

**A Species Action Plan for the
Brown Pelican
*Pelecanus occidentalis***

**Final Draft
November 1, 2013**



Florida Fish and Wildlife Conservation Commission
620 South Meridian Street
Tallahassee, FL 32399-1600
Visit us at MyFWC.com

BROWN PELICAN ACTION PLAN TEAM

Team Leader: Elena Sachs, Division of Habitat and Species Conservation

Team Members: Janell Brush, Florida Fish and Wildlife Research Institute
Blair Hayman, Division of Habitat and Species Conservation
Ricardo Zambrano, Division of Habitat and Species Conservation

Acknowledgements: Laura Barrett, Division of Habitat and Species Conservation
Claire Sunquist Blunden, Office of Policy and Accountability
Brie Ochoa, Division of Habitat and Species Conservation

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EXECUTIVE SUMMARY

This plan was developed in response to the Florida Fish and Wildlife Conservation Commission (FWC) determination that the brown pelican (*Pelcanus occidentalis*) be removed from the Florida Endangered and Threatened Species List. The goal of this plan is that the conservation status of the brown pelican is maintained or improved so that the species will not again need to be listed. The actions outlined in this plan include monitoring and reassessment to determine current population trends. Although the brown pelican will no longer be listed as a Species of Special Concern, it will remain a conservation priority.

The objectives of this plan are to maintain or increase the population of brown pelicans in Florida and to protect and maintain existing colony locations distributed around the state and provide additional protected breeding habitat where possible. Priority habitat conservation actions that will promote the objectives of this plan include utilizing shoreline stabilization activities in and around colonies and working with partners to protect, restore, and create breeding habitat on spoil islands. Establishing new Critical Wildlife Areas where possible and posting signs around colonies will provide further protection for breeding pelicans. One major threat to pelicans is monofilament entanglement and targeted outreach will be necessary to reduce mortality and injury to pelicans and help anglers better understand how to minimize interactions between fishing line and birds. A statewide monitoring strategy and determining the statewide population of breeding brown pelicans can be developed through a coordinated effort with partners and is critical to determine if plan goals and objectives are being met. Lastly, we propose that protecting active brown pelican colonies from disturbance by preventing public access to colonies year-round and protecting brown pelicans from the threats associated with intentional feeding are imperative for the conservation of this species so that it will not need to be listed in the future.

Successful management of the brown pelican through implementation of actions within this plan requires the cooperation of local, state, and federal governmental agencies; non-governmental organizations; business and industrial interests; universities and researchers; and the public. This plan was developed by the FWC in collaboration with stakeholders, and will require the cooperation of and coordination with other agencies, organizations, private interests, and individuals.

This plan details the actions necessary to improve the conservation status of the brown pelican. A summary of this plan will be included in the Imperiled Species Management Plan (ISMP), in satisfaction of the management plan requirements in Chapter 68A-27, Florida Administrative Code, Rules Relating to Endangered or Threatened Species. The ISMP will address comprehensive management needs for 60 of Florida's imperiled species and will include an implementation plan; rule recommendations; permitting standards and exempt activities; anticipated economic, ecological, and social impacts; projected costs of implementation and identification of funding sources; and a revision schedule. The imperiled species management planning process relies heavily on stakeholder input and partner support. This level of involvement and support is also critical to the successful implementation of the ISMP. Any significant changes to this plan will be made with the continued involvement of stakeholders.

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GLOSSARY OF TERMS AND ACRONYMS

ACP: Area Contingency Plan, developed to address removal of oil and hazardous substances from waterways. The ACP geographically defines regional environmental and socio-economic resources that require priority protection.

Active Nest: A nest that shows (or has recently shown) evidence of breeding, such as an adult attending the nest or in incubating position, a clutch of eggs, or a brood of nestlings.

Area of Occupancy: The area within its extent of occurrence (See Extent of Occurrence), which is occupied by a taxon (excluding cases of vagrancy). This reflects the fact that a taxon will not usually occur throughout the area of its extent of occurrence, which may contain unsuitable or unoccupied habitats (as defined by IUCN).

Beach: The expanse of sand adjacent to or along the shoreline, generally considered to extend landward from the mean low water line to the line of permanent vegetation or marked change in physiographic form.

Breeding Behavior: Flying with nesting materials (sticks, straw), territorial defense, and/or egg-laying.

Breeding Productivity: (Also see Reproductive Success) The number of fledged young produced by a pair or population, usually calculated annually or per breeding season. (Productivity = clutch size * nesting success [fledges per clutch] * number of clutches laid per breeding season).

Breeding Season: In Florida, brown pelicans may breed year-round in many parts of the state, though the peak nesting season is typically April through August.

BRG: Biological review group, a group of taxa experts convened to assess the biological status of taxa using criteria specified in Rule 68A-27.001, Florida Administrative Code, 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).

Brood: One or more young birds hatched and reared together, and dependent upon adults for feeding, sheltering, and/or safety.

BSR: Biological status review report, the summary of the biological review group's findings. Includes a Florida Fish and Wildlife Conservation Commission (FWC) staff recommendation on whether or not the species status meets the listing criteria in Rule 68A-27.001. These criteria, based on IUCN criteria and IUCN guidelines, are used to help decide if a species should be added or removed from the Florida Endangered and Threatened Species List. In addition, FWC staff may provide within the report a biologically-justified opinion that differs from the criteria-based finding.

CAMA: Coastal and Aquatic Managed Areas

GLOSSARY OF TERMS AND ACRONYMS

Chick: (Also see Nestling) A young bird not yet flight-capable and dependent upon adults for food, shelter and/or safety.

Clutch: A group of eggs produced by a female in a single breeding attempt.

Colony: A congregation of one or more pairs of breeding birds that nest and roost in close proximity at a particular location.

CWA: Critical Wildlife Area

CWCI: The Coastal Wildlife Conservation Initiative, an FWC-led effort to improve collaboration within and among partner agencies, local governments, conservation groups, businesses, and other stakeholders on a host of issues related to coastal wildlife. The structure of CWCI consists of regional working groups, which prioritize local focal issues, and the FWC's Coastal Team, which provides technical expertise and works to address issues of statewide scale.

DDT: Dichlorodiphenyltrichloroethane, a pesticide that impacted avian populations by reducing and contaminating their prey.

DEP: Florida Department of Environmental Protection

Disturb: To agitate or bother birds to the degree that it causes or is likely to cause, based on the best scientific information available, 1) injury to the bird; 2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior; or 3) nest or brood abandonment by substantially interfering with breeding, feeding, or sheltering behavior.

Extent of Occurrence: The geographic area encompassing all observations of individuals of a species, including intervening areas of unoccupied habitat. Synonymous with range. See Also Area of Occupancy (as defined by IUCN).

F.A.C.: Florida Administrative Code. The Department of State's Administrative Code, Register and Laws Section is the filing point for rules promulgated by state regulatory agencies. Agency rulemaking is governed by Chapter 120, Florida Statutes, the Administrative Procedures Act. Rules are published in the Florida Administrative Code.

FBCI: Florida Bird Conservation Initiative

Fledgling: Young that is capable of flight and has left the nest, though it may still return to the nest to roost. Compare with Nestling.

Forage: To search for, acquire, and ingest food.

FSA: Florida Shorebird Alliance, a statewide partnership of government and non-government organizations committed to advancing shorebird and seabird conservation in Florida. The FSA coordinates partners to identify and address important needs with regard to research, management, education, outreach, and public policy.

