Brown Pelican Biological Status Review Report

March 31, 2011

FLORIDA FISH AND WILDLIFE CONSERVATION COMMISSION
620 South Meridian Street
Tallahassee, Florida 32399-1600

Biological Status Review
For the Brown Pelican
(*Pelecanus occidentalis)*
March 31, 2011

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 November 8, 2010 that had not undergone a status review in the past decade. Public information on the status of the brown pelican was sought from September 17 to November 1, 2010. The three-member Biological Review Group (BRG) met on November 3 - 4, 2010. Group members were Janell M. Brush (FWC lead), Stephen A. Nesbitt (retired biologist, FWC) and Gary L. Sprandel (Kentucky Department of Fish and Wildlife Resources) (Appendix 1). In accordance with rule 68A-27.0012, Florida Administrative Code (F.A.C.), the Brown Pelican BRG was charged with evaluating the biological status of the brown pelican using criteria included in definitions in 68A-27.001, 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://myfwc.com/wildlifehabitats/imperiled/listing-action-petitions/ to view the listing process rule and the criteria found in the definitions.

In late 2010, staff developed the initial draft of this report which included BRG findings and a preliminary listing recommendation from staff. The draft was sent out for peer review and the reviewer's input has been incorporated to create this final report. The draft report, peer reviews, and information received from the public are available as supplemental materials at http://myfwc.com/wildlifehabitats/imperiled/biological-status/.

The Brown Pelican BRG concluded from the biological assessment that the brown pelican does not meet any listing criteria. Staff recommends that the brown pelican not be listed as a threatened species and that it be removed from the Species of Special Concern list.

This work was supported by a Conserve Wildlife Tag grant from the Wildlife Foundation of Florida. FWC staff gratefully acknowledges the assistance of the biological review group members and peer reviewers. Staff would also like to thank Michelle VanDeventer who served as a data compiler on the species.

BIOLOGICAL INFORMATION

Life History References – Anderson 1988; Brinkley and Humann 2001; FWC 2003; Nesbitt et al. 1978; Nesbitt et al. 1980; Nesbitt et al. 1981; Rodgers et. al 1996; Schreiber and Mock 1988; Schreiber and Schreiber 1982; Shields 2002; USFWS 2007.

Taxonomic Classification – Generally, six subspecies of the brown pelican (*Pelecanus occidentalis*) are recognized. The Florida brown pelican population is included in the subspecies *P. o. carolinensis*, also referred to as the eastern brown pelican.

Population Status and Trend - The global population of brown pelicans is estimated to be at least 200,000 individuals (Shields 2002). The Southeast United States Regional Waterbird Conservation Plan (Hunter et al. 2006) determined that brown pelican populations have increased dramatically along the Gulf and Atlantic coasts of the southeastern U.S. since the population was delisted from the US Endangered Species Act (US ESA) in 1985. However, recent declines have been documented in South Carolina and Georgia (P. Jodice and B. Winn Pers. comm.) It is estimated that nearly 40,000 pairs of *P. o. carolinensis* bred in the U.S. in 1999, with 60% occurring on the Gulf Coast (Shields 2002). Florida supports resident, breeding brown pelicans, as well as migratory individuals. The state population appears to have been stable since the late 1980s, although fluctuations in nesting numbers have been observed. Nesbitt et al. (2002) provide an average annual number of nesting brown pelicans between 1968 and 2001 at 9,028 pairs (max 12,310, min 5,491) (±1,321 SD) statewide.

Geographic Range and Distribution – Brown pelicans are found in the western hemisphere, with breeding ranges along the Pacific coast from California to Chile, and along the Atlantic coast from Maryland and Virginia south to Venezuela and into the West Indies. The species is not generally considered pelagic, preferring coastal and inshore waters, estuaries and bays. In Florida, the species occurs along both coasts, and has been documented at a few interior locations (McNair 2000). Breeding distribution shifts have been well documented within Florida with some local populations decreasing while adjacent in-state regions have increased (Rodgers et al. 1996).

