Supplemental Information for the Limpkin

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

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Peer review #1 from Dana Bryan

Sent: Tuesday, January 11, 2011 2:15 PM
To: Folk, Marty
Subject: RE: Limpkin Draft BSR Report

Please look this over and see if it is what you had in mind. I will be here through Friday, but out of state all next week. - DCB

Dana C. Bryan
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Florida Department of Environmental Protection
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Biological Status Review
for the Limpkin
(*Aramus guarauna)*

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 limpkin was sought from September 17 to November 1, 2010. The three-member biological review group met on November 3 – 4, 2010. Group members were Martin J. Folk (FWC lead), Stephen A. Nesbitt (retired biologist, FWC), and Marilyn G. Spalding (Emeritus Faculty at the University of Florida). In accordance with rule 68A-27.0012 Florida Administrative Code (F.A.C.), the Limpkin Biological Review Group was charged with evaluating the biological status of the limpkin 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)* and *Guidelines for Using the IUCN Red List Categories and Criteria (Version 8.1).* Please visit http://www.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 limpkin did not meet criteria for listing, and FWC staff recommends removing the species from the FWC list of threatened species.

BIOLOGICAL INFORMATION

Life History References – Kale et al. 1992, Armistead 2001, Hipes et al. 2001, Bryan 2002, Florida Fish and Wildlife Conservation Commission 2003, Fain et al. 2007, IUCN 2009.

Taxonomic Classification – Limpkins (*Aramus guarauna*) are the only extant species belonging to the family Aramidae, within the order Gruiformes, which also includes the cranes and rails. There are four recognized subspecies of limpkins; the Florida, Cuba and Bahamas limpkin populations are members of the subspecies *A. g. pictus*.

Population Status and Trend – Wetlands International (2006) estimated the global population of limpkins at >1,000,000 and relatively stable. Population estimates for the subspecies *A. g. pictus* throughout its range are not well documented (Bryan 2002). Hunter et al. (2006) estimated the Florida population of limpkins to be between 4,000 – 6,000 pairs. I have not been able to ascertain how this figure was derived. Hunter states limpkin estimates "were based on extrapolations from information provided in Cox et al. (1994) and Bryan (1996)" as well as crane direct counts. Bryan only documented populations along 2 spring runs where the populations were concentrated. Cox estimated habitat type acres around the state and assumed a number of territories per area of habitat, but there was no ground-truthing to determine if the estimate of territories per acre of habitat was uniform. Given the patchiness known for limpkins, I would judge this type of analysis tentative at best. As an example, 2,470 acres of potential habitat is listed in the Econfina Creek (Bay County) watershed, but the occurrence of limpkins there is unusual. Analysis of historic counts revealed significant regional declines in the northern part of the state, which is consistent with a range contraction in the southeastern U.S. over the past one hundred years (Kennedy 2009). For example, a once stable and abundant population of limpkins on the Wakulla River in north Florida experienced a severe decline during the 1990s with eventual disappearance from the area (Bryan 2002, NeSmith and Jue 2002, Kennedy 2009). The species was also extirpated from the Okefenokee Swamp area on the Florida-Georgia border by the 1950s (Kennedy 2009). I'm not sure about the claim of a range contraction. In the panhandle, it is true they are not at Wakulla because the apple-snail was extirpated, but they remain only 20 miles to the east, still breeding on the Wacissa. Casual occurrences to the west in Florida (e.g, the Lower Econfina Creek/Upper Deer Point Lake in Bay County) are questionably considered to be within the "range". Furthermore, Ls are breeding in Tallahassee, due north of Wakulla, where the exotic apple-snail has become established. Furthermore, the claim that their range into Georgia has been "extirpated" is debatable. Georgia records cite it as "accidental", "rare", and at best "casual" in the SE corner of the state, with no confirmed breeding records. Because the species is still prone to be sighted occasionally in many SE states, I'm not confident that the range has really changed at all. It is possible that apparent increases in limpkin populations in central Florida are balancing recent losses observed in north Florida, and that the statewide population has been stable overall in recent years (Hipes et al. 2001 Hipes is not a proper reference for population changes - it only refers to the Wakulla loss documented elsewhere ; Kennedy 2009) Kennedy recognizes that the last two CBCs had "dramatic increase" in limpkins numbers, and that the last of these had record limpkin counts in 10 circles. I am quite sure this reflects the increased exotic apple-snail population. So while it is accurate to say that averaging CBCs across the state indicates the population is stable, I see evidence for two major trends. One is the loss of Wakulla Springs, which was a minor population in the big picture and notable only because it was on the edge of the breeding range (but does not constitute a range contraction). The other is the exotic snail invasion which is probably boosting limpkin populations wherever is occurring. Cox et al. (1994) calculated an approximate area of 1,981 km^2 (489,356 acres) of potential limpkin habitat in Florida, with an estimated 49% of that habitat occurring in conservation areas. No argument, but it would be nice

to see the potential range of the exotic apple-snail – that would probably be a better metric for "potential limpkin habitat".