GLOSSARY OF TERMS AND ACRONYMS

Florida Shorebird Database, the statewide monitoring database for shorebirds and seabirds. A standard protocol is followed to collect and enter data online at www.FLShorebirdDatabase.org.

FWC: Florida Fish and Wildlife Conservation Commission, the state agency constitutionally mandated to protect and manage Florida's native wildlife species.

FWRI: Florida Fish and Wildlife Research Institute, the fish and wildlife research branch of the FWC.

GIS: Geographic Information System

Habitat: The area used for any part of the life cycle of a species (including foraging, breeding, and sheltering).

Harass: An intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns that include, but are not limited to, breeding, feeding, or sheltering.

INRMP: Integrated Natural Resources Management Plan, the mechanism by which military installations manage natural resources on their properties.

ISMP: Imperiled Species Management Plan

IUCN: International Union for Conservation of Nature, a professional global conservation network.

IUCN Red List: IUCN Red List of Threatened Species, an objective, global approach for evaluating the conservation status of plant and animal species, the goals of which are to: Identify and document those species most in need of conservation attention if global extinction rates are to be reduced; and provide a global index of the state of change of biodiversity.

LMR: Land Management Review

Local Government: Any administrative offices, agency, or governmental body of an area smaller than a state. The term is used to contrast with offices at the national or state level and generally includes municipal (town, city), county, and regional agencies.

MBTA: Migratory Bird Treaty Act (16 U.S.C. 703–711), the federal statute that protects nearly all native birds, their eggs and nests. Specifically, the statute makes it unlawful to “pursue, hunt, take, capture, kill, attempt to take, capture or kill, possess, offer for sale, sell, offer to purchase, purchase, deliver for shipment, ship, cause to be shipped, deliver for transportation, transport, cause to be transported, carry, or cause to be carried by any means whatever, receive for shipment, transportation or carriage, or export, at any time, or in any manner, any migratory bird, included in the terms of this Convention for the protection of migratory birds or any part, nest, or egg of any such bird.”

GLOSSARY OF TERMS AND ACRONYMS

MRRP: Monofilament Recovery and Recycling Program

Natal Site: The colony (site) from which an individual bird hatched and fledged.

Nestling: Young that is still confined to the nest for protection.

Population: The total number of individuals of the taxon. Population numbers are expressed as numbers of mature individuals only (as defined by IUCN).

Posting: Placement of informational signs and posts to delineate buffer areas around 1 or more pelican colonies or other critical habitat. Posting may or may not include cord, twine, or rope strung between posts to form a symbolic fence. While not providing any significant physical barrier to entry, posting around nests delineates areas where people and/or pets should not enter in order to prevent flushing of adults, disturbance to eggs or young, and to provide an area where adults and/or chicks can rest, forage, and seek shelter from human disturbance.

Predation: (Depredation, predated) To be killed or destroyed by a predator.

Reproductive Success: The number of fledglings (young that is capable of flight and has left the nest, though it may still return to the nest to roost) produced annually by one breeding pair. Compare with Breeding Productivity.

Roosting Site: An area where pelicans gather to rest.

SSC: Species of Special Concern. Protected under Rule 68A-27.005, F.A.C., which declares that “no person shall take, possess, transport, or sell any species of special concern included in this subsection or parts thereof or their nests or eggs except as authorized by permit from the executive director, permits being issued upon reasonable conclusion that the permitted activity will not be detrimental to the survival potential of the species. For purposes of this section, the definition of the word take in Rule 68A-1.004, F.A.C., applies.”

Take: As defined in 68A-1.004 F.A.C. (General Prohibitions), “Taking, attempting to take, pursuing, hunting, molesting, capturing, or killing any wildlife or freshwater fish, or their nests or eggs by any means whether or not such actions result in obtaining possession of such wildlife or freshwater fish or their nests or eggs.”

USFWS: United States Fish and Wildlife Service, the federal agency mandated to protect and manage the nation’s native freshwater fish and wildlife resources.

WMD: Water Management District(s)

INTRODUCTION

Biological Background

Species Description

The brown pelican is a charismatic symbol of the Florida coast, often recognized by its distinct silhouette. With a typical wingspan of approximately 2.1 m (7 ft), the brown pelican is among the largest birds commonly observed along Florida's coast. It is easily recognizable by its slender neck, long, hooked bill, and deep gular pouch. Its wings are gray to brown, and darken towards the wingtips. In breeding plumage, the brown pelican's white neck assumes a rust color, and its pale head becomes light yellow. Juveniles are uniformly brown-tan, with a cream-colored belly (Nesbitt 1996). Because juvenile birds molt continuously throughout the first 2 to 3 years and their breeding plumage changes in stages, pelicans appearance is variable (Shields 2002).

Taxonomy

There are 8 species of pelicans in the world, and 6 generally recognized subspecies of the brown pelican (*Pelecanus occidentalis*). The Florida brown pelican population is included in the subspecies *P. o. carolinensis*, also referred to as the eastern brown pelican. Of all pelican species, the brown pelican has the darkest plumage and is the only truly marine species. While all other pelican species forage by corralling fish on the surface of the water and scooping them into their bills, brown pelicans are the only pelican species that forage by plunge diving (entering the water head first after sighting prey from above).

Food

Brown pelicans plunge dive for fish and occasionally invertebrates in salt, brackish, and fresh water. If the dive is successful, the pelican will press its gular pouch against its breast and tighten the gular muscles to squeeze out and release water before tilting its head backwards to swallow captured prey (Shields 2002). Dives begin at heights up to 20 m (65 ft), and often attract other foraging seabirds (Shields 2002).

The brown pelican regularly exploits the feeding activities of other species, and capitalizes on human activity that provides by-catch (Shields 2002, Jodice et al. 2011); they follow fishing boats, loiter at marinas, and spend time near bait buckets.

Habitat

In Florida, brown pelicans inhabit coastal islands and beaches, including mangrove islands, dredge material (spoil) islands, and other areas that provide suitable roosts near foraging grounds. Where found inland, roosts are sought near foraging areas that are free of disturbances.



Figure 1. Brown pelicans plunge diving for prey. Photograph by Jack Rogers.

Breeding Behavior

In Florida, brown pelicans nest primarily in mangroves, though several ground colonies are regularly documented around the state, ranging from several dozen to several hundred pairs. Breeding sites in Florida have consistently been small to medium-sized islands (most <5 ha, some to 10 ha [12 to 24 ac]), often located on Intracoastal Waterways (Nesbitt 1996). Preferred breeding sites are free of mammalian predators. Adult pelicans are able to defend against aerial predators if human disturbance or tree-climbing predators (such as raccoons [*Procyon lotor*]) do not force them off the nest. Roosting sites play an important role in the establishment of new colonies as they may evolve into breeding sites over time (Schreiber and Schreiber 1982). Colonies are often reused, but can become unsuitable over time as continued use may alter the vegetative structure of the site. However, colonies that are unused for one or more seasons may become active again in subsequent years.

In central and north Florida, breeding typically begins in April, though it can be initiated earlier depending on conditions each year; however, breeding has also been recorded year-round, especially in south Florida (Shields 2002). The female builds the nest with materials gathered by the male, who supplies progressively smaller sticks over 7 to 10 days until the nest is complete (Shields 2002). The nest is generally lined with fine materials like grasses and green leaves. Both parents incubate, using their fully webbed (totipalmate) feet to warm and protectively cover the eggs (Schreiber 1977). A typical clutch is 3 eggs and hatches in about 30 days. Young hatch as naked chicks with closed, fused eyelids. In a few days, white downy feathers grow, which protect the chick against cold and heat exposure. Young must generally remain in the nest or in trees at the nest site to receive parental care and food until they are flight-capable and ready for independence. Young fledge (leave the nest) around 12 weeks after hatching (Schreiber 1976).

