Supplemental Information for the White Ibis

Biological Status Review Report

The following pages contain peer reviews received from selected peer reviewers, comments received during the public comment period, and the draft report that was reviewed before the final report was completed

March 31, 2011

Table of Contents

Peer review #1 from Jim Kushlan

From: Jim Kushlan
To: Imperiled
Subject: White Ibis
Date: Tuesday, November 23, 2010 11:00:55 PM

As requested I have reviewed the Biological Status Review for the White Ibis.
Information used on taxonomic classification and distribution is correct. Information on population size and trend is less certain. Overwhelmingly important elements of the biology of this species are its nomadic tendencies and variable breeding system. Florida's White Ibis population can be expected to nest irregularly in numbers, frequency, timing and location, making definitive statements of population size and trend based on nesting counts problematical. Estimates made from airplanes, the most logistically feasible way for counting these birds, have a debilitatingly high degree of uncertainty as to make them nearly unusable. In its Statewide Population Estimate, the Review Group is to be congratulated for its perceptive admission, in the text, of the large margin of error associated with the rather substantial quantity of numerical data that exist for the species. It would be preferred that this uncertainty also be acknowledged in the Findings Table where population changes and sizes are given. However, as the Review concludes, population data that do exist are sufficiently robust as to infer an order of magnitude for the Florida population which supports the Review Group's conclusion that the species does not merit listing. In the greater Everglades, for example, given all historic and present information, it can be concluded that the White Ibis has always been and remains the most abundant breeding wading bird species, and so not a likely listing candidate. One point not mentioned in the review, which might be for completeness, is the recent (perhaps a decade long) increasing presence of the White Ibis within the urban environment, at least in South Florida. While the coastal population numbers would add only some thousands to the statewide total, their presence is so obvious to average Floridians that this change in habitat might be noted.

Jim Kushlan

Peer review #2 from Julie Heath

From: Julie Heath
To: Imperiled
Subject: Re: White ibis Draft BSR Report
Date: Thursday, December 16, 2010 6:04:52 PM
Attachments: draft to FWC.pdf

Hi,

My peer-review of the White Ibis BSR is attached.

Thanks

Julie

15 December 2010

To Whom It May Concern:

I have completed my peer-review of the Biological Status Review (BSR) for the White Ibis (*Eudocimus albus*) prepared by the Biological Review Group for the Florida Fish and Wildlife Commission. The Biological Review Group are well qualified for this task. I do have some concerns about data interpretation and whether there are enough reliable data to follow the IUCN protocol for status designation. Below are my comments and suggestions, I hope you find them useful.

1) The life history of ibises makes population assessment very difficult. White ibises can have high rates of dispersal and rapidly immigrate or emigrate from areas depending on environmental conditions (Frederick et al. 1996, Stangel et al. 1991). The range of the North American population most likely includes Cuba (Frederick et al. 1996) and perhaps other Caribbean or South American nations. Given the wide-ranging distribution of the White Ibis population and high rates of dispersal, regional assessment of extinction risk may be "inaccurate" and "unreliable" (IUCN 2001). The BSR would benefit from a discussion about whether a regional assessment can adequately gauge ibis extinction risk.

2) The IUCN (2001) recommends that: "*results from a regional assessment process should include at least three measures: (1) the regional Red List Category, (2) the global Red List Category, and (3) an estimate of the proportion (%) of the global population occurring within the region.*" The BSR's goal is to recommend a regional category (1), but the global Red List Category (2) is not provided in the regional assessment. The **Geographic Range and Distribution** section provides an estimate of 150,000 pairs in the southeastern U.S. (not including Cuba) with three citations: Frederick et al. 1996, Hunter et al. 2006 and IUCN 2009. Frederick et al. 1996 estimated that the minimum ibis population size in the southeastern U.S. was 51,000 pairs not 150,000 pairs. I cannot find a population estimate on the IUCN 2009

website. The population estimate of 150,000 pairs is presented in Hunter et al. (2006) based on "*Estimates for breeding populations of most colonial waterbirds in the Southeast U.S. Region were obtained by asking state wildlife agency and other knowledgeable biologists to make their* ***best guess*** *as to the existing number of pairs for each species and within each state or BCR. All states provided information, but cooperators were generally uncomfortable with the level of accuracy they could provide."* To follow the IUCN guidelines for a regional assessment for a high mobile species, it is necessary to have a good sense of the (global) population size. I do not think those data are available for White Ibis within the population's range (including the Caribbean or at least Cuba) and the data that do exist (for a portion of the range) are most likely highly inaccurate (a sum of best guesses). Thus, the BSR will have a difficulty in meeting IUCN recommendation 3 above.

3) **Threats** to White Ibises outside of Florida should be considered because of their wide-ranging distribution and high dispersal rates. For example, Hunter et al. (2006) express concern about ibis dependence on aqua-culture or the perception that ibises are a pest species.

4) In the **Statewide Population Assessment**, the review panel notes that the margin of error in (snap shot) aerial surveys may be very high and therefore these data may not be useful in trend analysis but then provide a series of population estimates based on aerial surveys, and use survey data to reach conclusions about population trends in Table 1. Given the problems associated with observer error (Frederick et al. 2003) and problems with asynchronous breeding patterns (Frederick et al. 2006) extinction assessments based on aerial survey counts are most likely unreliable because the data lack precision and accuracy.

5) Table 1 of the BSR contains a summary of whether ibises meet criteria for listing.

- **Population Size Reduction**. Please provide the methods used to generate the statement "from 1980 to 2006… increase about 2.2% per year". This result is not in the BNA account (listed as a reference). Also, are these results for the Everglades or the State of Florida? The references to the SFWMD and ENP indicate that these are Everglades trends. The Everglades is most likely the most important breeding area for ibises in Florida, yet is it appropriate to use only these counts for a state analysis of extinction risk?
- Is the trend estimate based on a model that includes all years between 1980 and 2006 or is it a two-point estimate comparing 1980 and 2006 and dividing by number of years? The later technique does not address the question of whether there has been a trend over time, only whether these two years are different.
- Perhaps most importantly, a point trend estimate (+2.2%/year) created with high variable data is uninformative. If this is the result of a multi-year analysis (includes all years between 1980 and 2006), please include a confidence interval with this point estimate. Does the confidence interval for annual change include a value that would result in a 30% decline over the period of interest (i.e., a change of -1.5%/year would result in a ~30% population decrease over 26 years and a change of -2.5%/year would result in a ~50% decrease over 26 years)?
- It is unclear why the years of consideration are 1980 to 2006. The BSR indicates a 3-generation period of 33 years. If this is the case should the analysis be from 1973-2006? Or 1976-2009? If so, in 1972 and 1975 the number of breeding White Ibises in the

Everglades was estimated as > 50,000 individuals (Kushlan 1973, Kushlan and White 1977) and the number of nesting white ibises in the Everglades were "*3-year running averages for the number of nesting white ibises in the Everglades were 21,133 (2005-2007), 17,541 (2006-2008), and 23,953 (2007-2009)*"(from BSR). These data suggest that there has been at least a 30% and perhaps a 50% decline in nesting ibises within the timeframe of interest and would result in a different status decision.

- I disagree with the "data type" designation as observed, the data are (at best) estimates.
- **Population Size and Trend. "***Estimated about 40,000 nests in 2009 or about 90,000 mature birds total in S. Florida alone.*" It is misleading to use abnormal year (2009, see BSR introduction) as a benchmark.
- As survey protocols are being improved (use of photography) reviewers should be wary about interpreting increased counts as indications of population increase.

7) Table 2 provides a regional assessment.

- Line 10. Is there a non-breeding, wintering population of ibises in Florida? I believe the IUCN guidelines recommend treating breeding and non-breeding populations as separate populations and doing separate regional assessments on each. Is that necessary here? "*Is the taxon reproducing within the region, or is it a visitor utilizing resources within the region? If the answer to the headline question is both yes and no, then there are two distinct subpopulations, with one being a nonreproducing migrant and the other being a reproducing subpopulation. In such cases each subpopulation should be treated as different taxa and should be assessed separately*."
- Line 11. In my opinion the answer here is "yes" not "do not know". There are multiple references that suggest high recruitment from areas outside of Florida.

In sum, I think that a regional assessment of extinction risk based on a portion of the region (Everglades) that represents an unknown proportion of the global population may be unreliable. Further, the data used to estimate these risks are problematic and it is not clear how the data were used to address the question of population change in Florida. The details about the quantitative analysis of population size and changes should be evaluated carefully before the BSR moves forward with a decision.

Julie Heath

Frederick, P. C., K. L. Bildstein, B. Fleury and J. Ogden. 1996. Conservation of large, nomadic populations of White Ibises (*Eudocimus albus*) in the United States. *Conservation Biology* 10:203-216.

Frederick, P.C., Hylton, B., J.A. Heath, and M. Ruane. 2003. Accuracy and variation in estimates of large numbers of birds by individual observers using an aerial survey simulator. Journal of Field Ornithology 74:281–287.

Frederick, P.C., J.A. Heath, R. Bennetts, and H. Hafner. 2006 Estimating nests not present at the time of breeding surveys: an important consideration in assessing nesting populations Journal of Field Ornithology 77:212–219.

Hunter, W. C., W. Golder, S. L. Melvin, and J. A. Wheeler. 2006. Southeast United States regional waterbird conservation plan. U.S. Fish and Wildlife Service, Atlanta, Georgia.

Kushlan, J. A. 1973. White Ibis Nesting in Florida Everglades. *Wilson Bulletin* 85: 230-231.

Kushlan, J. A. and D. A. White. 1977. Nesting Wading Bird Populations on Southern Florida. *Florida Scientist* 40:65-72.

Stangel, P. W., J. A. Rodgers and A. L. Bryan 1991. Low genetic differentiation between two disjunct White Ibis colonies. Colonial Waterbirds 14: 13-16.

Peer review #3 from Evan Adams

From: Evan Adams
To: Imperiled
Subject: RE: White ibis Draft BSR Report
Date: Monday, January 17, 2011 8:15:59 AM
Attachments: White Ibis BSR Independent Review 011311.pdf

Here is my independent assessment of the White Ibis Biological Status Review. Thanks for inviting me into the process. Cheers,

Evan Adams
Migratory Bird Program Director/Seaside Sparrow Project Coordinator
BioDiversity Research Institute
652 Main St.
Gorham, ME 04038

White Ibis 2011 Biological Status Review Independent Review
Evan M. Adams

The Florida Fish and Wildlife Conservation Commission (FWC) recently concluded that the White Ibis (*Eudocimus albus*) no longer merits inclusion on the state's Species of Special Concern list in their 2010 Biological Status Review (BSR). I plan on evaluating the accuracy of the biological information used to make this decision and the validity of their conclusions based the data they used.

The taxonomic classification of the White Ibis is accurate in the BSR. The geographic range and distribution information is correct as well, though it could be noted that the large coastal colonies of the past have been less prominent in recent years. Currently most of the large colonies are inland in Florida and it seems unclear how big an impact sea level rise will have on current populations given the recent move away from the coast. The assessment does mention the importance of fresh water prey to ibis nestlings, so it seems that the committee has considered the effect of higher salinity (which is associated with sea level rise) on nesting success. In the "Threats" section there seems to be two factors that weren't really dealt with. First, while referenced, what Adams and Frederick (2009) point out is that nestling females could have significantly higher mortalities than males in years of low food availability. The resulting population skew from this ecological process could be large enough that breeding population sex ratios could be male-biased, a scenario which significantly reduces the breeding population. Starvation events could have an even larger impact on effective population size than previously considered. Second, recent evidence from Frederick and Jayasena (2010) and to some degree Adams and Frederick (2008) and Adams et al. (2009) suggest that ibises are extremely sensitive to methylmercury exposure and even the current low levels available in the Everglades can have physiological and population-level effects. Thus the threat of bioavailable mercury appears to remain for the White Ibis despite the decrease in mercury input into the Everglades.

