlier than in 1998.

Results: There were an estimated 2064 wading bird nests found (including 285 Cattle Egret nests) on the mainland colonies during the 1999 season. The estimate (excluding Cattle Egrets) represents a 62% increase from 1998 nesting season. Even so, the number of wading birds nesting in Everglades National Park continues to remain low. For the sixth consecutive year both the Lane River and East River colonies were not active. It should be mentioned that

Tricolored Herons and Snowy Egrets were seen in the Rodgers River Bay rookery and the Tamiami West colonies, but nesting could only be confirmed for the Tamiami West colony. As has been pointed out in the past, a better survey method is needed to determine the extent of nesting of some species such as the Tricolored Heron, Little Blue Heron, and Snowy Egret.

Sonny Bass and Jason Osborne

*South Florida Natural Resources
Center Everglades National Park
40001 State Road 9336
Homestead, FL 33034
(305) 242-7800
sonny_bass@nps.gov*

Number of wading bird nests in Everglades National Park, March-June 1999

Colony Name and Location	Date	GREG	WOST	LBHE	TRHE	BCNH	SNEG	WHIB	GWHE	CAEG	Status
Upper Taylor Slough SW corner of L31W & main ENP road	3/5/99 4/7/99 6/2/99										IA*
Maderira Ditches	3/5/99										IA
25°19.39 /80°38.74	4/10/99										
Cuthbert Lake	3/5/99	75							4		
25°13.10 /80°46.50	4/7/99 6/2/99										
Paurotis Pond	3/5/99	100	40								
25°16.89/80°48.18	4/10/99 6/2/99	150	125								
East River Rookery	3/5/99										IA
25°16.08/80°52.03	4/10/99 6/2/99										
Lane River Rookery	3/5/99										IA
25°18.02/80°53.18	4/10/99 6/2/99										
Rodgers River Bay	3/5/99	300	10								
25°33.40/81°04.19	4/10/99 6/2/99	250	15								
West of Obsv. Tower	3/5/99	100									
25°39.48/80°47.96	4/10/99	125									
Headwaters of Broad River	4/10/99	100									
25°30.30/80°58.60	6/2/99	85									
Grossman Ridge	3/5/99	150									
25°37.68/80°38.74	4/10/99	100									
Tamiami East**		41									
25°45.48/80°30.47											
Tamiami West**		400	75	6	8	10	15	150		35	
25°45.47/80°32.69											
NE Grossman	3/5/99	25									
25°38.81/80°36.55	4/10/99	30								200	
	6/2/99									250	
Total***		1371	215	6	8	10	15	150	4	285	

* IA = Inactive

** Data collected by Peter Frederick

*** Totals are sum of maximum counts per colony

FLORIDA BAY

Methods: Nesting water bird activity in Florida Bay was monitored monthly by aerial survey from March 1995 - June 1999. The platform is an H-65 Dolphin helicopter furnished by the Miami Station of the U.S. Coast Guard. Coverage in January 1998 was incomplete and did not include the western portion of the bay (i.e., Derelict to Sandy Keys).

Results: The table (page 9) includes 7 wading bird species, 2 large diving bird species, and 2 raptors: the Great White Heron, Great Blue Heron, Great Egret, Snowy Egret, Roseate Spoonbill, White Ibis, Tricolored Heron, Double-crested Cormorant, Brown Pelican, Bald Eagle, and Osprey. We also observed Laughing Gulls nesting in Florida Bay.

The largest wading bird colonies, consisting of more than 100 birds, are consistently located on Tern Key in the northeastern portion of the bay and Frank and Sandy Keys in the northwestern part of the Bay. Nesting also occurs on many other islands in the Bay. Great White Heron nesting is distributed over much of the bay, and colonies are made up of a relatively small number of birds (e.g., from 3 or 4 nests to 20 or more).

Corkscrew Swamp Sanctuary, Collier County

The 1999 nesting season at Corkscrew included a mostly unsuccessful nesting effort by a comparatively large number of Wood Storks and the first nesting by Roseate Spoonbills in recent decades. Storks initiated nesting during February-March and peaked at 890-900 pairs (aerial surveys) in late April and early May. By late April, a few stork nests contained small to medium sized nestlings. Some stork nests were deserted in late May, followed by colony-wide desertions during June. Although summer rains began in June, the intensity of the initial rains was not excessive, and no specific weather event seemed to explain the June desertions. Approximately 100-300 nestling storks were estimated to have successfully fledged during June, prior to the collapse of the colony.

Six Roseate Spoonbill pairs successfully fledged young during April and May. No spoonbills are previously known to have attempted nesting at Corkscrew during the 20th Century.

John C. Ogden
System-wide Programs
South Florida Water Management District
O.E. 148, University Park
Florida International University
Miami, FL 33199
(561) 906-9277
jogden@sfwmd.gov

There is little nesting activity in the Bay from July to September. During the first 2 years, maximum nesting activity occurred in the winter or early spring for most species. During 1997-1998, less nesting activity was observed during winter and early spring and relatively more nesting activity was observed April-June. In the fourth year, the number of observed nests was lower for wading bird species but higher for Double-crested Cormorants and Bald Eagles. Great White Herons were observed nesting in all but 4 of the 53 months covered by the survey, but numbers varied seasonally with greatest intensity during November-April. Nesting by Great Blue Herons and Roseate Spoonbills usually occurs within the same period. Great Egrets, White Ibis, Snowy Egrets, and Tricolored Herons nest somewhat later.

Great Egret nesting in the Bay was sizeable the first year (maximum of 195 nests in March, 1996), minimal the second year, high again in April and June of 1998, and low in 1999.

We saw few Roseate Spoonbill nests in 1998-1999, compared to previous years, although J. Lorenz found sizeable nesting groups of Roseate Spoonbills in 1999 (See Lorenz, this report). Although we have a few observations of nesting by Tricolored Herons and Roseate Spoonbills, we are not able to see their nests well from the air; therefore, our records do not provide a complete picture of their nesting activity.

