# SOUTH FLORIDA WADING BIRD REPORT

Volume 8 Dale E. Gawlik, Editor November 2002

## SYSTEM-WIDE SUMMARY

Water levels and rainfall in 2002 were unremarkable, which, for the Everglades, is noteworthy. Water levels were above average over most of the area, particularly at the onset of the dry season. The most serious event was heavy rainfall early in the dry season, which caused some 1200 pairs of Wood Storks at Corkscrew Swamp Sanctuary to abandon their nests. These birds re-nested at the same site without serious consequences. Other species were not far enough along in the nesting cycle to be disrupted.

In contrast to the unremarkable hydrologic patterns, the estimated number of wading bird nests in 2002 was quite unusual. There were an estimated 68,750 wading bird nests (excluding Cattle Egrets, which are not dependent on wetlands) in south Florida. This is about twice the number of nests that has characterized the last decade and it is on par with historic nesting events of the 1940s.

The large nesting effort in 2002 was almost entirely due to increases in nesting by White Ibises and Snowy Egrets with notable increases in Wood Storks, collectively, the 3 species that have declined most since the 1930s. Numbers of nests for species with very different foraging requirements, Great Blue Heron and Little Blue Heron, actually decreased from 2002.

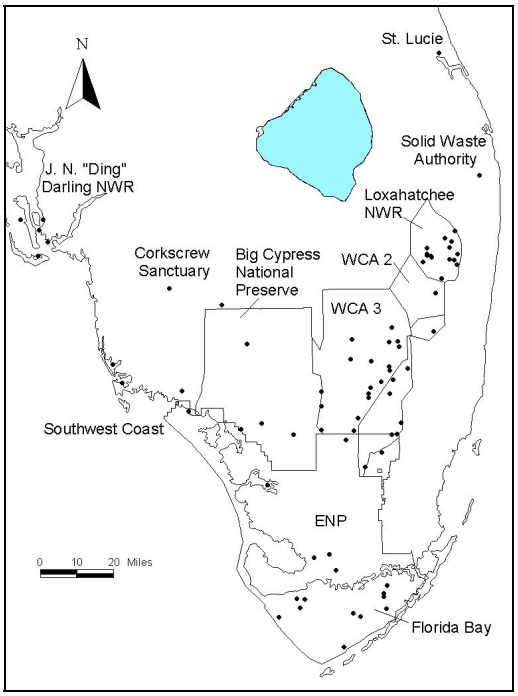
Even more noteworthy was that the majority of this year's nesting effort was concentrated in a single colony (Alley North) in NE WCA3A. That colony contained over half (35,000 nests) of all known wading bird nests in South Florida. Eighty nine percent of Snowy Egret nests were in that colony as were 59% of White Ibis nests and 35% of Tricolored Heron nests. Wood Storks, which did not nest at Alley North, were also concentrated in a single colony, located at Corkscrew Swamp Sanctuary. Other areas, such as ENP, Ding Darling NWR, and the Southwest coastal region showed only slight increases in nest numbers over 2001. The number of nests in LNWR decreased slightly since 2001 but nest success was higher in 2002. Roseate Spoonbills in Florida Bay were similar in that there were about the same number of nests in 2002 as in 2001, but nesting success was higher this year.

Aerial wading bird distribution surveys (SRFs) also showed an increase in *total bird abundance* (not nest numbers) for White Ibises, Wood Storks, and small white herons in the WCAs, where their numbers of nests increased dramatically, but not in ENP where their numbers of nests increased only slightly. System-wide, total bird abundance in 2002 was slightly below that of 2001.

As was the case last year, 3 of 4 wading bird species in 2002 met the target proposed by the South Florida Ecosystem Restoration Task Force for the restoration goal related to nest numbers. There was also some improvement in the restoration goal of earlier nest initiation date for Wood Storks. However, all species fell far short of the target for the restoration goal of increased nesting in the coastal Everglades. There was a record low 3% of Everglades wading birds nesting in the coastal zone of ENP where the large colonies historically occurred.

The response of wading birds documented in this report provides

**Locations of wading bird colonies in South Florida in 2002. Colonies with more than 69 nests are depicted in LNWR and the WCAs. Colonies with >9 nests are shown for ENP and Florida Bay. Florida Bay not surveyed completely.**

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an annual test of our understanding of how the Everglades ecosystem functions. This is another year in which location and timing of nesting appear to be more closely related to hydrologic patterns than does the numbers of nests. Proposed explanations for the large number of nests range from birds adjusting to changes in the ecosystem to increases in the amount of prey available to wading birds. Indeed the density of prey for White Ibises is thought to increase following droughts such as the one in 2001, and a strong uninterrupted recession of water during the dry season has long been known to affect prey availability. Perhaps the input of ecologists into routine water management operations, a standard practice in recent years, may have reduced undesirable water level reversals that scatter prey and reduce their availability to birds. But even if hydrologic conditions were perfect, the large nesting effort by White Ibis this year would still be extreme. It suggests that other factors played a role.

For example, for several species, 1999, 2000, and 2002 were years of good nesting effort; collectively the best years in decades. Because wading birds do not breed until they are 2-3 years of age, 2002 was first year that pulses of fledglings from 1999 and 2000 could have added to nest counts. Although it is not certain that these fledglings returned to the Everglades to nest in 2002, it is likely that the pool of potential breeders for some species is greater now than during the 1990s. It begs the question of whether we should expect to see similar strong responses in the future when hydrologic conditions are good.

The ability to answer this and other key wading bird questions rests largely on the shoulders of the contributors to this Report. With no obligation or agency mandate to provide information here, the individuals have taken the initiative to do so, leading to a free flow of information across agency bounds to managers, the public, students, and other scientists. Perhaps because an understanding of wading birds leads to a landscape view of ecology, contributors are prone to recognize the importance of a system-wide assessment measure. They provide that broad assessment even though it is beyond the logistic or financial means of any single agency. At some point this effort will likely be recast formally under the umbrella of CERP. The contributors will have the satisfactions of knowing they established the model for this effort, which may become a cornerstone of our ability to restore and sustain North America's most diverse wading bird community.

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# HYDROLOGY 2002

A year ago it was thought that the full impact of the 2001 drought might not be felt until the 2002 water year. However, there was no indication of any hydrologic lag effects or delayed impacts. On average, water depths were greater than the 33-year annual means. In general, recession rates in the Everglades were not as extreme as they were last year during the drought. They were consistent with the SFWMD's Natural Systems Model (NSM) with the exception of a reversal in the dry season recession rates due to high rainfall in Feb. Also, hydroperiod dynamics were somewhat erratic. The greatest water level fluctuations occurred in WCA-2A where water levels went down and back up 5 separate times during the year. There were a few minor fires in the spring of 2001, and there were no fires in the spring of 2002. No direct ecological impacts of the above average water depths or erratic hydroperiod patterns have been observed as of yet. These recent hydrologic trends, summarized in the 2002 Everglades Consolidated Report by the SFWMD, compare the 2002 Water-Year with a 33-year average of observed data and a 31-year average of NSM output. A water-year is defined here as beginning May 1 (the start of the wet season) and ending Apr 30 (the end of the dry season).

**Average weekly water depths (ft) for water-year 2002 in comparison to a 33-yr average weekly water depths.**

| Area (gage) | Average (1970 – 2002) | Average 2002 | Average 2001 | Average 2000 |
|---|---|---|---|---|
| LNWR (1A-7) | 0.76 | 1.12 | 0.80 | 1.3 |
| WCA-2 (2A-17) | 1.32 | 0.9 | 0.78 | 1.7 |
| WCA-3 (3A-NE) | 0.09 | 0.6 | 0.22 | 1.2 |
| Shark Slough (P33) | 0.97 | 1.09 | 1.10 | 1.8 |

## ABBREVIATIONS

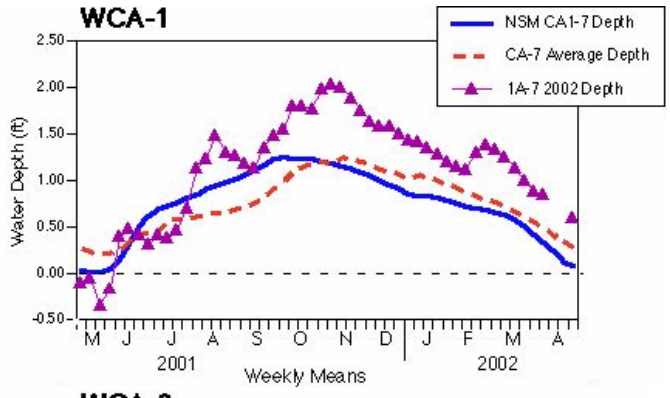
**Species:** Great Egret (GREG), Snowy Egret (SNEG), Reddish Egret (REEG), Cattle Egret (CAEG), Great Blue Heron (GBHE), Great White Heron (GWHE), Little Blue Heron (LBHE), Tricolored Heron (TRHE), Green Heron (GRHE), Black-crowned Night-Heron (BCNH), Yellow-crowned Night-Heron (YCNH), Roseate Spoonbill (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 white herons (SMWH).

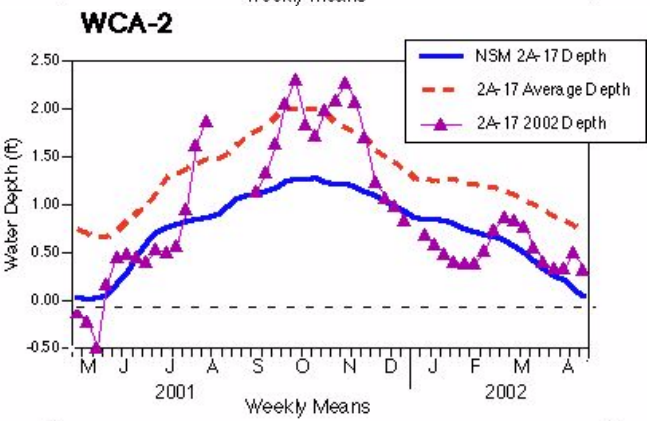
**Regions, Agencies, and Miscellaneous:** Water Conservation Area (WCA), Everglades National Park (ENP), Wildlife Management Area (WMA), A.R.M. Loxahatchee National Wildlife Refuge (LNWR), Lake Worth Drainage District (LWDD), Solid Waste Authority (SWA), South Florida Water Management District (SFWMD),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

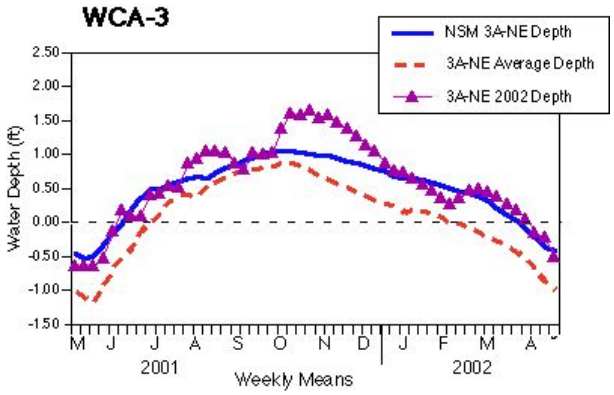
A summary of the hydrologic trends in LNWR (or WCA-1) (See table above and Figs this page) indicated above average conditions for LNWR in 2002. Last year, rainfall in LNWR was 21% below average. This year rain was 11% above average, and water depths in LNWR were 47% above average. This relatively higher water depth, in comparison to rain, was due to greater than average structure inflows. The summary of the hydrologic trends in WCA-2A indicated a very different pattern. Water depth was below average despite an above average (+28%) rainfall. This depth trend may be due, in part, to a 57% below average input of structure inflows. For the northern, drier regions of WCA-3A the average water level was significantly above average and 173% above last year. This was surprising because the average weekly 2002 structure inflows to WCA-3A decreased by 36 percent and the rainfall was not significantly different from the average. Assuming that all gages were working properly, this increase in depth must be due to longer residence times, in turn due to, better hydroperiod management in the northern Everglades. In the ENP, rainfall amounts were typical for both wet and dry seasons, and the average weekly 2002 structure inflows to ENP increased 18% (during the wet season it increased by 100%). These high inflows were indicative of rainfall-driven management. As a result, the average depth at P33 (Shark Slough) was 0.12 ft greater than the 33-year historic average.

The water levels in the LNWR were, for the most part, above the 33-year average and the NSM average throughout the water-year (See Fig). For a short period of time in early summer, the depths were very low. This was due to the drought of 2001. This drought came to a relatively abrupt ending by Aug due to high summer rainfall and large quantities of structure inflows. From May to Jul the water levels in the marsh went from –0.5 ft to 1.5 ft. This rapid rise in water levels stopped and reversed itself in Aug because ET remained high but rainfall stopped. Once the rains returned in Sep, water levels began to rise and a peak of 2.0 ft (1.0 ft above average) was maintained for most of Oct. This peak was also reached last year in Oct during the drought. However, last year this peak was reached due to 1 rainfall event. And last year this peak was followed by a relatively rapid recession (approximately 2 ft in 5 months). This year, the recession rate was much lower (0.5 ft in 5 months). The difference was due to relatively high spring rainfall patterns in 2002.

Historically, the water levels in WCA-2A have been managed approximately 1 foot above the NSM targets. This has created an environment that can no longer sustain a healthy population of tree islands. The District lowered the regulation schedule for WCA-2A in the early 70s, in an attempt to bring it more in line with NSM. Depths are now less than they were historically. However, the 2002 water depth trend in WCA-2A (See Fig) was very erratic. Like last year, rates of water level change were much greater in WCA-2A than in any other WCA. This year the wet season started off very dry (-0.5 ft in May) but, like LNWR, quickly reached 2.0 ft by Jul. Water levels then went down and back up 4



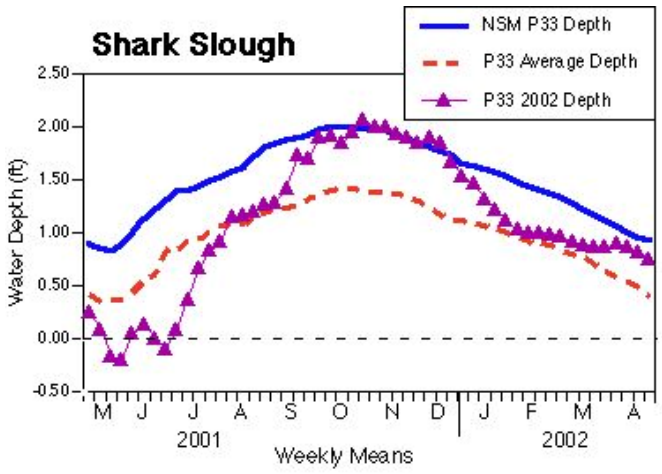



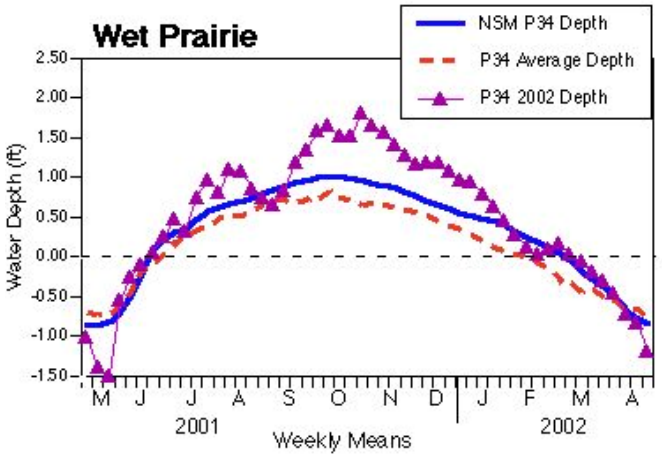

more times during the year. There was a clear connection between rainfall and water depths in WCA-2A. Lack of rain after Nov was responsible for the "healthy" spring recession while a high rainfall period in Feb was responsible for the reversal of the spring recession.