The statewide population assessment is based on the best data available. While there can be problems with assessing population size via airplane, care has been taken to understand how ground and aerial estimates related to one another and the biased associated with aerial counts in large colonies (Williams et al. 2008). The traditional technique of using annual peak counts to compare across years has many problems; peak count estimation is confounding by nesting synchrony and consistently underestimates the total breeding population size. The BSR acknowledges that these techniques have problems and that variability can be high, but they should also mention that these estimates are highly conservative and represent the bare minimum of ibises breeding in the greater Everglades area. While these data can be unsatisfying, it is fairly clear that populations are much higher than in the 90's and do not appear to be currently decreasing.

In conclusion, I agree with the committee's assessment that the White Ibis should no longer be present on Species of Special Concern list given the listing requirements and the available data. However, I should present some concerns about our understanding of their population status and trends. White Ibises are traditionally sensitive to hydrological conditions in their foraging areas and can have strict hydrological requirements, minor changes could have a large impact on high quality foraging habitats. Their populations have fluctuated wildly in the past over relatively short amounts of time and it seems logical that future fluctuations in population size could also occur in short periods of time. While populations appeared to have increased 2% since the 1980's, only 15 years ago the population was at an all time low in the Everglades. Perhaps the 30 year time frame used in the BSR is inadequate for describing meaningful population fluctuations in this species. Lastly, the problem with estimating population size with unmarked individuals is that movements cannot be taken into account. It's impossible to differentiate survival from emigration using the current survey methods. Since White Ibises are known for large scale movements it would be easy to confound population growth with mass immigration from another site within or outside of Florida.

Literature Cited

Adams, E.M. and P.C. Frederick. 2008. Effects of methylmercury and spatial complexity on foraging behavior and efficiency in juvenile White Ibises (*Eudocimus albus*). *Environmental Toxicology and Chemistry* 28(5):982-989.

Adams, E.M. and P.C. Frederick. 2009. Sex-related mortality due to a starvation event in White Ibis (*Eudocimus albus*) in the Florida Everglades. *Waterbirds* 32(1):123-127.

Adams, E.M., P. C. Frederick, I.L.V. Larkin, and L. J. Guillette, Jr. 2009. The effects of chronic methylmercury exposure upon fecal testosterone, estradiol, and corticosterone levels in juvenile White Ibises (*Eudocimus albus*). *Environmental Toxicology and Chemistry* 27(8):1708-1712.

Frederick, P.C. and N. Jayasena. 2010. Altered pairing behavior and reproductive success in white ibises exposed to environmentally relevant concentrations of mercury. *Proceedings of the Royal Society B* Published online, doi: 10.1098/rspb.2010.2189.

Williams, K.A., P.C. Frederick, P.S. Kublis, and J.C. Simon. 2008. Bias in aerial estimates of the number of nests in White Ibis and Great Egret colonies. *Journal of Field Ornithology* 79(4):438-447.

Letters and emails received during the solicitation of information from the public period of September 17, 2010 through November 1, 2010

Email from Diane Erdely

From: Diane Erdely
To: Imperiled
Subject: Imperiled species
Date: Tuesday, October 05, 2010 10:19:24 AM

Hello Gentlemen:

My name is Diane Erdely. I live in the community of Solivita, zip code 34759. We straddle the Polk/Osceola County lines. The community, which will consist of about 600 homes when completed, was built with lots of conservation area, and many retention ponds, some of large size. We also have two golf courses. We are within a few miles of the Nature Conservancy's Disney Wilderness preserve. We see some of the imperiled species here on a regular basis.

Florida Sandhill Crane
Very common here. There are at least five breeding pairs in our development. One pair who has had chicks in the past was not successful this year. Several pair successfully raised 2 chicks this year, and one pair raised 1 chick. Have also seen a pair along Marigold Avenue (Marigold and Pleasant Hill Rd.), and sevearl pair on Pleasant Hill Road between here and Kissimmee. I am sure you have the information on the FSC's in The DWP, as we have helped with the survey there.

Limpkin
Often seen around the lakes here. Breed on the property. Several broods have been seen in the development and just outside. At one point this summer, there was a flock of 10 wandering around the area.

Little Blue Heron
Very common around the lakes in this development. There is a little blue rookery by a small natural pond within the development. They have been very successful for several years, raising easily 20 chicks at a time..standing room only.

Osprey
Seen daily flying over the lakes. Don't know the location of a nest.

Snowy Egret
Common. Seen almost daily around the lakes.

Tricolor Heron
Seen occasionally around the lakes.

White Ibis
Common. Seen daily in small flocks, including immature.
Hope this is helpful to you.

PS. We also see swallow-tail kites daily in season. Thery are gone now.

Email from Kurt Snyder

From: Kurt Snyder
To: Imperiled
Subject: Florida Imperiled Species - Living in Port Orange Florida
Date: Tuesday, October 19, 2010 2:04:37 PM

Hello,

I read in the FWC Newsletter about the Biological Status Review being made concerning Florida Imperiled Species. I live in the Cypress Head Golf Course Community in Port Orange, Florida. We have six different species included on the Imperiled Species List that are full time residents here, and one other bird on the list that occasionally has been spotted here. I am not sure if this is the kind of information you are looking for, but if so, let me know and I can provide you with further details.

Here is a list of the 6 species we have at Cypress Head year round:
Florida Sandhill Crane (a dozen or more adult birds, and at least four that were born this spring)
Little Blue Heron (a dozen or more adult birds)
Osprey (two or three adult pairs)
Snowy Egret (5-10 adult birds)
Tricolored Heron (5-10 adult birds)
White Ibis (at least three dozen adult birds and many immature birds born this spring)

Also, for the last three years we have observed one or two Roseate Spoonbills that have stopped for a day or so. If this information is what you are looking for, I would be happy to provide additional details.

Best regards,

Kurt Snyder

Email from Neil Langenberg

From: Langenberg, Neil
To: Imperiled
Subject: Imperiled Species Report
Date: Wednesday, October 20, 2010 7:43:47 AM
Attachments: Report.doc
FWC DATA1.xls

Please find two attachments pertaining to requested information about Florida's Imperiled Species/Biological Status Review.

Neil Langenberg
Environmental Specialist
Florida Department of Environmental Protection
Charlotte Harbor Aquatic Preserves
12301 Burnt Store Road
Punta Gorda, Fl. 33955

Florida's Imperiled Species – Biological Status Review
Department of Environmental Protection
Coastal and Aquatic Managed Areas
Charlotte Harbor Aquatic Preserves
Punta Gorda, Florida 33955

October 14, 2010

Please find attached rookery monitoring data for the Biological Status Review regarding Florida's imperiled species requested by the Florida Fish and Wildlife Conservation Commission. Data was collected from rookery islands in 2008, 2009 and 2010 by staff from Charlotte Harbor Aquatic Preserves (CHAP) and J.N. "Ding" Darling National Wildlife Refuge (USFWS). The study area is located in southwest Florida, within Lee County, more specifically, the lower Charlotte Harbor area including Pine Island Sound Aquatic Preserve, Matlacha Pass Aquatic Preserve, and portions of J.N. Ding Darling NWR complex. Colonial bird nesting activities were documented by direct counts of active nests via boat during the breeding season. Counts reflect the maximum number or peak estimates of adults with nest by species. Data listed is only for the following imperiled species; Tricolored heron (TRHE), Little blue heron (LBHE), Snowy egret (SNEG), Reddish egret (REEG), White ibis (WHIB), and the Brown pelican (BRPE).

Neil Langenberg
Environmental Specialist
Florida Department of Environmental Protection
Charlotte Harbor Aquatic Preserves
12301 Burnt Store Rd
Punta Gorda, Fl 33955
941-575-5861x102

Table 1. Colonial nesting bird survey peak estimates for Pine Island Sound AP, Matlacha Pass AP and J.N "Ding" Darling NWR complex between February and August 2010.

COLONY (ISLAND)	Lat	Long	TRHE	LBHE	SNEG	REEG	WHIB	BRPE
Bodiford Key	26.4977	-82.1125	0	0	0	1	0	18
Broken Isl. N	26.6768	-82.1940	1	0	3	0	0	62
Fish Hut Island	26.5467	-82.1245	0	0	0	0	0	5
Givney Key	26.5144	-82.0552	2	0	1	0	14	1
Hemp Key	26.6004	-82.1525	8	1	2	1	0	72
Lower Bird Island	26.5125	-82.0330	0	0	2	0	0	37
N. of York Island	26.4945	-82.1043	2	0	2	0	0	8
N. E. of York Island	26.4939	-82.1021	2	0	0	0	0	0
NW of Mason Island	26.5545	-82.1252	0	0	0	0	0	2
N. W. of Pumpkin Key	26.5660	-82.1279	0	0	0	0	0	1
Skimmer Island	26.5101	-82.0250	7	0	33	2	0	72
SW of Mason Island	26.5534	-82.1249	0	0	0	0	0	1
S. W. of Pumpkin Key	26.5642	-82.1276	0	0	0	0	0	1
Tarpon Bay Keys	26.4573	-82.0745	5	0	9	0	0	34
Useppa Oyster Bar	26.6522	-82.2144	9	1	1	3	0	100
TOTAL			36	2	53	7	14	414

Table 2. Colonial nesting bird survey peak estimates for Pine Island Sound AP, Matlacha Pass AP and J.N "Ding" Darling NWR complex between March and July 2009.

COLONY (ISLAND)	Lat	Long	TRHE	LBHE	SNEG	REEG	WHIB	BRPE
Bodiford Key	26.4977	-82.1125	0	0	0	0	0	6
Broken Isl. E	26.6782	-82.1920	0	0	0	0	0	1
Broken Isl. N	26.6768	-82.1940	1	0	1	1	0	10
BrokenIsl. S	26.6741	-82.1944	2	0	1	0	0	60
Givney Key	26.5144	-82.0552	0	0	0	0	108	2
Hemp Key	26.6004	-82.1525	5	0	0	0	0	56
Lumpkin Island	26.6015	-82.0526	2	1	1	0	0	1
N. of York Island	26.4945	-82.1043	3	0	3	1	1	0
Skimmer Island	26.5101	-82.0250	0	1	0	1	0	44
Tarpon Bay Keys	26.4573	-82.0745	7	5	8	5	0	40
Useppa Oyster Bar	26.6522	-82.2144	1	0	0	0	0	0
TOTAL			21	7	14	8	109	220

Table 3. Colonial nesting bird survey peak estimates for Pine Island Sound AP, Matlacha Pass AP and J.N "Ding" Darling NWR complex between March and July 2008.