Water bird nesting in Florida Bay may be affected by rainfall and runoff patterns. The year 1995-1996 was the second of 2 unusually wet years. The year 1996-1997 was moderately wet. During 1997-1998, the dry season dry down was delayed until late spring. A severe dry season occurred in 1998-1999, with little rain during February-May.

Joan A. Browder¹
Oron Bass²
Jason Osborne², Jennifer Gebelein¹, Lori Oberhoffer²,
Michael Hearon¹, and Tom Jackson¹

¹NOAA
National Marine Fisheries Service
75 Virginia Beach Drive
Miami, FL 33149
(305) 361-4270
joan.browder@noaa.gov
²*Everglades National Park*



Number of nests observed in Florida Bay, by month 1996 - 1999*														
Year	Month	GWHE	GBHE	GREG	REEG	TRHE	SNEG	WHIB	ROSP	DCCO	BRPE	BAEA	OSPR	Total
1996	Jan	257	33	130	0	0	0	0	18	0	225	5	4	672
1996	Feb	188	20	165	1	0	0	0	9	75	365	6	37	866
1996	Mar	152	24	195	0	1	0	101	21	50	350	7	32	933
1996	Apr	104	6	84	0	10	10	275	0	0	251	3	13	756
1996	May	71	15	163	0	29	0	200	0	10	168	1	6	663
1996	Jun	14	3	20	0	0	0	150	0	25	40	0	0	252
1996	Jul	17	0	3	0	0	5	0	0	50	0	2	0	77
1996	Aug	4	1	0	0	0	0	0	0	0	0	0	0	5
1996	Sep	35	0	0	0	0	0	0	0	20	0	0	0	55
1996	Oct	81	5	0	0	0	0	0	0	0	0	2	4	92
1996	Nov	90	6	0	0	0	0	0	20	0	77	0	3	196
1996	Dec	131	21	0	0	0	0	0	40	50	100	0	23	365
1997	Jan	200	20	0	0	20	0	0	24	75	235	4	29	607
1997	Feb	153	15	0	0	0	0	0	0	50	275	3	27	523
1997	Mar	133	48	75	0	0	0	0	0	55	420	7	31	769
1997	Apr	80	3	30	0	0	0	150	0	110	270	8	0	651
1997	May	30	1	0	0	0	1	75	0	50	40	0	0	197
1997	Jun	9	0	0	0	50	0	100	0	0	0	0	0	159
1997	Jul	15	0	78	0	50	75	50	0	35	0	0	0	303
1997	Aug	7	0	50	0	50	10	0	0	71	0	0	0	188
1997	Sep	11	0	0	0	0	0	0	0	20	0	0	0	31
1997	Oct	0	0	0	0	0	0	0	12	25	0	0	9	46
1997	Nov	139	5	37	0	0	0	0	20	10	0	0	9	220
1997	Dec	171	13	0	0	0	0	0	50	51	0	0	27	312
1998	Jan	79	15	0	0	0	0	0	30	0	0	1	17	142
1998	Feb	52	4	0	0	0	0	0	0	0	190	1	16	263
1998	Mar	19	1	0	0	0	0	0	0	0	81	0	6	107
1998	Apr	34	9	308	0	0	0	200	0	5	200	2	7	765
1998	May	16	1	0	0	0	0	0	0	10	16	0	0	43
1998	Jun	17	1	200	2	220	70	250	0	5	30	0	0	795
1998	Jul	9	0	12	0	0	0	0	0	0	30	0	0	51
1998	Aug	11	0	0	0	0	0	0	0	0	0	0	0	11
1998	Sep	18	0	0	0	0	0	0	0	0	0	0	0	18
1998	Oct	73	1	0	0	0	0	0	0	0	0	0	1	75
1998	Nov	107	5	1	0	0	0	0	5	0	0	0	11	129
1998	Dec	68	2	5	0	0	0	0	2	0	0	2	11	90
1999	Jan	101	0	48	0	0	0	0	1	0	250	1	42	443
1999	Feb	23	1	75	0	0	0	0	0	125	125	2	3	354
1999	Mar	196	19	106	0	0	0	0	0	125	470	1	26	943
1999	Apr	32	6	50	0	5	0	1	4	235	270	20	5	628
1999	May	12	0	75	0	0	0	0	0	55	111	0	1	254
1999	Jun	8	0	17	0	2	0	0	0	0	0	0	0	27
Total 1999**		196	19	106	0	5	0	1	5	235	470	20	42	
*Data from 1995 reported in previous volumes of the South Florida Wading Bird Report.														
**Totals represent maximum counts per species per month Nov 1998 - Jun 1999.														

ROSEATE SPOONBILLS - FLORIDA BAY

Methods: National Audubon Society conducted Roseate Spoonbill nesting surveys during the winter-spring breeding season. Sandy, Tern, and Duck Keys were visited every other week from 23 November through 31 January, 1999 to monitor nesting. Once a full clutch of eggs had been laid, 53, 40, and 5 nests were tagged on Sandy, Tern, and Duck Keys, respectively. These nests were revisited during subsequent visits to the colony so that nest success could be evaluated. Success was gauged by the number of chicks surviving to 21 days. Each of the islands listed in the table was visited at least once between 31 January and 19 February, 1999. Total nests and chicks were counted and, when possible, an estimate of nest success was made. On 26 March, Sandy and Tern Keys were revisited. There was no activity on Sandy Key, but spoonbills were renesting on Tern Key. Bi-weekly nest checks were resumed at Tern Key and continued through May 15. The same set of tagged nests was observed during the second nesting. Sandy was visited for the last time on 6 April, 1999 and there were no spoonbills on the island. Ten colonies in eastern Florida Bay were surveyed on 26 April, 1999.

Results: This is the first full survey of Florida Bay spoonbill colonies since 1992. The most significant change since the 1992 survey is that the major nesting region in the bay has switched from the northeast to the northwest. The trend towards northwestern nesting sites began in the mid 1980's, but this is the first time that more than 50% of the nests were located in that region. This increase in northwestern nesting effort coincides with a dramatic decline in nesting effort in the northeastern region. A similar switch from southeastern to northeastern colonies occurred in the 1960's.