Although LNWR and WCA-2 began the water year with very low water levels due to the drought, the northern, drier region of WCA-3A (site 3A-NE) started the year in line with NSM targets, 0.5 ft above average (See Fig). This was due to good WCA-3 drought management in 2001 and some exceptionally high and localized rainfall events. Water levels continued to increase throughout the wet season in WCA-3 due to regular rainfall and relatively high structure inflows. Depths peaked in Oct at 1.75 ft and stayed high for 5-6 weeks. The previous year, during the drought, depths peaked in Oct at 1.0 ft and stayed high for only 2-3 weeks (Note: the average NSM peak is 1.0 ft). Last year the recession rate was extreme, going

from 1 ft to -0.6 ft in 5 months. This year the recession was moderate going from 1.5 ft to 0.5 ft in 5 months. This fifth month was not typical, for instead of having a further decline of water levels, it experienced a reversal of the recession trend. For the most part, the hydrologic trends followed those predicted for pre-drainage by the NSM. It appears that this was due to high summer rainfall and below average structure inflows during the spring of 2002.

Water depth stations at P33 and P34 in ENP are used here to illustrate some interesting local differences between slough and wet prairie marsh, respectively (See Fig). The Shark Slough and wet prairie depths indicated some depressed water levels at the start of the wet season despite some May rainfall, due to the 2001 drought. Water levels quickly returned to NSM average conditions in the wet prairie due to rainfall. However, for Shark Slough, it took 5 months to reach the NSM average despite high rainfall-driven structure inflows. This suggests that hydrologic requirements for marsh habitats along the Shark Slough edge may be met by localized rainfall but that hydrologic requirements for Shark Slough itself must be met by upstream inflows. Last year during the drought, the P34 depths were below the NSM average depths for the entire water-year. This year, depths were near or above the NSM average for about 12 weeks. For P34, the dry season recession appeared very conducive for wading bird foraging. The wet prairie depth dropped from 1.5 ft to 0.0 ft in 4 months while the Shark Slough depths stayed rather flat all through Feb, Mar, and Apr. This was probably due to the rainfall-driven schedule and abnormally high spring rainfall upstream.




**SW Coast Hydrology**:
Each year Ted Below, at the Rookery Bay Audubon Society, uses a long term data base (37 years) of inland water levels recorded at Corkscrew Swamp Sanctuary (CSS) and coastal pond water levels at Rookery Bay (20 years) to compare to the current nesting. Over the years he has found that water levels in RB generally fluctuate in unison with the inland ponds at CSS (36 km N). This is the fourth year in a row that the interior ponds at CSS were completely dry. Only once before, in 1989-90, have these ponds been dry for 2 years in a row, thus illustrating the unusualness of this trend**.** Rainfall for the 8-month period (Oct-May) this year was down 35% from the 37-year mean at CSS and 10% from the 20-year mean at RB. This probably explains why the ponds at RB only dried down for a short time.

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# REGIONAL NESTING REPORTS

## WATER CONSERVATION AREAS AND A.R.M. LOXAHATCHEE NATIONAL WILDLIFE REFUGE

In 2002, the Univ. of Florida team monitored nesting in WCAs 2 and 3 as it has for the past 14 years. In addition, we also for the first time took over survey duties in LNWR from the Refuge staff. Updates on studies of nesting success and postfledging survival of Wood Storks and White Ibises appear in the Special Topics section of this Report.

**Methods**

We performed 2 types of systematic surveys; 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 Feb and Jun, we performed systematic aerial surveys for colonies, with observers on both sides of a Cessna 182, flight altitude at 800 feet AGL, and east-west oriented flight transects spaced 1.6 nautical miles apart. These conditions have been demonstrated to result in overlapping coverage on successive transects under a variety of weather and visibility conditions, and have been used continuously since 1986. All colonies are circled, positions noted, and counted while circling at a variety of altitudes. Photographs of the larger colonies were taken from overhead and multiple angles, and counted later via projection.

Ground surveys by airboat were done in all areas at least once per season, between early Apr and late May, and were designed to document small colonies or those of dark-colored species that are difficult to detect from aerial surveys. GPS-guided belt transects were generally in north-south orientations, and were also designed to give overlapping coverage. The width of belt transects varied between 0.5 nautical miles apart in extremely open habitat of southern WCA 3, to 0.2 nautical miles apart in the heavier cover of LNWR. All tree islands were approached closely enough to flush nesting birds, and nests were either counted directly, or estimated from flushed birds.

Due to the extremely large number of nests at the Alley North, or Rescue Strand colony, we adopted some new techniques for estimating numbers of nests. The majority of birds were nesting underneath the tree canopy, leading to a likely massive undercount using aerial estimation and photographic methods. We therefore counted the numbers of nests on the ground in quadrats of known size, and then compared these counts with aerial estimates of nests in the same area. The quadrats were marked on the ground with 4 x 4 ft blue or silver tarps, and could be seen in photos taken from the air. This comparison gave us a correction factor to apply to the raw counts from aerial photos, in order to achieve an estimated total number of nests.

**Results**

The Alley North Colony. The total numbers of wading bird nests initiated this year depended strongly on the estimation of numbers of ibis nests at the dominant Alley North colony (see Tables 1 and 2). It is important to realize that there are several ways to estimate this figure, and that only 1 of the estimation techniques is probably comparable with past survey methods. We have reported in Table 1 that 20,000 ibises nested in Alley North, based on peak estimates made by observers while in the air using both fixed-wing (Univ. of Florida) and helicopter (Gawlik and Crozier) in late Apr. This figure (20,000) is most comparable with estimates made during past years. We believe this is a considerable underestimate of the true numbers of ibis nests, however, because the majority of birds were nesting beneath the tree canopy. In support of this notion, our highest count of nests from photos taken on the same survey date (18 Apr) shows only 9,536 nests. Aerial observers probably estimated much more than this because they were able to view the colony from a variety of oblique angles, allowing them to see some of the nests underneath the trees.

We compared our ground counts of 6 quadrats with aerial photographic counts of the same quadrats. The ground counts ranged between 3.55 and 88 times higher than the aerial counts. This suggests that we were missing large numbers of birds beneath the canopy, but presents a dilemma about which of the correction factors to use. If one uses the low correction (3.55), there were an estimated 28,000 ibis nests in the colony. If one uses the high correction factor (88) there were 524,750 ibis nests in the colony.

This exercise illustrates that there is some futility in attempting to accurately count a colony of the size of Alley North. However, we feel certain that there were considerably more birds in the colony than are represented by the 20,000 figure that we have used in Table 1. Based on the ground counts, it seems likely that there were at minimum 30,000 ibises nesting in the colony. However, we wish to make it clear that for the purposes of comparing with past trends, the 20,000 figure is the only defensible one to use because of consistency in survey techniques used.

Overall nesting in LNWR and WCAs

Combining all species at all colonies in LNWR, WCA 2, and WCA 3, we estimated a grand total of 60,760 nests of wading birds (Cattle Egrets, Anhingas and cormorants excluded) initiated between Feb and Jul of 2002. Note that this figure does not include birds nesting at the Tamiami West or Tamiami East colonies, which are just outside the boundaries of WCA 3. If the Tamiami colonies are

**Table 1. Numbers of wading bird nest starts found in WCAs 2 and 3 from Feb - Jun 2002**

| Latitude | Longitude | Colony name | GREG | GBHE | WOST | BCNH | LBHE | SNEG | TRHE | WHIB | GLIB | ROSP | USH* | CAEG | ANHI | Colony Total** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| N26 10.77 | W80 31.72 | Alley North | 2,000 | | | | present | 12,000 | 1,000 | 20,000 | | | | | | **35,000** |
| N25 46.36 | W80 50.24 | Hidden | 400 | | | | | 432 | 873 | 500 | | | | | 40 | **2,205** |
| N25 52.00 | W80 50.15 | Jetport | 235 | | 550 | | | | | | | | | | | **785** |
| N25 57.88 | W80 34.48 | L67 | 350 | | | | | | 50 | | | | | | 100 | **400** |
| N26 09.78 | W80 20.74 | 2B Mel | 200 | | | | | 20 | | | | 10 | | | 300 | **230** |
| N25 48.08 | W80 29.40 | 3B MUD East | 270 | | | | | | | | | | | | | **270** |
| N26 01.48 | W80 32.36 | Donut | 250 | | | | | | | | | | | | | **250** |
| N25 56.41 | W80 37.25 | Starter Mel | 247 | | | | | | | | | | | | | **247** |
| N26 07.32 | W80 32.50 | Cypress City | 243 | | | | | | | | | | | | | **243** |
| N25 54.05 | W80 37.90 | | 242 | | | | | | | | | | | | | **242** |
| N25 55.51 | W80 50.10 | Crossover | 187 | | 76 | | | | | | | | | | 3 | **263** |
| N26 03.18 | W80 40.52 | | 160 | | | | | | | | | | | | | **160** |
| N26 07.33 | W80 30.20 | Mini Cypress | 160 | | | | | | | | | | | | 50 | **160** |
| N26 07.93 | W80 42.14 | | 150 | | | | | | | | | | | | | **150** |
| N25 55.07 | W80 37.93 | FLC #2 | 149 | | | | | | | | | | | | | **149** |
| N26 02.75 | W80 37.10 | Big Melaluca | 120 | | | | | | | | | | | | | **120** |
| N25 54.947 | W80 37.69 | | 100 | | | | | | | | | | | | | **100** |
| N26 00.48 | W80 32.36 | | 100 | | | | | | | | | | | | | **100** |
| N26 00.97 | W80 27.61 | Mud Canal | 100 | | | | | 86 | | | | | | | | **186** |
| N26 06.20 | W80 29.85 | George's camp | 100 | | | | | 50 | | | | | | | | **150** |
| N26 18.84 | W80 20.25 | 2A | | | | | 100 | | | | | | | | | **100** |
| N25 49.291 | W80 40.69 | | 70 | | | | | | | | | | | | 82 | **70** |
| N25 46.266 | W80 41.613 | | 80 | | | | | | | | | | | | 62 | **80** |
| N25 58.36 | W80 31.50 | | 72 | | | | | 39 | | | | | | | | **111** |
| Colonies with <70 nesting attempts | | | 1,650 | 256 | | 130 | 505 | 42 | 359 | | | 29 | 45 | 35 | 643 | **3,016** |
| **Total Nesting Attempts** | | | **7,635** | **256** | **626** | **130** | **605** | **12,669** | **2,282** | **20,500** | **0** | **39** | **45** | **35** | **1,280** | **44,787** |

* Unidentified Small Herons

**Totals do not include Anhingas or Cattle Egrets

included, the total is 62,423.

This was an extremely large nesting event by almost any historical measure of the ecosystem. From our records, we can find no larger nesting years in the entire Everglades since 1941. The numbers nesting in the WCAs in 2002 were 2.9 times the average of the past 5 years, and 3.7 times the average of the previous 10 years. Increases were seen this year by comparison with the previous 10 for Wood Storks (+5.4 times), White Ibises (+4.19 times), and Great Egrets (+2.64 times). The numbers of Snowy Egrets were particularly high (+11.54 times) by comparison with the mean of the previous 10 years. However, this increase was dominated by the nesting at Alley North (>12,000 nests) that was probably largely unsuccessful (see below). Other small herons had modest increases, with 1.88 times as many Tricolored Herons in 2002 as the average of the previous 10, and 1.26 times as many Little Blue Herons. There were actually fewer Great Blue Herons nesting in 2002 than the mean of the previous 10 years (0.84 times).

Nesting Success: Unlike 2001, nesting success in 2002 was generally high. Wood Storks had generally high nest success at all colonies, including Tamiami West, where we were able to measure nest success using marked nests (see Hylton and Frederick this Report). For example, at this colony, we saw over 92% of nests survive between hatching and fledging. This was the first year in many in which birds at the

Crossover site were largely successful. In addition, it looks as though many of the young birds were successful in fledging and dispersing from south Florida (see Hylton and Frederick this Report).

Ibises had generally high nesting success (see Semones and Frederick this Report) at nearly all colonies at which they were monitored, and it appears that the huge Alley North colony was successful in fledging very large numbers of young birds. This is therefore probably the largest annual cohort of ibises produced from the Everglades in decades. The success was probably in part due to many of the birds having begun nesting relatively early in Mar or even late Feb this year.

The large increases in Snowy Egrets this year was due almost entirely to the huge aggregation at Alley North (12,000 nests). However, this group of birds began nesting in late May or early Jun, shortly before the onset of heavy rains. Colony visits in early Jul (Univ. of Florida and D. Gawlik) showed few active nests, so it is likely that these birds were largely unsuccessful.

Great Egrets began nesting on a typical schedule (Feb and early Mar) at Hidden, Tamiami West, 3bMud East, L-67, Jetport, Crossover and Mud Canal colonies. However, at Alley North colony, Great Egrets were quite late in nesting by comparison with previous years. Although adults were present in Mar, there was no evidence of nesting. By the middle of Apr, we were seeing active nests on ground counts with eggs or young chicks. These birds seemed to be nesting 1 – 1.5 months later than is typical for the area. We have no explanation for this late nesting. In other colonies, we found some evidence for an extended nesting season for this species. In late Jun, for example, we found hundreds of active nests at Alley North, Tamiami West, 3b Mud East, Starter Mel, and Donut Mel. Even in successful seasons in past years, we have rarely seen active nests past early Jun.