COLONY (ISLAND)	Lat	Long	TRHE	LBHE	SNEG	REEG	WHIB	BRPE
Broken Isl.E	26.6782	-82.192	0	0	0	1	0	30
Broken Isl. N	26.6768	-82.1940	1	1	2	0	4	16
Broken Isl. S	26.6741	-82.1944	0	2	1	2	0	92
Crescent Island	26.5978	-82.0637	0	0	0	0	0	7
Givney Key	26.5144	-82.0552	6	4	4	0	201	9
Hemp Key	26.6004	-82.1525	14	3	2	4	0	153
Lower Bird Island	26.5125	-82.0330	0	0	0	0	0	37
Lumpkin Island	26.6015	-82.0526	15	10	5	1	0	0
Skimmer Island	26.5101	-82.0250	2	1	2	0	0	35
Tarpon Bay Keys	26.4573	-82.0745	8	14	13	3	10	32
TOTAL			46	35	29	11	215	411

Email from Ann Hodgson

From: HODGSON, Ann
To: Imperiled
Cc: WRAITHMELL, Julie
Subject: Status of colonial waterbird populations in the Tampa Bay area from 1984-2009
Date: Friday, October 29, 2010 5:20:28 PM
Attachments: Hodgson-twenty_five_years-06-21-10.pdf

Attached is our recent report:

TWENTY-FIVE YEARS AFTER BASIS: AN UPDATE ON THE CURRENT STATUS AND RECENT TRENDS OF COLONIAL WATERBIRD POPULATIONS IN TAMPA BAY

Ann B. Hodgson, Audubon of Florida, Florida Coastal Islands Sanctuaries, 410 S. Ware Boulevard, Suite 702, Tampa, Florida 33619, ahodgson@audubon.org

Ann F. Paul, Audubon of Florida, Florida Coastal Islands Sanctuaries, 410 S. Ware Boulevard, Suite 702, Tampa, Florida 33619, apaul@audubon.org

Representatives of 4 orders dominate the avifauna of Tampa Bay: pelecaniformes (pelicans, cormorants, anhingas); ciconiiformes (herons, ibis, spoonbills, storks); anseriformes (waterfowl); and charadriiformes (shorebirds, gulls, and terns). The first bay-wide assessment of colonial waterbird populations was presented at BASIS by Paul and Woolfenden (1985). Twelve of the 22 colonies they reported have been abandoned since due to various causes of habitat loss or disturbance and c. 59,000 pairs (mostly Laughing Gulls) nested on 5 colonies that no longer support very large populations. After 1985, 50 new colonies became active, including 15 inland colonies, of which 16 were abandoned later. Using annual breeding bird surveys, we provide recent trends in the populations of 30 bird species breeding in Tampa Bay, 13 of which receive enhanced conservation protection through their listing by federal or state agencies. The Tampa Bay breeding population totals 30,000-58,000 nesting pairs, averaging 39,000 annually. The 2009 nesting population (all species) was 58,500 at 44 colonies. Up to 50% of the total colonial waterbird nesting occurs in Hillsborough Bay; the remainder is distributed at colony sites around Tampa Bay. Human disturbance has become the most significant cause of nesting failure annually, accompanied by anthropogenically-induced predator population increases and urban development affecting the number and ecological integrity of estuarine and palustrine wetland foraging sites. We provide a suite of habitat and population management recommendations that should be implemented to conserve the bay's avifauna. Please cite the information as:

Hodgson, A. and A. Paul. 2010. Twenty-Five Years after Basis I: An Update on the Current Status and Recent Trends in Bird Colonial Waterbird Populations of Tampa Bay, in: Cooper, S.T. (ed.). 2010. Proceedings, Tampa Bay Area Scientific Information Symposium, BASIS 5: 20-23 October 2009. St. Petersburg, FL. 538 pp.

Please call if you have further questions.

best, Ann

Ann B. Hodgson, Ph. D., P.W. S.
Gulf Coast Ecosystem Science Coordinator
Audubon of Florida
Florida Coastal Islands Sanctuaries Program
410 Ware Blvd., STE 702
Tampa, FL 33619

TWENTY-FIVE YEARS AFTER BASIS: AN UPDATE ON THE CURRENT STATUS AND RECENT TRENDS OF COLONIAL WATERBIRD POPULATIONS IN TAMPA BAY

Ann B. Hodgson, Audubon of Florida, Florida Coastal Islands Sanctuaries, 410 S. Ware Boulevard, Suite 702, Tampa, Florida 33619, ahodgson@audubon.org

Ann F. Paul, Audubon of Florida, Florida Coastal Islands Sanctuaries, 410 S. Ware Boulevard, Suite 702, Tampa, Florida 33619, apaul@audubon.org

ABSTRACT

Representatives of 4 orders dominate the avifauna of Tampa Bay: pelecaniformes (pelicans, cormorants, anhingas); ciconiiformes (herons, ibis, spoonbills, storks); anseriformes (waterfowl); and charadriiformes (shorebirds, gulls, and terns). The first bay-wide assessment of colonial waterbird populations was presented at BASIS by Paul and Woolfenden (1985). Twelve of the 22 colonies they reported have been abandoned since due to various causes of habitat loss or disturbance and c. 59,000 pairs (mostly Laughing Gulls) nested on 5 colonies that no longer support very large populations. After 1985, 50 new colonies became active, including 15 inland colonies, of which 16 were abandoned later. Using annual breeding bird surveys, we provide recent trends in the populations of 30 bird species breeding in Tampa Bay, 13 of which receive enhanced conservation protection through their listing by federal or state agencies. The Tampa Bay breeding population totals 30,000-58,000 nesting pairs, averaging 39,000 annually. The 2009 nesting population (all species) was 58,500 at 44 colonies. Up to 50% of the total colonial waterbird nesting occurs in Hillsborough Bay; the remainder is distributed at colony sites around Tampa Bay. The Cockroach Bay-Terra Ceia Bay, Hillsborough Bay, Johns Pass, and Lower Tampa Bay Important Bird Areas are listed by Audubon of Florida among its 100 Important Bird Areas in Florida. Lower Tampa Bay and Hillsborough Bay were designated by Birdlife International and the National Audubon Society, Inc. in 2003 and 2009, respectively, as "Important Bird Area of Global Significance". Human disturbance has become the most significant cause of nesting failure annually, accompanied by anthropogenically-induced predator population increases and urban development affecting the number and ecological integrity of estuarine and palustrine wetland foraging sites. We provide a suite of habitat and population management recommendations that should be implemented to conserve the bay's avifauna. Hodgson and Paul

INTRODUCTION

The species richness of colonial waterbirds that nest in the Tampa Bay estuarine system is unique, as many birds of temperate North America breed here, as well as some typically "tropical" birds (Reddish Egrets, Roseate Spoonbills) that do not nest further north, and some species that nest only in low numbers anywhere in Florida (Caspian, Royal, Sandwich, and Gull-billed terns) (Howell 1932, Paul and Woolfenden 1985, Paul and Schnapf 1997, Paul and Paul 2005, Hodgson, Paul and Rachal 2006).

Within Tampa Bay, colonial waterbirds (pelecaniformes [pelicans, cormorants, anhingas]; ciconiiformes [herons, ibis, spoonbills, storks]; and charadriiformes [shorebirds, gulls, and terns]) nest preferably on small islands that are off-shore, separated by open water and deep channels with tidal currents that discourage predatory mammals from swimming to them, and

have no resident mammalian predators. Large numbers of birds of many species may breed at a single site. Generally, sites occupied by larids are sparsely vegetated sand or shell beaches or dredged spoil material, while pelecaniform and ciconiiform birds nest where shrubs or trees are available (Schreiber and Schreiber 1978). Thirteen species are currently listed by the state and federal wildlife management agencies to receive elevated regulatory protection. Several other species that nest in the watershed, although not formally listed, are very rare (Willet, Wilson's Plover, Gull-billed, Caspian, Royal, and Sandwich terns) and warrant comparable protection. The importance of Tampa Bay's bird community has been widely recognized by national and international authorities. The Cockroach Bay-Terra Ceia Bay, Hillsborough Bay, Johns Pass, and Lower Tampa Bay Important Bird Areas (IBAs) are listed by Audubon of Florida among its 100 Important Bird Areas in Florida, and BirdLife International and the National Audubon Society recognized Lower Tampa Bay and Hillsborough Bay as globally-significant IBAs in 2003 and 2009, respectively.

In this paper, we briefly summarize the current status and population trends of 30 species of birds nesting in the Tampa Bay system, mostly colonial but also some territorial nesters that often select sites within a mixed species colony, review current management programs to protect them, and provide conservation recommendations to maintain stable populations in the future.

METHODS

We (Florida Coastal Islands Sanctuaries [FCIS]) surveyed colonial waterbird colonies and territorial shorebirds from 1985 to 2009 in Tampa Bay, using direct nest counts or flight line counts, and counting nesting pairs and productivity (chicks/nest) when possible (Buckley and Buckley 1976; King 1978; Erwin and Ogden 1980, Portnoy 1980; Erwin 1981, Paul et al. 2004). Laughing Gulls were censused using a circular plot technique and extrapolating nesting density among areas of similar nesting density (Patton and Hanners 1984). We added colony locations to the survey schedule as they were discovered. We also included 15 bird colonies that occur on the bay's periphery at inland locations within the Tampa Bay Estuary Program's watershed boundaries in Hillsborough, Pasco, and Polk counties, but not colonies outside the watershed in Clearwater Harbor and St. Josephs Sound, although they contribute to the regional population (Agency on Bay Management 1995). Numbers of colonies surveyed varied inter-annually contingent on colony activity, personnel, weather, and other constraints. English and scientific names follow the Check-list of North American Birds 7th edition (American Ornithologists' Union 1998) and 50th Supplement (Chesser et al. 2009).

RESULTS

In Tampa Bay, 58,424 nesting pairs of colonial birds (all species), 42.7% of which were Laughing Gulls, bred at 44 colonies in 2009 (Table 1). The 10 year (2000-2009) mean number of nesting pairs (all species) was 44,141 (SD 10,946.57), and the mean number of active colonies was 32 (SD 6.88) (Table 2).

Of the 71 colonies mapped in the Tampa Bay watershed, 22 were discussed in BASIS, of which 12 (54.5%) were abandoned ("winked out") later for various reasons (altered habitats [e.g., urban development, plant succession], predators, human disturbance) since 1985, including 5 colonies that supported most of the gull population (Figs. 1, 2, 3). In the past 25 years we located and surveyed 50 new sites undescribed in 1985; however, 16 colonies (32.0%) subsequently collapsed and were abandoned. Cumulatively, the inland colonies supported 10.0% of the regional population. Of the initial 22 colonies, all but six were islands (Paul and

Woolfenden 1985). Five were small colonies of Yellow-crowned Night-Herons or Great Blue Herons nesting high in tall oak trees or slash pines near the bay, and the last site was the shore of the Howard Frankland Causeway, where the Florida Department of Transportation planted the roadside in the early 1990s to discourage Black Skimmers from nesting and causing traffic hazards. All recently-active colonies were islands, except the Mobbly powerlines, scattered oystercatcher territories in Apollo Beach, and the Cockroach Bay borrow pit.

In 1985, the Alafia Bank Bird Sanctuary, Washburn Sanctuary, and Tarpon Key National Wildlife Refuge were the three largest mixed colonies of pelecaniforms, herons and ibis in the region. In 2009, pelicans nested at only four sites, Washburn Sanctuary had very few pairs since 2004, and Tarpon Key was abandoned in 2005, so that the three largest colonies with similar species composition were Egmont Key National Wildlife Refuge and State Park (33,700 pairs, of which 300 were pelicans and >25,000 were larids), the Richard T. Paul Alafia Bank Bird Sanctuary (10,500 pairs, only 150 pairs of pelicans), and Alligator Lake (745 pairs), which had no pelicans.

Table 1. Colony characteristics and management status of colonial waterbird colonies in Tampa Bay, Florida, USA, in 2009.