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

BIOLOGICAL STATUS ASSESSMENT

Threats – The brown pelican was listed under the US ESA of 1973 following dramatic declines in their populations during the decades prior. The use of persistent organochlorine pesticides, particularly DDT/DDE, from the late 1940s to early 1970s resulted in bioaccumulation in prey fish and transfer to brown pelicans. Sub-lethal effects included thinning of egg-shells and reduced breeding productivity. Since the banning of these chemicals, and with the benefit of greater conservation efforts, the brown pelican population has responded positively. The U.S. Fish and Wildlife Service removed the endangered status for brown pelicans on the Atlantic and Gulf coasts of the U.S., including Florida, on February 4, 1985. The distinct population segment of the species that remained (including the Gulf coast in Mississippi, Louisiana, and Texas) listed following the 1985 final rule was also officially removed from the Federal List of Endangered and Threatened Wildlife (US ESA) on December 17, 2009 (USFWS 2009).

Despite population recovery over the past 40 years, there remain threats and concerns for the brown pelican. Examples include the potential impact of adverse weather on critical breeding areas, oiling of individuals and rookeries from oil spills, heavy metal exposure (e.g. mercury, cadmium, lead), reduced prey availability (fisheries decline), degradation of coastal wetland habitat, nesting colony disturbance, sea level rise, and entanglement in and/or ingestion of fishing gear (Burger and Gochfeld 2002, Schreiber and Burger 2002, Shields 2002). Like other waterbirds, brown pelicans in Florida could also be impacted by hydrologic alterations resulting from water management activities (Hunter et al. 2006).

Population Assessment – Findings from the BRG are included in Biological Review Information Findings Tables.

LISTING RECOMMENDATION

Staff recommends the brown pelican not be listed as a Threatened species and that it be removed from the Species of Special Concern list because the species does not meet criteria for listing as described in 68A-27.001, F.A.C..

SUMMARY OF THE INDEPENDENT REVIEW

Comments were received from 5 reviewers, Patrick Jodice (USGS Cooperative Research Unit, Clemson University), Patty Kelly (U.S. Fish and Wildlife Service), Ann Paul (Audubon of Florida, Florida Coastal Islands Sanctuaries), Betty Anne Schreiber (Pelican Springs Lodge), and Lovett Williams (Former Pelican Researcher). Appropriate editorial changes recommended by the reviewers were made to the report.

Two reviewers mentioned the brown pelican is an 'at risk' species. One reviewer cited concerns about the current and future loss of nesting sites due to sea level rise and climate change as well as oil spills and other stochastic events that could affect the population. Another reviewer stated that the average number of breeding pairs may be misleading and overly influenced by two high nesting years in the 1980s. He also did not agree with how the BRG applied the term "fluctuation" and stated that it was really a population increase followed by a decrease rather than a true fluctuation. This does not affect the BRG's findings or staff's recommendation. The reviewer also asked if we had considered separating out the Atlantic and Gulf Coast populations separately for evaluation. The BRG was tasked with evaluating Florida's brown pelican population and did not separately evaluate the two coasts.

Four of the five reviewers concurred with the BRG findings, the fifth did not state one way or the other. Several reviewers expressed concern about the brown pelican population declining in Florida. Several also suggested that future monitoring and analysis of population trends will be important to detect changes in the population. Identified threats and concerns raised by the reviewers will be considered and addressed in the management plan for the species which must be approved before the brown pelican is removed from Florida's Threatened list. The full text of peer reviews is available at MyFWC.com.

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Biological Status Review Information
Findings

Species/taxon:	Brown Pelican (*Pelecanus occidentalis carolensis*)
Date:	11/04/10
Assessors:	Janell Brush, Gary Sprandel, Steve Nesbitt
Generation length:	12 years (Schreiber and Mock 1988; Shields 2002) *See Notes*