Geographic Range and Distribution – In the continental U.S., limpkins occur only in the state of Florida, where they are resident breeders. Their range extends south through the Caribbean, Central America and most of South America east of the Andes. Globally the IUCN (2009) regards the limpkin as "Least Concern" due to its extremely large range and large, stable population. Limpkins inhabit freshwater wetlands that support an ample supply of their preferred prey, the apple snail Darby, and perhaps others prefers "apple-snail". Mature males tend to be territorial, although behavior can be somewhat nomadic as individuals search for new prey sources. Banding studies have indicated that females may be partially migratory. Limpkins are solitary nesters, with nest site selection and characteristics highly variable. I noted in Bryan 2002 that in expansive marsh habitats nests have been reported to be clumped as if loosely colonial.

Quantitative Analyses – A population viability analysis on the Florida population of limpkins has not been conducted.

BIOLOGICAL STATUS ASSESSMENT

Threats – In Florida, limpkins were once hunted to the point of near extirpation but have benefitted from conservation measures and hunting regulations enacted since the early 1900s. Limpkins are largely dependent on healthy populations of their staple prey item, apple snails in the genus *Pomacea*. Loss of wetland habitats due to drainage for agriculture and development, along with hydrologic alterations that impact prey availability, are primary threats to the limpkin population in Florida. Invasive exotic plant species, especially hydrilla (*Hydrilla verticillata*) and water hyacinth (*Eichhornia crassipes)*, can result in reduced abundance of apple snails and an overall decline in habitat quality for limpkins (Bryan 2002; NeSmith and Jue 2002) I don't think NeSmith is a proper reference for hydrilla or hyacinth reducing habitat for snails or limpkins. Bryan 2002 reported on my results of apple-snail surveys under hyacinth, but I never surveyed in hydrilla. NeSmith reported both abundant apple-snails and choking hydrilla on the Wacissa, and I don't think she attempted to relate the two there or at her other study sites. The direct and indirect impacts of nutrient and chemical pollution are also a concern, as with all wading bird species that forage and breed in wetland habitats (Crozier and Gawlik, 2002; Bryan 2002).

The Biological Review Group felt that the limpkin was "on the edge" of meeting several listing criteria. They also concurred that there are a number of areas where more information is needed regarding limpkins in Florida. A state-wide monitoring program would allow a more refined understanding of limpkin numbers and distribution. Priority topics for future research include: the relationship between the limpkin and its prey (native and exotic); the effects of water quality, hydrology, and invasive aquatic plants on survivorship, productivity, and movements of limpkins; age structure and other basic demographic characteristics of the population I would judge this not important to understand numbers and distribution; limpkin movements within and beyond the state I would stress that verification of critical wintering grounds is especially important. Bryan 2002 cites personal observations and historical records, and speculates that females and juveniles may congregate in south Florida in the non-breeding season. If true, critical areas should be identified.; and diseases impacting the population It may not be worth

mentioning, but the potential reliance of limpkins on an exotic snail may introduce a new vulnerability to disease within snail populations. Future monitoring and research will not only provide a better understanding of the basic biology of the species that will allow appropriate management practices, but will facilitate a more informed recommendation regarding its listing status in the future.

Statewide Population Assessment – Findings from the Biological Review Group are included in the Biological Status Review Information tables.

LISTING RECOMMENDATION

Staff recommends that the limpkin be removed from the State-designated Threatened species list because the species does not meet any one of the criteria for listing as described in 68A-27.001(3), F. A. C. The de-listing of the limpkin does not reflect a recent biological change in the abundance or distribution of the species in Florida; current information for the species did not allow it to meet any of the thresholds of criteria applied here. I concur that the available information does not indicate a population decline, which is the basis for a threatened listing. However, I believe the information used for the population estimates is insufficient to attribute any confidence to either Hunter's or Cox's estimates. This notwithstanding, I also believe that Limpkins are not so few as to qualify for the "**Population Very Small or Restricted"** criterion. So, I concur with the de-listing recommendation,

SUMMARY OF THE INDEPENDENT REVIEW

Peer review #2 from Katy Nesmith

To: Marty Folk
From: Katy NeSmith
Date: 9 January, 2011
Subject: Peer review of the Biological Status Review for the Limpkin

Thank you for the opportunity to review the draft Biological Status Review (BSR) for the limpkin. The biological information and associated information tables provided by the Biological Review Group (BRG) for the limpkin effectively address the criteria established by the IUCN for status review. The BRG concludes that the limpkin does not meet any one of the criteria necessary to remain on the State-designated Threatened species list.