Migration

Florida hosts both resident and wintering populations of brown pelicans. Florida is a significant nursery for young from other states and there is documented movement of Florida-born birds to other states.

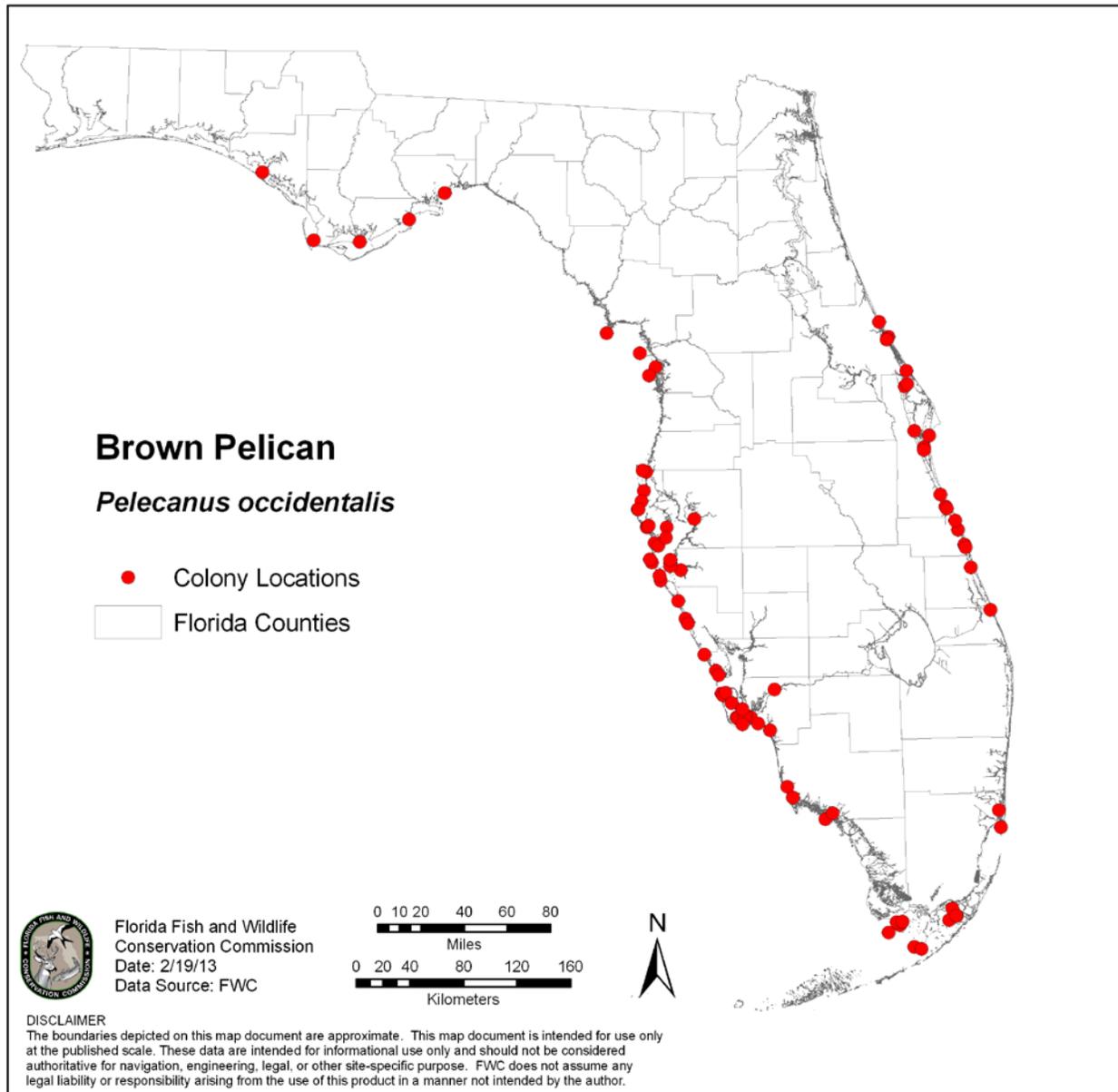


Figure 2. Distribution of documented historical and current brown pelican colony locations in Florida (1968-2012).

Distribution

The brown pelican is found along both coasts of Florida and has been documented at a few inland locations (McNair 2000) near bodies of water where prey is available. The species prefers coastal and nearshore waters, estuaries, and bays. Breeding distribution shifts have been well-documented within Florida; some local populations have decreased, while neighboring states have observed increases (Nesbitt 1996, Jodice et al. 2007).

Outside of Florida, the species occurs on the Pacific Coast from British Columbia south to Cape Horn and from Venezuela through the entire Gulf of Mexico and Caribbean north to Maryland (Nesbitt 1996).

Conservation History

Heavily impacted by plume hunters in the late 19th century, the brown pelican (and many other waterbirds) prompted the creation of the National Wildlife Refuge system after President Theodore Roosevelt was persuaded to designate Pelican Island, near Vero Beach, Florida, as a protected area. In 1903, Pelican Island was designated as the first of the National Wildlife Refuges. Slaughter from plume hunters was curtailed in part due to the 1918 establishment of the Migratory Bird Treaty Act (16 U.S.C. 703–711), which provides measures to prohibit the take of birds (and their nests and eggs), including the brown pelican, native to North America,.

Brown pelican populations were nearly decimated by the use of chlorinated hydrocarbon pesticides, particularly, dichlorodiphenyltrichloroethane (DDT) in the 1950s and 1960s. Following a steep decline, the brown pelican was federally listed as an Endangered species in 1970. Research being conducted on brown pelicans in California during this time documented that DDT was harmful to bird populations both through a reduction in reproductive success due to eggshell thinning and through direct toxicity to their aquatic prey. Endrin, another frequently used pesticide, had similar impacts on regional pelican populations. Louisiana's population of brown pelicans verged on extinction; the Pelican State's namesake eventually rebounded through the reintroduction of nearly 1,300 birds from Florida. In 1972, the U.S. Environmental Protection Agency restricted the use of all chlorinated hydrocarbon pesticides. The prohibition has allowed for recovery from pesticide poisoning, though heavy metals and other contaminants continue to threaten the health of the brown pelican population.

In Florida, the brown pelican was granted protections against harassment through its designation as a Species of Special Concern (Rule 68A-27.005, Florida Administrative Code [F.A.C.]), as well as under General Prohibitions (Rule 68A-4.001, F.A.C.), which outlined specific protection against commercial feeding. Habitat protection, including protection of wetlands, has benefitted pelicans by protecting both breeding and foraging habitat. The Florida Department of Environmental Protection's Aquatic Preserve program offers additional protections to coastal foraging and breeding habitat. Site-specific habitat protection at national wildlife refuges, state parks, and national parks throughout Florida have also been important in safeguarding colonies where birds return to nest year after year. These efforts contributed to the federal delisting of the brown pelican in 2009.