A.R.M. Loxahatchee National Wildlife Refuge (LNWR)
This was the first year that the Univ. of Florida team has performed all of the aerial and ground surveys in LNWR, and it is important to examine any potential differences in survey technique. In the past, systematic aerial surveys have been performed in Loxahatchee using similar methods to those we describe in Methods. However, past breeding season surveys have been performed either

**Table 2. Numbers of wading bird nest starts found in A.R.M. Loxahatchee National Wildlife Refuge**

| Latitude | Longitude | Name | GREG | GBHE | BCNH | LBHE | SNEG | TRHE | WHIB | GLIB | ROSP | CAEG | ANHI | Colony Total* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| N26 26.25 | W80 14.581 | Lox 70 | 200 | | | 11 | 150 | | 3,300 | | | 60 | 40 | **3,661** |
| N26 26.35 | W80 23.51 | Lox 99 | 600 | | | | 80 | 40 | 3,230 | | | | | **3,950** |
| N26 31.03 | W80 15.78 | Lox 111 | 250 | 2 | 50 | 60 | 55 | | 2,300 | | | 60 | 25 | **2,717** |
| N26 33.585 | W80 15.061 | canal north | 55 | | | 40 | 100 | 15 | 1,600 | 50 | | 30 | 10 | **1,860** |
| N26 28.072 | W80 22.322 | | 73 | | 20 | | 15 | 1 | 600 | | 2 | | 12 | **711** |
| N26 27.45 | W80 14.20 | | | | | | | | | | | | | **0** |
| N26 26.799 | W80 16.572 | | | | | 150 | | | | | | | 1 | **150** |
| N26 27.355 | W80 21.239 | | | | | 150 | | 4 | | | | | 4 | **154** |
| N26 27.67 | W80 21.39 | | 135 | | | | | | | | | | | **135** |
| N26 27.20 | W80 21.18 | | | | | | | | | | | | | **0** |
| N26 22.31 | W80 18.57 | | 90 | | | | | | | | | | | **90** |
| N26 31.843 | W80 17.704 | | | | | 90 | | 2 | | | | | 1 | **92** |
| Uncertain | Uncertain | | 85 | | | | | | | | | | | **85** |
| N26 26.67 | W80 15.30 | | 85 | | | | | | | | | | | **85** |
| N26 29.526 | W80 22.335 | | | | | 80 | | 1 | | | | | | **81** |
| N26 27.720 | W80 22.351 | | | | | 78 | 10 | 1 | | | | | 1 | **89** |
| N26 27.999 | W80 15.131 | | | | | | | | | | | 77 | | **0** |
| N26 28.075 | W80 14.411 | | | | | 75 | 6 | 10 | | | | 77 | | **91** |
| N26 29.560 | W80 16.496 | | | | | 75 | | 2 | | | | | | **77** |
| Colonies with <70 nesting attempts | | | 1,064 | 101 | 8 | 764 | 95 | 74 | 50 | 37 | 2 | 196 | 204 | **2,195** |
| **Total Nesting Attempts** | | | **2,637** | **103** | **78** | **1,573** | **511** | **150** | **11,080** | **87** | **4** | **500** | **298** | **16,223** |

* Totals do not include Anhingas or Cattle Egrets

once annually, or in some years monthly between Mar and May. In contrast, we performed aerial surveys monthly this year. Ground surveys in the recent past have been performed in LNWR using belt transects that were 0.5 nm apart, while the transects in 2002 were 0.2 nm in width in densely vegetated areas, and 0.5 in sparsely vegetated areas. In addition, past surveys have been performed over a variable area, depending on available manpower. In 2002, we estimate that we covered >70% of the area with transects within the refuge. The other 30% that were not surveyed by airboat were either very dense vegetation, or extremely dry (N of 26° 36.00 and west of W80° 21.00).

Total numbers of nesting birds in LNWR in 2002 were considerably larger than the average of the last 5 years (2.11 times) and 10 years (2.87 times, see Table 2). This was due in large part to the larger numbers of ibises (2.6 times the 5-year mean and 2.8 times the 10-year mean). However, there were also considerable increases in numbers of Great Egret nests (2.8 times the 5-year mean, and 3.7 times the 10-year mean). Total numbers of nesting birds were, however, somewhat smaller than the 2001 totals (0.86 times 2001). This decrease was similar for White Ibises (0.87 times) but not for Great Egrets (3.4 times).

It is unlikely that the increases in numbers of nesting birds were a result of increased survey coverage or efficiency. First, we saw very large increases elsewhere in the ecosystem in which we had been using the same survey techniques for many years. Second, the big increases in total numbers in LNWR were clearly affected most strongly by differences in numbers of White Ibises and Great Egrets. Nesting aggregations of these species are those most likely to be discovered and efficiently counted by aerial surveys. Therefore, increases in ground survey efficiency that resulted from increased coverage and tighter transect spacing were probably not an important source of the increase in total nesting numbers.

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## WOOD STORK NESTING AT CORKSCREW SWAMP SANCTUARY

**Methods**
Aerial surveys were conducted in a fixed wing aircraft with complete coverage of the area. Slide photos were taken of the entire colony on each survey date from approximately 1800ft, circling the colony until full slide coverage was attained. Visual estimations were made counting each nest when the colony size was small, and estimating as the colony approached its maximum density. Photos of each sub-colony were taken from 300-500ft during a single pass to assist in productivity estimates and stage of development. Eighteen flights occurred between Nov 21 2001 and Jun 7, 2002 (54 person-hours).

**Analysis**
Photos of each aerial survey were projected on a grid and individual nests were then counted. Once the flights revealed that fledging was occurring (Apr 23) productivity was determined from the previous flight date (Apr 17). Chicks from subset of 156 nests (all nests clearly visible from photos taken at 300 ft) were counted. This number was used to determine colony productivity.

**Results**
The Wood Stork colony nesting at Corkscrew Swamp Sanctuary produced an estimated 3160 chicks from 1240 nests. Nest productivity averaged 2.55 chicks per nest. The first nests were occupied the week Dec 12, 2001. Heavy rainfall caused these early nesters to abandon and renest. Wood Storks began leaving the nests around Apr 23. Nearly all nests had fledged by Jun 7.

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# EVERGLADES NATIONAL PARK

## Methods

Aerial colony surveys were conducted monthly (Jan through Jul) by 1 or 2 observers using a Cessna 182 fixed-wing aircraft (~22 person-hours). Both traditional colony sites as well as new colonies discovered during SRF flights were surveyed. Nesting began in Jan and increased through Apr. Successful colonies had fledged all young by Jun.

## Results

We located 3083 wading bird nests in 15 mainland colonies during the 2002 season (See table). This number represents a slight increase over last year's effort with 11 additional colonies initiating nesting. A number of small Great Egret colonies (n=6, <50 birds each) attempted to nest along the edges of Shark River Slough, but most completely failed. The most prevalent species found nesting in mainland ENP colonies were Great Egrets, Wood Storks, White Ibis and Cattle Egrets. The following species were observed in nesting colonies but numbers of nests could not be estimated due to their location within the colonies: Snowy Egret, Little Blue Heron, Tricolored Heron, and Roseate Spoonbill.

A few notable differences from the 2001 nesting season were seen this season. We observed an increase in the number of Wood Storks nesting at Paurotis Pond, Cuthbert Lake, and Rodgers River Bay. Wood Stork nests increased at Paurotis Pond by 62%, Cuthbert Lake by 33%, and Rodgers River Bay by 32%. Great Egret nests also increased considerably at these colonies: Paurotis Pond was up by 55% and numbers at Rodgers River Bay more than tripled (from 60 nests the previous year to 230 nests this year.) Great Egrets also returned to a few other colonies that were not occupied in 2001 (Grossman Ridge and NE Grossman). Even though the Cuthbert Lake colony initiated nesting much later than other colonies (some Wood Storks were still seen incubating in Apr while others only had very small young), both Great Egrets and Wood Storks had large fledglings that were seen flapping on branches in May and Jun. Great Egrets and Wood Storks also appeared to successfully fledge young at Paurotis Pond, Rodgers River Bay, and Tamiami West.

Another substantial difference from last year (and previous years) was the formation of a large White Ibis colony at Paurotis Pond. During our May flight we observed more than 500 nests within the center island of the pond. A significant number of nests fledged young as we later observed many juvenile birds flying about the center island and chasing after adult birds.

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**Number of wading bird nests found in Everglades National Park Jan - Jun 2002**

| Latitude | Longitude | Colony Name | GREG | WOST | WHIB | GWHE | SNEG | CAEG | TRHE | LBHE | ROSP | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| N 25 45.447 | W 80 32.701 | Tamiami West | 200 | 450 | 400 | + | + | + | + | | | **1050** |
| N 25 16.866 | W 80 48.191 | Paurotis Pond | 275 | 200 | 550 | + | | + | + | + | | **1025** |
| N 25 33.400 | W 81 04.190 | Rodgers River Bay | 230 | 125 | | | | | | | | **355** |
| N 25 12.536 | W 80 46.510 | Cuthbert Lake | 100 | 60 | | 3 | | | | | | **163** |
| N 25 41.100 | W 80 34.500 | NE Grossman B | 85 | | | | | 250 | | | | **335** |
| N 25 37.680 | W 80 38.740 | Grossman Ridge | 60 | | | | | | | | | **60** |
| N 25 16.116 | W 80 52.071 | East River Rookery | 35 | | | | | | | | | **35** |
| N 25 45.457 | W 80 30.481 | Tamiami East | 35 | | | | | | | | | **35** |
| N 25 43.987 | W 80 43.851 | E. of Shark Tram Rd | 10 | | | | | | | | | **10** |
| N 25 35.091 | W 80 48.808 | (W side Shark R. Slough, col3) | 8 (= 25 initiated, 8 fledged) | | | | | | | | | **8** |
| N 25 38.540 | W 80 42.990 | (W side Shark R. Slough, col7) | 4 (= 8 initiated, 4 fledged) | | | | | | | | | **4** |
| N 25 41.422 | W 80 42.043 | (W side Shark R. Slough, col5) | 3 (= 30 initiated, 3 fledged) | | | | | | | | | **3** |
| N 25 37.713 | W 80 47.075 | (W side Shark R. Slough, col2) | 0 (= 30 initiated, all failed) | | | | | | | | | **0** |
| N 25 33.117 | W 80 50.380 | (W side Shark R. Slough, col4) | 0 (= 50 initiated, all failed) | | | | | | | | | **0** |
| N 25 38.810 | W 80 36.550 | (E side Shark R. Slough, col6) | 0 (= 15 initiated, all failed) | | | | | | | | | **0** |
| | | **Total** | **1045** | **835** | **950** | **3** | **0** | **250** | **0** | **0** | **0** | **3083** |

+ Indicates species present but unable to determine numbers

## EVERGLADES NATIONAL PARK - FLORIDA BAY

**Methods**
Although systematic coverage of the entire Florida Bay was not done this year (see Browder this Report) an aerial colony survey of the majority of the islands within Florida Bay was conducted once with the intent of finding new large colonies. After the initial survey, colony flights were conducted intermittently due to time constraints and funding. Success for most of the smaller colonies could not be determined as we had only visited the colonies once. However half-grown young were observed in Feb on many islands during the initial search. Nesting for most species in the larger colonies that we visited began in Feb and increased through Apr. The largest colony, Frank Key, appeared to be successful as fledged birds (Great Egret and White Ibis) were seen perched on branches above nests and flying about the island.

**Results**
We located 1151 wading bird nests on 16 Florida Bay islands during the 2002 season. We observed the following species nesting in Florida Bay: Great Egret, Great White Heron, White Ibis, Snowy Egret, Tri-colored Heron, and Roseate Spoonbill. Tricolored Herons and Roseate Spoonbill nest numbers could not be estimated due to their hidden location under tree canopies. See Lorenz (this Report) for detailed information on Roseate Spoonbills in Florida Bay.

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## UPCOMING MEETINGS

Florida Chapter of The Wildlife Society: 12-14 Mar, 2003, Sebastian, Florida

USFWS Refuge Centennial Celebration and Wildlife Festival: 13-16 Mar, 2003, Sebastian, Florida.

## BIG CYPRESS NATIONAL PRESERVE

**Methods**
Wading bird nesting activity was determined using 2 methods: random observations during wildlife-associated aerial fixed-wing and helicopter flights, and aerial helicopter surveys of a sample of previous years' colonies. The fixed-wing flights averaged 10 hours per week and occurred throughout the year, whereas, the helicopter surveys occurred on Feb 5, Mar 12, Apr 11, and Apr 26. Total flight time was approximately 6 hrs. One ground check of the only known Wood Stork colony occurred on Apr 25. Twenty of 53 sites previously documented with Wood Stork and/or Great Egret nests were sampled at least once in 2002.

**Results**
One Wood Stork and 4 Great Egret colonies were documented. The stork colony had an estimated 25 nests and the Great Egret colonies ranged from 12 to 80 nests.

One Great Blue Heron and 3 Anhinga nests were observed within the colonies. All colonies were within the Preserve boundaries with the exception of a Great Egret colony approximately 1 mile north of the Preserve on private land in the Okaloacoochee Slough.

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## FLORIDA BAY

From Apr 1995 - Apr 2001, the Miami Station of the U.S. Coast Guard provided an H-65 Dolphin helicopter, pilot, and air mechanic for the census of water birds in Florida Bay. The census consisted of 2 flights per month except the first year, when they were more frequent. However, the May 2001 flights were cancelled and put on hold until further notice. The flights were part of a cooperative program between the Miami Station, U.S. Coast Guard, and the Southeast Fisheries Science Center, NOAA Fisheries. The cooperative program began with sea turtle surveys over the reef tract and was expanded to include several other projects, including the water bird survey over Florida Bay. ENP collaborated with NOAA Fisheries in the water bird census.

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# SOLID WASTE AUTHORITY OF PALM BEACH COUNTY COLONY

**Methods**

From Feb – Jul 2002, Breeding Bird Censuses were conducted in the SWA Roost by 2 observers every 8 weeks, representing approximately 12 man-hours. During censuses, all islands from 3 abandoned shell pits were systematically surveyed from a small boat, and the identified bird species and nest numbers were recorded. Surveys were conducted during the morning hours so as to minimize any burden caused by the presence of observers.

**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°46'41"N: Long. 80°08'32"W NAD27). 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 Loxahatchee Watershed Preserve (i.e., Water Catchment Area), a 44 km$^2$ remnant of the Loxahatchee Slough.

**Results**

This report presents preliminary data for the 2002 breeding season. Typically nesting activities have been observed at this colony through Sep, and these surveys being reported are only through the end of Jul. Nest surveys were conducted on Feb 20, Apr 3, May 17, and Jul 12, 2002. Only the peak nest numbers are being reported for each of the bird species (see Table below).