However, rightly so, the authors feel that the limpkin is "on the edge" of meeting the required listing criteria and stress the need for more comprehensive data state-wide for the limpkin. There has been no state-wide survey to date. The most comprehensive data set available, Audubon's Christmas Bird Count, does not include much of the freshwater wetlands in south Florida (e.g., the vast areas of habitat in the Everglades and Francis S. Taylor Wildlife Management Area). The BRG outlines many considerations in the Threats section that will be important to address in the management plan for the species. The fact that the limpkin has experienced range reduction in north Florida and little is known about its status on some of the larger conservation areas in south Florida is cause for concern.

The BRG does a good job of incorporating and interpreting available data and provides a helpful Additional Notes section to further explain their recommendation to de-list the limpkin. I agree with the biological assessment and the decision to de-list the limpkin, and also with the team's concerns regarding future inventory, monitoring, and research.

Peer review # 3 Sammy King

From: Sammy King
To: Imperiled
Subject: Comments on Limpkin Report
Date: Monday, January 10, 2011 9:12:48 AM
Attachments: Review of Limpkin BSR.docx

Colleague:

Below and attached are my comments on the Limpkin report. Please do not hesitate to contact me for clarification or if I can be of use in the future.

Sincerely,

Sammy King
Leader, USGS Louisiana Cooperative Fish and Wildlife Research Unit
124 School of Renewable Natural Resources
LSU
Baton Rouge, LA 70803

Review of Limpkin BSR

Overall, I thought the review and recommendations for the Limpkin were warranted based on the available biological information. However, I strongly urge that further research be conducted on this species. There is very limited data on the species, particularly process-based (i.e., linkages among biotic and abiotic processes) and demographic data. Thus while these decisions are justifiable based on available data, additional data are needed to make more defensible decisions.

In addition to the research needs outlined in the BSR, I would also suggest that predictive models be developed to evaluate future habitat changes within the range of the Limpkin based on projected growth of urban development and public works projects. Studies are needed to strengthen our understanding of the habitat needs of this species. It is only through a better integrated understanding of habitat needs, demographics, and wetland dynamics will we be able to fully assess the current and future status of this species.

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

Email from Dana Bryan

From: Bryan, Dana
To: Imperiled
Subject: Limpkin listing
Date: Monday, October 04, 2010 4:13:15 PM
Attachments: Limpkin status for FWC listing 4-4-10.doc

I put together some initial thoughts (attached) and welcome further discussions. - DCB

Dana C. Bryan
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Limpkin status for FWC listing – Dana C. Bryan 10-4-10

To my knowledge, no one has published any population estimate or assessment of Limpkins in Florida. Historically, the population is greatly reduced by loss of habitat, chiefly from the drainage of wetlands for agriculture. However, there have been population strongholds, especially in south Florida, so I suspect the Species of Special Concern was based more on the thought that the Limpkin was a specialist on apple-snails, and thus was somewhat vulnerable. My accounts for the *Birds of North America* and the *Handbook of the Birds of the World* details their diet specificity, and there is validity to the concern – while they readily eat bivalves as well, I don't think they breed anywhere in Florida except where there is a healthy apple-snail population. I can provide PDFs of those publications on request.

I also report in those publications that the breeding bird surveys and Christmas counts note a population decline or contraction in the northern part of their range, but the analysis should be updated. Also, they are not a species that tends to be found in driving BBS routes, so the numbers contributing to those analyses are small.

I continue to be concerned about the Limpkin for a few reasons. The population at Wakulla Springs, which was a northern stronghold, disappeared following an apple-snail disappearance in the late 1990s. They have not returned to breed to date. If the serious decline in Snail Kite reproduction in the Everglades and Francis S. Taylor Wildlife Management Area (WMA) reflects low apple snail availability, the Limpkins certainly have suffered similarly. Water management practices in Lake Okeechobee have reportedly also decimated apple-snail populations over the last decade or so, and the Limpkin stronghold, especially in the southwestern quadrant, is probably greatly reduced. I used to get reports from FWC's Jim Rodgers about the Limpkin abundance there, but don't have "eyes on the ground" any more.

I note in FWC's *Endangered and Threatened Species Management and Conservation Plan FY 2008-2009 Progress Report* that the populations were reported to be declining in the J.W. Corbett Wildlife Management Area in Palm Beach County and in the Jones/Hungryland Wildlife and Environmental Area in Martin and Palm Beach Counties.

These scattered reports are of concern to me because I rarely can find anyone to report on Limpkin numbers. I fear that because their habitat is so widespread in south Florida, no one will notice if populations disappear from certain locations, or if numbers gradually decrease across the range. The fact that Limpkins readily move in drought and flood, makes population trends all the more difficult to discern.