Threats and Recommended Listing Status

While brown pelicans have rebounded from plume hunting and the effects of pesticide contamination, many threats still exist. Coastal development, hydrologic alteration, climate change, habitat degradation due to non-native plant species, and declines in their prey base threaten habitat quality and availability. During breeding, brown pelicans are vulnerable to human disturbance; eggs may be crushed or pushed out of the nest when adults are flushed out, and eggs and young are vulnerable to predators and the elements. Monofilament entanglement (in fishing line, lures, hooks, leaders, nets, etc.) threatens individual birds and can also impact colonies if entangled birds return to the colony and expose other birds to the fishing line. The threat of entanglement is likely exacerbated by casual feeding of pelicans by fisherman and tourists. Fishing hardware such as hooks and weights can be accidentally ingested by the birds and may cause injury or death. Feeding pelicans the discarded skeletons of filleted large fish can lead to perforation of pouches, stomachs, and intestines of birds designed to digest small fish

bones. Because of brown pelicans' coastal dependency and documented sensitivity to toxins, oil spills and other causes of poor water quality pose significant threats to pelicans.

In 2010, the Florida Fish and Wildlife Conservation Commission (FWC) directed staff to evaluate the status of all species listed as Threatened or Species of Special Concern that had not undergone a status review in the past decade. To address this charge, staff conducted a literature review and solicited information from the public on the status of the brown pelican (*Pelecanus occidentalis*). The FWC convened a biological review group (BRG) of experts on the brown pelican to assess the biological status of the species by using criteria specified in Rule 68A-27.001, F.A.C. This rule includes a requirement for BRGs to follow the Guidelines for Application of the International Union for Conservation of Nature (IUCN) Red List Criteria at Regional Levels (Version 3.0) and Guidelines for Using the IUCN Red List Categories and Criteria (Version 8.1). FWC staff developed an initial draft of a Biological Status Review report (BSR), which included the BRG's findings and a preliminary listing recommendation from staff. The draft was sent out for peer review, and the reviewers' input was incorporated into the final [BSR report](#).

Based on the literature review, information received from the public, the BRG findings, and peer reviewer input, FWC staff recommends the brown pelican not be listed as a Threatened species and that it is removed from the list of Species of Special Concern.

Results of the BRG

The BRG found that the brown pelican did not meet any listing criteria. While available data indicate that the number of breeding pairs has declined in recent years, neither the rate of decline nor the most recent population estimate meets listing criteria.

The FWC conducted nesting brown pelican surveys from 1968 to 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 to 2007 (not 3 generations), there was an apparent decline in the minimum number of nesting individuals.

This trend may be the result of normal fluctuation within a stable population, and does not meet the criteria for listing, which is a 30% decline over 3 generations. The actions outlined in this plan include monitoring and reassessment to determine if the downward trend is continuing. Although the brown pelican will no longer be listed as a Species of Special Concern, it will remain a conservation priority and as new data is obtained, it may be necessary to reevaluate the status of the brown pelican through the BSR process.

CONSERVATION GOAL AND OBJECTIVES

Goal

The conservation status of the brown pelican is maintained or improved so that the species will not again need to be listed on the Florida Endangered and Threatened Species List.

Objectives

I. Maintain or increase the population of brown pelicans in Florida.

Rationale

Florida's brown pelican population appears to have been relatively stable since the late 1980s, although fluctuations in breeding numbers have been observed. Nesbitt and Schwikert (2002) provide an average annual number of breeding brown pelicans during 1968 to 2001 of 9,028 pairs (maximum, 12,310; minimum, 5,491) ($\pm 1,321$ standard deviation) statewide.

II. Protect and maintain existing colony locations distributed as shown in [Figure 2](#) and provide additional protected breeding habitat where possible.

Rationale

Though the populations are not severely fragmented, it is critical to protect and maintain existing habitat, in order to maintain stable or increasing populations of brown pelicans. There were 56 colonies that were active within the past 10 years. It is critical that historic colonies are preserved because data suggests that pelicans are not colonizing new areas; rather they have exhibited site fidelity according to the last 40 years of surveys in Florida (FWC, unpublished data). Although new colony establishment does not appear to occur frequently in Florida, enhancing breeding habitat where opportunities exist may offset the loss of historical sites that no longer support pelican colonies.

CONSERVATION ACTIONS

The following sections describe the conservation actions that will make the greatest contribution toward achieving the conservation objectives. Actions are grouped by category (e.g., Habitat Conservation and Management, Population Management). The Conservation Action Table ([Table 1](#)) provides information on action priority, urgency, potential funding sources, likely effectiveness, identified partners, and leads for implementation.

Habitat and Conservation Management

Action 1 Promote and utilize shoreline stabilization activities in and around colonies.

Erosion caused by waves and currents and coastal development results in the need for shoreline stabilization activities. Well-implemented shoreline stabilization can reverse poor management (such as dredging bulkheads and unconsolidated fill); dissipate wave energy; and potentially minimize damage caused by vessel wakes, extreme weather events, pollution, and sea level rise. Shoreline stabilization is designed to protect shorelines from erosion, improve water quality, and stabilize bottom sediment. Methods beneficial to wildlife and habitat include planting emergent vegetation, removing exotic vegetation and replacement with native vegetation, placing turbidity curtains, creating oyster reefs and breaks (natural buffers), placing lime rock boulders into deep dredge holes (e.g., Biscayne Bay), and managing for mature mangroves.

There are several successful examples throughout the state including: Pelican Island Restoration and Stabilization Project (U.S. Fish and Wildlife Service [USFWS]), [Oyster Reef Restoration in the Indian River Lagoon](#) (The Nature Conservancy), Biscayne Bay Restoration and Enhancement Program [“Shoreline and Habitat Enhancement Guide”](#) (Miami-Dade Department of Environmental Resources Management), and Breakwater Project at Spoil Island MC-2 in Martin County, Florida. FWC will partner with other agencies and organizations to implement stabilization measures at colony locations (for instance, as outlined in [Action 2](#) below).



Figure 3. Red mangrove (*Rhizophora mangle*) plantings for shoreline restoration and stabilization at a spoil island in Biscayne Bay, Florida. Photograph by Janell Brush.

Action 2 Work with partners to restore, protect, improve, or create suitable breeding habitat on spoil islands.

The majority of brown pelican colonies in Florida are located on spoil islands. Spoil islands have been created along much of Florida’s coasts as a byproduct of creating and maintaining navigable waterways. These islands are typically owned by the state or county and the Florida Department of Environmental Protection (DEP) has management authority for most, but the management approach differs regionally. On the east coast, DEP’s Coastal and Aquatic Managed Areas (CAMA) created the [Spoil Island Working Group](#) to manage 137 spoil islands included in the Indian River Lagoon management plan. Working Group membership currently includes the FWC, other state agencies, counties, and non-governmental organizations. Group members cooperatively manage recreational and habitat management activities such as treating invasive plants, restoring native vegetation, and shoreline stabilization. The FWC and partners will continue to actively participate in the Spoil Island Working Group on the east coast to ensure that brown pelican habitat, particularly in and near breeding colonies, is appropriately managed and protected.

A [Northeast Florida Management Plan](#) is currently being developed for coastal restoration from Georgia to Brevard County, and will include spoil island management. In southern Florida (e.g., Miami-Dade and Palm Beach counties), spoil islands are managed primarily by the counties. These islands are typically submerged and dominated by mangroves. In this region, FWC involvement is primarily through the provision of technical assistance on rehabilitation and management, including creation of shallow foraging habitat where feasible. Juvenile brown pelicans have been observed utilizing these areas for foraging immediately following fledging (Steve Nesbitt, former FWC Avian Research staff, personal communication).