The estimated peak number of wading bird nests for the SWA Colony is 2,851 which represents a 14.8% increase from the 2001 season. The number of White Ibis, Great Egret, Tricolor Heron, Little Blue Heron, and Anhinga nests are higher during this year than the 2001 season. Cattle Egret, Wood Stork, Snowy Egret, and Great Blue Heron nest numbers appeared to be less than observed in 2001. There is a 20% decrease of Wood Stork nests from last year. However, from personal observation it seems that the number of Wood Stork young per nest has increased, averaging 3-4 fledglings per nest. It should also be mentioned that Glossy Ibis nests and young have been observed again this year in the SWA Rookery. However, these nests were not easily identified during the nest surveys and therefore are not included in the reports.

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**Peak number of wading bird nests in the SWA Colony Feb - Jul 2002**

| GREG | SNEG | CAEG | GBHE | LBHE | WOST | WHIB | ANHI | TRHE | Total nests |
|---|---|---|---|---|---|---|---|---|---|
| 119 | 18 | 672 | 2 | 110 | 213 | 1152 | 324 | 105 | 2851 |

# HOLEY LAND AND ROTENBERGER WMAs

As in recent years, there was no wading birds nesting observed on Holey Land and Rotenberger Wildlife Management Areas during the 2002 nesting season.

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# ROSEATE SPOONBILLS IN FLORIDA BAY

## Methods

Thirty-three of Florida Bay's keys have been used by Roseate Spoonbills as nesting colonies (Table 1). These colonies have been divided into 5 distinct nesting sub-regions based on each colony's primary foraging location (Lorenz et al. 2002). During the 2001-2002 nesting cycle (Nov-May), complete nest counts were performed in 3 of the 5 sub-regions (i.e., Northwestern, Northeastern and Central) and most of the active colonies were surveyed in the Southeast sub-region (Table 1). Nest counts were performed by entering the active colony and thoroughly searching for nests. Nesting success was estimated for 4 of the sub-regions through mark and re-visit surveys of the most active colony within the sub-region. These surveys entail marking between 15 and 50 nests shortly after full clutches had been laid and re-visiting the nests on an approximate 2 week cycle to monitor chick development. Prey fish availability was estimated at 4 sites (TR, JB, HC, and BS) in the coastal wetlands of northeastern Florida Bay (see Lorenz et al. 1997 for location coordinates) known to be spoonbill foraging locations for the Northeastern and Central sub-regions. Prey abundance was also estimated at a site located in southern Bear Lake (BL) on Cape Sable where large numbers of spoonbills nesting in the Northwestern sub-region regularly feed. Prey fish were collected monthly from Nov through Apr with a $9m^2$ drop trap using the techniques of Lorenz et al. 1997. Prey availability data have not been fully analyzed and the qualitative information presented should be considered preliminary.

## Results

*Northwestern Sub-Region: Sandy Key*

The count of 264 nests in the Northwestern sub-region was well above average in 2001-02 (Table 1), and a new colony was quantified for the first time. Following the 2001 nesting period, we received reports of spoonbill nesting activity on Clive Key, however, the information was received well after the fledging period so numbers could not be estimated. The island was added to our list of colonies to be surveyed and nesting was confirmed in 2002 with 24 nests.

Nesting surveys were conducted at Sandy Key on Nov 21, Dec 5, 18, Jan 1, 10, 23, Mar 8, and Apr 16. We estimated that eggs were first laid on Nov 15, the mean egg laying date was Dec 3, and mean hatch date was Dec 24. A total of 140 nests were counted on the island, which is a little below average (Table 1). However, it was an increase over last year's count (130 nests). Spoonbills nesting at Sandy Key exhibited a high degree of nesting success when compared to previous years and other sub-regions (Table 2, Lorenz et al. 2002). Mean nest production was estimated at 1.72 chicks fledged per nest attempt with 86% of nest attempts fledging young. Large numbers of adult-sized young-of-the-year spoonbills were also observed flying in and around the other Northwestern colonies, thereby adding credibility to the high nesting success estimate for Sandy Key.

A discussion of water levels and prey fish availability at the BL fish collection station is pertinent to understanding why spoonbills nesting in the Northwestern sub-region achieved such a high degree of success. Lorenz (2000) estimated that prey fish become concentrated into small pools when water levels on the surrounding wetland drop to about 12.5 cm, thereby making them susceptible to predation by spoonbills and other wading birds. In Nov, while spoonbills were courting, water levels at BL were declining rapidly but were well above the fish concentration threshold. Fish availability on the foraging site was estimated at less than 1 fish/$m^2$ (<0.1 g/$m^2$ by weight). In mid-Dec, water levels declined to below 12.5 cm and fish density jumped to an estimated 285 fish/$m^2$ (about 50g/$m^2$). At approximately the same time, chicks were hatching at Sandy Key and parents likely experienced a high degree of foraging success as a result of the high prey availability on proximal wetlands (as indicated by BL samples). Water levels at BL remained below 12.5 cm throughout most of Jan and Feb and fish availability remained above 100 fish/$m^2$ (>20 g/$m^2$) for the 2 months following hatching. Spoonbills were frequently observed utilizing the BL foraging location with as many as 25 spoonbills feeding at a given time.

*Northeastern Sub-region: Tern Key*

Spoonbill nesting effort in the Northeastern sub-region was the lowest since 1963 with only 106 pairs nesting within the sub-region. Since 1984, spoonbill numbers have steadily decline in the Northeastern sub-region (Lorenz et al. 2002) and this continued decline is reflected by comparisons with previous years (Table 1). Beside Tern Key, only 2 other colonies were active in the northeastern sub-region with only 17 nests located outside of Tern Key. To put this in perspective, 3 years ago, 3 northeastern colonies in addition to Tern Key had an excess of 17 nests.

Spoonbill nesting surveys were conducted at Tern Key on Dec 2, 5, 20, Jan 7, 24 Feb 26, Mar 9, 14 and 19. As has been the norm for the last several decades, there were 2 distinct nesting events. We estimated the first egg was laid Dec 9, the mean lay date was Dec 12, and the mean hatch date was Jan 3. Although the number of nests was higher this year than last year (89 versus 65 nests), the number was alarmingly small compared to 25 years ago (591 nests in 1978) or even just 10 years ago (178 nests in 1992). Fortunately, spoonbills nesting at Tern Key experienced a high degree of nesting success in 2001-02 (Table 2). The estimated 1.26 chicks fledged per nest attempt was the first unqualified successful year that spoonbills have had since 1992 (Lorenz et al. 2002). Almost 70% of the attempted nestings produced offspring.

As at BL, water levels at the northeastern foraging grounds began to decline rapidly in Nov, coinciding with the onset

of spoonbill courtship at Tern Key. By the time chicks hatched in early Jan, water levels at 3 of the 4 foraging locations being monitored had dropped to 12.5 cm. Adult spoonbills were observed foraging at 2 of these 3 locations at the time of our Jan fish collections. At all 4 sites available prey density steadily increased from Nov to through Apr. The highest abundance of fish occurred at the JB site (the site closest to Tern Key) where collection estimates were greater than 10g/m$^2$ from Jan through Apr.

Contrary to the previous few years, the second nesting attempt was smaller than the first (only 44 nests). The uncharacteristically small second nesting might be due to the high first nesting success rate in both the Northeastern and Northwestern sub-regions. We suspect that the second nesting is generally comprised of pairs from throughout Florida Bay that failed during the fist nesting . Since this has been the majority of pairs for the past few years, the second nesting was generally larger than the first nesting at Tern Key. Since most nesting pairs were successful in 2001-02, they were likely still caring for chicks at the time of the second nesting, thereby reducing the potential pool of second nesters.

We estimated the mean lay date of the second nesting as Feb 5 and the mean hatch date as Feb 26. This nesting was moderately successful with an average of 0.60 chicks per attempt. The standard definition of successful nesting (≥1 chick/nest attempt) suggests a failed nesting.

## NORTH FORK OF THE ST. LUCIE RIVER

### Methods

The colony is situated near the boundary of the St. Lucie River State Buffer Preserve at 27°15.7 N and 80°19.0 W. It has been active since at least 1998, although it was only surveyed formally in 2000. This year, casual observations were made from a kayak during a recreational outing. The colony was observed at the time young storks were hatching.

### Results

There were 50 Wood Storks on nests, 5 Great Egrets, several Anhingas with young, and numerous Cattle Egrets.

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**Table 1. Number of ROSP nests in Florida Bay Nov. 2001-May 2002. * indicates colony with nesting success surveys (see Table 2).**

| Sub-region | Colony | 2001-02 | Summary since 1984 | | |
|---|---|---|---|---|---|
| | | | Min | Mean | Max |
| **Northwest** | Sandy* | 140 | 62 | 168.53 | 250 |
| | Frank | 99 | 0 | 38.27 | 125 |
| | Clive | 24 | | - | |
| | Oyster | 1 | 0 | 9.00 | 45 |
| | **Subtotal** | **264** | **65** | **200.53** | **325** |
| **Northeast** | Tern* | 89 | 65 | 114.88 | 184 |
| | N. Nest | 0 | 0 | 0.00 | 0 |
| | S. Nest | 2 | 0 | 22.83 | 59 |
| | Porjoe | 0 | 0 | 40.07 | 118 |
| | N Park | 15 | 0 | 23.92 | 50 |
| | Duck | 0 | 0 | 2.00 | 13 |
| | Pass | 0 | 0 | 0.80 | 4 |
| | **Subtotal** | **106** | **106** | **217.67** | **310** |
| **Cental** | E. Bob Allen* | 25 | 0 | 17.50 | 35 |
| | Manatee | 0 | 0 | 0.00 | 0 |
| | Jimmie Channel | 32 | 6 | 21.92 | 47 |
| | Caloosa | 12 | 0 | 6.00 | 12 |
| | Little Pollach | 0 | 0 | 7.00 | 13 |
| | S. Park | 4 | 0 | 12.50 | 39 |
| | **Subtotal** | **73** | **15** | **55.00** | **96** |
| **Southwest** | E. Buchanon | ns | 0 | 9.60 | 27 |
| | W. Buchanon | ns | 0 | 5.67 | 9 |
| | Barnes | ns | 0 | 0.00 | 0 |
| | Twin | ns | 0 | 2.56 | 0 |
| | **Subtotal** | **ns** | **2** | **16.00** | **35** |
| **Southeast** | M. Butternut* | 10 | 10 | 27.42 | 66 |
| | Bottle | 10 | 0 | 13.36 | 40 |
| | Stake | 0 | 0 | 4.50 | 19 |
| | Cowpens | 2 | 0 | 9.20 | 15 |
| | Cotton | 0 | 0 | 0.00 | 0 |
| | West | ns | 0 | 4.56 | 9 |
| | Low | 0 | 0 | 0.00 | 0 |
| | Pigeon | 8 | 0 | 4.40 | 12 |
| | Crab | ns | 0 | 1.67 | 7 |
| | East | 2 | 0 | 2.64 | 12 |
| | Crane | 13 | 11 | 15.80 | 27 |
| | E. Butternut | ns | 4 | 4.78 | 11 |
| | **Subtotal** | **?** | **64** | **90.78** | **117** |

However, more than one third of the nests succeeded in fledging young with an average of 1.67 chicks/nest. These results indicate that a significant percentage of nesting parents were successful in finding food in sufficient quantities to fledge multiple young. A possible reason for the low percentage of successful attempts may be that there was a reversal in declining water levels in early Mar (about the same time as the chicks were estimated to hatch). This could account for mortality as food in sufficient quantity to raise young may have been less available. By mid-Mar ,water had once again receded and fish became concentrated (see above discussion on prey availability). Parents with chicks that survived the reversal likely found prey in abundance and, therefore, completed the nesting cycle with a high rate of success.

*Southeastern Sub-Region: Middle Butternut Key*

Complete nest surveys were not conducted at all colonies in the Southeastern sub-region but most of the colonies surveyed had nesting effort well below average (Table 1; the exception being Crane Key). Nesting success surveys were conducted at Middle Butternut Key on Dec 6, 20, Jan 7, 24 and Mar 11. Only 10 nests were found on the island, the lowest number recorded since 1984 (Table 1). The first egg was laid approximately Dec 10, the mean lay date estimated as Dec 12 and the estimated mean hatch date was Jan 2. All but 1 nest failed by Jan 24. At that time, the lone remaining nest had 2 chicks at 21d of age. Two chicks were observed flying around the colony during the Mar 11 survey indicating the lone surviving nest succeeded in fledging young (Table 2). Historically, the southeastern colonies focused foraging on the mangrove wetlands on the mainline Florida Keys. Although most of these wetlands were filled by 1972 as part of Keys land boom, we presume (based on anecdotal evidence) that the few remaining Keys wetlands still serve as important foraging grounds for these birds. Since 1972 (when large scale filling of wetlands ended), nesting attempts in the Southeastern sub-region generally faired poorly: 5 of 7 years surveyed were failures (Table 2). Based on these observations it appears that conditions during the 2002 nesting were typically poor in the Southeastern sub-region. Based on previous work (Lorenz et al. 2002) it appears that the quality of the Southeastern sub-region for nesting spoonbills is marginal at best. This is stark contrast to the period prior to the keys land boom when spoonbills nesting in the Southeastern sub-region successful fledged young every year with an average production of >2 chicks per nest (Lorenz et al. 2002).

**Table 2. Mean number of chicks per nest attempt. Numbers in paranthesis indicate the percentage of nest attempts successful. Success is defined as fledging 1 or more chicks per nest. Second nesting attempts not included.**

| | | | Summary since 1984 | | | |
|---|---|---|---|---|---|---|
| **Sub-region** | **Colony** | **2001-02** | **Min** | **Mean** | **Max** | **% of Yrs Successful** |
| **Northwest** | Sandy | 1.72 (86%) | 0 | 1.27 | 2.5 | 65% |
| **Northeast** | Tern | 1.26 (68%) | 0 | 0.74 | 1.9 | 33% |
| **Cental** | E. Bob Allen | 0.77 (46%) | 0 | 0.90 | 1.52 | 29% |
| **Southeast** | M. Butternut | 0.29 (14%) | 0.29 | 1.15 | 2.09 | 29% |

*Central Sub-Region: East Bob Allen Key*

As has been the trend over recent years, the Central sub-region once again experienced greater than average nesting effort (Table 1). Surveys at East Bob Allen Key (EBA) were conducted on Dec 5, Jan 1, 21, and Feb 26. The first egg was laid approximately Dec 4, the mean lay date estimated as Dec 11 and the estimated mean hatch date was Jan 2. Once again EBA proved difficult to survey. A total of 25 nests were counted, however, as many as 45 adults were observed within the colony and all expressed behavior typical of nesting spoonbills. This apparent contradiction resulted in a thorough search of the island but no new nests were discovered. We hope to perform a helicopter survey of the island this year with the hope of discovering any hidden nesting locations. However, the estimate of 25 nests may be accurate: the excess adults may have been in the courting phase for a second nesting (as occurred at EBA last year) that never came to fruition in 2002. Furthermore, the estimate of 25 nests compares well with the more meticulous counts by G.V.N. Powell from 1987 and 1992 (8, 9 ,15, 34, 35, and 24 respectively).