Having said all that, it is also apparent that Limpkins have easily accommodated to the larger exotic apple-snails, especially *Paludosa insularum*. As such, populations have been reported to me in new places in central, north, and panhandle Florida. I'm not sure this gives me hope for the Limpkin in the long run, however. I think it is still to early to tell whether the exotic apple-snail will become a permanent resident in new habitats (thus supporting a larger Limpkin population and range), or will simply boom and bust, and perhaps just replace the native apple-snail in the same habitats.

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 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

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

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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.

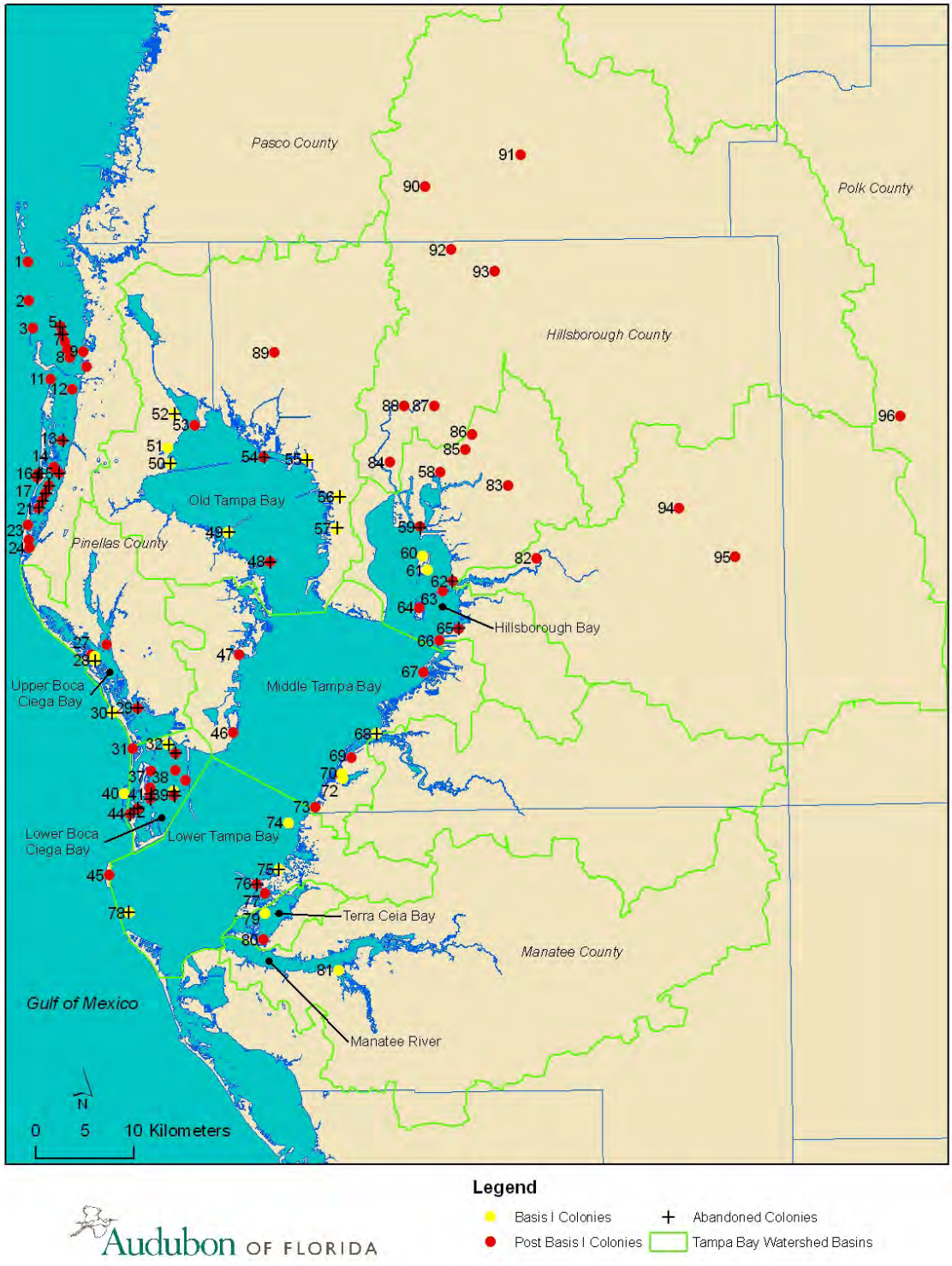

Figure 1. Bird colonies in the Tampa Bay, Florida, USA, ecosystem from 1984-2009 (colonies 1-24 are excluded because they are not in the Tampa Bay watershed).

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.