Colony Number	*Name*	Bay Segment	Taxa	Species *(n)*	Pairs *(n)*	Abandoned after 1984	New since 1984	Ownership / Management	Protected status	Regional population (%)	Active within last 5 yrs?	*Latitude*	*Longitude*
25	Dogleg Key	BCB	P, Ci	12	296		X	FDEP-AP / FCIS	Y	0.51	Y	27.8021	-82.7618
26	Johns Pass, Little Bird Key	BCB	Ci	1	2			Suncoast Seabird Sanctuary	Y	0.00	Y	27.7932	-82.7777
27	Johns Pass, Middle Bird Island	BCB	Ci	2	5			FDEP-AP	Y	0.01	Y	27.7913	-82.7739
28	Johns Pass, Eleanor Island	BCB	Ci			X		City of Treasure Island	Y	0.00	Y	27.7878	-82.7738
29	South Pasadena Marker 34	BCB	L			X	X	City of Pasadena		0.00	N	27.7431	-82.7299
30	Sunset Beach	BCB	L			X	X	City of Treasure Island	N	0.00	N	27.7391	-82.7565
31	Don CeSar Colony	BCB	P, Ci	6	50		X	Private	N	0.09	Y	27.7059	-82.7352
32	Bayway Spoil	BCB	L			X		Developed	N	0.00	N	27.7094	-82.6995
33	Indian Key NWR	BCB	Ci			X	X	USFWS NWR	Y	0.00	Y	27.7011	-82.6909
34	Little Bird Key NWR	BCB	Ci	5	16		X	USFWS NWR	Y	0.03	Y	27.6852	-82.7169
35	Cow and Calf Islands	BCB	P, Ci	2	9		X	FDEP-AP		0.02	Y	27.6856	-82.6916
36	Darling Key	BCB	P, Ci	3	17		X	FDEP-AP		0.03	Y	27.6765	-82.6813
37	Jackass Key NWR	BCB	P, Ci	4	30		X	USFWS NWR	Y	0.05	Y	27.6693	-82.7177
38	Tarpon Key NWR	BCB	P, Ci			X		USFWS NWR	Y	0.00	N	27.6666	-82.6932
39	Whale Island NWR	BCB	P, Ci			X	X	USFWS NWR	Y	0.00	N	27.6626	-82.6930
40	Shell Key County Preserve	BCB	Ch					Florida / Pinellas County	Y	0.00	Y	27.6645	-82.7445
41	Mule Key NWR	BCB	P, Ci			X	X	USFWS NWR	Y	0.00	Y	27.6619	-82.7178
42	Listen Key NWR	BCB	P, Ci			X	X	USFWS NWR	Y	0.00	N	27.6596	-82.7179
43	Sister Key	BCB	P, Ci			X	X	Florida / Pinellas County		0.00	N	27.6503	-82.7312
44	Ft. DeSoto Park	LTB	L, Ch			X	X	Pinellas County	Y	0.00	N	27.6488	-82.7433
45	Egmont Key NWR/State Park	LTB	P, Ci, Ch	10	36,521		X	USFWS NWR / Florida State Parks	Y	62.51	Y	27.5894	-82.7614

Colony Number	*Name*	Bay Segment	Taxa	Species *(n)*	Pairs *(n)*	Abandoned after 1984	New since 1984	Ownership / Management	Protected status	Regional population (%)	Active within last 5 yrs?	*Latitude*	*Longitude*
46	Little Bayou Bird Island	MTB	P, Ci	10	140		X	FDEP-AP / FCIS	Y	0.24	Y	27.7196	-82.6312
47	Coffeepot Bayou Bird Island	MTB	P, Ci	14	612		X	Private	Y	1.05	Y	27.7916	-82.6241
48	Gandy Radio Tower	OTB				X	X	Unknown	N	0.00	N	27.8772	-82.5902
49	Howard Frankland	OTB	L			X		FDOT	N	0.00	N	27.9046	-82.6335
50	Cooper's Point	OTB				X		Pinellas County / City of Clearwater	N	0.00	N	27.9730	-82.6891
51	Alligator Lake	OTB	P, Ci	12	745			City of Safety Harbor / Pinellas County	Y	1.27	Y	27.9813	-82.6990
52	Philippe Park	OTB	Ci			X		Pinellas County	N	0.00	N	28.0053	-82.6778
53	Mobbly Bay Powerlines	OTB	P	1	19		X	Progress Energy	N	0.03	Y	28.0038	-82.6677
54	Courtney Campbell Causeway	OTB	L			X	X	FDOT	N	0.00	N	27.9736	-82.5958
55	Wilson Property/Grand Hyatt	OTB	Ci			X		Private	N	0.00	N	27.9654	-82.5514
56	Sunset Park	OTB				X		City of Tampa	N	0.00	N	27.9374	-82.5201
57	Westshore	OTB				X		City of Tampa	N	0.00	N	27.9002	-82.5361
58	McKay Bay	HB				X	X	City of Tampa / TPA	Y	0.00	N	27.9371	-82.4143
59	Hooker's Point	HB				X	X	TPA	Y	0.00	N	27.9076	-82.4338
60	Tampa Port Authority Spoil Island 2D	HB	Ch	9	2,152			TPA / FCIS	Y	3.68	Y	27.8805	-82.4313
61	Fantasy Island	HB	Ch	1	1			TPA / FCIS	Y	0.00	Y	27.8683	-82.4253
62	Spoil Area C	HB	L, Ch			X	X	Mosaic	Y	0.00	N	27.8571	-82.4003
63	Richard T. Paul Alafia Bank Bird Sanctuary	HB	P, Ci, Ch	16	6,234			Mosaic / FCIS	Y	10.67	Y	27.8483	-82.4106
64	Tampa Port Authority Spoil Island 3D	HB	Ch	2	23			TPA / FCIS	Y	0.04	Y	27.8331	-82.4352

Colony Number	*Name*	Bay Segment	Taxa	Species *(n)*	Pairs *(n)*	Abandoned after 1984	New since 1984	Ownership / Management	Protected status	Regional population (%)	Active within last 5 yrs?	*Latitude*	*Longitude*
65	Port Redwing	HB	L, Ch			X	X	TPA	Y	0.00	N	27.8132	-82.3951
66	Fishhook Spoil Island	HB	Ch	2	13			TPA / TECO	Y	0.02	Y	27.8024	-82.4152
67	Apollo Beach Oystercatchers	HB	Ch	2	15		X	Private	N	0.03	Y	27.7733	-82.4318
68	Mouth of Little Manatee River	MR	P, Ci			X		FDEP Cockroach Bay Aquatic Preserve	N	0.00	N	27.7160	-82.4823
69	Cockroach Bay Preserve	MTB	Ch	1	30		X	ELAPP	Y	0.05	Y	27.6955	-82.5079
70	Hole in the Wall, Cockroach Bay Preserve 1	MTB	Ci				X	ELAPP	Y	0.02	Y	27.6811	-82.5183
71	Hole in the Wall, Cockroach Bay Preserve 2	MTB	Ci	1	20		X	ELAPP	Y	0.02	Y	27.6799	-82.5198
72	Hole in the Wall, Cockroach Bay Preserve 3	MTB	Ci				X	ELAPP	Y	0.02	Y	27.6764	-82.5169
73	Piney Point	MTB	P, Ci	14	2,795		X	SWFWMD	Y	4.78	Y	27.6505	-82.5462
74	Manbirtee Key	MTB	Ci, Ch	4	24			MCPA / FCIS	Y	0.04	Y	27.6359	-82.5740
75	Two Brothers Island	LTB	Ci			X		Private	N	0.00	N	27.5935	-82.5847
76	Skyway Bridge Least Tern colony	LTB	L			X	X	FDOT	N	0.00	N	27.5808	-82.6090
77	Miguel Bay Colony	LTB	P, Ci				X	FDEP-AP / FCIS	Y	0.00	Y	27.5708	-82.5995
78	Passage Key	LTB	P, Ci, L, Ch			X		USFWS NWR	Y	0.00	Y	27.5545	-82.7404
79	Nina Washburn Sanctuary	TCB	P, Ci	7	52			FCIS	Y	0.09	Y	27.5527	-82.5999
80	Washburn Junior/Terra Ceia Bay Little Bird Key	TCB	P, Ci	14	407		X	FDEP Terra Ceia Aquatic Preserve / FCIS	Y	0.70	Y	27.5285	-82.6015
81	Dot Dash Dit Colony	MR	P, Ci	13	2,360			Private / Florida / FCIS	Y	4.04	Y	27.4993	-82.5243
82	Heath Yellow-crowned Night-Heron Colony	HC	Ci	1	5		X	Private	N	0.01	Y	27.8772	-82.3129
83	Office/Ferman Bird Colony	HC	P, Ci	8	74		X	Private	Y	0.13	Y	27.9448	-82.3417

Colony Number	*Name*	Bay Segment	Taxa	Species *(n)*	Pairs *(n)*	Abandoned after 1984	New since 1984	Ownership / Management	Protected status	Regional population (%)	Active within last 5 yrs?	*Latitude*	*Longitude*
84	Robles Park	HC	Ci	4	31		X	City of Tampa	Y	0.05	Y	27.9740	-82.4550
85	Corporex Colony	HC	P, Ci	7	94		X	Private	N	0.16	Y	27.9786	-82.3857
86	East Lake Island	HC	P, Ci	5	14		X	Florida Audubon Society	Y	0.02	Y	27.9922	-82.3784
87	Temple Crest/Orange Lake/Wargo Bird Colony	HC	P, Ci	8	51		X	City of Tampa / TPA	N	0.09	Y	28.0193	-82.4174
88	River Cove Yellow-crowned Night-Heron colony	HC	Ci				X	Hillsborough County	N	0.02	Y	28.0192	-82.4486
89	Citrus Park Bird Colony	HC	P, Ci	9	486		X	Private	N	0.83	Y	28.0699	-82.5834
90	Heron Point	PaC	P, Ci	7	57		X	Private	N	0.10	Y	28.2157	-82.4349
91	Saddlebrook	PaC	P, Ci	3	48		X	Private	Y	0.08	Y	28.2277	-82.3297
92	Cypress Creek Preserve	HC	P, Ci	11	3,294		X	ELAPP	Y	5.64	Y	28.1629	-82.3975
93	Cross Creek Colony	HC	P, Ci	2	8		X	Private	N	0.01	Y	28.1424	-82.3520
94	Medard County Park	HC	P, Ci	10	477		X	Hillsborough County	Y	0.82	Y	27.9218	-82.1630
95	Alafia River Corridor Preserve	HC	P, Ci	5	46		X	ELAPP	Y	0.08	Y	27.8756	-82.1053
96	Wood Lake/Somerset Lake	PoC	P, Ci	14	1,151		X	City of Lakeland / Private	Y	1.97	Y	28.0036	-81.9311
	Totals				58,424	27	48			100.00			

Taxa: P-pelecaniformes, Ci-ciconiiformes, Ch-charadriiformes, L-larids.

Values are number of species, nesting pairs, and % of 2009 regional nesting population.

Abbreviations: ELAPP – Environmental Lands Acquisition & Protection Program, FDEP-AP - Florida Department of Environmental Protection Aquatic Preserves, FDOT – Florida Department of Transportation, MCPA – Manatee County Port Authority, TPA – Tampa Port Authority, USFWS NWR - U. S. Fish & Wildlife Service National Wildlife Refuge.