The success of the EBA colony was mixed with an overall production rate of 0.77 chicks per nest, however, almost half of the nests succeeded in fledging young with an average of 1.67 chicks/nest. These results indicate that a significant percentage of nesting parents were successful in finding food in sufficient quantities to fledge multiple young. Significant nesting in the Central sub-region is a relatively new phenomenon, having started in the mid-1980's. As such, little information has been collected on where these birds feed but the central locations suggests that they may opportunistically exploit the primary resources used by the other sub-regions. Compared to the Central colonies, the stringent foraging nature of birds in the other 4 sub-regions commits them to a particular foraging habitat. If, for some reason, that habitat becomes compromised, then the nesting attempt is likely doomed (as occurred in the southeast this year). However, spoonbills nesting in the Central sub-region have access to the entire mosaic of foraging habitats found in the other 4 sub-regions. This catholic foraging style may cost a little more energetically (longer flights to foraging areas), but the increased likelihood in finding suitable foraging locations may counterbalance the cost. Using this year as an example, the foraging grounds associated with both the Northeastern and Northwestern sub-regions were of high quality during the nesting period on EBA. Perhaps the birds from the Central sub-region were flying the relatively long distance to these foraging areas. The extra travel time and energetic costs of the longer foraging flights may have manifested itself in reduced nesting success compared to the Northeastern and Northwestern sub-regions. However, in contrast to the Southeastern sub-region, the Central bay nesters performed well. As indicated above, foraging areas in the

southern bay were likely of poor quality resulting in failure. Southern nesting birds were likely too distant from the northern foraging grounds to take advantage of their high quality conditions, thereby committing these birds to foraging in the poor quality southern foraging grounds and, ultimately, to nest failure. In short, the Central colonies were median in success estimates when compared with the other 4 sub-regions (as has been the case the last 4 years), as would be expected if the hypothesis were accurate. Aerial surveys would be needed to further evaluate this hypothesis.

*Bay-wide synthesis*

Unfortunately, lack of funding once again limited our ability to perform a total count for all of Florida Bay. However, nest counts of the northeastern colonies indicate that spoonbill use continues to decline in that sub-region while remaining fairly stable or increasing in other sub-regions. Nesting success estimates clearly indicate that, this year, spoonbill nest production on a bay-wide scale was the highest in 10 years. The complementary forage fish data supports previous findings that spoonbill nesting success is dependent upon prey availability and hydrological conditions on proximal foraging grounds (Lorenz et al. 2002). Even though this was a successful year in northeastern Florida Bay, the combined results of an overall regional decline in effort in the northeast and a linkage between success and foraging quality indicate that the northeastern foraging grounds are not as reliable as they were 20 years ago. As indicated elsewhere, this decline seems to be related to water management practices associated with the C-111 canal and the South Dade Conveyance System (Lorenz et al. 2002).

The high degree of success in Florida Bay in general and in the northeastern sub-region in particular, may be linked to Everglades drought cycles. Frederick and Ogden (2001) indicated that 'normal' hydrologic years immediately following a drought result in supernormal nesting events in the Everglades. The implication is that normal conditions following a drought promote favorable conditions for nesting. The authors further indicate that such conditions promote a highly dense or available prey base. From these findings, it follows that last year's drought and this year's normal rainfall patterns would result in conditions favorable to nesting wading birds. Our finding that spoonbills had the best year bay-wide and the only successful year in the Northeastern sub-region since 1992 supports the hypotheses of Frederick and Ogden. Furthermore, 1992, the last time spoonbills were successful in the northeastern bay was a normal year following the 1989-1991 drought. A future goal is to compare our fish collections from the northeastern foraging grounds for these 2 years with the intervening years in which spoonbills failed so as to determine a stronger causal link between hydropatterns, prey abundance and spoonbill success.

One programmatic note: in conjunction with Robert Bennetts of USGS-BRD, we performed a pilot study concerning the efficacy of banding nestlings with an eye toward performing a state-wide population study of Roseate Spoonbills. We banded 7 chicks at Tern Key that were 5d to 14d post hatching. Three of the chicks were confirmed dead before fledging. The other 4 were observed flying within the colony at up to 42d post-hatching. Conditions within Tern Key are particularly bad for re-sighting birds relative to other colonies around the state. Our ability to re-sight and confirm deaths within Tern Key was promising and we are currently pursuing funding for a larger banding effort.

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# SOUTHWEST COAST

If we follow nesting long enough only a catastrophe will seem exceptional. This year's nesting falls well within the range of the last 20 yrs. This was a very good year for Great Egret nesting and another dry year in the fresh water wetlands (see Sklar this Report). It is noteworthy in that this is the forth year in a row that the fresh water wetlands I monitor have dried down completely. There appears to be a pattern of low nesting for small waders (SNEG, LBHE, TRHE and CAEG) for this same 4-yr period. Within this period, the 4 species (pooled) are down 42% from the overall mean. During the 20 years I have recorded no instance of these 4 species responding as a group over a period of years. This would lead me to suspect that there is some link between the small coastal wader nesting and freshwater but I feel that it will take much more information to establish it, let alone understand it.

**Location and Methods**

Rookery Bay (RB): 26°01'51"N 81°44'43"W. Two Red Mangrove islands, 0.22 ha. Nest census conducted 3 Jun, walk through, complete coverage; 1 person, 1 hr. This is the first year that all the wader nests were on the southern island.

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 8 Apr and 31 May, walk through, complete coverage; 1 person, 2 hrs.

East River (ER): 25°55'39"N 81°26'35"W. Three Red Mangrove islands, 0.25 ha (about). Nest census conducted 6 Jun, canoe, complete coverage, 1 person, 1 hr. Unlike the last several years nesting this year did not start earlier than at the other colonies.

Chokoloskee Bay (CHOK): 25°50'43"N 81°24'46"W. Four Red Mangrove islands, 0.2 ha (about). Census conducted 22 Apr. This year most of the waders in the area used 2 of the 4 islands, boat census, 1 person, 1 hr.

Chokoloskee Pass (CHPS): 25°46'48"N 81°24'26"W. One mostly Red Mangrove (2-3 Blacks) island, 0.5 ha (about). Census conducted 22 Apr, powerboat circling the islands, 2 people, 0.5 hrs. This colony not active this year.

Note: All of the walk or canoe censuses are conducted during peak nesting, about the beginning of Jun.

**Results**

Great Egret: This year had the highest number of nests ever recorded (See Table below). Unlike 2000 when there were high numbers of nests and very few young, this year Great Egrets were very productive, with at least 2 fledglings per nest. Most of the nesting was during the beginning of the nesting season with young fledging earlier than usual. The typical second wave of nesting started late (23 Jun) and so far had only a few nests.

Snowy Egret: This species started a little early and produced a good crop of fledglings. Nesting was spreading out some at the ABC colony and increasing a little at East River. On 9 Jul a second wave of nesting was initiated.

Little Blue Heron: This species seem to be just holding on; they are producing young but with very few nests.

Tricolored Heron: As mentioned above, nesting was low the last few years. One difference this year was that this species nested more around the edges of the Marco Colony than in the past. On 9 Jul a second wave of nesting was initiated.

Reddish Egret: There were about the same number of nests as the last 4 years. All were at the Marco Colony, where they produced good numbers of fledglings. Although there are few nests in the area, they steadily produce young and there has been an increase in the number of sightings of mature birds in the area over the years. Last year 1 white fledgling was produced, this year there were 2.

Cattle Egret: This was another low nesting year. Like the Tricolored Heron at Marco, this species has moved to the periphery of the nesting islands, possibly because there were an unusually high number of noisy Great Egret chicks in the center of the colony. On 25 Jun a second wave of nesting was just initiated.

White Ibis: This species came back from nesting in the interior earlier this year. Although it is usual for the adults to appear before there is an influx of fledglings, this year there were many fledglings with the adults when they arrived. White Ibis in breeding plumage came in later (18 Jun) in the season at Marco, which is common. There were more birds than ever (59 in 1 area) which may indicate a few more nests but it is early to tell.

Glossy Ibis: There were more nests this year but their productivity is unknown.

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**Number of wading bird nests in coastal Southwest Florida during 2002**

| Colony | GBHE | GREG | SNEG | LBHE | TRHE | REEG | CAEG | WHIB | GLIB | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| Rookery Bay | | 20 | 26 | 5 | 25 | | 43 | | | **138** |
| Marco (ABC) | 32 | 247 | 117 | 8 | 91 | 8 | 225 | 10 | 84 | **450** |
| East River | | | 37 | 4 | 115 | | | | | **132** |
| Chokoloskee Bay | | 141 | | | | | | | | **36** |
| Chokoloskee Pass | | | | | | | | | | **4** |
| **Total** | **32** | **408** | **180** | **17** | **231** | **8** | **268** | **10** | **84** | **1238** |
| **Mean (19-year)** | **9** | **181** | **301** | **70** | **506** | **4** | **461** | **8** | **46** | **1586** |

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

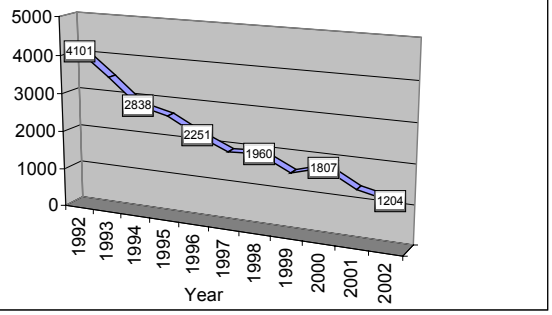
**Methods**

Colonial Nesting Bird Surveys at J.N. "Ding" Darling National Wildlife Refuge were conducted via motorboat once per month from Apr to Jul at 6 rookery islands located within 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). Coordinates of colonies were collected in NAD83, UTM ft, state plane format. Colonial nesting bird surveys include wading birds (herons, egrets, and ibis) as well as diving birds (Brown Pelicans, Double-crested Cormorants, and Anhingas). Surveys are conducted during high tide in the early morning by slowly circling each island and counting all nest-tending adult birds visible. Total nests are derived from the maximum number of nest-tending birds observed for each species. All distinguishable immature birds are tallied separately. Observers also tally non-breeding birds at each colonies. Survey dates for 2002 were Apr 24, May 8, Jun 20, and Jul 25. Two observers conducted all surveys, during Apr-Jul in 9.8 hrs.

**Results**

The 2002 peak estimate for colonial bird nesting (1,204) was 13% below the 2001 peak estimate (1,379). Trends in the maximum total number of estimated nests indicate a 71% decline in overall nesting effort since 1992 (Fig 1). However, wading bird nesting increased 16% from 2001 to 2002 (219 to 261). Whereas, diving bird nesting decreased 23% from 2001 to 2002 (1,160 to 943; Table 1).

Fig. 1. Trends in Colonial Bird Nesting Effort at J.N. "Ding" Darling NWR Complex, 1992-2002




Tarpon Bay Keys (631,692.79; 771,947.00): Colonial bird nesting decreased from 2001 by 2.1%. However, wading bird nesting increased 13%, whereas diving bird nesting decreased 16% from 2001.

Pine Island Sound: Compared to 2001, colonial bird nesting decreased by 39% at Hemp Island (606,325.94; 824,081.96) and 33% at Bird Key (581,688.77; 848,488.18). Additionally, wading bird nesting decreased 900% and 26%, at Hemp Island and Bird Key, respectively. Diving bird nesting decreased 30% and 42% at Hemp Island and Bird Key, respectively.

Matlacha Pass: Colonial bird nesting decreased from 2001 by 75% at Upper Bird Island (632,848.67; 808,881.08) and increased 65% at Lower Bird Island (645,360.11; 791,988.32). Colonial nesting also decreased 6.2% from 2001 at Lumpkin Island (637,567.88, 814,531.83). Furthermore, wading bird nesting decreased 21% at Upper Bird Island and increased 67% at Lower Bird Island. However, on Lumpkin Island, wading bird nesting increased 50% from 2001. Diving birds decreased 116% and increased 65% at Upper Bird Island and Lower Bird Island, respectively. Nesting diving birds on Lumpkin Island decreased 100% from 2001.

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**Table 1. Colonial bird nesting survey peak estimates for J.N. "Ding" Darling National Wildlife Refuge Complex, Apr-Jul, 2002. Counts reflect the maximum number of nest-tending adults during 4 monthly surveys.**

| Island Surveyed | BRPE | ANHI | DCCO | BCNH | GRHE | TRHE | LBHE | REEG | CAEG | SNEG | GREG | GBHE | WHIB | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Tarpon Bay Keys | 90 | 0 | 9 | 0 | 0 | 2 | 2 | 1 | 0 | 27 | 57 | 1 | 0 | **189** |
| Hemp Island | 214 | 0 | 65 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | **282** |
| Bird Key | 257 | 0 | 79 | 1 | 0 | 21 | 0 | 0 | 0 | 3 | 2 | 3 | 20 | **386** |
| Upper Bird Island | 31 | 1 | 4 | 0 | 0 | 5 | 10 | 0 | 4 | 3 | 3 | 3 | 0 | **64** |
| Lower Bird Island | 145 | 0 | 12 | 0 | 0 | 1 | 2 | 0 | 0 | 2 | 24 | 1 | 0 | **187** |
| Lumpkin Island | 3 | 20 | 13 | 0 | 0 | 22 | 2 | 0 | 11 | 9 | 5 | 1 | 10 | **96** |
| **TOTAL** | **740** | **21** | **182** | **1** | **0** | **51** | **16** | **1** | **15** | **44** | **91** | **9** | **33** | **1,204** |

# WADING BIRD ABUNDANCE (FORAGING & NESTING)

## EVERGLADES NATIONAL PARK AREA

**Methods:** Systematic reconnaissance flights (SRF) were performed monthly between Dec 2001 and May 2002. Flights were done over 3 consecutive days using a fixed-wing Cessna 182 at an altitude of 60 m. The area covered, included Everglades National Park and the southern region of Big Cypress National Preserve. The area was surveyed using transects oriented E to W and separated by 2 km (Fig 1). Wading birds were counted, identified and geographically located using GPS units. Changes in surface water patterns (hydropatterns) were also recorded. Five categories were used to describe the hydropatterns: DD - absence of surface water and no groundwater visible in solution holes or ponds; WD - absence of surface water but groundwater present in solution holes or ponds; DT - ground surface area mostly dry but small scattered pools of surface water present and groundwater visible in solution holes or ponds; WT - ground surface area mostly wet but small scattered dry areas; and WW - continuous surface water over the area.