Spoonbills nesting in the southeastern region of the Bay presumably feed along the keys and in the Bay, in addition to foraging on the mainland. These 15 colonies initiated nesting in late November, and chicks left the colonies by about the end of February. Nesting success was approximately 40%, and the total number of nests was 129 for all colonies combined. The number of nests found in this region is similar to numbers observed over the last 2 decades. Visual observations from a boat on 26 March indicated that the largest of these colonies were inactive, indicating that there was no second nesting. No spoonbills or nests were found in the Bottle, Crane and Middle Butternut colonies on 26 April, 1999, supporting this observation.

Birds in the northeastern region typically forage in the dwarf mangrove forests on the mainland to the north of Florida Bay. Flight-line observations this year supported that pattern. The 7 colonies (136 nests) in the northeastern region initiated and completed their first nesting at about the same time as the southern colonies and also had about the same success rate (40%). It appears that the northeastern colonies are going through or have gone through a serious

decline, at least during the traditional nesting period (Nov-Feb). Similar surveys conducted from 1987 to 1992 found that between 230 to 360 nesting pairs utilized the 7 colonies in the northeastern part of the Bay (5-yr average = 280 nests). In the late 1970's these colonies had more than 600 nesting pairs. The 40%

Number of nests and nesting success of Roseate Spoonbills in Florida Bay November 1998 - May 1999.

Colony	First nesting	First	Second	
		nesting success	nesting success	
Bottle	28	0.40	0	
Stake	0			
Cowpens	10			
Cotton	0			
West	0			
Low	0			
Pigeon	8	0.75		
Crab	7			
East	2			
Crane	11		0	
E. Butternut	4			
M. Butternut	47	0.43	0	
Total SE region	117		0	
E. Bob Allen	11	0.36	0	
Manatee	0			
Jimmie Channel	23	0.27	13	
S. Park	7			
Total Central Region	41		13	
Tern	60	0.40	208	2.04
N. Nest	0			
S. Nest	19	0.32	0	
Porjoe	9		2	
N Park	39		30	
Duck	9	0.44	7	0.71
Pass	0			
Total NE Region	136		247	
E. Buchanan	0			
W. Buchanan	0			
Barnes	0			
Twin	2			
Total SW Region	2			
Frank	125	>1.0	0	
Oyster	23			
Sandy	177	1.44	0	
Total NW region	325		0	
Florida Bay Total	621		260	

success rate is low when compared to years prior to 1992; however, it is a definite improvement over the success rates observed since 1992 (0%, 0%, 0%, 7%, 27% and 0% over the previous 6 years).

The second nesting at Tern Key was much larger than the first (208 compared to 60). Great Egret, Reddish Egret, Tricolored Heron, and White Ibis combined to account for more than 400 additional nests. Porjoe Key had a large (100-150 nests) mixed-species colony, but only contained 2 spoonbill nests. Spoonbill nests were also found on N. Park and Jimmie Keys. A likely explanation for renesting at the northern colonies but not the southern is that ideal conditions existed on the mainland foraging grounds. Water levels in the mangrove zone were very low through May and, as a result, prey-sized fish densities of greater than 100 per square meter were collected from our eastern most fish sampling location (Highway Creek). Landscape elevations are generally higher on the eastern side of the mangrove zone and lower toward the west; therefore, the eastern mangrove zone tends to dry first. Low rainfall during the spring resulted in declining water levels in a general east to west pattern. Presumably, fish continued to concentrate into the remaining wetted area, providing a continuous and sustained prey base for parental wading birds along this east to west gradient. The last time such dry down patterns occurred in the mangrove zone was the period from 1989-1992. During this period, spoonbills exhibited nesting success rates of 220%, 180% and 150% for the 3 nesting cycles, respectively; however, these occurred during the traditional first nesting period. The success rate for the second nesting in 1999 was 2.04 chicks per nest. This is surprising given that spoonbills traditionally did not renest.

Comparison of aerial and ground surveys: Ground visits to 10 colonies in eastern Florida Bay were synchronized with Browder *et al.*'s (this report) helicopter survey of eastern Florida Bay on 26 April. Browder *et al.* observed 4 spoonbill nests on Tern Key. They observed no other nests in eastern Florida Bay. Ground counts revealed 206 spoonbill nests on Tern Key, 2 on Porjoe Key, 7 on Duck Key, 13 on Jimmie Channel, and about 30 on N. Park. This confirms Browder *et al.*'s observation that spoonbill nests are difficult to accurately count from aerial surveys.

Jerry Lorenz

Acting Director

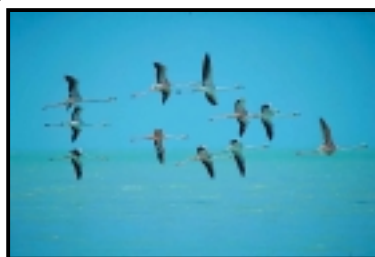
National Audubon Society Research Unit

115 Indian Mound Trail

Tavernier, FL 33070

(305) 852-5092

jlorenz@audubon.org



FLORIDA ATLAS OF BREEDING SITES FOR HERONS AND THEIR ALLIES

Approximately every decade for the past 30 years, the Florida Fish and Wildlife Conservation Commission has conducted a statewide colonial wading bird survey in order to produce an atlas of breeding sites for these species. In the past, surveys were supplemented with colony information provided by state, federal, and private organizations that monitor wading bird activity. Previous surveys also encompassed more than 1 breeding season. To reduce observer biases and maximize survey consistency for the 1999 survey, Fish and Wildlife Conservation Commission biologists flew the entire state in a single season. Several hundred hours of flight were logged by 2 aircraft and 4 biologists (2 in each plane).