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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.

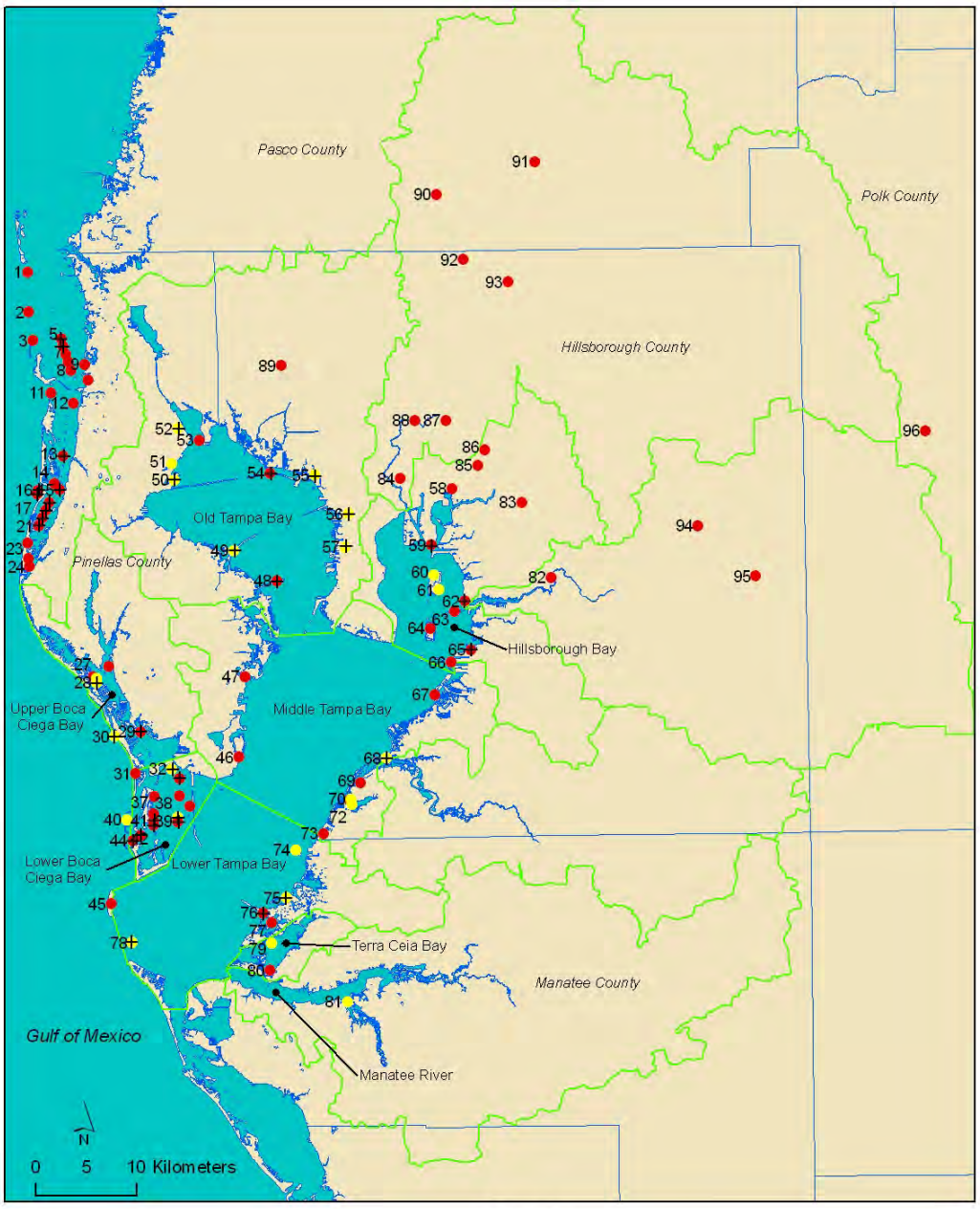
Colony Number	*Name*	Bay Segment	Taxa	Species *(n)*	Pairs *(n)*	Abandoned after 1984	New since 1984	Ownership / Management	Protected status	Regional *population* (%)	Active within last 5 yrs?	*Latitude*	*Longitude*
25	Dogleg Key	BCB	P, Ci	12	296		X	FDEP-AP / FCIS	Y	0.51	Y	27.8021	-82.7618
26	Johns Pass, 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

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.