On the west coast from Charlotte Harbor to the Big Bend region, spoil island management activities include conducting surveys and posting breeding bird colonies that are at risk of disturbance. Many of these islands are in need of shoreline stabilization (see [Action 1](#)), shoreline plantings, or offshore wave breaks to maintain living shorelines. A spoil island working group exists for Brevard, Indian River, St. Lucie, and Martin counties on Florida's east coast, in which the FWC should continue active participation. A similar group to address issues related to spoil islands is needed for the southwest coast, and perhaps other areas of the state. Creating or improving suitable breeding habitat on spoil islands should be a primary focus of any Spoil Island Working Group. The Coastal Wildlife Conservation Initiative (CWCI) could be an existing mechanism for establishing this group, which should cooperatively facilitate needed management actions for spoil island maintenance.

Action 3 Eliminate non-native plant species in and around colonies.

The introduction and spread of invasive, non-native, and nuisance vegetation is contributing to habitat degradation and population declines for many species, including pelicans. Some non-native species displace native trees that serve as nesting substrate for brown pelicans in Florida. These include vines and trees such as the Old World climbing fern (*Lygodium microphyllum*), melaleuca (*Melaleuca quinquenervia*), Brazilian pepper (*Schinus terebinthifolius*), carrotwood (*Cupaniopsis anacardoides*), leadtree (*Leucaena leucocephala*), Queensland umbrella tree (*Schefflera actinophylla*), and Balsam-apple (*Momordica charantia*). Some species, like the Australian-pine (*Casuarina equisetifolia*), can accelerate shoreline erosion on islands used by nesting brown pelicans. Coastal development fuels the spread of exotics and allows some non-native plants to outcompete native vegetation.

In order to provide suitable foraging and breeding habitat, restoration is necessary to support native vegetation and to limit the growth and spread of non-native species. The Invasive Plant Management Section of the FWC takes the lead on coordinating and funding programs controlling invasive aquatic and upland plants on public conservation lands and waterways throughout Florida. The FWC will coordinate with partners to seek additional funding to remove invasive plants and restore native vegetation in areas outside of FWC jurisdiction.

Action 4 Work with partners to ensure continued water quality monitoring, estuary health assessments, etc., and assist and advise where water quality is poor in order to improve conditions for brown pelicans.

There are many ongoing efforts within various organizations for monitoring water quality throughout Florida. Working with partners on these efforts will ensure that the needs of wildlife are considered and included on water quality projects. Projects include, among many others, the following: [Southeast Environmental Research Center Water Quality Monitoring Network](#), the [Florida Coastal Everglades Long Term Ecological Research Program](#), [South Florida Seagrass Ecosystems Monitoring](#), the [Florida International University Program](#), and the research on seagrass and coastal wetland ecosystems program through the FWC's Fish and Wildlife Research Institute (FWRI). Additionally, there are multiple programs within the [Water Management Districts](#) that may benefit brown pelican habitat.

Action 5 Encourage private landowners to manage for brown pelicans and potentially acquire private lands where brown pelican colonies are located if it is determined that further management and protection is necessary.

The FWC can encourage private landowners to manage for brown pelicans by providing outreach, technical assistance, volunteer support, and incentives to landowners. Though a relatively small number of pelican colonies are located on private land, these sites provide important breeding habitat. Providing incentives for these landowners may encourage them to support pelican colonies. Partners should work together to find suitable incentives for property owners who support pelicans on their property (e.g., those who authorize pre-posting or posting on their property, etc.). Grants or other fiscal incentives should be explored (such as USFWS's Coastal Program, administered through ecological services offices) for potential to provide financial support for habitat management (such as removal of exotics and planting native vegetation). The Coastal Program can support restoration efforts on state and federal lands as well as on private lands. Though the program is primarily focused on protecting federally listed species, it can also fund habitat-based conservation actions. In addition to monetary incentives, positive recognition through CWCI, Florida Shorebird Alliance (FSA), Florida Bird Conservation Initiative (FBCI), and partner websites and newsletters, and press releases can be used to provide incentives to property owners.

Additionally, FWC can identify priority colonies under private ownership which may be subject to development or disturbance in the future. For example, a former brown pelican colony on Black's Island in St. Joseph Bay has now been developed with condominiums. Another brown pelican colony in northern Biscayne Bay in Miami-Dade County, also under private ownership, could be developed in the future unless it is acquired. Similar sites could be purchased through programs such as Florida Forever or through partnerships with organizations such as Audubon Florida or The Nature Conservancy, which occasionally purchase properties and donate to local, state, or federal governments.

Population Management

Action 6 Identify brown pelican colonies where predation is a threat and manage according to established predator control recommendations for that area.

Mammalian predators appear to be the greatest threat to breeding waterbirds in the southeast United States (USFWS 2006). For example, in Florida's Tarpon Key, a historic brown pelican

colony that once had 1,300 nests has been abandoned in recent years, in part, due to a high occupation by raccoons (Steve Nesbitt, personal communication). In Florida, mammalian predators include coyotes (*Canis latrans*), raccoons, opossums (*Didelphius virginiana*), grey foxes (*Urocyon cinereoargenteus*), bobcats (*Lynx rufus*), rodents, and, possibly, free-roaming pets (including feral and domestic cats and dogs). In addition to mammals, gulls (*Laridae* spp.), crows (*Corvus* spp.), and green iguanas (*Iguana iguana*) have been documented predated the eggs or young of brown pelicans (Shields 2002). Highest-priority colonies should be surveyed regularly for significant levels of mammalian predation and managed accordingly. Additional site-specific monitoring for fire ants (*Solenopsis invicta*), iguanas, and other predators should also be conducted regularly to assess the need for further management actions.

Predator management recommendations from the USFWS (2006) include the following:

- The presence and impact of predators on breeding birds should be assessed at all important sites;
- Predator management should be considered at sites with introduced predators, predators that exist at unnaturally high populations due to human influences, species experiencing significant population declines, and at potential breeding sites where restoration efforts are underway;
- Predator management should be specific to individual breeding sites and should target only depredating animals.

Predator control recommendations for pelican colonies should be developed for dissemination to land managers, conservation organizations, and agencies. The FWC will coordinate with USFWS, United States Department of Agriculture Wildlife Services, and other institutions as necessary to develop management recommendations for predator control where problems exist. The FWC will also coordinate with the CWCI working groups to help implement these recommendations where needed.

Action 7 Post brown pelican colonies where feasible and appropriate.

Active colonies should be posted where there is a potential for disturbance. By posting sites, a buffer zone is established using signs or buoys to discourage vessels from approaching and potentially disturbing colonies. Ideally, a 10- m (300-ft) buffer zone should be established around colonies to reduce or prevent disturbance (Rodgers and Smith 1995).

Pelicans nest on private and public islands, owned and managed by various agencies and organizations. Remote locations that receive little to no human disturbance likely do not need to be posted. Signs and brochures at nearby boat ramps should identify the locations, closure dates, and regulations where there are human disturbance issues at breeding sites. Signs should be maintained and visible. The FWC will continue to coordinate with the National Park Service, USFWS, CAMA and other land managing agencies or private land owners where pelican breeding occurs to ensure colonies are marked and protected, where appropriate.

Action 8 Establish new Critical Wildlife Areas (CWAs) for colonies and continue management of existing CWAs that support brown pelicans.

CWAs are established by the FWC under Rule 68A-14.001, F.A.C., to prevent the take of fish and wildlife where important congregations exist. Disturbance can cause both direct and indirect negative impacts to wildlife, ranging from mortality to exclusion of species from otherwise suitable habitat. CWA designation is a tool used to protect important congregations of 1 or more species from disturbance during critical life stages by closing portions of the designated area that are being used by wildlife to public access. In most cases, these species are state listed or otherwise believed to be imperiled or in decline. Where colonies are large, have persisted over time, and partners can assist with staff and funds, CWA establishment should have priority.