Criterion/Listing Measure	Data/Information	Data Type*	Sub-Criterion Met?	References
*Data Types - observed (O), estimated (E), inferred (I), suspected (S), or projected (P). Sub-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]	Data do not support.	Estimated	NO	Nesbitt 2006; Brush 2007; Unpublished Data, Nesbitt
(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]	Using 12 years as the generation length, we used the survey data from 1971 – 2007 (36 years) to conduct our trend analysis of annual minimum nest counts. The model was a good fit for the data with an r^2=0.63 and the cubic term was significant (F1, 27 = 5.44, p = 0.0274). However, the estimated change was -8.80% with a 95% confidence interval of -29.57 to 18.09, so it was non-significant for the comparison of the 1971 estimated number of pairs to the 2007 estimated number of pairs and not at the criterion level of 30%. *See Notes*	Estimated	NO	Nesbitt 2006; Brush 2007; Unpublished Data: Nesbitt, Leone
(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]	Uncertainties exist. Larger colonies fractionated into smaller colonies with unknown stability and/or success.	Estimated	NO	Nesbitt 2006; Brush 2007; Unpublished Data: Nesbitt
(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 evidence from recent nesting data to indicate that the population is not stable. Local declines and increases have been documented in the past. From 1989-2007 (not three generations), there is an apparent decline in the minimum number of nesting individuals. However, we are not confident that this decline is not fluctuations within a stable population. The snapshot survey is potentially not capturing the entire nesting population because of the protracted nesting season and these values should be treated as a minimum number of nesting individuals. *See Notes*	Estimated/ Projected	NO	Nesbitt 2006; Brush 2007; Rodgers et al. 1996; Unpublished Data Nesbitt
[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	2,276 miles x 1 mile width (shoreline range) = 2,276 sq. miles	Estimated	YES	Fernald and Purdum 1992
(b)2. Area of occupancy < 2,000 km^2 (772 mi^2)	Data not available to determine.	Estimated	NO	Brush 2007
AND at least 2 of the following:				
a. Severely fragmented or exist in ≤ 10 locations	Is not severely fragmented, but colonies are located in approximately 8 geographical locations ("estuary systems").	Observed	YES	Brush 2007
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	No definitive data to indicate continuing decline. However, species is extremely sensitive to habitat quality issues and other regions have experienced extreme fluctuations in response to habitat degradation.		NO	Nesbitt 2006; Brush 2007; Rodgers et al. 1996; Schreiber and Burger 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	Not documented in Florida, but extreme fluctuations in breeding populations observed in other regions.		NO	Shields 2002
(C) Population Size and Trend				
Population size estimate to number fewer than 10,000 mature individuals AND EITHER	Estimated breeding population has mean of 12,816 individuals for past 3 years (2005 - 2007).	Estimated	NO	Nesbitt 2006; Brush 2007
(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	See above Bb		NO	See above Bb
(c)2. A continuing decline, observed, projected, or inferred in numbers of mature individuals AND at least one of the following:	See above Bb		NO	See above Bb
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 breeding population of more than 10,000 individuals	Estimated	NO	Nesbitt 2006; Brush 2007
(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	Estimated to be more than 20 sq km	Estimated	NO	Nesbitt 2006; Brush 2007
(E) Quantitative Analyses				
e1. Showing the probability of extinction in the wild is at least 10% within 100 years	No population viability analyses has been conducted.		NO	

Initial Finding (Meets at least one of the criteria/sub-criteria OR Does not meet any of the criteria)	Reason (which criteria/sub-criteria are met)
Does not meet any of the criteria	
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/sub-criteria OR Does not meet any of the criteria/sub-criteria)	Reason (which criteria/sub-criteria are met)
Does not meet any of the criteria for listing *See Notes*	

1	Biological Status Review Information Regional Assessment Species/taxon:	Eastern Brown Pelican (*Pelecanus occidentalis carolensis*)
2	Date:	11/4/10
3	Assessors:	Janell Brush, Gary Sprandel, Steve Nesbitt
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
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.	YES
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.	YES
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.	NO
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	NO CHANGE
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	
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 associated with BSR Tables:

Generation Length: The generation length used for the Biological Status Review was 12 years. This was based on age of first breeding of 3-5 years, and maximum age of 30 years (Shields 2002). The oldest recaptured individual (according to banding records) was 28 years old. Mean life expectancy once individuals reach breeding age can be estimated at about 5 - 6 years (Schreiber and Mock 1988). Using 12 years as the generation length, we used the survey data from 1971 – 2007 (36 years) to conduct our trend analysis of annual nest counts. We also conducted the analysis using 9 years as the generation length because we decided generation length is most likely somewhere between 9 – 12 years for the species. None of the listing criteria were met when using either 9 or 12 years as the generation length.