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

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 Limpkin BSR draft report that was sent out for peer review

Biological Status Review
for the Limpkin
(*Aramus guarauna)*

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 limpkin was sought from September 17 to November 1, 2010. The three-member biological review group met on November 3 – 4, 2010. Group members were Martin J. Folk (FWC lead), Stephen A. Nesbitt (retired biologist, FWC), and Marilyn G. Spalding (Emeritus Faculty at the University of Florida). In accordance with rule 68A-27.0012 Florida Administrative Code (F.A.C.), the Limpkin Biological Review Group was charged with evaluating the biological status of the limpkin 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)* and *Guidelines for Using the IUCN Red List Categories and Criteria (Version 8.1)*. Please visit http://www.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 limpkin did not meet criteria for listing, and FWC staff recommends removing the species from the FWC list of threatened species.

BIOLOGICAL INFORMATION

Life History References – Kale et al. 1992, Armistead 2001, Hipes et al. 2001, Bryan 2002, Florida Fish and Wildlife Conservation Commission 2003, Fain et al. 2007, IUCN 2009.

Taxonomic Classification – Limpkins (*Aramus guarauna*) are the only extant species belonging to the family Aramidae, within the order Gruiformes, which also includes the cranes and rails. There are four recognized subspecies of limpkins; the Florida, Cuba and Bahamas limpkin populations are members of the subspecies *A. g. pictus*.

Population Status and Trend – Wetlands International (2006) estimated the global population of limpkins at >1,000,000 and relatively stable. Population estimates for the subspecies *A. g. pictus* throughout its range are not well documented (Bryan 2002). Hunter et al. (2006) estimated the Florida population of limpkins to be between 4,000 – 6,000 pairs. Analysis of historic counts revealed significant regional declines in the northern part of the state, which is consistent with a range contraction in the southeastern U.S. over the past one hundred years (Kennedy 2009). For example, a once stable and abundant population of limpkins on the Wakulla River in north Florida experienced a severe decline during the 1990s with eventual disappearance from the area (Bryan 2002, NeSmith and Jue 2002, Kennedy 2009). The species was also extirpated from the Okefenokee Swamp area on the Florida-Georgia border by the 1950s (Kennedy 2009). It is possible that apparent increases in limpkin populations in central Florida are balancing recent losses observed in north Florida, and that the statewide population

has been stable overall in recent years (Hipes et al. 2001; Kennedy 2009). Cox et al. (1994) calculated an approximate area of 1,981 km^2 (489,356 acres) of potential limpkin habitat in Florida, with an estimated 49% of that habitat occurring in conservation areas.

Geographic Range and Distribution – In the continental U.S., limpkins occur only in the state of Florida, where they are resident breeders. Their range extends south through the Caribbean, Central America and most of South America east of the Andes. Globally the IUCN (2009) regards the limpkin as "Least Concern" due to its extremely large range and large, stable population. Limpkins inhabit freshwater wetlands that support an ample supply of their preferred prey, the apple snail. Mature males tend to be territorial, although behavior can be somewhat nomadic as individuals search for new prey sources. Banding studies have indicated that females may be partially migratory. Limpkins are solitary nesters, with nest site selection and characteristics highly variable.

Quantitative Analyses – A population viability analysis on the Florida population of limpkins has not been conducted.

BIOLOGICAL STATUS ASSESSMENT

Threats – In Florida, limpkins were once hunted to the point of near extirpation but have benefitted from conservation measures and hunting regulations enacted since the early 1900s. Limpkins are largely dependent on healthy populations of their staple prey item, apple snails in the genus *Pomacea*. Loss of wetland habitats due to drainage for agriculture and development, along with hydrologic alterations that impact prey availability, are primary threats to the limpkin population in Florida. Invasive exotic plant species, especially hydrilla (*Hydrilla verticillata*) and water hyacinth (*Eichhornia crassipes),* can result in reduced abundance of apple snails and an overall decline in habitat quality for limpkins (Bryan 2002; NeSmith and Jue 2002). The direct and indirect impacts of nutrient and chemical pollution are also a concern, as with all wading bird species that forage and breed in wetland habitats (Crozier and Gawlik, 2002; Bryan 2002).

The Biological Review Group felt that the limpkin was "on the edge" of meeting several listing criteria. They also concurred that there are a number of areas where more information is needed regarding limpkins in Florida. A state-wide monitoring program would allow a more refined understanding of limpkin numbers and distribution. Priority topics for future research include: the relationship between the limpkin and its prey (native and exotic); the effects of water quality, hydrology, and invasive aquatic plants on survivorship, productivity, and movements of limpkins; age structure and other basic demographic characteristics of the population; limpkin movements within and beyond the state; and diseases impacting the population. Future monitoring and research will not only provide a better understanding of the basic biology of the species that will allow appropriate management practices, but will facilitate a more informed recommendation regarding its listing status in the future.

Statewide Population Assessment – Findings from the Biological Review Group are included in the Biological Status Review Information tables.