We started surveying the Lower Keys in January and progressed northward until the entire state was covered. We finished our last flights in the Panhandle in late June. Flights were conducted using a Cessna 172 fixed-wing aircraft. Latitudinal transects (n = 133) were flown coast to coast at 5-km intervals every week from March until June. We flew at an altitude of 800 ft until colonies were sighted, then descended to approximately 200 ft. to collect colony information. We recorded GPS coordinates, species composition, numbers of nesting pairs, and other habitat characteristics. All colonies from previous surveys were checked in addition to newly-found colonies. Some locations were inaccessible due to airspace restrictions and/or military operations. Many colonies were checked by airboat, motorboat, and on foot to determine accuracy of survey flights. The Keys, Florida Bay, the Atlantic and Gulf coasts, and a few select transects were flown on 2 separate occasions to help identify temporal variations in colony structure.

We are currently proofing and summarizing the data and finishing ground checks in parts of the state. Within the year we will produce the 1999 update of the "Florida Atlas of Breeding Sites for Herons and their Allies". This atlas will be made available to the public and will include a list of all colonies (active and vacant) surveyed, their lat/lon coordinates, species information, nest numbers, habitats, and county maps with colony locations. For more information contact Steve Nesbitt (Principal Investigator), FFWCC, Gainesville Research Laboratory, 4005 S Main St., Gainesville, FL 32601, (352) 955-2230, nesbits@gfc.state.fl.us or Rodney Felix (co-Principal Investigator), FFWCC, 5300 High Bridge Road Quincy, FL 32351, (850) 627-9674, snakez1869@hotmail.com.

Kristoffer Bowman

Florida Fish and Wildlife Conservation Commission

5300 High Bridge Road

Quincy, FL 32351

(850) 627-9674

ktbowman@tfn.net

SOUTHWEST COAST

In addition to the 5 colonies monitored for the last few years, Wood Stork nesting was monitored at Corkscrew Swamp Sanctuary (CSS). Each nesting season my initial feelings are that nesting/weather is different. This year is no exception, particularly with regard to hydrology (see Hydrology 1999, this report). Nesting activity started about the typical time but there were fewer birds and they finished nesting earlier than usual.

Location and Methods

Rookery Bay (RB): 26°01'51"N 81°44'43"W. Two Red Mangrove islands, 0.22 ha. Nest census conducted 2 June, walk through, complete coverage; 1 person, 1 hour. Note: at both RB and ABC, sundown fly-in is censused (23 years, bi-weekly and 21 years, monthly, respectively) to give an index to the numbers of birds using the roosts at night and thus the surrounding area.

Marco Colony (ABC): 25°57'24"N 81°42'13"W. Three Red Mangrove islands, 2.08 ha. Nest census conducted, 3 June, walk through, complete coverage; 1 person, 2 hours.

East River (ER): 25°55'39"N 81°26'35"W. Three Red Mangrove islands, about 0.25 ha. Nest census conducted 4 June, canoe, complete coverage; 1 person, 1 hour. Nesting this year must have started at least 3 weeks early. When I arrived, there were numerous fledglings in the top of the mangroves and very few nest structures left. Numbers of nests in the table are an estimate derived from my guess of productivity.

Chokoloskee Bay (CHOK): 25°50'43"N 81°24'46"W. Four Red Mangrove islands, about 0.2 ha. Nest census peak, 12 May, powerboat circling the islands; 2 people, 0.5 hour. The islands are small and thin, and it is possible to count all of the large nests from the boat; as next to no small waders breed here, it is not necessary to do a ground census.

Chokoloskee Pass (CHPS): 25°46'48"N 81°24'26"W. One mostly Red Mangrove (2-3 Blacks) island, about 0.5 ha. Nest census, 12 June, aerial survey, photographed; 2 people, 0.25 hour. Note: All of the walk or canoe censuses are conducted during peak nesting, about the beginning of June. The powerboat censuses are done on regularly scheduled monthly censuses. Counts represent the peak number recorded. The regular June census for Chokoloskee was canceled because of weather; an aerial census was flown 12 June.



Corkscrew Swamp Sanctuary (CSS): 26°20'N 81°30'W. From 15 March to 12 June, 7 aerial censuses were conducted. Wood Storks were nesting in the tops of Bald Cypress in 4 sub-colonies that totaled about 40 ha and were mostly around the Central Marsh of CSS. Nests were photographed from both 150 m (to count nests) and 60 m (to ascertain condition of nesting). Results of the census were later determined from the slides. Each census; 2 people, 0.5 hour.

Results

Great Egret: In all 4 coastal colonies nesting started in the beginning of March, which is typical. At both RB and ABC, these egrets seem to be stable and appeared to be productive. In contrast, the 2 colonies near Chokoloskee were not very productive. The 30 nests at CHOK were deserted (as were pelican and cormorant nests) and didn't produce any young. Nesting at CHPS started later. It is possible that CHOK birds relocated here. As of 9 July, number of nests had dropped to 15, but 35 large chicks and fledglings were recorded. It seems that 1999 was a fair year for Great Egrets.

Snowy Egret: The numbers of nests for this species have dropped slowly at both RB and ABC (exceptionally low at ABC this year) for the past 5 years. At ER, Snowy Egrets have increased (but not enough to account for the overall decline) over the years and had about the same number of nests as last year. The numbers coming into both RB and ABC to roost at night were quite low for the nesting season, indicating that numbers were down in the area.

Little Blue Heron: There was a steady decline in nesting over the last 5 years at both RB and ABC. Over the same period there has been a decline in the numbers roosting. The numbers in the area are considerably less

Colony	GBHE	GREG	SNEG	LBHE	TRHE	REEG	CAEG	GLIB	Total
Rookery Bay		17	41	16	93		58		225
Marco (ABC)	17	147	23	6	124	7	256	46	623
East River			125	12	125		1		263
Chokoloskee Bay		30							30
Chokoloskee Pass		31	2						33
Total	17	225	191	34	342	7	315	46	1174
Mean (21 year)	6	139	224	55	353	2	480	44	1313

than reported for the late 1930's (E. Reimann, Audubon Warden).

Tricolored Heron: Although the drop in nesting has not been as dramatic over the years, there has been a slow general decline in numbers of nests and roosting birds at both RB and ABC. The ER colony is stable.

Reddish Egret: Numbers of nests have increased slowly over the period of study. This year was a good year at ABC, but like the last 2 years, they did not attempt to nest at RB. This is only the second year (1997 was the first) white phase chicks about to fledge were seen. Both records were in the same area of the A Island of the ABC Colony.