Currently, 12 CWAs in Florida contain brown pelican breeding and foraging habitat. Some sites are managed by the FWC, while many sites are managed by other organizations and agencies. The FWC has recently updated the process for creating CWAs and hired a CWA Coordinator to organize and standardize management of existing sites and the establishment of new areas. The process for establishing a new CWA is as follows: a request from either FWC staff or an external entity initiates the process. Once a request is received, a determination is made on whether significant disturbance is affecting 1 or more wildlife species at a site and whether management actions may be necessary to address that disturbance. FWC staff identifies and works with stakeholders to review and discuss recommendations for potential CWA boundaries and closures. CWA establishments must be approved by the Commissioners.

Action 9 Ensure that the brown pelican is included and considered in U.S. Coast Guard Area Contingency Plans and FWC Oil Spill Response Plans.

Brown pelicans are highly susceptible to oil spills since breeding, roosting, and foraging sites are often located near shipping channels, marinas, and harbors (Shields 2002). The [Oil Pollution Act of 1990](#) required the development of Area Contingency Plans (ACPs) for all coastal areas of the United States through Area Committees composed of federal, state, regional, and local stakeholders. ACPs address removal of oil and hazardous substances from waterways, and geographically define regional environmental and socio-economic resources that require priority protection. The U.S. Coast Guard's ACPs include a partnership with the FWC to develop an [ArcIMS \(Internet Map Server\) website](#) that contains data used in planning and response activities, including an Environmental Layer (mangroves, salt marsh, Environmental Sensitivity Index, shoreline, primary wildlife areas, etc.). FWC staff will continue to ensure that important pelican colony locations, major roosting site locations, and breeding stage data are included in the environmental data layer for ACPs. In addition, the FWC will ensure that recommended practices for emergency response and clean-up efforts of pelican colonies and major roosting sites are provided to response teams.

Monitoring and Research

Monitoring

Action 10 Develop and implement a statewide monitoring protocol.

The brown pelican is an important indicator of the health of nearshore waters and any decrease in population or nesting activity may be indicative of an imbalance in that ecosystem. Natural

resource disciplines frequently depend on aerial surveys to provide information over a larger scale than could be gathered solely by ground-based surveys. Aerial surveys have often been used to census waterbird colonies (Rodgers et al. 1995); however, count accuracy is a problem when birds are in large concentrations (Rodgers et al. 2005). Visual counts from airplanes frequently result in underestimation and high variability in bird population estimates (Rodgers et al. 1995, Frederick et al. 2003). Such errors can be reduced by the use of photographic counts (Frederick et al. 2003, Brush 2008), which rely on post-flight analysis of photographs. Even with the advantages of photographs in wildlife counts (Frederick et al. 2003), human-count estimates of animal populations can result in considerable error (Bazjak and Piatt 1990). As a result, attempts have been made to use computers to automatically detect and count conspicuous animals (Laliberte and Ripple 2003, Abd-Elrahman et al. 2005). This method works best when larger groups of animals (i.e., hundreds) appear in images. Brown pelican monitoring programs should use a combination of aerial surveys, photographs, and ground surveys.

The FWC's [Breeding Bird Monitoring Protocol for Florida's Shorebirds and Seabirds](#) has a great deal of built-in flexibility. However, the protocol is not specific to brown pelicans. Information on trends in pelican breeding effort, breeding success, and productivity are dependent on the ability of trained observers to accurately conduct ground counts of breeding birds and young within a colony. Even when monitoring programs are carefully designed and data are collected using standard methods, they will rarely be able to detect every individual of a population. The sources of potential error in the estimates of population size obtained from surveys include variation in time and space as well as detection (Steinkamp et al. 2003). In order to become confident in our statewide population estimates, these sources of error should be considered when developing a pelican-specific monitoring protocol (see [Action 11](#)).

Implementing monitoring actions will necessitate the expansion of the FSA to engage partners who may already be monitoring pelican colonies or who may be able to monitor colonies. The Florida Shorebird Database will serve as a central data repository and a resource for managers and researchers. FWC staff, under the umbrella of the FSA, will continue to work collaboratively with partners to monitor accessible pelican colonies on the ground, though additional funding will be required to perform a more comprehensive, state-wide colony survey similar to aerial surveys conducted by FWC staff in previous years.

Action 11 Determine statewide population size and trend of breeding brown pelicans.

The goal and objectives outlined in this plan are based on population estimates. A standardized monitoring protocol will ensure consistency of data and assessing the species annually to determine whether the goals and objectives of this plan are being met. Monitoring protocols will be developed by FWRI. Monitoring will be conducted by the FWC and partners and data will be interpreted by FWRI (see [Action 10](#)). The FWC listing criteria includes an assessment of population size and trends. The [BSR](#) for the brown pelican (FWC 2011), recommends monitoring annually for the next 2 to 3 years. This was recommended to address concerns about the long-term trends of the Florida brown pelican.

Action 12 Determine breeding productivity for a subsample of brown pelican colonies.

The FWC listing criteria includes an assessment of population size reduction, which can be attributed to low productivity and recruitment of new individuals into the population. In the biological status review report for the brown pelican (FWC 2011), it was recommended that productivity be determined per nest at select colonies. As part of the FWC long-term monitoring of the brown pelican population, productivity has been documented periodically using a subsample of nests from 3 to 5 colonies. For example, in 2005, 179 nests were monitored for production. Productivity was estimated to be 1.54 young per productive nest (Nesbitt 2005). Monitoring productivity will require sub-sampling the nesting population. Prior to monitoring, a power analysis will be conducted to determine how many nests need to be monitored for sufficient power to detect a difference among years for productivity in brown pelicans.

Action 13 Document distribution of brown pelican colonies.

The FWC listing criteria includes an assessment of geographic range (extent of occurrence and area of occupancy). Monitoring of the distribution and number of pelican colonies will determine if the goals and objectives of this plan are being met. The last aerial survey by the FWC was conducted in 2012. The survey documented 40 active pelican colonies statewide, of which 9 were new. There have been 65 documented colonies since the FWC started pelican surveys in 1968. Of the 40 that were active in 2012, 29 have been active in the last 10 years (Brush 2012). Monitoring distribution of colonies is part of the overall monitoring strategy. Currently, limited monitoring is conducted on the ground by FSA partners.

Action 14 Determine the nesting chronology of brown pelicans nesting in Florida.

There are annual fluctuations in the timing and duration of the brown pelican breeding season in Florida. In recent years the breeding season has been extended, therefore the peak of the nesting season is later in the season and harder to predict (Steve Nesbitt, personal communication). In order to develop and refine monitoring protocols and management actions, it is important to understand the nest initiation time and duration of pelican breeding in Florida. Pelicans have been documented breeding year-round in parts of Florida, although peak breeding season statewide is April through June (Shields 2002, Brush 2012). Due to limited resources, initiation and completion dates by colony are not typically monitored year-round. This information may be important at the local level in consideration for management actions and for permits for coastal projects, as well as monitoring mortality and threats.

Action 15 Monitor and assess health of brown pelicans at selected colonies to determine effects of toxins, oil spill, disease, ectoparasites, etc.