Data obtained during each SRF were compiled into a database that contains the information collected since 1985. During this period, SRF surveys were not conducted during Dec 1984, Dec 1987, and Jan 1998. The average total number of wading birds during the months of Dec with SRF data was used to estimate the missing data for these particular months. The same

Densities of birds were estimated using a 2 x 2 km grid. The number of birds counted during the SRF inside the 300m strip width were extrapolated to the rest of the 4 km$^2$ cell dividing the number of birds observed by 0.15.

**Results:** This year a 15% decrease in the estimated number of wading birds compared to the previous year was observed. However, the overall trend since 1985 to the present showed an increase in the number of birds (Fig 2). This year most of the species show a decrease in the number of individuals in comparison with the 2001 survey. Great Egrets declined 27%, Great Blue Herons 20%, small dark herons 3%, White Ibis 9%, Glossy Ibis 37%, Wood Stork 27% and Roseate Spoonbill 8%. The only species or species group that showed an increase in the number of birds were the small white herons ( 36%) and Great White Heron with (27%).

The peak density of birds occurred in Feb (Table 1). During this month, 5 of the 9 species studied showed the maximum number of birds for the whole season, including those species that encompassed the largest number of individuals such as Great Egret and White Ibis. Maximum abundance occurred in Mar for small white herons and the Roseate Spoonbill, Jan for the Great Blue Heron, and Apr for the Glossy Ibis.

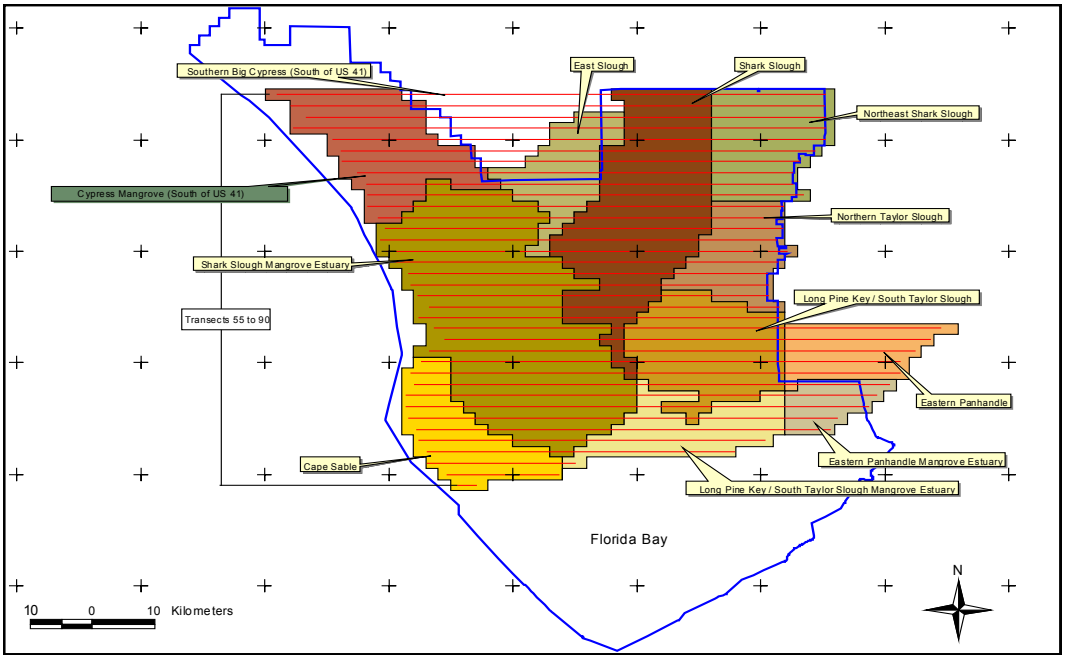


**Fig. 1 Map of ENP and southern Big Cypress National Preserved with sampling transects and drainage basins.**

This year the lack of normal rainfall produced unusual low water levels that altered the distribution and abundance of wading birds (Table 2). Shark Slough (SS) was the basin where most of the birds were found (26%), followed by Shark Slough Mangrove Estuary (SSME) and Big Cypress Mangrove Estuary (BCME) with 15% respectively. These 3 basins combined, made up to 57% of the total number of birds observed during the entire season.

In a normal rainfall year, SS has the lowest density of birds during the first 3 months of the survey due to the high water levels in that basin. However, this year SS had the largest concentration of birds for all months except Dec due to the lack of water in the other basins**.**

Considerable changes in hydropatterns and birds distribution were observed throughout the season as shown in Fig 3. During the month of Dec, as usual, most of the study area was covered by water; 54% of the area was classified as WW and 31% as WT. Even though more than half of the area was completed flooded, the highest densities of birds occurred in areas with the WT hydropattern. The next 2 types of hydropatterns with the highest densities were WW and DT respectively. Jan had a very similar coverage in hydropattern as the previous month (50% WW and 37% WT). However, the highest density of birds occurred at the WW areas rather than WT as in Dec. As water receded, it made WW areas more suitable for wading birds to forage in shallower water.

Despite the sharp decrease in the percentage of land covered by WW and WT observed in Feb, bird densities were higher in those areas. This pattern continued to May when the area covered by WW and WT represented only

**Table 1. Estimated abundance of wading birds in the Everglades National Park and adjacent areas, Dec 2001 -May 2002.**

| Species | Dec-01 | Jan-02 | Feb-02 | Mar-02 | Apr-02 | May-02 |
|---|---|---|---|---|---|---|
| **GREG** | 21,484 | 18,100 | 25,807 | 18,326 | 9,305 | 9,849 |
| **GBHE** | 1,611 | 2,497 | 1,305 | 1,544 | 756 | 1,048 |
| **SMDH** | 1,023 | 1,547 | 4,635 | 2,951 | 965 | 2,738 |
| **SMWH** | 2,880 | 1,812 | 3,639 | 4,782 | 2,631 | 2,287 |
| **WHIB** | 19,944 | 25,563 | 45,504 | 33,164 | 20,956 | 24,118 |
| **GLIB** | 134 | 200 | 216 | 874 | 882 | 73 |
| **WOST** | 962 | 2,397 | 3,205 | 1,643 | 902 | 1,461 |
| **ROSP** | 288 | 261 | 543 | 1,162 | 622 | 799 |
| **GWHE** | 35 | 35 | 166 | 49 | 21 | 14 |
| **Total Abundance** | **48,361** | **52,412** | **85,020** | **64,495** | **37,040** | **42,387** |

**Table 2. Estimated abundance of wading birds (all species combined) for the different drainage basins in the Everglades National Park, Dec 2001 - May 2002.**

| Month | SBC | BCME | SS | NESS | ES | SSME | NTS | LPK/STS | EP | CS | LPK/STSM | EPME | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dec-00** | 2,326 | 17,579 | 4,123 | 1,372 | 2,739 | 5,320 | 446 | 1001 | 2,619 | 4,756 | 4,771 | 1,309 | **48,361** |
| **Jan-01** | 4,375 | 10,003 | 10,972 | 1,299 | 3,369 | 10,227 | 462 | 1,044 | 3,142 | 4,797 | 1,434 | 1,288 | **52,412** |
| **Feb-01** | 8,067 | 7,159 | 20,385 | 2,262 | 13,798 | 17,436 | 134 | 2,638 | 2,289 | 5,982 | 4,183 | 687 | **85,020** |
| **Mar-01** | 10,436 | 8,252 | 17,863 | 1,329 | 8,020 | 10,731 | 176 | 760 | 1,253 | 1,694 | 3,095 | 886 | **64,495** |
| **Apr-01** | 3,901 | 2,537 | 11,508 | 1,009 | 10,716 | 2,724 | 14 | 1,203 | 369 | 635 | 2,303 | 121 | **37,040** |
| **May-01** | 2,422 | 3,637 | 22,684 | 1,542 | 448 | 4,387 | 0 | 3,106 | 95 | 608 | 3,383 | 75 | **42,387** |
| **Total** | **31,527** | **49,167** | **87,535** | **8,813** | **39,090** | **50,825** | **1,232** | **9,752** | **9,767** | **18,472** | **19,169** | **4,366** | **329,715** |

**SBC** = Southern Big Cypress (South of US 41)
**BCME** = Big Cypress Mangrove Estuary (South of US 41)
**SS** = Shark Slough
**NESS** = Northeast Shark Slough
**ES** = East Slough
**SSME** = Shark Slough Mangrove Estuary
**NTS** = Northern Taylor Slough
**LPK/STS** = Long Pine Key / South Taylor Slough
**EP** = Eastern Panhandle
**CS** = Cape Sable
**LPK/STSM** = Long Pine Key / South Taylor Slough Mangrove Estuary
**EPME** = Eastern Panhandle Mangrove Estuary

12% and 15% respectively. Despite the reduction in WW and WT area, densities of birds during Mar and Apr were predominant on those areas. During the last month of the survey, the Park became very dry with DD covering 50% of the total area. At the end of the season, most birds were located in WT and in DT areas with 34% and 33% respectively of the total number of birds.

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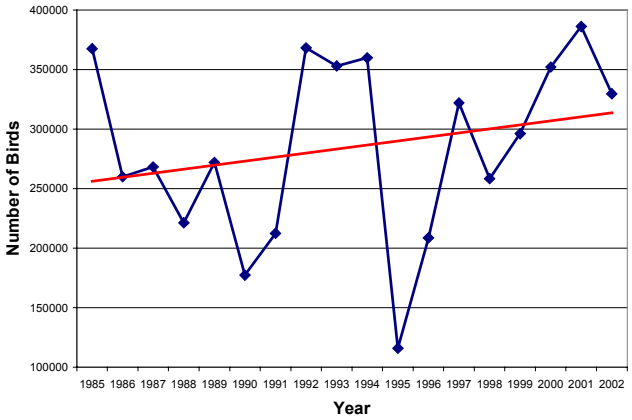
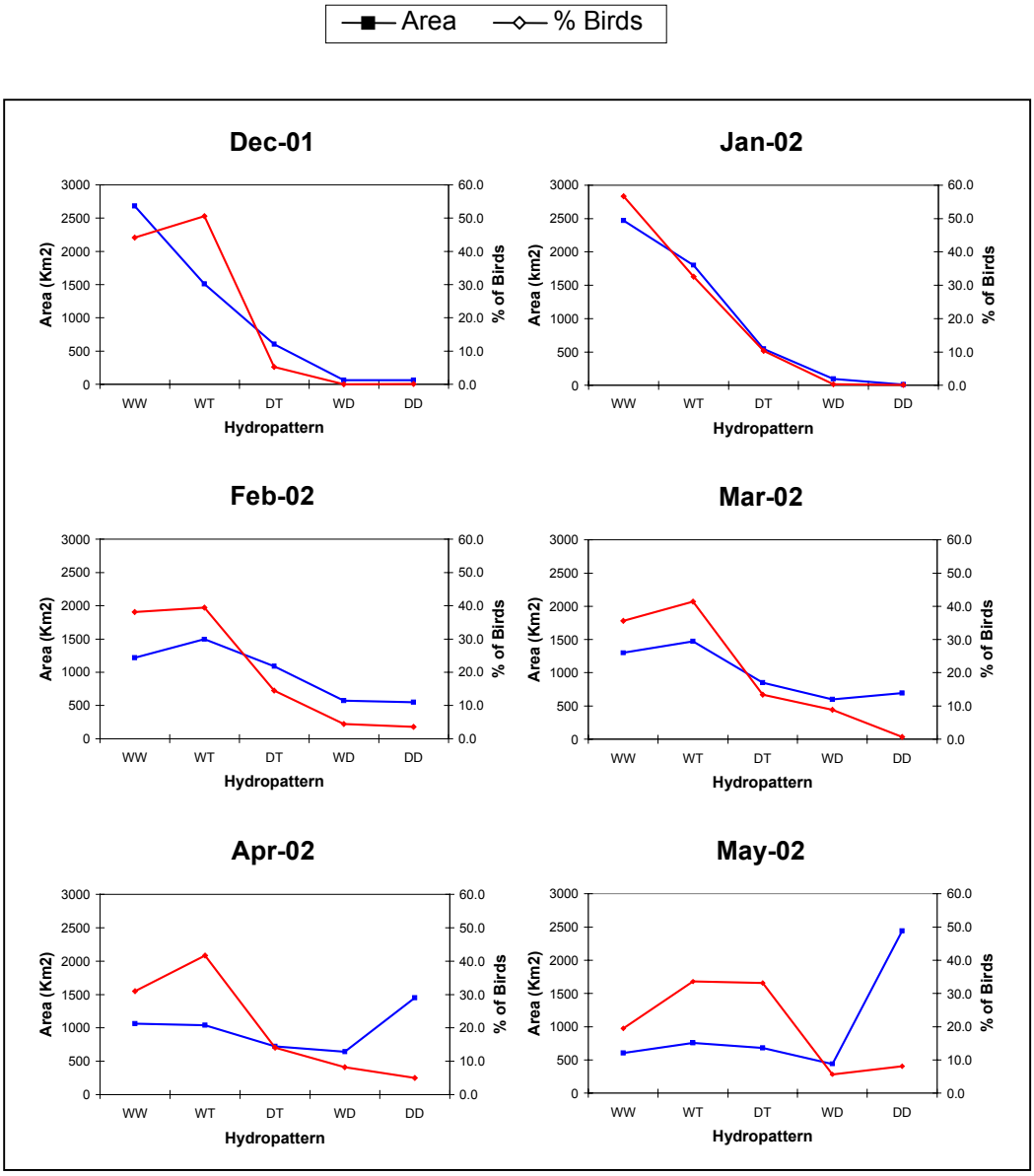



**Fig. 2 Estimated number of wading birds (all species pooled) observed from the months of Dec - May from 1985 - 2002.**

**Fig. 3 The areal extent and percentage 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.**



# Northern and Central Everglades

**Methods**

Wading bird surveys (SRF) were conducted from a fixed-wing aircraft at an altitude of about 60 m along parallel transects with 2-km spacing each month from Jan to Jun 2001. 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. The data were downloaded into a computer spreadsheet, edited for errors, and compiled using a program written in Dephi® programming language. Transects were recorded with a high-resolution digital video linked with GPS.

**Results**

Monthly wading bird relative abundance peaked in Feb, then declined in Mar, increased in Apr and May, then decreased to a low in Jun (see Table). Mean monthly estimated abundances in 2002 were lower than in 2001 for all species in Water Conservation Areas except for White Ibis and small dark herons. The lower relative abundances in the Water Conservation Areas for 2002 are mostly a result of lower numbers of Great Egrets being observed.