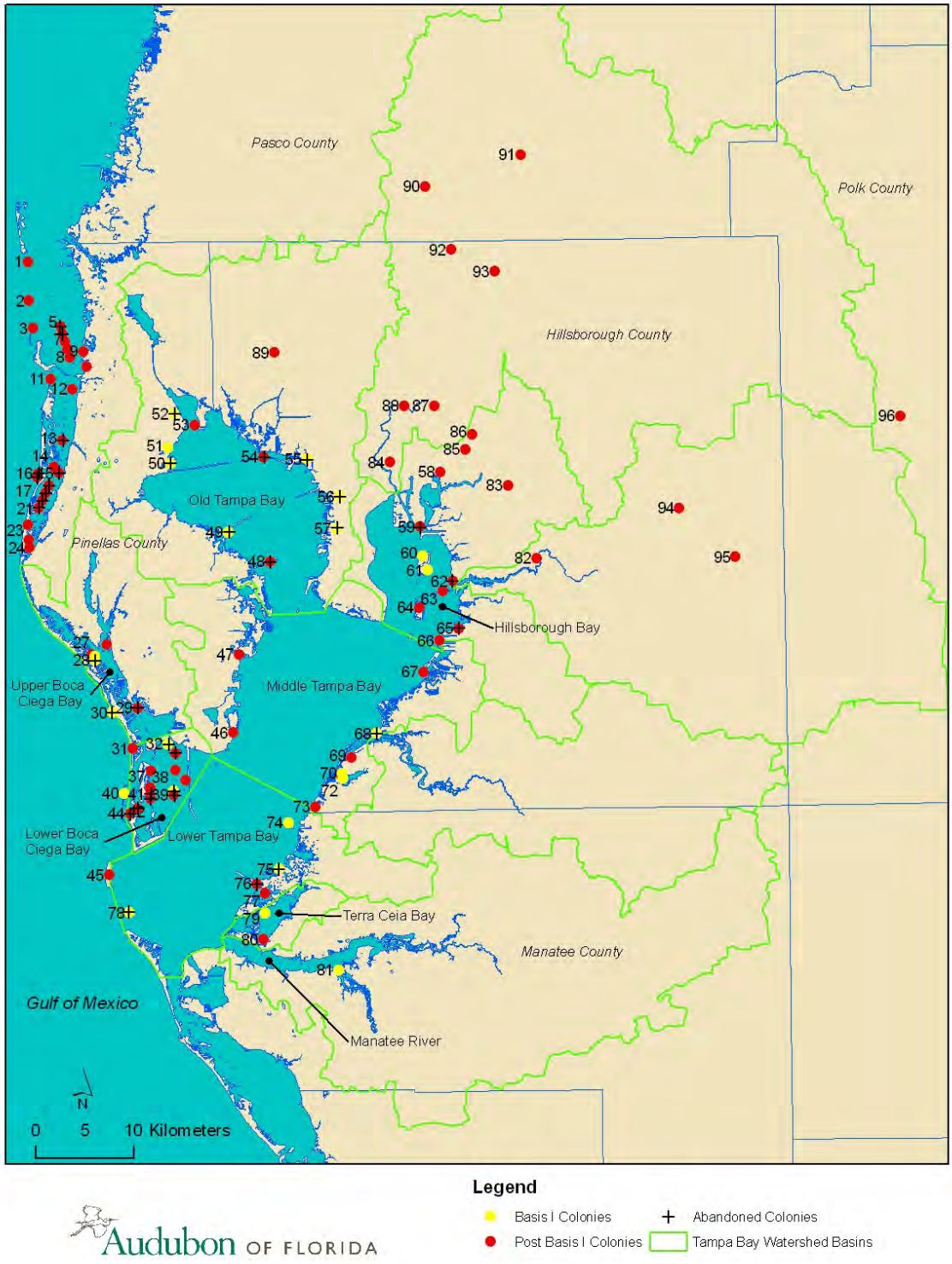

Figure 1. Bird colonies in the Tampa Bay, Florida, USA, ecosystem from 1984-2009 (colonies 1-24 are excluded because they are not in the Tampa Bay watershed).

Figure 2. Bird colonies in Boca Ciega Bay, Florida, USA, from 1984-2009.

Figure 3. Bird colonies in Terra Ceia Bay, Florida, USA, from 1984-2009.

Table 2. Nesting pairs (no./species) of 30 colonial waterbirds and shorebirds and assessment of recent population trends in Tampa Bay, Florida, USA, from 2000-2009.

Species	Mean	SD	Population trend
Brown Pelican	1,024	326.15	45 is the major nesting site since 2004 when 79 and 38 collapsed; widespread also at several smaller colonies, declining
Double-crested Cormorant	455	68.48	Widely distributed at 7 sites; shifted from 79 and 38 when they collapsed; stable
Anhinga	334	93.11	Widely distributed at 7 sites; stable
Least Bittern	2	1.69	Uncommon – nesting at 4 or more freshwater sites with large cattail stands; under-surveyed
Great Blue Heron	217	61.80	Widely distributed at 10 heronries, and various misc. sites; stable
Great Egret	740	148.15	Nesting at 18 sites, >100 prs at 63, 81, 25, 47, and I-25 (Clearwater Harbor) in that order; stable
Snowy Egret	923	193.63	c. 75% decline since 1970s (Ogden 1978); stable last 10 yrs; 73 increased to 300 prs
Little Blue Heron	315	88.92	Nesting at 73, 63, and 94, and other sites, declined since 1950s with freshwater wetland loss; stable last 10 yrs
Tricolored Heron	788	178.87	Widespread at all mixed heronries; c. 60% of the population at 3 colonies: 73, 63 and 51; stable
Reddish Egret	57	21.19	Nesting at 6 sites: 63 largest group; 51 – only known freshwater site; c. 16% of state popn in Tampa Bay
Cattle Egret	4,146	2,836.85	Abundant at 63, 73, 51, 92, and 81; increasing since 1980s.
Green Heron	29	12.01	Nesting at 11 sites, notably 73, and other solitary locations; stable
Black-crowned Night-Heron	112	52.27	Nesting at the major heronries, notably 73, and inland sites; stable
Yellow-crowned Night-Heron	73	39.58	Nesting in mixed heronries; other small groups in tall coastal trees in residential areas; declining since 1980s; recent decline more rapid
White Ibis	9,180	3,464.63	Most common endemic wading bird; dependent on El Niño cycles and prey concentrated as freshwater wetlands draw down; most nesting at 63 and 73
Glossy Ibis	285	102.58	Nesting only at 63, 73, and 92; formerly approx. 50% were at 79; require shallow freshwater wetlands; stable to declining
Roseate Spoonbill	329	111.26	Exponential increase at 63 since 1975; radiated to 11 sites in the past 5 yrs; popn not stabilized
Wood Stork	212	116.93	Nesting only at 81, plus inland colonies 92, 93, 86, 95, and 89
Snowy Plover	0.4	1.26	Rarely nesting at 44, 40, 45 and usually unsuccessful due to disturbance
Wilson's Plover	25	20.68	Spottily distributed in salterns and suitable bare habitat; 74 recently important; stable; prob. under-surveyed
American Oystercatcher	91	13.58	C. 72 prs in Hillsborough Bay on spoil island shorelines (60, 63, 64, 66); the rest at widespread sites; stable, approx. 21% of state popn nests in Tampa Bay
Black-necked Stilt	32	31.35	Nesting sporadically at 60, 64, 69 around drying algae mats; rare
Willet	34	14.43	Rare and inconspicuously distributed in salt marshes and dune vegetation; under-surveyed
Laughing Gull	19,698	8,741.13	Nesting only at 60, 64 and 45; approx. 50% decline since early 1980s; Tampa Bay hosts c. 20% of entire southeast U. S. popn
Gull-billed Tern	8	5.69	A few pairs annually, often with Black Skimmers, nearly annually at 60 or 64

Species	Mean	SD	Population trend
Caspian Tern	83	10.57	Most nesting at 60, 64; formerly 63; Hillsborough Bay colony is the state's largest
Royal Tern	3,618	1,857.76	Nesting formerly at 63 and 78; now at 45 and Hillsborough Bay 60 or 64; increasing since 1990s
Sandwich Tern	811	341.14	All at 45 in 2009; formerly Hillsborough Bay (60, 64, or 63); poss. increasing
Least Tern	116	91.38	Most natural habitat lost; recently c. 80% are rooftop nesters; declining; most nesting on beaches unsuccessful due to human disturbance
Black Skimmer	406	192.24	In the last five years, skimmers nested at 60, 64, 45, 78, 40, and 29; stable, but in some years, zero nesting success

Values are mean and standard deviation of nesting pairs; see Table 1 for colony identification numbers.

DISCUSSION

Species richness (30 species) of the regional colonial waterbird population did not change in Tampa Bay from 1985 to 2009, with every endemic species and introduced Cattle Egrets represented. This community remains the largest and most significant colonial waterbird population in Florida outside of the Everglades. The Laughing Gull population has diminished by around 50% since the 1980s and is now concentrated in Hillsborough Bay and Egmont Key. These populations have persisted despite significant and continuing alteration of shoreline habitats, bay bottom, and freshwater wetlands, although recent population declines in Brown Pelicans, Laughing Gulls, Least Terns, and Snowy Plovers suggest that, as elsewhere in Florida, progressive urbanization threatens to further reduce the ecological integrity of the Tampa Bay ecosystem. Roseate Spoonbills and Reddish Egrets, extirpated as nesting species from Tampa Bay until the mid-1970s, have increased significantly, while widely expanding their distribution among suitable habitats in the bay, and Wood Stork, and Royal and Sandwich tern populations have increased slightly. The other pelecaniformes, ciconiiformes, charadriiformes and larids have remained relatively stable. The inland colonies are particularly important for small herons and Wood Storks.

Five additional species are found uniquely in coastal habitats: Clapper Rails, Mangrove Cuckoos, Gray Kingbirds, Black-whiskered Vireos, and Prairie Warblers. Clapper Rails occur in low and high marsh and require expansive areas of continuous cover, areas which are diminishing as the shoreline has been developed. Black-whiskered Vireos have virtually disappeared from Tampa Bay since c. 1991. Mangrove Cuckoos were found annually in mangroves in Boca Ciega Bay, Weedon Island, and Terra Ceia Bay in some years, but are infrequent now. Prairie Warblers are more widely distributed along Tampa Bay mangrove shorelines. Although Gray Kingbirds may also nest in uplands beyond the mangroves, all five species are primarily coastal birds whose populations have decreased in recent years. The four estuarine passerines are susceptible to nest parasitism by increasing populations of Brown-headed Cowbirds.

Paul and Woolfenden (1985) identified a number of biotic and abiotic stressors that influence bird abundance in Tampa Bay. In the decades leading up to the 1980s, coastal habitat loss dominated. In the 1990s, with the large increase in registered watercraft, the most significant issues to have emerged are anthropogenic disturbances from the increasing numbers of recreational boaters and beachgoers that: "…present a vast potential for annual disturbance of breeding birds", as predicted by Paul and Schnapf (1997:94), continued dredge and fill activities that have had both beneficial and negative effects for colonial waterbirds and beach-nesting species, continued loss of palustrine wetlands (particularly short hydroperiod and ephemeral "prairie ponds"), the trend toward reducing the spatial distribution of palustrine wetlands by condensing them into stormwater ponds and mitigation banks from the natural patterns that birds cue to throughout the landscape, and extremely high populations of meso-carnivores (raccoons, to a lesser extent opossums and, potentially, coyotes and invasive exotic herptiles).

Management Initiatives

Through site-specific management initiatives by FCIS at Audubon-owned and leased sanctuaries, Audubon's Project ColonyWatch, which engages volunteers to observe and protect colonies in cooperation with site managers, and a continuous effort to expand colony management partnerships among agencies and private landowners, most of the now active colonies have been posted, are managed during the year to control predators and remove entangling fishing line during the Tampa Bay Watch and Audubon Monofilament Cleanup, are regularly surveyed to establish colony species composition and productivity, and are intermittently patrolled. However, with the dramatic increase in public recreation on the water, this program is insufficient to fully protect most colonies. In the past five years we have also implemented a series of inter-agency workshops for law enforcement marine units about the biology, habitat requirements, and laws protecting colonial waterbirds.