Population Size Reduction A(2): We compared a linear, quadratic, cubic, and quartic linear model incorporating a negative binomial distribution. For the 12 years generation time model (1971 – 2007), a cubic trend was fit to the data, incorporating a negative binomial distribution (based on lowest AICC). The model was a good fit for the data with an r^2=0.63 and the cubic term was significant ($F_{1, 27} = 5.44$, $p = 0.0274$). However, the estimated change was -8.80% with a 95% confidence interval of -29.57 to 18.09, so it was non-significant between estimated number of pairs between 1971 – 2007 and not at the criterion level of 30%. When we tested a 9-yr generation time (1980 – 2007), the quadratic model was best fit model based on the lowest AICC. The model fits well and predicts a decline (from 1980 to 2007) of 21.50% (95% CI: -35.05 to -5.12). The change was significant but not at the criterion level of 30%. (Figures 1,2).

Figure 1: Generation time = 12 years (1971 – 2007); Criterion A2 not met.

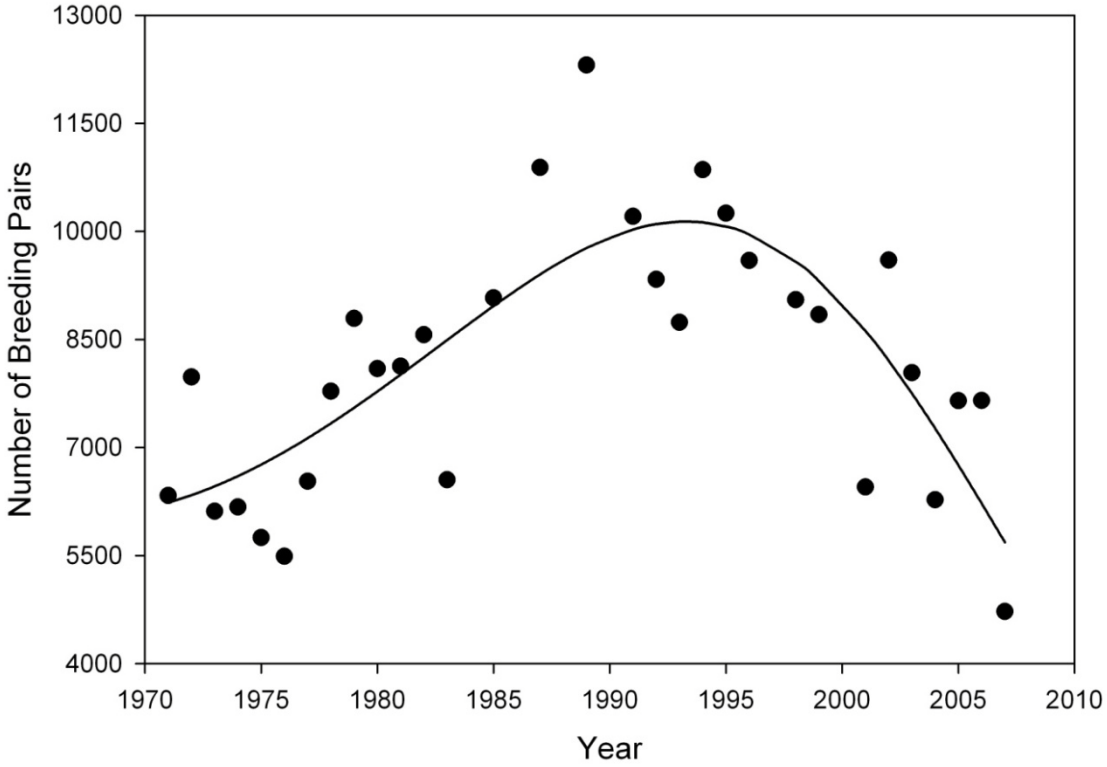
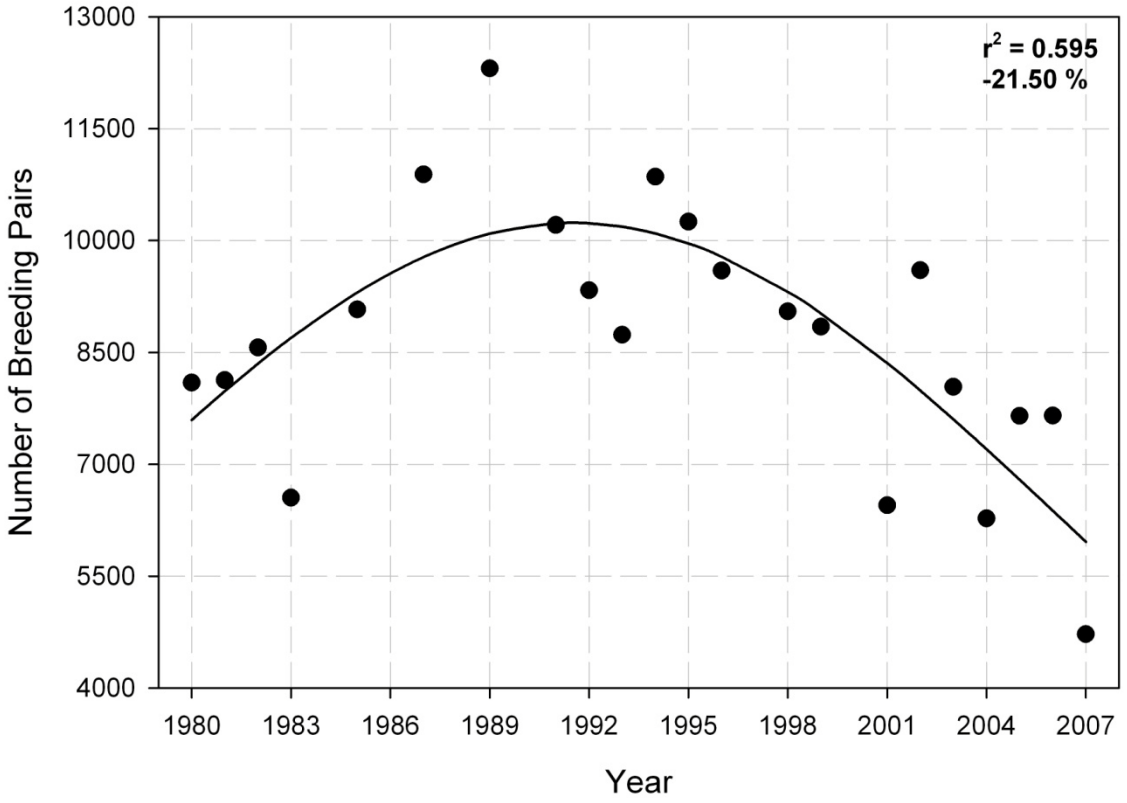