Pelicans are exposed to a variety of chemicals, diseases, and parasites. The effects are not completely understood and more monitoring of these threats is required in order to direct management. Land managers, biologists, and other partners should work collaboratively to conduct regular health assessments of pelicans at a subset of colonies to identify potential sources of illness that may lead to decreased productivity, particularly at colonies where environmental stressors are known to have occurred (e.g., areas impacted by the Deepwater

Horizon oil spill). Although pelicans are frequently involved in oiling events, there are few published data on oiling in Florida (Clapp et al. 1982). There is evidence that pelicans rehabilitated from oil spills have lower survival and reproductive rates than control birds 6 months after treatment (Anderson et al. 1996).

Potential disease threats in Florida include *Aspergillosis* (a fungal disease in the respiratory tract of birds) and, possibly, Newcastle disease (a rare but always fatal virus found in wild birds). Brown pelicans are potentially susceptible to Newcastle due to their close association (may nest alongside) with double-crested cormorants (*Phalacrocorax auritus*), who are prone to contracting this disease. FWC staff is currently testing fecal samples of pelicans at select sites in close proximity to cormorants. Avian botulism also affects pelicans in Florida. Although outbreaks are usually fairly localized, this disease still causes high mortality in Florida each year.

From 1974 to 1998, die-offs involving brown pelicans occurred in 13 years; 8 of the 13 years included die-off from unknown causes (Forrester and Spalding 2003). Some mercury concentrations have been measured in brown pelicans and, although levels were high (36 ppm), this was not considered to be the cause of death. Pelican die-offs have occurred in Florida during the winter months. The FWC and partner agencies have an online reporting system for wild bird die-offs at <http://legacy.myfwc.com/bird/default.asp>, and it should be used to report all bird mortalities. These events were cyclical mortality events with no explanation. Such events provide an opportunity to collect samples and conduct health assessments. The effect of mercury on reproduction in pelicans has not been investigated (Forrester and Spalding 2003). Health assessments for an array of diseases and toxins may include serum titers, oral or fecal swabs, visual surveys, and necropsy. Collecting samples outside of die-off events can be labor intensive and expensive, so regular surveys are dependent upon securing funding and staff resources (see [Action 16](#)).

Lastly, it is important to determine presence, absence, and extent of ectoparasites and their effects on breeding pelicans. A potential limiting factor for brown pelicans is parasitism by ectoparasites. The re-use of colonies year after year may encourage the buildup of large numbers of parasites, such as ticks and mites, which may also act as the vectors for viruses and other microbes (Schreiber and Burger 2002). Monitoring the presence and extent of ectoparasites at selected colonies and determining the impacts caused by the infestation will inform managers of the severity of the threat to the population, and whether action is required at a particular site to limit ectoparasites (Eggert and Jodice 2008).

Action 16 Monitor rates and causes of mortality in brown pelicans.

Trauma caused by fishing gear is the greatest cause of mortality in brown pelicans in Florida (Forrester and Spalding 2003). The foraging technique used by brown pelicans, plunge diving, is energetically costly and successful only when both food resources are good and the bird is in excellent health (Forrester and Spalding 2003). Winter season die-offs of brown pelicans in Florida are not uncommon. Most often the cause of the die-off goes undetermined. During die-off events, when viable carcasses are available, various bird tissues are collected and sent to multiple labs to test for a variety of things including various biotoxins (including botulism), heavy metals, bacteria, and viruses. The sources and extent of adult and juvenile brown pelican

mortality in Florida should continue to be evaluated. These data, coupled with population monitoring, will aid in determining the cause or causes of any decline in the pelican population. An increased mortality rate or a rapid change in the causes of mortality may trigger a management action to address the problem. The FWC and partner agencies have an online reporting system for wild bird die-offs at <http://legacy.myfwc.com/bird/default.asp>, and it should be used to report all bird mortalities. In addition, other resources (i.e., rehabilitation databases) are available and should be utilized to obtain a better understanding of mortality. Mortality rates of young at selected colonies should also be monitored to determine which local threats may limit populations.

Research

Action 17 Identify coarse and fine-scale habitat features of active brown pelican colonies.

Information on coarse- and fine-scale habitat features for active brown pelican colonies can be obtained from a geographic information system (GIS) spatial analysis. Important parameters relating to habitat, isolation, and prey availability have been determined for brown pelican colonies in other states (Visser et al. 2005). Information collected will include area of island, island complexity, distance to nearest freshwater inflow, distance to mainland, distance to boat ramp, area of associated shallow water, distance to deep-water channel, nearest active pelican colony, and occupancy over time. This information will allow managers to focus restoration efforts for current and potential colony locations. FWRI staff received funding for a 1-year study to determine this information and the analysis is currently being conducted.

Action 18 Investigate changes in water quality near historical pelican colonies that have been abandoned.

The water quality in nearshore environments may be impacted by contaminants, sediments, nutrients, and pathogens, which may affect the quality or quantity of nearshore resources as well as the pelican's ability to locate prey (as particles are churned by waves). Pelicans are plunge divers that require relatively clear water to keep a visual fix on their targeted prey as they dive (Shealer 2002). Direct inputs of contaminants from watersheds adjacent to pelican colonies should be measured to determine potential problems in the adjacent nearshore environment. Historical water data can be obtained in areas where pelican colonies used to be located to determine a potential cause of increased turbidity in the water and eventual abandonment of the colony. Results may influence regulation of sediment inputs in potential nesting areas.

Action 19 Determine diet composition and prey availability for breeding brown pelicans.

Diet studies, when coupled with information about the prey base, can reveal other aspects of pelican foraging behavior, such as where they feed, foraging site fidelity, trip duration, and energetic considerations (Shealer 2002). Prey harvests are often correlated with prey abundance and changes in diet often reflect changes in the prey base (Shealer 2002). Small, surface-schooling fishes make up the bulk the brown pelican diet throughout its range (Shields 2002). Along the Atlantic and Gulf coasts of the U.S. brown pelicans commonly select menhaden (*Brevoortia* spp.) and mullet (*Mugil* spp.) (Shields 2002). Quantitative analysis of the diet of

nesting Florida pelicans has not been conducted and may provide important information about prey size class and selection. Studies should include the relationship of prey availability with water temperature, pelican nesting numbers at related colonies, and regional productivity.

Action 20 Determine nest-site fidelity, movement patterns, and turnover rate for pelican colonies within and among years.

Information about colony fidelity will inform protection of present colonies as an effective long-term management tool. Fledge-site fidelity has been documented in pelicans in Louisiana and other locations (Walter et al. 2013, Shealer 2002). Studying the return rate to breed at or near natal sites, will generate estimates of survival, recruitment, and movement patterns of Florida-reared pelicans. Documenting distribution, as well as understanding the factors potentially contributing to movement (e.g., disturbance, sand nourishment impacts, prey abundance, predator risk, or physical alterations to the habitat) will allow a better understanding for management of the species. In addition, knowledge of colony longevity will allow insight into how long colonies persist at individual and regional scales. Colonies that have persisted over time should receive protection and management, as they are potentially more valuable than newer colonies. Research should focus on the persistent colonies to evaluate the surrounding ecological parameters for what determines stable, successful colonies and populations (see [Action 18](#)).

Action 21 Model the impact of climate change (e.g., sea level rise, temperature change, and change in rainfall) on the foraging and breeding habitat and distribution of brown pelicans.