Management Recommendations

Environmental education – In collaboration with land managers and management partners, continue to produce and distribute to the public boaters guides describing the bay's natural resources and protected areas, and present informational talks about the bay's avifauna.

Colony management - Continue current management activities, and establish and enforce spatial buffers around colonies to prevent site disturbance. Increase enforcement of wildlife protection laws.

Habitat management - Manage existing sites to provide required habitats; the spoil islands in the Hillsborough Bay Important Bird Area support some of the largest colonies of pelicans, herons, ibis, gulls, and oystercatchers in the state. Many nesting colony sites have been abandoned and fewer new sites will be available in the future given the development density. Currently functioning sites must be carefully protected.

Habitat restoration – Continue to acquire land and restore coastal ecosystems to replace the large areas of coastal mangroves, salterns, intertidal mudflats, and freshwater wetlands that have been lost; restore tidal creeks and re-establish altered coastal drainage patterns.

Wetland protection - The loss of both coastal estuarine and inland palustrine wetlands by drainage or alteration has been a dominant cause of population declines of colonial birds regionally and statewide. Locally, habitat fragmentation, seasonal wetland draw downs, and consolidation of freshwater wetlands decreases wetland functioning in the landscape, and

reduces forage availability, which particularly affects successful nesting of White Ibis, small herons, and Wood Storks.

Sea level rise – Participate in the dialogue about climate change and potential effects of sea level rise; include in future conservation planning initiatives acquisition of lands and sites that will not be affected by increasing water levels.

Maintaining the vibrant, diverse colonial waterbird population in Tampa Bay in the future will be more challenging than during the past three decades since BASIS, and much more difficult than in the decades preceding widespread coastal development. Despite 25 years of intensive public outreach and environmental education activities by Audubon and others, sedulous volunteers in Audubon's Project ColonyWatch and in the Florida Shorebird Alliance providing colony guardianship, and expanded coordination between non-governmental, local, county, state, and federal wildlife protection programs, human disturbance is an incessant threat to the persistence of local bird colonies. More protective regulations, more enforcement, and heightened public cooperation will all be needed to protect the spectacular, charismatic bird populations of Tampa Bay.

ACKNOWLEDGMENTS

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From: HODGSON, Ann
To: Imperiled
Cc: WRAITHMELL, Julie; Rodgers, James
Subject: RE: BRPE trend data
Date: Tuesday, November 02, 2010 1:24:07 PM
Attachments: Audubon Tampa Bay colony descriptions and map.doc

The data presented below were acquired at colonial waterbird colonies throughout the Tampa Bay region (Pinellas, Hillsborough, Manatee, Sarasota, and Polk counties) during annual colonial waterbird nesting surveys conducted by Audubon of Florida's Florida Coastal Islands Sanctuaries in cooperation with land management partners, as shown on the attached table and map.

Ann B. Hodgson, Ph. D., P.W. S.
Gulf Coast Ecosystem Science Coordinator
Audubon of Florida
Florida Coastal Islands Sanctuaries Program
410 Ware Blvd., STE 702
Tampa, FL 33619

Hodgson, A. and A. Paul. 2010. Twenty-Five Years after Basis I: An Update on the Current Status and Recent Trends in Bird Colonial Waterbird Populations of Tampa Bay, in: Cooper, S.T. (ed.). 2010. Proceedings, Tampa Bay Area Scientific Information Symposium, BASIS 5: 20-23 October 2009. St.
Petersburg, FL. 538 pp.

Table 1. Colony characteristics and management status of colonial waterbird colonies in Tampa Bay, Florida, USA, in 2009.

Colony Number	*Name*	Bay Segment	Taxa	Species *(n)*	Pairs *(n)*	Abandoned after 1984	New since 1984	Ownership / Management	Protected status	Regional *population* (%)	Active within last 5 yrs?	*Latitude*	*Longitude*
25	Dogleg Key	BCB	P, Ci	12	296		X	FDEP-AP / FCIS	Y	0.51	Y	27.8021	-82.7618
26	Johns Pass, Little Bird Key	BCB	Ci	1	2			Suncoast Seabird Sanctuary	Y	0.00	Y	27.7932	-82.7777
27	Johns Pass, Middle Bird Island	BCB	Ci	2	5			FDEP-AP	Y	0.01	Y	27.7913	-82.7739
28	Johns Pass, Eleanor Island	BCB	Ci			X		City of Treasure Island	Y	0.00	Y	27.7878	-82.7738
29	South Pasadena Marker 34	BCB	L			X	X	City of Pasadena		0.00	N	27.7431	-82.7299
30	Sunset Beach	BCB	L			X	X	City of Treasure Island	N	0.00	N	27.7391	-82.7565
31	Don CeSar Colony	BCB	P, Ci	6	50		X	Private	N	0.09	Y	27.7059	-82.7352
32	Bayway Spoil	BCB	L			X		Developed	N	0.00	N	27.7094	-82.6995
33	Indian Key NWR	BCB	Ci			X	X	USFWS NWR	Y	0.00	Y	27.7011	-82.6909
34	Little Bird Key NWR	BCB	Ci	5	16		X	USFWS NWR	Y	0.03	Y	27.6852	-82.7169
35	Cow and Calf Islands	BCB	P, Ci	2	9		X	FDEP-AP		0.02	Y	27.6856	-82.6916
36	Darling Key	BCB	P, Ci	3	17		X	FDEP-AP		0.03	Y	27.6765	-82.6813
37	Jackass Key NWR	BCB	P, Ci	4	30		X	USFWS NWR	Y	0.05	Y	27.6693	-82.7177
38	Tarpon Key NWR	BCB	P, Ci			X		USFWS NWR	Y	0.00	N	27.6666	-82.6932
39	Whale Island NWR	BCB	P, Ci			X	X	USFWS NWR	Y	0.00	N	27.6626	-82.6930
40	Shell Key County Preserve	BCB	Ch					Florida / Pinellas County	Y	0.00	Y	27.6645	-82.7445
41	Mule Key NWR	BCB	P, Ci			X	X	USFWS NWR	Y	0.00	Y	27.6619	-82.7178
42	Listen Key NWR	BCB	P, Ci			X	X	USFWS NWR	Y	0.00	N	27.6596	-82.7179
43	Sister Key	BCB	P, Ci			X	X	Florida / Pinellas County		0.00	N	27.6503	-82.7312
44	Ft. DeSoto Park	LTB	L, Ch			X	X	Pinellas County	Y	0.00	N	27.6488	-82.7433

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Colony Number	*Name*	Bay Segment	Taxa	Species (*n*)	Pairs (*n*)	Abandoned after 1984	New since 1984	Ownership / Management	Protected status	Regional *population* (%)	Active within last 5 yrs?	*Latitude*	*Longitude*
45	Egmont Key NWR/State Park	LTB	P, Ci, Ch	10	36,521		X	USFWS NWR / Florida State Parks	Y	62.51	Y	27.5894	-82.7614
46	Little Bayou Bird Island	MTB	P, Ci	10	140		X	FDEP-AP / FCIS	Y	0.24	Y	27.7196	-82.6312
47	Coffeepot Bayou Bird Island	MTB	P, Ci	14	612		X	Private	Y	1.05	Y	27.7916	-82.6241
48	Gandy Radio Tower	OTB				X	X	Unknown	N	0.00	N	27.8772	-82.5902
49	Howard Frankland	OTB	L			X		FDOT	N	0.00	N	27.9046	-82.6335
50	Cooper's Point	OTB				X		Pinellas County / City of Clearwater	N	0.00	N	27.9730	-82.6891
51	Alligator Lake	OTB	P, Ci	12	745			City of Safety Harbor / Pinellas County	Y	1.27	Y	27.9813	-82.6990
52	Philippe Park	OTB	Ci			X		Pinellas County	N	0.00	N	28.0053	-82.6778
53	Mobbly Bay Powerlines	OTB	P	1	19		X	Progress Energy	N	0.03	Y	28.0038	-82.6677
54	Courtney Campbell Causeway	OTB	L			X	X	FDOT	N	0.00	N	27.9736	-82.5958
55	Wilson Property/Grand Hyatt	OTB	Ci			X		Private	N	0.00	N	27.9654	-82.5514
56	Sunset Park	OTB				X		City of Tampa	N	0.00	N	27.9374	-82.5201
57	Westshore	OTB				X		City of Tampa	N	0.00	N	27.9002	-82.5361
58	McKay Bay	HB				X	X	City of Tampa / TPA	Y	0.00	N	27.9371	-82.4143
59	Hooker's Point	HB				X	X	TPA	Y	0.00	N	27.9076	-82.4338
60	Tampa Port Authority Spoil Island 2D	HB	Ch	9	2,152			TPA / FCIS	Y	3.68	Y	27.8805	-82.4313
61	Fantasy Island	HB	Ch	1	1			TPA / FCIS	Y	0.00	Y	27.8683	-82.4253
62	Spoil Area C	HB	L, Ch			X	X	Mosaic	Y	0.00	N	27.8571	-82.4003