Cattle Egret: Numbers of nests are down from the mean. They were especially low at RB, where there was also fewer birds coming in at night. Overall, the population seems stable.

White Ibis: This species was not included in the table because there were only 2-3 late nests at the ABC Colony, which was typical of the last few years. What is significant is that at both of the night roosts, adults started returning (adults decline considerably during nesting, as they nest inland) almost a month early, indicating a curtailed nesting season this year. But, interestingly, fair numbers of fledglings also appeared early. It is too early to compare the numbers and get any idea of success (I feel this is possible in normal years).

Glossy Ibis (GLIB): Birds nested at the ABC Colony again this year as in the last 5 years. They fledged some chicks but exact numbers aren't known. It is interesting that over the years the numbers coming to night roost at ABC have steadily increased (from a mean of 50 to 350 in 19 years). They have appeared in small groups (2-15) sporadically at RB over the 22 years of bi-weekly sundown censuses. Since November 1998, a group of 25-50 have been roosting regularly.

Roseate Spoonbill: The first nesting ever recorded at CSS and probably the first confirmed inland nesting in Southwest Florida, occurred this year in at least 1 (possibly 2) of the Wood Stork sub-colonies. About 10 nests were observed from the ground (the cypress was too dense to census adequately from the air). Several fledglings were photographed feeding in the area during the Wood Stork aerial censuses.

Wood Stork: This species nested late again. Nesting commenced about the beginning of March. By 15 March (first aerial census) the 4 sub colonies had some 800+ nests, many with eggs. The numbers of nests peaked a little above 900 on 3 May. Hatching appeared good but by 18 May, many of the nests were deserted and some contained dead chicks. By 12 June, there were 64 active nests and a few fledglings. It was estimated <100 chicks fledged. In the 42 years that stork nesting was recorded at CSS only 14 years have produced at least 1.25 fledges per nest. In the last 22 years, only 5 years have reached this level of production. Over the same period, numbers of nests declined greatly; mean number of nests 1958-78 = 2593, mean number of nests 1979-99 = 678.

Theodore H. Below

Rookery Bay Sanctuary, National Audubon Society, and Oystercatchers Ltd.

3697 North Rd.
Naples, FL 34104
941-643-2249
roost@gate.net

WADING BIRD PROTECTION NETWORK

Florida Fish and Wildlife Conservation Commission's Wading Bird Protection Network has been modified significantly this year. The project, in its seventh year, was initially designed to incorporate volunteer assistance in monitoring and protecting wading bird colonies. Conclusions leading to this year's modifications are:

1. Data collected by numerous individuals using different monitoring techniques in a variety of situations, produced data with too much inherent variability to be statistically sound and reveal meaningful trends.
2. Volunteers, while genuinely enthusiastic about visiting and monitoring colonies, are reluctant to, or feel inadequately equipped to, implement conservation actions on their own.
3. The agency staff is spread too thin to effectively manage a large corp of volunteers.

The focus of the project has shifted from large-scale monitoring and volunteer management to a reduced number of management/conservation actions for several of the most biologically important colonies within each of the agency's regions. These actions include attempting to develop the legal means of posting colonies that occur in navigable waters, undertaking educational campaigns near specific colonies, and working with ecotour operators to encourage responsible wildlife viewing of sensitive rookeries. We will use the results of the statewide survey to prioritize our efforts.

Nancy Douglas

*Regional Nongame Biologist
Florida Fish and Wildlife Conservation Commission
3900 Drane Field Road
Lakeland, FL 33811
941-648-3203
douglan@gfc.state.fl.us*

HOLEY LAND AND ROTENBURGER WMAs

It was dry in both Holey Land and Rotenberger this year and there was no wading bird nesting.

Blake Sasse

*Biological Scientist III
Florida Fish and Wildlife Conservation Commission
11320 Fortune Circle, Suite G-16
Wellington, FL 33414
Phone: 561-791-4052 Fax: 561-791-4056
sassed@gfc.state.fl.us*

J.N. "DING" DARLING NATIONAL WILDLIFE REFUGE COMPLEX

Methods: Colonial nesting bird surveys at J.N. "Ding" Darling National Wildlife Refuge are conducted monthly from April-August via motorboat at 7 active rookery islands in Tarpon Bay (Tarpon Bay Keys), Pine Island Sound (Hemp Island, Bird Key and Broken Island) and Matlacha Pass (Lumpkin Island, Upper Bird Island and Lower Bird Island). Total nests are estimated as the maximum number of nest-tending adults for each species during surveys. Pelicans are classified as adults, juveniles, and nestlings and other species are classified as either adults or immatures. Surveys are conducted during high tide in the early morning by slowly circling each island. Observers attempt to determine breeding stages (i.e., nest building, on nests, feeding young, or fledged young). Observers also tally non-breeding birds at colonies and whether birds are loafing, roosting, feeding, or flying. Estimates are based on all observable birds (i.e., "best guess" estimate). Survey dates for 1999 were 27 April, 26 May, 23 June, and 27 July. Two observers conducted all surveys, during April-July, in 5.9 hrs.