Figure 2. Generation time = 9 years (1980 – 2007); Criterion A2 not met.



A(4): FWC conducted nesting brown pelican surveys from 1968 – 2007. The surveys were conducted between the middle of April and the first week of May; corresponding to the peak of nesting season for that survey year. Results of these surveys should be seen as a minimum population size. There is no evidence from recent nesting data to indicate that the population is not stable. Local declines and increases have been documented in the past (Rodgers et al. 1996). From 1989-2007 (not three generations), there is an apparent decline in the minimum number of nesting individuals. We are aware that this apparent recent decline could be, to some extent, a product of normal fluctuations in nesting effort within a stable population. These "snapshot" surveys (annual index of nesting population) should be treated as a minimum number of nesting individuals.

Final Finding – Recommendations:

The data used for this BSR is a snapshot of the breeding season. The survey was conducted to correspond to the peak of the breeding season. In the past, this has usually been the last week in April – first week in May (with the exception of Florida Bay). There are annual fluctuations with the timing and duration of the breeding season. In recent years the breeding season may be extended into the summer, depressing the peak and spreading the nesting effort out through the year. The 2007 nesting season was the last time a survey was conducted. The number of nesting pairs estimated in 2007 was 4,724 in 42 sites. There are 54 historical nesting brown pelican colonies documented by FWC in Florida. The dynamic coastal environment of