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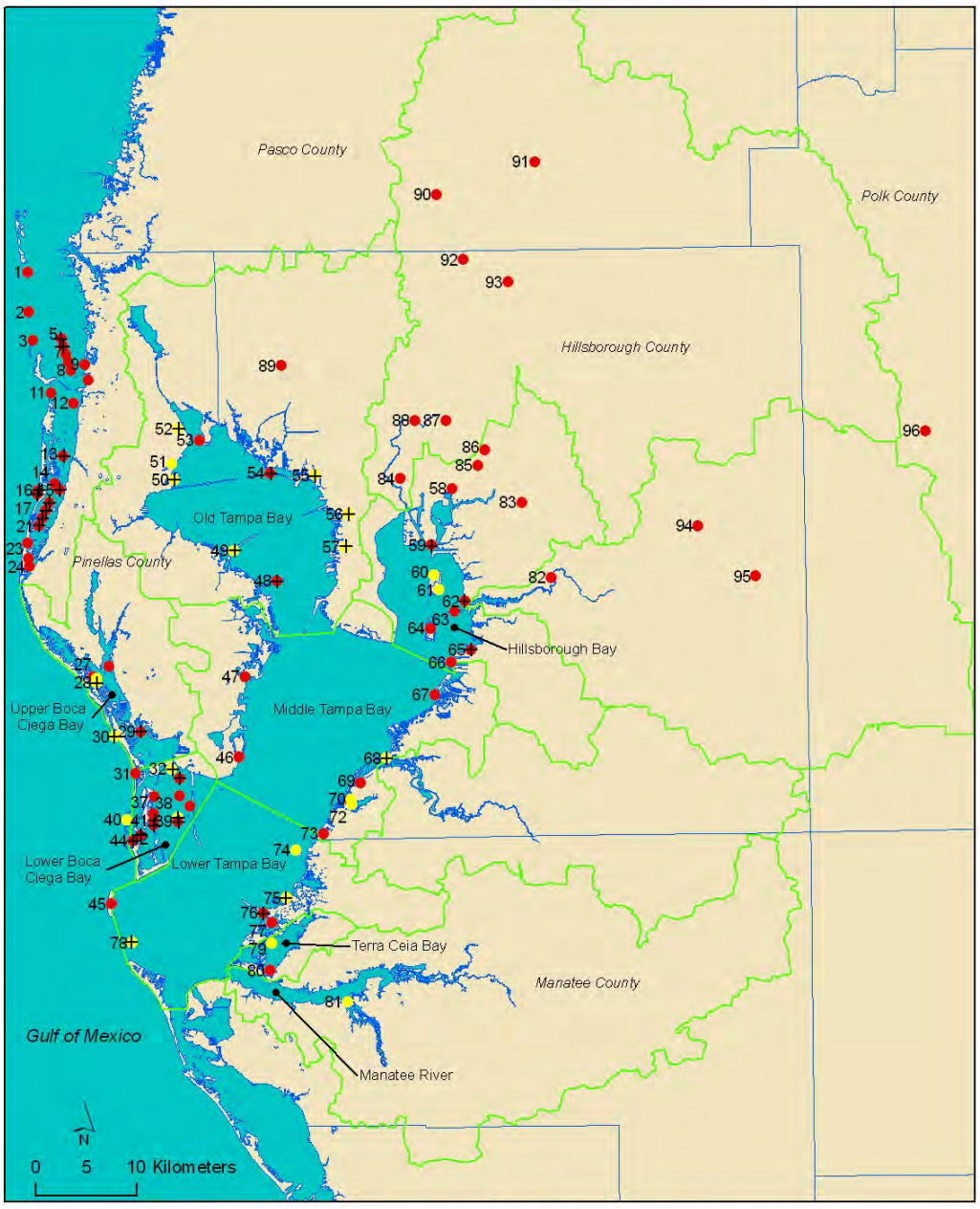
Colony Number	*Name*	Bay Segment	Taxa	Species (*n*)	Pairs (*n*)	Abandoned after 1984	New since 1984	Ownership / Management	Protected status	Regional *population* (%)	Active within last 5 yrs?	*Latitude*	*Longitude*
63	Richard T. Paul Alafia Bank Bird Sanctuary	HB	P, Ci, Ch	16	6,234			Mosaic / FCIS	Y	10.67	Y	27.8483	-82.4106
64	Tampa Port Authority Spoil Island 3D	HB	Ch	2	23			TPA / FCIS	Y	0.04	Y	27.8331	-82.4352
65	Port Redwing	HB	L, Ch			X	X	TPA	Y	0.00	N	27.8132	-82.3951
66	Fishhook Spoil Island	HB	Ch	2	13			TPA / TECO	Y	0.02	Y	27.8024	-82.4152
67	Apollo Beach Oystercatchers	HB	Ch	2	15		X	Private	N	0.03	Y	27.7733	-82.4318
68	Mouth of Little Manatee River	MR	P, Ci			X		FDEP Cockroach Bay Aquatic Preserve	N	0.00	N	27.7160	-82.4823
69	Cockroach Bay Preserve	MTB	Ch	1	30		X	ELAPP	Y	0.05	Y	27.6955	-82.5079
70	Hole in the Wall, Cockroach Bay Preserve 1	MTB	Ci				X	ELAPP	Y	0.02	Y	27.6811	-82.5183
71	Hole in the Wall, Cockroach Bay Preserve 2	MTB	Ci	1	20		X	ELAPP	Y	0.02	Y	27.6799	-82.5198
72	Hole in the Wall, Cockroach Bay Preserve 3	MTB	Ci				X	ELAPP	Y	0.02	Y	27.6764	-82.5169
73	Piney Point	MTB	P, Ci	14	2,795		X	SWFWMD	Y	4.78	Y	27.6505	-82.5462
74	Manbirtee Key	MTB	Ci, Ch	4	24			MCPA / FCIS	Y	0.04	Y	27.6359	-82.5740
75	Two Brothers Island	LTB	Ci			X		Private	N	0.00	N	27.5935	-82.5847
76	Skyway Bridge Least Tern colony	LTB	L			X	X	FDOT	N	0.00	N	27.5808	-82.6090
77	Miguel Bay Colony	LTB	P, Ci				X	FDEP-AP / FCIS	Y	0.00	Y	27.5708	-82.5995
78	Passage Key	LTB	P, Ci, L, Ch			X		USFWS NWR	Y	0.00	Y	27.5545	-82.7404
79	Nina Washburn Sanctuary	TCB	P, Ci	7	52			FCIS	Y	0.09	Y	27.5527	-82.5999
80	Washburn Junior/Terra Ceia	TCB	P, Ci	14	407		X	FDEP Terra Ceia Aquatic	Y	0.70	Y	27.5285	-82.6015

Colony Number	*Name*	Bay Segment	Taxa	Species (*n*)	Pairs (*n*)	Abandoned after 1984	New since 1984	Ownership / Management	Protected status	Regional *population* (%)	Active within last 5 yrs?	*Latitude*	*Longitude*
	Bay Little Bird Key							Preserve / FCIS					
81	Dot Dash Dit Colony	MR	P, Ci	13	2,360			Private / Florida / FCIS	Y	4.04	Y	27.4993	-82.5243
82	Heath Yellow-crowned Night-Heron Colony	HC	Ci	1	5		X	Private	N	0.01	Y	27.8772	-82.3129
83	Office/Ferman Bird Colony	HC	P, Ci	8	74		X	Private	Y	0.13	Y	27.9448	-82.3417
84	Robles Park	HC	Ci	4	31		X	City of Tampa	Y	0.05	Y	27.9740	-82.4550
85	Corporex Colony	HC	P, Ci	7	94		X	Private	N	0.16	Y	27.9786	-82.3857
86	East Lake Island	HC	P, Ci	5	14		X	Florida Audubon Society	Y	0.02	Y	27.9922	-82.3784
87	Temple Crest/Orange Lake/Wargo Bird Colony	HC	P, Ci	8	51		X	City of Tampa / TPA	N	0.09	Y	28.0193	-82.4174
88	River Cove Yellow-crowned Night-Heron colony	HC	Ci				X	Hillsborough County	N	0.02	Y	28.0192	-82.4486
89	Citrus Park Bird Colony	HC	P, Ci	9	486		X	Private	N	0.83	Y	28.0699	-82.5834
90	Heron Point	PaC	P, Ci	7	57		X	Private	N	0.10	Y	28.2157	-82.4349
91	Saddlebrook	PaC	P, Ci	3	48		X	Private	Y	0.08	Y	28.2277	-82.3297
92	Cypress Creek Preserve	HC	P, Ci	11	3,294		X	ELAPP	Y	5.64	Y	28.1629	-82.3975
93	Cross Creek Colony	HC	P, Ci	2	8		X	Private	N	0.01	Y	28.1424	-82.3520
94	Medard County Park	HC	P, Ci	10	477		X	Hillsborough County	Y	0.82	Y	27.9218	-82.1630
95	Alafia River Corridor Preserve	HC	P, Ci	5	46		X	ELAPP	Y	0.08	Y	27.8756	-82.1053
96	Wood Lake/Somerset Lake	PoC	P, Ci	14	1,151		X	City of Lakeland / Private	Y	1.97	Y	28.0036	-81.9311
	Totals				58,424	27	48			100.00			



Audubon OF FLORIDA

Copy of the White ibis BSR draft report that was sent out for peer review

Biological Status Review for the White Ibis (*Eudocimus albus)*

EXECUTIVE SUMMARY

The Florida Fish and Wildlife Conservation Commission (FWC) directed staff to evaluate all species listed as Threatened or Species of Special Concern as of September 1, 2010. Public information on the status of the white ibis was sought from September 17, 2010 to November 1, 2010. The three member biological review group met on November 3 – 4, 2010. Group members were James A. Rodgers (FWC lead), Peter C. Frederick (University of Florida), and Mike Cook (South Florida Water Management District). In accordance with rule 68A-27.0012 F.A.C, the White Ibis Biological Review Group was charged with evaluating the biological status of the white ibis using criteria included in definitions in 68A-27.001(3) F.A.C. and following the protocols in the *Guidelines for Application of the IUCN Red List Criteria at Regional Levels Version 3.0 (2003)* and *Guidelines for Using the IUCN Red List Categories and Criteria Version 8.1 (2010)*. Please visit http://myfwc.com/WILDLIFEHABITATS/imperiledSpp_listingprocess.htm to view the listing process rule and the criteria found in the definitions.

The Biological Review Group concluded from the biological assessment that the white ibis no longer meets criteria for listing at any level. Based on the literature review, information received from the public, and the biological review findings, FWC staff recommends removing the white ibis from the FWC list of threatened species.

This work was supported by a Conserve Wildlife Tag grant from the Wildlife Foundation of Florida.

BIOLOGICAL INFORMATION

Taxonomic Classification – The white ibis (*Eudocimus albus*) is classified in the Family Threskiornithidae, along with other species of ibises and spoonbills (Heath et al. 2009). There has been some dispute as to whether or not the scarlet ibis (*E. ruber*) of South America is a conspecific color morph of the same species. However, the American Ornithologist Union currently regards these two ibises as separate species.

Geographic Range and Distribution – The range of the white ibis extends from the mid-Atlantic coast and southern Pacific coast of North America, south into northern South America (Kushlan and Bildstein 1992, Heath et al. 2009). The species can be found year round in Florida and throughout the Caribbean (Rodgers et al. 1996). White ibises occur throughout most of Florida with large nesting colonies in south Florida (Runde 1991, Kale et al. 1992, Rodgers et al. 1999, Florida Fish and Wildlife Conservation Commission 2003). White ibises prefer coastal marshes and wetlands, feeding in fresh, brackish and saltwater environments. They are generally nomadic, and flocks are often observed outside typical breeding areas in

search of new sources of prey (Bildstein et al. 1990, Frederick and Ogden 1997, Frederick and Ogden 2001, Melvin et al. 1999, Crozier and Gawlik 2002, Bancroft et al. 2002, Cook and Kobza 2009). Population and colony sizes are dependent on movement in response to water levels and prey abundance (Gawlik 2002, Gawlik and Crozier 2007, Johnson et al. 2007, Lantz et al. 2010). Frederick et al. (1996), Hunter et al. (2006), and IUCN (2009) estimated the population size of white ibises in the southeastern United States to be at least 150,000 pairs.

Life History References – Rodgers et al. 1996, Epanchin et al. 2002, Crozier and Gawlik 2003, Dugger et al. 2005, Dorn et al. 2008, IUCN 2009, Adams and Frederick 2009, Heath et al. 2009).

BIOLOGICAL STATUS ASSESSMENT

Threats – Loss of coastal marsh and wetlands habitats are a primary threat to the white ibis population (Rodgers et al. 1996, Hunter et al. 2006, Heath et al. 2009). Nestlings can suffer from salt stress, and prey availability is a critical factor influencing breeding productivity, so access to adequate freshwater prey is critical during the nesting period (Bildstein et al. 1990, Frederick 1987, Adams and Frederick 2009, Herring et al. 2010). The species is highly sensitive to hydrologic alterations to their foraging and breeding areas (Frederick 1987, Bancroft et al. 2002, Gawlik 2002). Like other wading birds that rely on ephemeral wetland habitats, white ibises are also vulnerable to exposure to pesticides, heavy metals, and other persistent environmental contaminants (Beyer et al. 1997, Frederick et al. 2004, Heath and Frederick 2005, Rodgers 1997). Increased depredation and human disturbances at colony sites are also potential concerns (Heath et al. 2009).

Statewide Population Assessment – Runde (1991) noted a decrease in the white ibis population in Florida from >180,000 individuals during the late 1970s to about 65,000 during the late 1980s, but differences in survey methods among statewide surveys (Rodgers et al. 1999) make it difficult to draw meaningful conclusions from these numbers. Crozier and Gawlik (2003) estimated that the number of white ibis nests in the Everglades decreased by 87% since the 1930s. Unfortunately, the margin of error associated with aerial surveys of wading bird populations raises questions about their validity and usefulness in determining trends even for white-plumaged species of wading birds (Rodgers et al. 2005, Conroy et al. 2008, Green et al. 2008, Williams et al. 2008). Annual surveys of nesting activity in the Everglades region have indicated that numbers for wading birds can be highly variable from season to season (Gawlik 1999, Frederick and Ogden 2001). About 43,415 white ibis nests were counted in the Everglades in 2009, an estimate that was 101% greater than the average of the previous 9 years (Cook and Kobza 2009). The 3-year running averages for the number of nesting white ibises in the Everglades were 21,133 (2005-2007), 17,541 (2006-2008), and 23,953 (2007-2009), which represents a substantial increase from 3-year averages during the late 1990s (Cook and Kobza 2009). In Hillsborough Bay, the white ibis breeding population ranged from 5,289-10,475 breeding pairs from 2005 through 2008 (unpublished data from Florida Coastal Islands Sanctuaries, Audubon of Florida).