In the Big Cypress National Preserve, monthly wading bird abundance was higher in 2002 than 2001 with surface water increasing after Apr 2002. The major contributors to the increases in Big Cypress for 2002 were White Ibis, Great Egrets, and Wood Storks. In 2002, the birds generally declined from Feb to Jun.

In the Holey Land WMA, wading bird monthly relative abundance was highest during Feb and was dominated numerically by Great Egrets and White Ibises. After Feb 2002, the relative abundance of birds general declined until Jun.

Final reports from 1996 to 2001 are currently available and the 2002 report should be available in Dec 2002.

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**Estimated Wading Bird Abundance (15% coverage) in 2002 from SRFs. Values in bold increased from 2001.**

| Region | Species | Feb | Mar | Apr | May | Jun |
|---|---|---|---|---|---|---|
| **Water Conservation Areas** | GREG | 26,607 | 7,140 | 17,500 | **31,900** | 6,120 |
| | GBHE | 633 | 380 | 613 | 660 | 320 |
| | SMDH | 387 | 167 | 193 | 340 | **113** |
| | SMWH | **1,113** | **607** | **1,527** | 1,840 | 293 |
| | WHIB | 61,900 | **39,047** | **39,193** | **38,747** | 2,233 |
| | GLIB | 307 | 1,220 | 433 | **313** | 0 |
| | WOST | **2,007** | 673 | 1,827 | **5,333** | **220** |
| | Other* | **527** | **314** | 380 | 640 | 500 |
| | **Regional total** | 92,848 | 49,168 | **58,053** | **79,113** | 9,479 |
| * Include Roseate Spoonbill, Cattle Egret, and Great White Heron | | | | | | |
| **Big Cypress National Preserve** | GREG | **14,693** | **2,280** | **2,2413** | **3,253** | **3,573** |
| | GBHE | 233 | **133** | **73** | 7 | 40 |
| | SMDH | **107** | **33** | **133** | 7 | **73** |
| | SMWH | **600** | 260 | 820 | 40 | 140 |
| | WHIB | **13,173** | 6,973 | 3,980 | 4,720 | 487 |
| | GLIB | 20 | 0 | 0 | 0 | **153** |
| | WOST | **2,347** | **1,680** | **1,953** | **1,580** | 127 |
| | CAEG | 193 | **440** | **1,906** | 87 | **2,273** |
| | GWHE | **147** | **60** | **33** | **13** | **367** |
| | **Regional total** | **31,513** | **11,859** | **11,311** | **9,707** | **7,233** |

# STATUS OF WADING BIRD RECOVERY – 2002

Once again we are providing an annual summary of the overall status of the recovery of nesting by wading birds in the Everglades basin. These annual status summaries have appeared in each edition of the South Florida Wading Bird Report beginning in 1996. The purpose of the status summaries is to compare the nesting patterns each year for 5 species of wading birds in the Everglades basin to a set of baseline data for the same species from 1986-1995, and to a wading bird restoration goal proposed for the Comprehensive Everglades Restoration Plan (Ogden et al. 1997). Information used in the annual status summary is synthesized from data collected during aerial surveys of nesting colonies in LNWR, WCAs 2 & 3, and mainland ENP, and reported in more detail in other sections of the South Florida Wading Bird Report.

**Results**

Numbers of Nesting Birds: In 2002, the estimated total number of nesting pairs (rounded to nearest 100) for the 5 indicator species in the Everglades was 11,100 Great Egret pairs, 13,000 Snowy Egret pairs, 2,400 Tricolored Heron pairs, 32,000 White Ibis pairs, and 1,600 Wood Stork pairs. The total for the 5 species was 60,100 nesting pairs, compared to 8,000 pairs in 1996, 8,300 pairs in 1997, 6,900 pairs in 1998, 21,600 pairs in 1999, 32,900 pairs in 2000, and 30,600 pairs in 2001. In addition, an estimated 1,700 pairs of Wood Storks nested at Corkscrew Swamp Sanctuary in 2002.

The table below presents 3-year running averages of numbers of nesting pairs for the 5 species. The table shows the highest and lowest values from among the 3-year running averages for the baseline years (1986-1995), the 7 recent running averages calculated from 1996-2002 data, and the initial restoration goals recommended by Ogden et al. (1997). In this table, numbers for Snowy Egrets and Tricolored Herons are combined.

Seasonal Timing of Nesting: The restoration target is to shift the timing of nesting, especially for storks, to a time frame earlier in the dry season that more closely matches pre-C&SF Project nesting patterns (Ogden et al. 1997). Storks at Corkscrew in 2002 initiated nesting in late Dec and early Jan, early enough for most pairs to successfully fledge young prior to the summer rainy season. Storks in the WCA colonies and at Tamiami West mostly had large young by mid-May, suggesting that nesting started early compared to some other recent years. Little information has been provided regarding the specific timing of nesting for most other species. Large numbers of Snowy Egrets that moved into Alley North in late May or early Jun, and new groups of White Ibis in Tamiami West and at a colony in eastern Loxahatchee in mid-May, may have mostly failed due to the late date of initiation.

Location of Colonies: The restoration target is to recover large, sustainable nesting colonies in the marsh-mangrove ecotone portion of the southern Everglades basin, where the largest colonies occurred in the pre-drainage system. The number of pairs for the 5 indicator species that nested in this ecotone region in southern Everglades National Park in 2002 was an estimated 1,500 pairs, or about 2.5% of the total Everglades nesting effort. The percentage nesting in the ecotone region probably exceeded 90% in most years during the 1930s and early 1940s, averaged 26% during the baseline years, 1986-1995, and has been less than 5% in all but 1 of the recent assessment years (11% in 1996).

**Discussion**

By recent standards, the 2002 nesting season was exceptional for 2 reasons. Both have to do with numbers. The total number of pairs for the 5 species, not less than 60,000 nests, was the highest reported in the mainland Everglades since 1940 (about 75,000 pairs, Ogden 1994)! The fact that over half of this total was White Ibis is to be expected; ibis always make up the majority of the nesting birds in the Everglades in big nesting years.

The estimate of 12,000 pairs of late nesting Snowy Egrets in the Alley North colony in WCA 3A may be unprecedented for this species in the Everglades for any year – ever! Not only is it a record number for a single colony in south Florida in modern times (the last 100 years), but it may exceed the combined nesting effort by Snowy Egrets in all Everglades colonies in a single year. I accept that the birds were there; good, well-trained biologists made the observation (see Frederick & Hilburn this Report). But trying to explain the event is difficult. The Snowy Egrets must have moved into Alley North in big numbers in late May and/or early Jun, and apparently few were successful at fledging young birds. No such numbers were in the colony 17 May (D. Gawlik, G. Crozier, and J. Ogden, personal

| Species | Base high/low | 1994-96 | 1995-97 | 1996-98 | 1997-99 | 1998-00 | 1999-01 | 2000-02 | Target |
|---|---|---|---|---|---|---|---|---|---|
| GREG | 1,163/3,843 | 4,043 | 4,302 | 4,017 | 5,084 | 5,544 | 5,996 | 7,276 | 4,000 |
| SNEG/TRHE | 903/2,939 | 1,508 | 1,488 | 1,334 | 1,862 | 2,788 | 4,270 | 8,614 | 10,000-20,000 |
| WHIB | 2,107/8,020 | 2,172 | 2,850 | 2,270 | 5,100 | 11,270 | 16,555 | 23,983 | 10,000-25,000 |
| WOST | 130/294 | 343 | 283 | 228 | 279 | 863 | 1,538 | 1,868 | 1,500-2,500 |

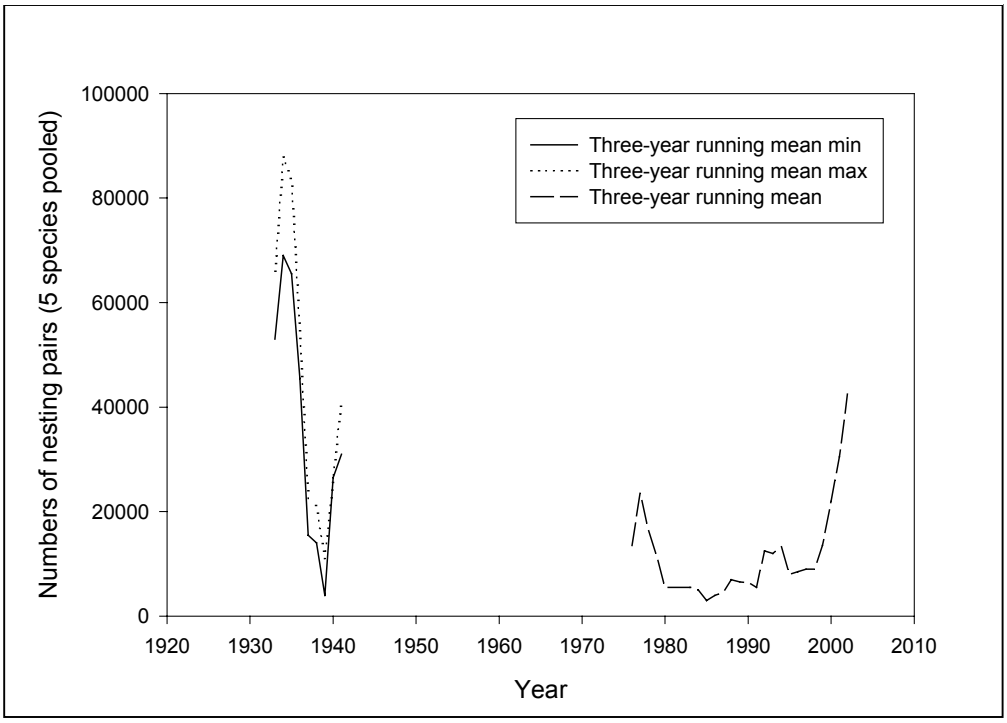
observation), when Ogden estimated 85% of the colony to be ibis) or in early Jul (D. Gawlik, personal observation). The monthly SRF survey of feeding wading birds throughout the WCAs showed that the total number of small white herons in the WCAs in 2002 was roughly similar to other recent years, whereas nest surveys showed that the number of nests in 2002 sharply increased.

The Figure below compares the 3-year running averages for total numbers of nesting pairs for the 5 species, for 2 time periods where reasonably complete surveys were attempted, 1931-1941 and 1974-2002 (some may quibble, perhaps rightfully so, with this characterization of the 1930s data). The messages suggested by this figure are, (1) that the numbers of pairs in the mainland Everglades basin was lowest from the late 1970s through the 1989-1991 drought, (2) that the average number of nesting pairs during this prolonged period of low nesting was roughly 5-10% of the average number that nested during the peak years of the early 1930s, and (3) that an unexpected increase in numbers of nesting pairs occurred at the end of the 1990s and has continued to 2002. I say unexpected because rainfall patterns alone do not provide an explanation for why so many more birds have nested in the 3 WCAs since 1999. A more sophisticated examination of water depth patterns, and of whatever we know about prey availability, will be required to develop a strong hypothesis to explain this change in nesting numbers. The discussion sections of my annual reports (See Ogden in the South Florida Wading Bird Reports starting in 1999) are full of attempts to explain the annual nesting patterns.

One hypothesis that I still feel has some merit has been expressed, in parts, in previous wading bird recovery status summaries (see status summaries for 1999, 2000). This might be called the "ecosystem adjustment hypothesis." This hypothesis takes a big picture view of the Everglades system, and assumes that there has been a substantial lag in ecological "adjustments" following the period of years between the 1950s and 1970s when considerable physical intrusions occurred throughout the remaining Everglades. The physical intrusions include both structural disruptions (levees and canals) and operational disruptions. The reorganized hydropatterns caused by these physical intrusions caused, in turn, a substantial reorganization in the location and timing of the major production and survival centers in the Everglades.

The first part of the hypothesis states that the ecological adjustments process (i.e., this reorganization of function and process) took many years or decades to "work itself out." The ecological adjustments continued well beyond the time when the structural changes were largely completed, especially as major operational changes continued to be made. In response to these physical and operational changes, and the subsequent prolonged period of ecological adjustments, wading birds have made a prolonged adjustment in the ways they operate across the Everglades. Wading birds started to shift the locations of the major colonies out of the traditional southern ecotone region beginning in the 1970s (mainly White Ibis initially), and continued to shift into the WCAs into the 1990s (averaged 26% of total nesting still in the southern Everglades for the

**Three-year running averages for total number of nesting pairs for five species of wading birds in the mainland Everglades basin. A low and high value was calculated for each three-year period, 1931-1941, using low and high estimates of annual nesting.**




baseline years, 1986-95, 11% of total nesting still in 1996; less than 5% in all years since then). Wood Storks were the last species to make the shift, mostly after the mid- to late 1980s.

The second part of this hypothesis states that enough time has now passed since the period ended when the greatest disruptions to the ecosystem occurred to allow some relative ecological stabilization to return to the system (i.e., less rapid changes). The more stabile system is providing wading birds with higher levels of predictably available prey than was the case during and following the period of more active disruptions. Early in this adjustment period, it may be that colony locations were less stabile than in recent years, and that nest success rates were lower (these 2 points need more careful analysis). This hypothesis could also explain the low numbers of nesting birds during and following the period of active disruptions, and the increases in total numbers of nesting birds during the 1990s and into the 2000s.

Given these recent dynamics in numbers of nesting birds, it may be difficult to establish a numerical pre-CERP baseline for nesting wading birds, as a means for measuring positive changes in the patterns of wading bird activity brought about by CERP. However, 1 feature of nesting that substantially changed between the early period (1931-1941) and the recent period (1974-2002), and which has shown no tendency to reverse itself in recent years, is the location of colony sites. The colonies of the 1930s, and apparently continuing well into the 1960s, were located primarily along the marsh-mangrove interface, and imbedded in the downstream mainland mangrove zone, at the lower end of the major Everglades flows. During this period, approximately 75-95% of all known nesting waders of these 5 species located their colonies in this southern ecotone-mangrove region. The last big colony in this region may have been the big nesting event that occurred in 1967 at Rookery Branch, at the extreme headwaters of Shark River. In all years since 1997, the number nesting on the mainland in southern Everglades National Park has been < 5% annually.

The reasons why wading birds have not returned to nest in the southern ecotone region are not certainly known. The best working hypothesis is that substantial reductions in fresh water marsh flow into the southern estuaries has had 2 adverse effects, (1) reduced primary and secondary production in the headwaters of the numerous headwater streams due to reduced inputs of organic carbon and other natural nutrients, and (2) reduced survival of small aquatic prey species due to increases in the duration and frequency of dry-outs in the extensive non-tidal mangrove swamps.

**Recommendations**

See my recommendations in the 2001 South Florida Wading Bird Report. We should continue to improve inconsistencies in survey techniques and expand coverage to include Lake Okeechobee.