LISTING RECOMMENDATION

Staff recommends that the limpkin be removed from the State-designated Threatened species list because the species does not meet any one of the criteria for listing as described in 68A-27.001(3), F. A. C. The de-listing of the limpkin does not reflect a recent biological change in the abundance or distribution of the species in Florida; current information for the species did not allow it to meet any of the thresholds of criteria applied here.

SUMMARY OF THE INDEPENDENT REVIEW

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Kennedy, T.L. 2009. Current population trends of the limpkin (*Aramus guarauna*) Florida Scientist 72(2): 134 – 141.

NeSmith, K. and Jue, S. 2002. Survey of the distribution of the limpkin (*Aramus guaruana*) in spring/spring run stream systems in central and north Florida. Florida Natural Areas Inventory Technical Report. Tallahassee, FL.

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Biological Status Review Information
Findings

Species/taxon: Limpkin
Date: 11/03/10
Assessors: Marty Folk, Steve Nesbitt, Marilyn Spalding. Adam Kent as facilitator.
Generation length: 5 years (3 generations is 15 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]	Kennedy reports, using Christmas Bird Count data, no significant changes in state-wide numbers of limpkins 1970-2007.	E	N	Kennedy 2009
(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]				
(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]				
(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]				
[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				
(b)2. Area of occupancy < 2,000 km^2 (772 mi^2)	1,981 square km	I	Y	Cox et al. 1994
AND at least 2 of the following:				
a. Severely fragmented or exist in ≤ 10 locations	Limpkins occur over most of Florida (Bryan 2002) and are not limited to ≤ 10 locations (Cox et al. 1994)	I	N	Bryan 2002, Cox et al. 1994
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	Area of occupancy - declining in North Florida (Kennedy); quality of some habitat (especially spring run) may be declining (NeSmith and Jue). Many unknowns.	E, S	Y	Kennedy 2009, NeSmith and Jue 2002

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	Resolution of current data not sufficient to regard fluctuations as extreme	S	N	
(C) Population Size and Trend				
Population size estimate to number fewer than 10,000 mature individuals AND EITHER	4,000-6,000 pairs (Hunter et al.); 3,000-6,000 territories on conservation lands (Cox et al.).	I	On the edge	Hunter et al 2006, Cox et al. 1994
(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		E	N	Kennedy 2009
(c)2. A continuing decline, observed, projected, or inferred in numbers of mature individuals AND at least one of the following:		E	N	Kennedy 2009
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		I	N	Hunter et al 2006, Cox et al. 1994
(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		I	N	Cox et al. 1994
(E) Quantitative Analyses				
e1. Showing the probability of extinction in the wild is at least 10% within 100 years				Quantitative analysis not available

Initial Finding (Meets at least one of the criteria OR Does not meet any of the criteria)	Reason (which criteria are met)
Does not qualify to be listed with current information	
Is species/taxon endemic to Florida? (Y/N)	N
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 qualify with current information	

1	Species/taxon:	Limpkin
2	Date:	11/3-4/10
3	Biological Status Review Information Regional Assessment Assessors:	Marty Folk, Steve Nesbitt, Marilyn Spalding.
4		Adam Kent as facilitator.
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
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.	DK
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

Additional notes:

Limpkins generally begin breeding in their first year; one adult was tracked to at least 12 years of age based on banding data, but little data exists as to average life span of breeding adults (Bryan 2002). We estimated the generation time for the limpkin as 5 years.

Criterion A: Kennedy (2009) reported no significant changes in state-wide numbers of limpkins 1970-2007. We looked at Fig. 4 in Kennedy (2009) for our time range of interest (3 generations, 15 years) and saw no evidence of population reduction large enough to meet the threshold for Criterion A.

Criterion B: Cox et al. (1994) inferred an area of occupancy of 1,981 square km, which is just under the threshold of 2,000. However, to meet this overall criterion, an additional 2 of 3 sub-criteria must be met. We found only 1 to be met; thus the limpkin did not meet the overall criterion B. The widespread distribution of the limpkin and the fact it is not restricted to $\leq$10 locations did not allow it to meet Criterion B.2.a. Criterion B.2.c. necessitates that there be extreme fluctuation in at least 1 of the following: (i) extent of occurrence; (ii) area of occupancy; (iii) number of locations or subpopulations; (iv) number of mature individuals. The group discussed fluctuations and did not interpret them to be extreme, given the current resolution of data available.

Criterion C: The limpkin population has been inferred at 4,000-6,000 pairs by Hunter et al. 2006. The middle of this range would give a population of 10,000 individuals, right on the threshold for this criterion. To meet the overall criterion for population size and trend, an additional subcriterion C.1 or C.2 must be met. We found neither to apply.

Criterion D: The limpkin did not meet the thresholds for a very small or restricted population.

Creterion E: There has been no quantitative assessment of the limpkin population in Florida.