Status Review - In our review of the status of the white ibis, the Biological Review Group made the following assumptions and conclusions:

- Generation time: age at first breeding is 2 years of age and maximum age of breeding is about 20 years of age (Heath et al. 2009, Frederick pers. comm.). The mid-point of breeding is (20-2)/2=9+2=11 years of age and equals the generation time. Thus, the time period for the species is 3x11 or 33 years. The beginning time for change/trend analysis is 1977.
- Extent of Occurrence (EOO): Species range is essentially the entire state of Florida (circa 95,000 km^2 or 59,000 $miles^2$) except for the western panhandle, which does not contain breeding colonies but is used as foraging habitat.

- Area of occupancy (AOO): based on the premise that wetland area makes up about 1/3 of a specified region of land area in Florida or about 31,200 km^2 or 19,500 $miles^2$; thus, the AOO exceeds 20,000 km^2 IUCN limit.

Biological Status Review for the white ibis—The review group concluded the white ibis no longer met any criteria for listing. See Table 1 for details.

Regional Application—The review group concluded there was no change in the recommendation for the white ibis. See Table 2 for details.

LISTING RECOMMENDATION

Staff recommends removing the white ibis from Florida's State-designated Threatened list because the species does not meet the criteria for listing as described in 68A-27.001(3) F.A.C.

SUMMARY OF THE INDEPENDENT REVIEW

To be added later.

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Table 1. Biological status review information findings for the white ibis in Florida.

Biological Status Review Information Findings		Species/taxon:	**White Ibis**	
		Date:	11/03/10	
		Assessors:	Rodgers, Frederick, Cook	
		Generation length:	11 years	
Criterion/Listing Measure	**Data/Information**	**Data Type***	**Criterion Met?**	**References**
*Data Types - observed (O), estimated (E), inferred (I), suspected (S), or projected (P). Criterion met - yes (Y) or no (N).				
(A) Population Size Reduction, ANY of				
(a)1. An observed, estimated, inferred or suspected population size reduction of at least 50% over the last 10 years or 3 generations, whichever is longer, where the causes of the reduction are clearly reversible and understood and ceased[1]	From 1980 to 2006, the species increased about 2.2% per year.	O	N	BNA account, SFWMD and ENP wading bird databases.
(a)2. An observed, estimated, inferred or suspected population size reduction of at least 30% over the last 10 years or 3 generations, whichever is longer, where the reduction or its causes may not have ceased or may not be understood or may not be reversible[1]	From 1980 to 2006, the species increased about 2.2% per year.	O	N	BNA account, SFWMD and ENP wading bird databases.
(a)3. A population size reduction of at least 30% projected or suspected to be met within the next 10 years or 3 generations, whichever is longer (up to a maximum of 100 years) [1]	No indications the species population is decreasing or will decrease in the near future. Sea level rise may create more foraging habitat as estuarine habitats increase inland, especially in south Florida.	I	N	BNA account, SFWMD and ENP wading bird databases.
(a)4. An observed, estimated, inferred, projected or suspected population size reduction of at least 30% over any 10 year or 3 generation period, whichever is longer (up to a maximum of 100 years in the future), where the time period must include both the past and the future, and where the reduction or its causes may not have ceased or may not be understood or may not be reversible.[1]	No indications the species population is decreasing or will decrease in the near future. Sea level rise may create more foraging habitat as estuarine habitats increase inland, especially in south Florida.	I	N	
[1] based on (and specifying) any of the following: (a) direct observation; (b) an index of abundance appropriate to the taxon; (c) a decline in area of occupancy, extent of occurrence and/or quality of habitat; (d) actual or potential levels of exploitation; (e) the effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites.				
(B) Geographic Range, EITHER				
(b)1. Extent of occurrence < 20,000 km^2 (7,722 mi^2) OR	Entire state of Florida or about 58,700 $miles^2$.	O	N	See notes tab for EOO calculations.
(b)2. Area of occupancy < 2,000 km^2 (772 mi^2)	About 19,500 $miles^2$.	O	N	See notes tab for AOO calculations.

AND at least 2 of the following:				
a. Severely fragmented or exist in ≤ 10 locations				
b. Continuing decline, observed, inferred or projected in any of the following: (i) extent of occurrence; (ii) area of occupancy; (iii) area, extent, and/or quality of habitat; (iv) number of locations or subpopulations; (v) number of mature individuals				
c. Extreme fluctuations in any of the following: (i) extent of occurrence; (ii) area of occupancy; (iii) number of locations or subpopulations; (iv) number of mature individuals				
(C) Population Size and Trend				
Population size estimate to number fewer than 10,000 mature individuals AND EITHER	Estimated about 40,000 nests in 2009 or about 90,000 mature birds total in S. Florida alone. Numerous other colonies and another 100,000 individuals in North and Central Florida. Estimated 300,000 individuals in the SE USA.	O	N	BNA account; SFWMD and ENP wading bird database.
(c)1. An estimated continuing decline of at least 10% in 10 years or 3 generations, whichever is longer (up to a maximum of 100 years in the future) OR	No evidence of decline during the past 33 years. From 1980 to 2006, the species increased about 2.2% per year.	O	N	BNA account; SFWMD and ENP wading bird database.
(c)2. A continuing decline, observed, projected, or inferred in numbers of mature individuals AND at least one of the following:	No evidence of decline during the past 33 years. From 1980 to 2006, the species increased about 2.2% per year.	O	N	BNA account; SFWMD and ENP wading bird database.
a. Population structure in the form of EITHER				
(i) No subpopulation estimated to contain more than 1000 mature individuals; OR				
(ii) All mature individuals are in one subpopulation				
b. Extreme fluctuations in number of mature individuals				
(D) Population Very Small or Restricted, EITHER				
(d)1. Population estimated to number fewer than 1,000 mature individuals; OR	Estimated about 40,000 nests in 2009 or about 90,000 mature birds total in S. Florida alone. Numerous other colonies and another 100,000 individuals in North and Central Florida.	O	N	BNA account; SFWMD and ENP wading bird database.
(d)2. Population with a very restricted area of occupancy (typically less than 20 km^2 [8 mi^2]) or number of locations (typically 5 or fewer) such that it is prone to the effects of human activities or stochastic events within a short time period in an uncertain future	Minimum of 59 ibis colonies were located in the FWC 1999 statewide survey.		N	Rodgers et al. 1999.
(E) Quantitative Analyses				
e1. Showing the probability of extinction in the wild is at least 10% within 100 years	None completed.		N	

Initial Finding (Meets at least one of the criteria OR Does not meet any of the criteria)	Reason (which criteria are met)
Does not meet any criteria.	None.
Is species/taxon endemic to Florida? (Y/N)	No
If Yes, your initial finding is your final finding. Copy the initial finding and reason to the final finding space below. If No, complete the regional assessment sheet and copy the final finding from that sheet to the space below.	
Final Finding (Meets at least one of the criteria OR Does not meet any of the criteria)	Reason (which criteria are met)
Does not meet any criteria.	None.

Table 2. Biological status review information for the regional assessment for the white ibis.

1	Biological Status Review Information Regional Assessment	Species/taxon: White Ibis
2		Date: 11/3-4/10
3		Assessors: Rodgers, Frederick, Cook
4		
5		
6		
7		
8	Initial finding	Supporting Information
9		
10	2a. Is the species/taxon a non-breeding visitor? (Y/N/DK). If 2a is YES, go to line 18. If 2a is NO or DO NOT KNOW, go to line 11.	No, breeds in Florida.
11	2b. Does the Florida population experience any significant immigration of propagules capable of reproducing in Florida? (Y/N/DK). If 2b is YES, go to line 12. If 2b is NO or DO NOT KNOW, go to line 17.	Do not know.
12	2c. Is the immigration expected to decrease? (Y/N/DK). If 2c is YES or DO NOT KNOW, go to line 13. If 2c is NO go to line 16.	
13	2d. Is the Florida population a sink? (Y/N/DK). If 2d is YES, go to line 14. If 2d is NO or DO NOT KNOW, go to line 15.	
14	If 2d is YES - Upgrade from initial finding (more imperiled)	
15	If 2d is NO or DO NOT KNOW - No change from initial finding	
16	If 2c is NO or DO NOT KNOW- Downgrade from initial finding (less imperiled)	
17	If 2b is NO or DO NOT KNOW - No change from initial finding	No change.
18	2e. Are the conditions outside Florida deteriorating? (Y/N/DK). If 2e is YES or DO NOT KNOW, go to line 24. If 2e is NO go to line 19.	
19	2f. Are the conditions within Florida deteriorating? (Y/N/DK). If 2f is YES or DO NOT KNOW, go to line 23. If 2f is NO, go to line 20.	
20	2g. Can the breeding population rescue the Florida population should it decline? (Y/N/DK). If 2g is YES, go to line 21. If 2g is NO or DO NOT KNOW, go to line 22.	
21	If 2g is YES - Downgrade from initial finding (less imperiled)	
22	If 2g is NO or DO NOT KNOW - No change from initial finding	
23	If 2f is YES or DO NOT KNOW - No change from initial finding	
24	If 2e is YES or DO NOT KNOW - No change from initial finding	
25		
26	Final finding	No change

APPENDIX 1. **Biographies of the members of the White Ibis Biological Review Group.**

Mark I. Cook has a M.S. in Ecology from the University of Durham, UK and Ph.D. in Ecology from Glasgow University, UK. He is a senior environmental scientist with the South Florida Water Management District. His expertise is in the behavioral ecology, conservation biology, habitat quality and reproductive success, and restoration ecology related to wading bird foraging and reproductive performance especially applied to hydrologic management and restoration issues in the Everglades. He has published numerous papers on the food ecology of wading birds.

Peter C. Frederick received a Ph.D. in Zoology from the University of North Carolina. He is Research Professor at the University of Florida. His expertise is in the areas of wetland ecology, ecotoxicology, and avian ecology of wading birds, especially with the wood stork, great egret and white ibis and the everglades. He has published numerous papers on waterbird ecology, pesticide contamination, population biology, and habitat requirements of wading birds in Florida.

James A. Rodgers received a M.S. from Louisiana State University and a Ph.D. from the University of South Florida. Since joining the FWC in 1980, he has worked on snail kites, double-crested cormorants, several species of wading birds including little blue herons and wood storks, development of buffer distances for waterbirds, pesticide contamination, and population genetics of birds. He was elected a Fellow of the American Ornithologist Union in 2009 and has published numerous papers on the breeding and nesting ecology of waterbirds.

APPENDIX 2. **Summary of letters and emails received during the solicitation of information from the public period of September 17, 2010 through November 1, 2010.**

Most information received by FWC staff was anecdotal and consisted of general observations of presence or absence. Information from Ann Hodgson (Tampa Bay Sanctuaries, NAS) for the status of the species in the Tampa Bay region and from Dale Gawlik (South Florida Water Management District and Florida Atlantic University) for the status in south Florida was used in the review of the species by the BSR panel on November 3-4, 2010.

APPENDIX 3. **Information and comments received from independent reviewers.**

To be added later.