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# SPECIAL TOPICS

## WATERBIRDS FOR THE AMERICAS: THE NORTH AMERICAN WATERBIRD CONSERVATION PLAN

**Background**
Waterbirds for the Americas: The North American Waterbird Conservation Plan (the Plan) is now available in published form. The product of an independent partnership of individuals and institutions having interest and responsibility for conservation of waterbirds and their habitats in the Americas, the Plan was written in support of a vision in which ***the distribution, diversity, and abundance of populations and waterbird habitats (breeding, migratory, and nonbreeding) are sustained or restored throughout the lands and waters of North America, Central America, and the Caribbean.*** The Plan provides a continental-scale framework for the conservation and management of 210 species of waterbirds, including seabirds, coastal waterbirds, wading birds, and marshbirds utilizing aquatic habitats in 29 nations throughout North America, Central America, the islands and pelagic waters of the Caribbean Sea and western Atlantic, the U.S.-associated Pacific Islands and pelagic waters of the Pacific.

**Findings**
Eighty percent of the species considered in the Plan are colonial nesters, and of this group, the Plan finds that one-third are considered to be at risk of serious population loss. Eleven species of pelagic seabirds are highly imperiled, and 36 species of pelagic and coastal seabirds as well as 7 species of wading birds are of high conservation concern. Although non-colonial waterbirds remain to be assessed quantitatively, many of these populations are also clearly at risk.

Many of the numerous threats to waterbird populations are habitat-based and affect all aquatic birds and other aquatic resources. The threats that the Plan identifies as requiring remedial action include destruction of inland wetlands, introduced predators and invasive species, pollutants, mortality from fisheries and other human industries, disturbance, and conflicts arising from abundant species.

**Recommendations**
The Plan identifies strategies and opportunities for achieving its vision, including a dynamic process for species status assessment. It identifies key issues and information needs for waterbird conservation. It proposes the development of a continental monitoring partnership including standardized methodology, bias-assessment, and internet-based communal database systems to support status and trend evaluation. It promotes habitat and site-based conservation throughout the Americas, especially via the Important Bird Areas programs and similar efforts.

Regional waterbird conservation working groups will step down the continental-level aspects of the Plan to the regional and local levels. Florida is included in the Southeast U.S. waterbird planning region; see www.nawcp.org for more details. Finally, the Plan details resources and infrastructure needed to more fully accomplish waterbird conservation. Rather than establishing new structures, delivery of the Plan will be entrusted to governmental and nongovernmental entities especially state and national governments, conservation-oriented nongovernmental organizations, habitat Joint Ventures, and other partnerships.

Copies of the Plan may be downloaded from www.nawcp.org. Hard copies may be requested from: American Bird Conservancy, P.O. Box 249, 4249 Loudoun Avenue, The Plains, VA 20198 (abc@abcbirds.org); or the U.S. Fish and Wildlife Service National Publications Unit, National Conservation Training Center, Shepherdstown, WV 25443 (1-800-344-WILD).

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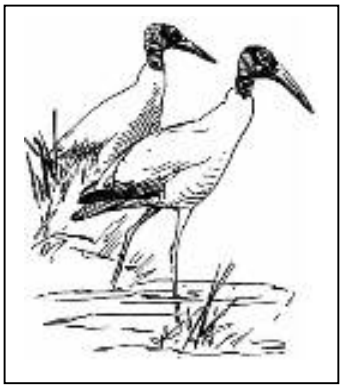

# SURVIVAL AND MOVEMENTS OF JUVENILE WOOD STORKS

This was the initial year of study examining factors that may affect the survival of juvenile Wood Storks. Storks are of special interest with regard to the restoration of the South Florida Ecosystem, both because wetlands of south Florida are considered prime habitat for this federally endangered species and because the storks' demographic responses are thought to be indicators of several aspects of normal ecosystem function. As the first few months of a bird's life are often the period of time when birds may experience their highest mortality, we examined nestling health and body condition of Wood Stork nestlings prior to fledging. Storks nesting in south Florida are actually a fluid subset of the larger southeastern U.S. population, yet the movements of these birds, and the specific habitats they use remain poorly understood. This study of the movement-dependent survival of individual storks may therefore lead to the identification of specific wetland areas used most heavily, and those that are most valuable.

We chose to work in the Tamiami West colony in Everglades National Park (N25º45.31, W80º31.90) for this study, as this colony was easily accessible from Florida State Road 441, was centrally located in the Everglades ecosystem, hosted a large number of nesting Wood storks (>400 pairs), and had stork nests easily reachable by ladder. The colony was visited on the ground from Mar through Jul 2002 after the majority of storks were well into incubation, thus avoiding the more sensitive courtship and egglaying periods.

**Reproductive Success**

We followed a total of 115 nests in this colony to determine rates of survival during incubation and nestling stages. At the initial time of marking, 57% of these nests had young. Using only nests for which we had complete data, we found average clutch size of our marked nests to be 3.09 (SE=0.075, n=46). Average brood size for nests containing nestlings 8-14 days old was 2.81 (SE=0.093, n=26).

Analysis of the nesting success for this colony reveals varying results, depending on the stage of nesting. Overall traditional nesting success for this colony was 77.39% (89 of 115 nests fledged young). Of the 26 nests that failed during this study, 57.69% of these failures occurred early in the nesting season, during Mar. We also used Mayfield's method of analyzing nesting success, which pro-rates survival on a daily basis. During the incubation stage, overall survival during this period was 49.66% (SE= 1.02). During the nestling stage, overall survival dramatically increased to 89.29% (SE=1.63). The overall, combined Mayfield nesting success for these 2 periods was 44.34% (SE=3.47).

**Nestling Health**

After nestlings reached 4-5 weeks of age, first-hatched nestlings from 33 nests were randomly selected for inclusion in our health and telemetry studies. After a juvenile stork was captured on the nest, we performed a health exam on each individual. Skeletal measurements (culmen and tarsus) and mass were recorded which will be used to develop an index of body condition. Each health exam included a physical examination for ectoparasites, palpation for Eustrongylides nematodes, and collection of up to 2 mL of blood. Blood was used for sexing, hematocrit, white blood cell counts, and blood smears which will later be examined for the presence of blood parasites. In addition, 4 – 6 growing scapular feathers were collected from each bird to determine level of mercury contamination. This information will be used to construct an estimation of the health, parasite load, and body condition of each bird.

**Satellite Telemetry**

Following the health exam, each bird was fitted with a backpack harness that combined a 10g VHF radio transmitter and a 35g solar-powered ARGOS certified platform transmitter terminals (PTT) for satellite tracking. The total weight of the Teflon harness, VHF transmitter and PTT did not exceed 3% of the Wood Stork's fledging mass (2 – 2.8 kg).

Signals from the PTTs are recorded by polar-orbiting environmental satellites and then processed by Argos Satellite Location and Data Collection System, Landover, MD. PTTs work on a 10 hour on/24 hour off cycle. Argos assigns each location an accuracy rating, and only locations with estimated accuracies of <1000m are being used in this study. These data will be used to follow their post-fledging survival and to examine their movement patterns and habitat use in years to come. We anticipate having a working website available by fall 2002 that will track the weekly movements of these birds.

After tagged storks left the colony without returning to be fed by parents, in general they moved north through the Water Conservation Areas and Big Cypress National Preserve. Following this initial movement, the majority of storks have continued moving north. As of 15 Jul 2002, half of the remaining 22 live storks were in north and central Florida, while the other 11 had moved into Georgia (6), Alabama (4), South Carolina (2), and Mississippi (1).

**Juvenile Survival**

Of the 33 birds tagged with satellite transmitters, satellite data suggests that 11 have died as of 15 Jul 2002 (33% mortality) and of the 29 that actually left the colony, 8 have died (27.6% mortality). Of the total 11 mortalities, 4 occurred within the colony, and 3 of these have been recovered. Of the remaining 7 mortalities that occurred outside the colony, 5 were within Florida while 2 were in Georgia. One of these fledgling mortalities occurred just north of the colony along a levee road. Cause of death is unknown for this bird, however upon retrieval of the carcass we noted that power lines occur along this road and vehicle traffic is not uncommon. We retrieved a second carcass directly under large power lines in orange groves due east of Lake Okeechobee and an electrical

power plant. We have currently been unable to relocate the remaining 5 mortalities.

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# CONSEQUENCES OF NESTING DATE ON NESTING SUCCESS AND JUVENILE SURVIVAL IN WHITE IBISES

This year concludes the second and final year of our study concerning the magnitude of the difference in survival between 1) White Ibis nests initiated early compared to late in the breeding season and 2) early and late hatched juvenile White Ibises in the Everglades system. During the 2001 breeding season, we monitored 570 White Ibis nests from LNWR, ENP, and WCAs 2B and 3A. We also monitored 53 radio-marked juvenile ibises throughout peninsular Florida and southern Louisiana.

As in 2001, during the 2002 breeding season we examined the survival of eggs to hatching, nestlings to 14 days old, and juveniles to 30 days after departure from the colony (this monitoring is still ongoing) in both early and late nesting birds. We marked and monitored 790 White Ibis nests between 20 Mar and 11 Jun 2002 from 5 colonies in WCA 3A, ENP, and LNWR (Table 1). This represents a 38.6% increase in nest monitoring compared to 2001.

In 2002, our total monitoring effort represented approximately 4.5% of the total White Ibis nests. This was down somewhat from 2001 (6%), due to the very large number of ibis nests in the ecosystem.

**Table 1. Nests marked per colony in 2002.**

| Nest Period | Colony | Nests |
|---|---|---|
| Early | Alley North (WCA 3A) | 246 |
| Early | Lox 70 (LNWR) | 138 |
| Mixed* | Lox 99 (LNWR) | 145 |
| Late | Hidden (WCA 3A) | 113 |
| Late | Tamiami West (E NP) | 148 |
| **Total** | | **790** |

*Contains nests from both early and late nesting ibises.

Early nesting ibises had a slightly smaller mean clutch size (2.49 ± 0.60, N = 183) than late nesters (2.62 ± 0.69, N = 265). Clutch size for both early and late nesting ibises was similar to those from 2001 (Early = 2.52; Late = 2.59 in 2001) and in the middle of the range for the species. Hatchability (the number of eggs hatching/number of eggs surviving to hatch) was significantly higher in early (87.7%, N = 164) compared to late nesters (83.0%, N = 199) (t-test, P = 0.031). Compared to previous years in the WCAs, overall 2002 hatchability was at the low end for the species, but comparable to overall hatchability in 2001 (Table 2).

**Table 2. Comparison of White Ibis hatchability from all marked nests in 2001 and 2002 with marked nests from the WCAs in previous years.**

| Year | Hatchability |
|---|---|
| 2001 | 0.854 |
| 2002 | 0.856 |
| 1986 | 0.888 |
| 1992 | 0.916 |
| 1995 | 0.931 |
| 1987 | 0.972 |

Overall Mayfield method nest survival estimates (probability of a nest producing at least 1 chick to 14 days old) were significantly higher in 2002 compared to 2001 ($Z = 20.14$, $P < 0.0002$). In addition, late-nesters had a significantly higher survival rate compared to early-nesters (z-test, P = 0.0019) in 2002 (Table 3).

**Table 3. Percent survival of early and late-hatched ibises in 2001 and 2002.**

| | 2001 | 2002 |
|---|---|---|
| **Early** | 4.6 ± 0.9 | 33.4 ± 2.7 |
| **Late** | 2.9 ± 0.9 | 44.9 ± 2.9 |
| **Overall** | 4.1 ± 0.7 | 44.5 ± 1.9 |

**Juvenile success**

In Jan of 2002 we began ground monitoring of White Ibis roost locations throughout peninsular Florida for birds radio-marked in 2001. We also monitored large roosts in southern Louisiana through 2 nighttime flights and a third night of ground monitoring. From mid-Jan through mid-Jul 2002, we resighted only 2 early-hatched ibises and 1 late-hatched ibis from the 2001 marked birds, all at the Palm Beach County Waste Facility.

During the 2002 season, we radio-tagged a total of 69 juvenile White Ibises (35 early hatched and 34 late hatched birds) from 3 colonies, a 30.2% increase in marked individuals over 2001. Intensive aerial tracking of 2002 marked birds began on 1 Jun 2002 and is ongoing. Through Jul, we logged 73.7 hours of aerial tracking and an additional 35 hours of tracking from the ground (including time spent searching for 2001 marked birds before Jun) (Table 4).

**Table 4. Number of hours spent tracking radio-marked ibises through Jul of 2001 and 2002.**

| | 2001 | 2002 |
|---|---|---|
| **Aerial** | 52 | 73.7 |
| **Ground** | 7 | 35 |

Our aerial tracking flights in 2002 covered the majority of mainland Florida south of Lake Okeechobee, with occasional flights to the northern edge of the lake. This includes ENP, all of the WCAs, Big Cypress National Preserve, the Everglades Agricultural Area, and the coastline along Florida Bay from Key Biscayne to Everglades City. Additional in-state flights are planned covering central and coastal Florida from the northern end of Lake Okeechobee north to Cedar Key and Daytona Beach.

A majority of marked birds fledged from their colonies at approximately 62 days of age (data only available for 3 of 4 colonies). We considered a bird fledged from a colony if we did not locate its signal (alive or dead) within a given colony on 2 successive tracking trials. The initial juvenile dispersal pattern appears similar to that of 2001 with some juveniles flying only a short distance (<5 km) upon first leaving a colony, while others rapidly migrated long distances (>90 km).

Through Jul 2002, we located on at least 1 occasion 38 of 52 (73.1%) marked birds that were assumed to have successfully fledged from their colony in 2002. This is a much higher resighting success rate than in 2001 (14 of 49, 28.6%). In addition, we located 14 dead radio-tagged birds from the 2002 cohort (2 early and 12 late-hatched) compared to 5 (1 early and 4 late-hatched) in 2001. One possible explanation for this increase in resighting of marked birds is that the young birds are surviving longer in 2002 compared to 2001. An alternative explanation is that a change in monitoring technique has resulted in the higher resighting rate. We conducted an experiment to determine the best flight elevation (between 1000-4000 ft) to locate birds, which resulted in our flying all 2002 flights at 3000' in elevation compared to 1000-1500 ft in 2001.

As in 2001, the majority of resights to date were in agricultural fields southwest, south, and east of Lake Okeechobee (i.e. Everglades Agricultural Area). Resights were also located at the Palm Beach County Waste Facility and WCAs 1, 2, and 3A. The low number of relocations of radio-tagged birds in any coastal or inland wetland areas is interesting as it suggests that juveniles are not foraging in these locations. Aerial observations through Jul confirmed low numbers of foraging ibises in south and central Florida in general, with the exception of the Everglades Agricultural Area and the Palm Beach County Waste Facility. We plan to conclude our aerial tracking flights in Aug 2002 and focus on further data analysis.

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