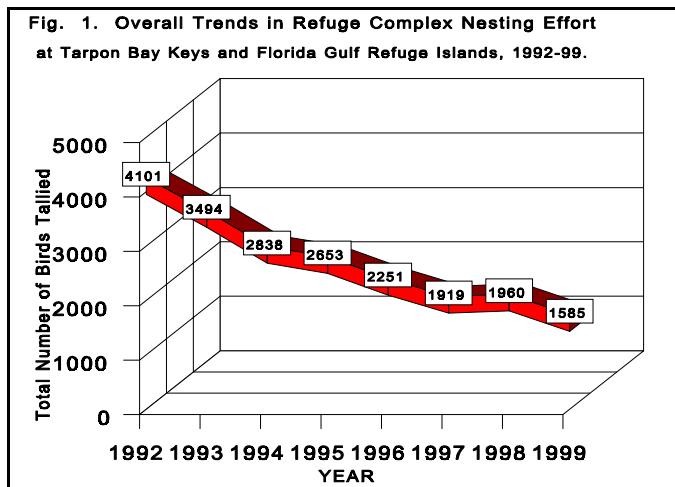
Results: This report presents preliminary information because it is based on surveys only through the month of July. Trends in the maximum total number of estimated nests indicate a 61% decline since 1992. I speculate that this steady downward trend in nesting effort is associated with declining habitat quality and forage availability. Sanibel Island habitats have generally become more forested since the 1950's, and interior wetlands have been drained, developed, or degraded. Other potentially deleterious factors include: 1) atmospheric mercury deposition associated with a new incinerator in the Caloosahatchee River watershed within the city of Ft. Myers; 2) increased point- and non-point source pollution runoff into the estuary from an increasing population in coastal southwest Florida; 3) disturbance from increased water craft operators at nesting rookeries in Pine Island Sound and Matlacha pass.

Tarpon Bay Keys: Maximum total number of nest-tending adults decreased from 1998 by 15%.

Pine Island Sound: Maximum total number of nest-tending adult birds decreased from 1998 by 44% and 18% at Hemp Island and Bird Key, respectively. The maximum total number of nest-tending adults at Broken Island increased from 1998 by 14%.

Matlacha Pass: Maximum total number of nest-tending adult birds decreased from 1998 by 29%, increased from 1998 by 89% and decreased from 1998 by 44% for Upper Bird Island, Lower Bird Island, and Lumpkin Island, respectively.

Jorge Coppen
J.N. "Ding" Darling NWR
1 Wildlife Dr.
Sanibel, FL 33957
(941) 472-1100
r4rw_fl.jnd@mail.fws.gov



Colonial bird nesting survey peak estimates for J.N. "Ding" Darling National Wildlife Refuge Complex, April-July, 1999. Counts reflect the maximum number of nest-tending adults during four monthly surveys.

	GBHE	LBHE	GREG	SNEG	TRHE	REEG	BCNH	WHIB	GRHE	ANHI	DCCO	BRPE	CAEG	Total
Tarpon														
Bay Keys	8	1	23	19	14	1	2	0	0	0	37	67	1	173
Hemp Isl.	10	3	2	15	37	0	1	33	0	1	66	138	10	316
Bird Key	0	3	0	2	7	0	0	10	1	0	50	319	2	394
Broken Isl.	4	2	1	1	3	2	0	2	0	0	113	207	0	335
Upper														
Bird Isl.	5	4	4	12	21	0	0	2	0	0	28	79	4	159
Lower														
Bird Isl.	2	2	10	4	5	0	0	0	0	3	36	43	1	106
Lumpkin Isl.	1	1	1	7	4	0	1	2	1	25	37	5	17	102
TOTAL	30	16	41	60	91	3	4	49	2	29	367	858	35	1585

Systematic Reconnaissance Flights

Methods: Wading bird surveys are flown with a fixed-wing aircraft at an altitude of 60 meters along 50 and 29 parallel transects with 2-km spacing in the WCAs and Big Cypress, respectively, from February to July 1999 (surveys were delayed a month due to untimely funding). The Holey Land WMA and Everglades Nutrient Removal Project, which are adjacent to the WCAs, also were surveyed each month by Dave Nelson and Craig Theriot. Wading birds were enumerated, their positions recorded, entered into a database, and summarized into tables. Densities of each species were separated into 4-km² cells and plotted onto maps.

High-resolution digital video linked with GPS is still used while flying each transect. The video is mainly for recording changing vegetation types, algal blooms, and water fluctuations throughout the survey months. This data could be used for geospatial data analysis and mapping.

Data is recorded using Newton palm top computers with touch screen features linked to a GPS unit on the plane. Once the data is collected, it is downloaded into Excel,

cleaned-up, checked for errors, saved in a DBASE format, and run through the DBASE program for analysis.

Results: Extremely high estimates of birds were calculated through the first 5 months of this year compared to last year (Feb-Jun 1998). Last season had higher water levels than normal from January to April, which spread the birds out and moved them to other areas. In May and June 1998, the WCAs began to dry, so that wading birds were able to feed around shallower pool areas where there were higher concentrations of food. This year, water levels were low and very dry in some areas, and birds were concentrated. From the middle of May through June 1999, water levels increased due to the rainy season, and birds were spread-out to higher areas.

Final reports from 1996-1998 are currently available and the 1999 report should be completed by October.

Craig T. Theriot and David A. Nelson, Ph.D.
Engineer Research and Development Center
Corps of Engineers / Waterways Experiment Station
3909 Halls Ferry Road
Vicksburg MS 39180-6199
Nelsond@mail.wes.army.mil
Therioc@wes.army.mil

Estimated abundance of wading birds in the Water Conservation Areas, 1999

Species	Feb	Mar	Apr	May	Jun	Jul
GREG	10,480	14,653	13,460	18,313	18,700	6,320
GBHE	680	573	687	907	407	300
SMDH	100	400	627	707	327	53
SMWH	240	873	633	813	1,287	667
WHIB	18,280	35,067	35,287	34,807	11,153	1,033
GLIB	760	1,453	693	160	107	0
WOST	853	187	393	1400	667	13
OTHER*	20	0	27	80	74	13
Total Abundance	31,413	53,207	51,807	57,187	32,720	8,400

*Includes Cattle Egret, Great White Heron and Roseate Spoonbill

Estimated abundance of wading birds (all species combined) in the Water Conservation Areas, 1999.