Florida has led to some historical nesting locations no longer meeting the nesting requirements of the pelicans. Many of these changes were environmentally or human influenced. The effects of hurricanes on the Gulf Coast of Florida can be seen on many of the historical nesting islands off the Coast of Lee County and in the Tampa Bay area. Historically, the colonies along the west coast were composed of a few colonies that could support a large number of nesting pelicans. Over the years, the number of colonies on the SW Gulf Coast has increased, but the numbers of nesting pelicans per colony are fewer (Nesbitt pers. comm.). The colonies on the east coast continue to support a large number of nesting pelicans. The foraging shadow of the islands is largely unknown and has not been studied. It is possible that the local fish resource on the SW Gulf Coast is not large enough to support the larger colonies, while the East and Northwest coasts can support fewer, large colonies of nesting pelicans. These are factors which need to be considered when conducting future surveys and evaluating the status of this species.

The brown pelican is as an important indicator of the health of near-shore waters and any decrease in population or nesting activity may be indicative of an imbalance in that ecosystem. To ameliorate concerns regarding the long term trends of the Florida brown pelican population we recommend a statewide survey be conducted three times during the nesting season for the next 2-3 years. With additional survey information we will be able to determine if the recent apparent declines in the minimum breeding pelican population are real or just fluctuations in a stable population. We also recommend a productivity study which examines productivity per nest at select colonies. Historically, the Florida population was assumed to be stable, such that individuals were transported from the Florida population to restore the nesting population in Louisiana (Nesbitt 1981; Holm et al. 2003).

Appendix 1. Brief biographies of the members of the Brown pelican Biological Review Group .

Janell M. Brush received her M.S. in Wildlife Ecology and Conservation from the University of Florida. Janell has managed avian research projects in Florida for over 10 years and joined the FWC in 2006. She is the project leader for two State Wildlife Grant funded coastal waterbird projects in Florida. Janell has experience working on research projects involving many different species of shorebirds and seabirds.

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.

Gary L. Sprandel has a B.S. degree in Computer Science from Colorado State University with coursework in wildlife biology. He has worked as a geoprocessor for the Kentucky Department of Fish and Wildlife Resources since 2005 on a variety of projects including the State Wildlife Action Plan, public hunting area mapping, survey databases, habitat mapping, and species distribution mapping. From 1992-2005 Gary worked for the FWC as a database manager on many projects including data collection and analysis for wintering shorebird surveys, support of breeding shorebird and seabird surveys, and species and site ranking databases. Gary has over a dozen published papers on Florida's bird life.

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.

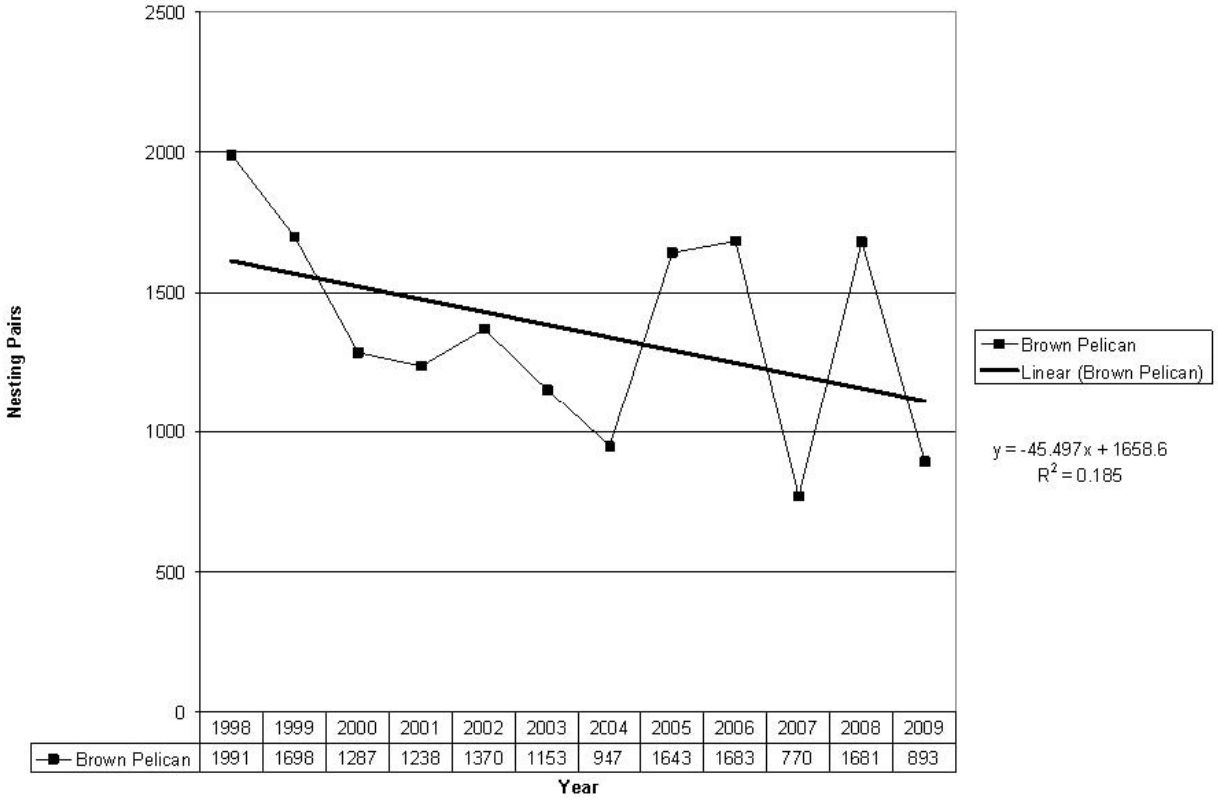
Email from Ann Hodgson, Gulf Coast Ecosystem Science Coordinator, Audubon of Florida, Florida Coastal Islands Sanctuaries, Tampa, Florida, dated October 29, 2010. Dr. Hodgson provided a copy of the following report:

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.

The average number of Brown Pelican nesting pairs in the Tampa Bay Region from 2000-2009 was 1,024 (698 – 1,350). A decline in the population was reported. The region includes one large colony and many smaller colonies. Progressive urbanization threatens to further reduce the ecological integrity of the Tampa Bay ecosystem. More protective regulations, more enforcement, and heightened public cooperation will all be needed to protect this region.

Email from Ann Hodgson, Gulf Coast Ecosystem Science Coordinator, Audubon of Florida, Florida Coastal Islands Sanctuaries, Tampa, Florida, dated November 1, 2010.

The number of nesting pairs of Brown Pelican has locally decreased 55.2% between 1998-2009, years for which Florida Coastal Islands Sanctuaries and its management partners have consistent survey effort among colonies with pelicans. They estimated the number of birds at Dogleg Key and Dunedin Sand Key West in 2009 by averaging 2008 and 2010 nesting data for each site. Little Bayou was not surveyed in 2009; at Little Bayou, there were 21 pairs in 2008 and 0 pairs in 2010. This colony has included pelicans and mixed Great Egrets and small herons, but is about 50 m from the residential seawall, and may collapse entirely from local predator pressure in the future. The following figure was provided to show regional decline:



Email received from Joseph W. Paeglow dated 10/19/10. Provides information about a brown pelican roost on the Orange River in Lee County. The nesting flock has numbered between 30 -35 individuals but they have noticed a decline in the number of individuals every year for the past five years. Nesting season 2009 they had about 15 adults and only 2 young birds. This year the flock had not arrived.

E-mail received from Neil Langenberg, Environmental Specialist, Charlotte Harbor Aquatic Preserves, Florida Department of Environmental Protection, Punta Gorda, FL, dated 10/14/10. Provided rookery monitoring data compiled from rookery islands in 2008, 2009, 2010 from staff from Charlotte Harbor Aquatic Preserves (CHAP) and J.N. "Ding" Darling National Wildlife Refuge (USFWS). The study area includes the lower Charlotte Harbor area including Pine Island Sound Aquatic Preserve, Matlacha Pass Aquatic Preserve, and portions of J.N. Ding Darling NWR complex. Brown pelican nesting counts were direct counts of active nests via boat during the nesting season. Counts reflect the maximum number or peak estimates of nesting adults by species. Brown Pelican total nest numbers were reported by surveyed colony and for the region (2008) = 411, (2009) = 220, (2010) = 414.