Regional Assessment: The limpkin occurs outside of Florida with the closest birds in the Bahamas and Cuba. It is not known if there is significant immigration of propagules capable of reproducing in Florida, so the finding remains unchanged.

Appendix 1. Biological Review Group Members Biographies

Martin J. Folk has a M.S. in Zoology from Southern Illinois University. He has worked for the Florida Fish and Wildlife Conservation Commission for 19 years, primarily on whooping and sandhill cranes. He oversees research on cranes in Florida and supervises a team of biologists. Marty is a member of the International Whooping Crane Recovery Team and is the newsletter editor for the Whooping Crane Conservation Association.

Stephen A. Nesbitt has a M.S. degree in Wildlife Ecology from Oklahoma State University. He has worked as a professional wildlife biologist since 1963 and from 1974 – 2006 with the Florida Fish and Wildlife Conservation Commission. Nesbitt has published over 120 scientific papers on various species in the field of wildlife ecology and population biology, including 70 papers on sandhill cranes.

Marilyn G. Spalding has a B.A. degree in biology from the University of Miami and a DVM degree from the University of Florida. She is emeritus faculty in the Department of Infectious Disease and Pathology at the University of Florida, specializing on the diseases of wild birds, particularly water birds. She was elected to the Council of the Wildlife Disease Association in 1996. In 1997 she was awarded the C. E. Cornelius Young Investigator Award by the College of Veterinary Medicine at UF. She acts as the consulting veterinarian to the FWC in its efforts to re-introduce the whooping crane to Florida and has published over 70 scientific papers, several review chapters and a book, most dealing with diseases of wild birds.

Appendix 2. Summary of letters and emails received during the solicitation of information from the public.

Email from Diane Erdely (danerd820@yahoo.com, phone 863-427-4369), 10/5/10, resides in the community of Solivita on Polk/Osceola County line (zip code 34759): 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.

Email from Dana Bryan (Dana.Bryan@dep.state.fl.us)
Limpkin status for FWC listing – Dana C. Bryan 10-4-10 FDEP/FPS
To my knowledge, no one has published any population estimate or assessment of Limpkins in Florida. Historically, the population is greatly reduced by loss of habitat, chiefly from the drainage of wetlands for agriculture. However, there have been population strongholds, especially in south Florida, so I suspect the Species of Special Concern was based more on the thought that the Limpkin was a specialist on apple-snails, and thus was somewhat vulnerable. My accounts for the *Birds of North America* and the *Handbook of the Birds of the World* details their diet specificity, and there is validity to the concern – while they readily eat bivalves as well, I don't think they breed anywhere in Florida except where there is a healthy apple-snail population. I can provide PDFs of those publications on request.

I also report in those publications that the breeding bird surveys and Christmas counts note a population decline or contraction in the northern part of their range, but the analysis should be updated. Also, they are not a species that tends to be found in driving BBS routes, so the numbers contributing to those analyses are small.
I continue to be concerned about the Limpkin for a few reasons. The population at Wakulla Springs, which was a northern stronghold, disappeared following an apple-snail disappearance in the late 1990s. They have not returned to breed to date. If the serious decline in Snail Kite reproduction in the Everglades and Francis S. Taylor Wildlife Management Area (WMA) reflects low apple snail availability, the Limpkins certainly have suffered similarly. Water management practices in Lake Okeechobee have reportedly also decimated apple-snail populations over the last decade or so, and the Limpkin stronghold, especially in the southwestern quadrant, is probably greatly reduced. I used to get reports from FWC's Jim Rodgers about the Limpkin abundance there, but don't have "eyes on the ground" any more.

I note in FWC's *Endangered and Threatened Species Management and Conservation Plan FY 2008-2009 Progress Report* that the populations were reported to be declining in the J.W. Corbett Wildlife Management Area in Palm Beach County and in the Jones/Hungryland Wildlife and Environmental Area in Martin and Palm Beach Counties.

These scattered reports are of concern to me because I rarely can find anyone to report on Limpkin numbers. I fear that because their habitat is so widespread in south Florida, no one will notice if populations disappear from certain locations, or if numbers gradually decrease across the range. The fact that Limpkins readily move in drought and flood, makes population trends all the more difficult to discern.

Having said all that, it is also apparent that Limpkins have easily accommodated to the larger exotic apple-snails, especially *Paludosa insularum*. As such, populations have been reported to me in new

places in central, north, and panhandle Florida. I'm not sure this gives me hope for the Limpkin in the long run, however. I think it is still too early to tell whether the exotic apple-snail will become a permanent resident in new habitats (thus supporting a larger Limpkin population and range), or will simply boom and bust, and perhaps just replace the native apple-snail in the same habitats.

Appendix 3. Information and comments received from the independent reviewers.