Month	1	2A	2B	3A	3B	Total
Feb	12,200	12,720	140	5,980	373	31,413
Mar	17,507	9,653	347	25,113	587	53,207
Apr	17,013	5,647	187	28,087	873	51,807
May	28,627	1,087	2,667	23,533	1,273	57,187
Jun	6,760	1,347	967	20,207	3,440	32,720
Jul	2,693	1,013	247	3,993	453	8,400

Status of Wading Bird Recovery – 1999

A set of performance measures and restoration targets for assessing the success of the South Florida ecosystem restoration program at recovering healthy wading bird “populations” has previously been recommended by Ogden et al. (1997) and Science Subgroup (1997). These measures have been used since 1996 as the basis for annual reports on the status of wading birds in the Everglades. In these reports the most recent nesting patterns and trends have been compared to a base condition (wading bird patterns for the period, 1986-1995) and to the restoration targets (see annual reports in Gawlik & Ogden 1996, Gawlik 1997, Gawlik 1998). For the Everglades basin, restoration targets have been established for 3 nesting parameters (number of nesting birds, seasonal timing of nesting, and locations of colonies) and for 5 characteristic species in the mainland Everglades colonies (Great Egret, Snowy Egret, Tricolored Heron, White Ibis, Wood Stork). This 1999 recovery assessment summarizes the most recent wading bird nesting season in the Everglades portion of South Florida, in the context of the recommended wading bird restoration targets. Information on nesting patterns in other subregions of South Florida in 1999, presented elsewhere in this report (Gawlik 1999), is not used in the recovery assessment because of incompleteness in survey coverages or because of limitations in survey techniques (see Discussion and Recommendations below).

Results

Numbers of Nesting Birds: In 1999, the combined nesting numbers (total of maximum estimates of nesting pairs for each reported colony) for LNWR, WCAs 2 and 3, and mainland ENP, was 7,781 nesting pairs of Great Egrets, 1,210 pairs of Snowy Egrets, 1,723 pairs of Tricolored Herons, 10,404 pairs of White Ibis, and 472 nesting pairs of Wood Storks. The total number of nesting pairs for the 5 species combined was 8,012 in 1996, 8,301 in 1997, 6,936 in 1998, and 21,590 pairs in 1999.

Ogden et al. (1997) recommended using 3-year running averages of numbers of nesting pairs as a means for measuring long-term trends in nesting effort. The following table shows the highest and lowest values from among the 3-year running averages for the base years, 1986-1995, the 3-year running averages for the 4 recent annual assessments, and the recommended restoration

BIG CYPRESS NATIONAL PRESERVE

We did not document any wading bird nesting activity in the Preserve this year. We didn't do formal surveys. However, our panther flights cover the entire Preserve south of I-75, and we watch for any rookery activity, especially in the larger strands and sloughs where stork activity had been documented in 1996.

Deborah Jansen

HCR 61 Box 110

Ochopee, FL 34141

(941) 695-2000 ext. 35

deborah_jansen@nps.gov

targets for 3-year running averages of nesting pairs for the 5 species (Snowy Egret and Tricolored Heron are combined).

Seasonal Timing of Nesting: The restoration target is to see a shift in the timing of nesting to earlier in the dry season, to more closely match pre-C&SF project timing patterns. Although timing data were not systematically reported for all species in 1999, the available information suggests that the initiation of nesting this year was generally earlier than occurred in the 3 previous assessment years. In 1999, Great Egrets initiated nesting throughout the Everglades basin during February, which for LNWR was about 1 month earlier than occurred there in 1998. The large White Ibis colony in WCA 3 mostly completed a successful nesting effort except for some late nesting pairs that abandoned the colony when summer rains began in June. Wood Storks initiated nesting in the WCAs in February, and at Paroutis Pond in ENP in late February and early March, approximately 2-4 weeks earlier than in the past 3-4 years. The large nesting effort by storks at Corkscrew Swamp Sanctuary (900 pairs) was initiated in early March, and mostly failed. These reports suggest that for the most part, Great Egrets and White Ibis met the timing target, but that Wood Storks did not. The target for storks is for colonies to form no later than late January.

Locations of Colonies: The restoration target is the recovery of large, sustainable colonies in the area of the traditional marsh-mangrove ecotone nesting sites generally located downstream from the freshwater Everglades flows. Prior to the C&SF project, an estimated 75-95% of all birds of these

Species	Base high/low	1994-1996	1995-1997	1996-1998	1997-1999	Target
GREG	1,163/3,843	4,043	4,302	4,017	5,084	4,000
SNEG/TRHE	903/2,939	1,508	1,488	1,334	1,862	10,000-20,000
WHIB	2,107/8,020	2,172	2,850	2,270	5,100	10,000-25,000
WOST	130/294	343	283	228	279	1,500-2,500



5 species that nested in the Everglades used colony sites that were located in the southern Everglades-mangrove ecotone subregion. By comparison, an average of 26% nested in the ecotone subregion during the base years, 1986-1995 (range, 6-58%). It is hypothesized that the ecotone subregion, under pre-drainage conditions, provided higher densities of prey and a greater range of foraging habitat conditions than is possible on a continuing basis in other portions of the system. In 1999, only 3.5% of the total nests of these 5 species were located in the southern Shark Slough-mangrove ecotone (Cuthbert, Paurotis Pond, Headwaters of Broad River, Rodgers River colonies). The percentages from the previous assessment years were 11% in 1996, 2% in 1997, 4.6% in 1998.

Discussion

The total number of nesting pairs in the Everglades basin in 1999 for the 5 key species was more than double the number of pairs in any year since the first base year, except for 1992. The number in 1999 was 21,590 pairs compared to 25,811 in 1992, and between 3,935 and 10,037 pairs in all other years since 1986. The prevailing explanation for the exceptional nesting effort this year is that the dry season created "text book" foraging conditions for wading birds, in that relatively rapid and uninterrupted drying occurred between January and May, on the heels of a multi-year period of wetter than normal conditions. Thus the 1999 dry season was the first major prey concentrating event following several consecutive years of comparably high levels of water, and high rates of fish production and survival.

The fact that the large number of nesting birds in 1992 occurred following a prolonged drought period, rather than following a prolonged wet period, suggests the probability that increased nesting effort by wading birds in the modern Everglades can be stimulated by 2 very different hydrological patterns. The 1992 nesting pattern is consistent with the "super colony" hypothesis, which states that large nesting colonies in the Everglades become possible when multi-year dry periods serve to organize pulses of available prey. This hypothesis suggests that prolonged droughts increase the overall prey base by

reducing the numbers of predatory fishes and/or by creating pulses of primary and secondary production where droughts synchronize and increase "releases" of nutrients in an otherwise low nutrient system.

Although the high numbers that nested in 1999 are encouraging, they can not be interpreted as a predictor of a more prolonged period of improved conditions for nesting wading birds. The 1992 nesting event was not followed by additional "good" nesting years. Because these occasional "spike" years in nesting effort are unlikely to be maintained in the current pre-restored Everglades system, the 3-year running averages for each species are better indicators of trends than are nesting efforts in a single year.

The most recent 3-year averages (1997-1999) are within the range of 3-year averages for the base years for all species except the Great Egret. The best interpretation is that, except for the Great Egret, the number of wading birds nesting in the Everglades basin has not improved (or declined) over the past 14 years (1986-1999).

The 3-year running averages for Great Egrets, beginning with the 1986-1988 years (see Ogden et al. 1997), show that the number of Great Egrets nesting in the Everglades has substantially increased since the mid-1980s. Much of this increase occurred during the period of comparably wet years, 1993-1999. The number of pairs that nested in 1999 (7,781) was higher than for any previous year since the first year of the base period (1986). The 1997-1999 running average is higher than for any 3 years during the base period, and substantially exceeds the recommended restoration target for Great Egrets (4,000 pair running average). Perhaps more astonishing, the number that nested in 1999 may have been greater than nested in the Everglades during the 1930s and 1940s (Ogden 1994).

Some thoughts are offered about Great Egrets, which may suggest why the once heavily hunted "long-whites" are doing so well in the Everglades. Compared to the other 4 species in the "group of 5", the Great Egret has much longer legs than all but the Wood Stork, and therefore can forage in a comparably greater range of water depths than ibis or the small herons/egrets. In recent years Great Egrets have usually shown increased nesting effort in the wetter years. Impounded water conditions such as occur in the lower ends of the WCAs and LNWR may even create good foraging habitat for Great Egrets in places that are not suitable for the other species (most of the nesting by Great Egrets is in WCA 3 and LNWR, not in ENP). And unlike Wood Storks, Great Egrets do not seem to require high densities of prey, or the larger sizes of prey, to successfully nest. Great Egrets also exhibit a comparably wide range of foraging behaviors, including the often observed practices of feeding in freshly burned marshes and newly reflooded wetlands, and of lone birds patiently still-hunting in places where prey densities seem to be low. The other 4 species of wading birds are much less often seen to employ these practices (except for the lone-hunting Tricolored Heron), suggesting that in general, Great Egrets may be able to exploit a greater range

of feeding habitats than the other species. In summary, Great Egrets may be the true habitat “generalist” among the Everglades wading birds. Is it possible that the Great Egret has benefited from hydrological patterns that have become somewhat stabilized in the Everglades over the past 2 decades (including the creation of impoundments), following completion of the major construction projects of the 1950s-1970s?

Another feature of the 1999 nesting season was the continued poor nesting effort in the southern Everglades, marsh/mangrove ecotone. The traditional colony sites located in ENP, symbolic of the former, healthier Everglades, are no longer attracting nesting wading birds. The percentages of the total nesting birds that nested in this subregion during the 3 of the 4 assessment years have been lower than the percentages during the base years, 1986-1995. It appears that this subregion continues to lose importance as selected nesting habitat, relative to the central and northern Everglades.

Thanks to a complete ground (boat) survey of Roseate Spoonbill nests in Florida Bay, the first since 1991, we have our first recent measure of trends by spoonbills in the Bay (see Lorenz, this report). The 1999 estimate of 621 nests is within the range of surveys between 1986-1991 (493-700 nesting pairs). While the 1999 number suggests that the recent nesting effort by spoonbills in the Bay has remained “stable”, these numbers are below the restoration target of 750-1,000 pairs (Ogden et al. 1997). Spoonbills continued to show modest nesting efforts in the interior of the southern mainland, including the first nesting (ever?) at Corkscrew Swamp Sanctuary (see T. Below, this report).

Recommendations

1. 1999 was another year without an organized colony survey for the Big Cypress region. Until this major subregion of south Florida wetlands is surveyed, measures and interpretations of wading bird status and trends, and assessments of the success of regional restoration programs, will be substantially constrained by this missing information.
2. The success targets recommended by Ogden et al. (1997) for the 5 species (Great Egret, Snowy Egret, Tricolored Heron, White Ibis and Wood Stork) should be reviewed. It is appropriate to periodically evaluate established success targets, and to revise these targets as new information becomes available. Additional success targets should be established for the Big Cypress basin and Lake Okeechobee.
3. The 1999 surveys reinforced the importance of ground surveys for certain species. For example, the aerial surveys over Florida Bay detected only a small percentage of the total number of nesting Roseate Spoonbills, and aerial surveys over mainland ENP were only able to report the “presence” of Tricolored Herons at 1 key colony. These limitations are not due to any flaw in the design of aerial surveys; they simply point out that

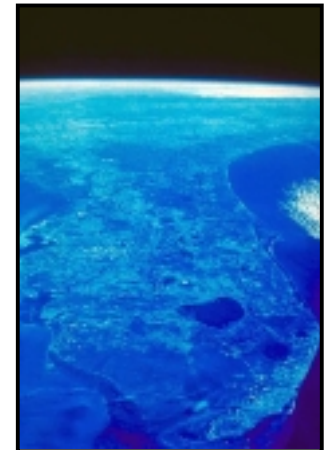
certain species, and birds nesting in dense mangroves, cannot be counted or estimated from the air. A regular program of ground surveys, to complement aerial surveys, should be established for a few target species (e.g., Roseate Spoonbill, Tricolored Heron).

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John C. Ogden

*System-wide Programs
South Florida Water Mgt. District
O.E. 148, University Park
Florida International University
Miami, FL 33199
(561) 906-9277
jogden@sfwmd.gov*



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Dale E. Gawlik, Ph.D.

*Everglades Systems Research Division
South Florida Water Management District
3301 Gun Club Road
West Palm Beach, FL 33406
(561) 682-6712
dale.gawlik@sfwmd.gov*