Pelican colony overwash (when extreme weather events cause nests to be flooded or blown down) and resulting vegetation loss is a leading cause of colony abandonment for a season or multiple seasons. Predicting the impacts of climate change on the coastal zone, species movement, nesting patterns, and adaptability is challenging. Rates of sea level rise are expected to accelerate, resulting in the inundation of many low-lying coastal and intertidal areas. The potential impact of 1 m (3.28 ft) of sea level rise in Florida would inundate the majority of breeding habitats (Cerulean 2008). The most severe losses are predicted to occur in areas where the coastline is unable to move inland because of topography or seawalls, and this effect is exacerbated by anthropogenic factors (Galbraith et al. 2002). Frequency and intensity of hurricanes and tropical storms will increase overwash events and impact the habitat and distribution of pelicans. In addition if less rainfall occurs in Florida due to climate change, the salinity of coastal estuaries will increase, potentially impacting prey species. Modeling climate change can inform management about coastal projects that will most effectively protect the brown pelican and its habitat.

Rule and Permitting Intent

Upon approval of the Imperiled Species Management Plan and associated rule changes to Chapter [68A-27.005, F.A.C.](#), the brown pelican will no longer be listed as a Species of Special Concern, but will remain protected under the FWC's General Prohibitions and under Rule [68A-4.001, F.A.C.](#), the brown pelican feeding rule. The pelican is also protected under the federal [Migratory Bird Treaty Act \(MBTA\)](#). Under the MBTA it is unlawful to pursue, hunt, take, capture, kill, possess, or sell migratory birds, including their feathers, eggs, and nests.

Intent of Protections

Action 22 Protect active brown pelican colonies from disturbance.

Disturbance from approaching vessels or pedestrian traffic can lead adult brown pelicans to continuously flush from their nest and expose their young and eggs to predators and environmental factors (Anderson and Keith 1980). Aggravated or persistent disturbance may cause the adults to abandon their nest, leading to egg and young mortality (Shields 2002). Adults in a panic to flush may crush eggs or knock their young out of the nest (Kushlan and Frohling 1985). Rodgers and Smith (1995) recommended a general set-back distance of 100 m (328 ft) for mixed brown pelican and wading bird colonies to minimize or prevent such losses due to human disturbance. Pelicans have been documented breeding year-round in parts of Florida, although peak breeding season statewide is April through June (Shields 2002, Brush 2012). Thus, public access to active colonies should be prohibited year-round. This will require collaboration with local law enforcement.

Action 23 Protect brown pelicans from the threats associated with intentional feeding.

The current brown pelican feeding rule, Rule [68A-4.001, F.A.C.](#), was developed to address large-scale feeding of pelican (e.g., from disposal of scraps from commercial fish processing operations), and does not address the situation of individuals directly or indirectly hand-feeding pelicans. The current interpretation of the rule is not intended to stop someone from feeding a fish to a pelican. Revising this rule to prevent any intentional feeding of brown pelicans, including throwing scraps to pelicans by anglers cleaning fish, would further protect pelicans from the threats associated with human feeding. When anglers and tourists purposely feed pelicans, the birds may be exposed to inappropriate food items (i.e., prey items that would otherwise be inaccessible to the birds), which can lead to choking (e.g., from fish that are too large or bones from scraps) or poor nutrition (e.g., from processed foods such as bread). Pelicans also become habituated to people feeding them, and this can lead to aggressive behavior by the pelicans. As pelicans become habituated to being fed by people, the birds may be more likely to steal fish from fishing lines and can become entangled in the hooks and monofilament lines (see [Action 32](#)). This will also require collaboration with local law enforcement.

Law Enforcement

Action 24 Develop a training module for the FWC's Law Enforcement on the rules and regulations associated with the protection of brown pelicans.

The FWC's Division of Law Enforcement, in conjunction with federal, state, and local partners, is responsible for enforcing Florida's wildlife and fisheries laws. FWC law enforcement officers are vital to the success of achieving the goals and objectives of this plan because they both ensure the enforcement of conservation laws and educate the public on how to identify and report violations.

FWC staff will provide adequate training to FWC law enforcement officers to ensure that they are able to accurately identify Florida’s protected avian species, are aware of all applicable rules and regulations pertaining to these species, and are able to explain to the public the ecological importance of these species. In order for FWC staff to enforce the rules and regulations associated with brown pelicans, they must be appropriately educated on the most pressing issues and threats to the species. Topics to be addressed in the training module should include the following: Migratory Bird Treaty Act, Critical Wildlife Area rules and regulations, monofilament entanglement (officers should be trained and equipped to properly remove hooks and monofilament from entangled birds), litter laws (associated with monofilament), and the brown pelican feeding rule. In order to successfully implement the rules and regulations associated with the protection of brown pelicans, it will be necessary to collaborate with local law enforcement. Staff from CWCI, FBCI, and FSA would be appropriate personnel to lead this effort.

Incentives and Influencing

Action 25 Collaborate with partners, land managers, and FWC staff to develop and implement management recommendations and write white papers and agency position papers on brown pelican conservation and management issues.

Information on management tools that are important to pelican conservation should be compiled and provided to land managers. For many of these issues, considerations for pelicans may be similar to those recommended for other coastal species (e.g., shorebirds and other seabirds). Management recommendations are needed for the following brown pelican conservation issues:

- Predator control
- Posting colonies (including recommended buffer distances). Currently a mechanism for posting buffers off shore of nesting islands (i.e., navigable waters) does not exist but should be considered.
- Minimizing human and pet disturbance
- Shoreline stabilization activities

Action 26 Encourage and influence site management through management plan review and group advisory process on state and federal lands important for pelicans.

The FWC currently participates in Land Management Reviews (LMRs), Integrated Natural Resource Management Plan (INRMP) processes, as well as reviews of management plans for National Forests and National Wildlife Refuges. LMRs evaluate, among other things, the extent to which management of state conservation, preservation, and recreation lands provides protection to Endangered and Threatened species and their habitat. INRMPs (updated every 5 years) are the mechanism by which military installations manage natural resources on their properties. When participating in management plan reviews, FWC staff should encourage site management consistent with pelican needs. FWC staff should become aware of revision schedules for sites inhabited by pelican and proactively offer recommendations, resources, and technical assistance during the review process.

Action 27 Work with partners to promote birding tourism and awareness of its economic impact.

Recreational and commercial coastal activities comprise an important component of Florida's economy. Ecotourism is a growing segment of the tourism industry, and birdwatchers comprise the largest group of ecotourists (Sekercioglu 2002). Florida ranks as the second highest state (following California) in the number of people participating in watchable-wildlife recreation (USFWS 2006). The FWC's Great Florida Birding and Wildlife Trail seeks to promote birding and wildlife viewing sites in communities throughout Florida, and to benefit those communities by bringing in tourism dollars. FWC staff should continue to promote the Great Florida Birding and Wildlife Trail's "Birding is Big Business" campaign and educate business owners about the importance of birding dollars.

Action 28 Support conservation easements as a means for protecting pelicans.

Direct purchase of land may be cost prohibitive, especially for coastal properties. Conservation easements, which protect the land from any future development, have become an important tool for conserving habitat. Private property owners may gain economic or practical benefits from conservation easements on their property. The FWC and partners should identify privately owned islands that host pelican colonies and encourage local governments and other conservation groups to consider those islands for easements. Additionally, informing local government staff of the benefits and opportunities afforded through conservation easements is important. Guidelines and management practices compatible with pelican conservation should be available to those staff for consideration when there is a possibility of acquiring a conservation easement.

Education and Outreach

Action 29 Develop and maintain a website that contains popular, scientific, legal, and permitting information for brown pelicans.

Existing brown pelican resources should be consolidated into a webpage and promoted. This online resource should include the following: The FWC's Great Florida Birding and Wildlife Trail blog <http://onthetrailmyfwc.blogspot.com/>, the FWC's species web page, social media, University of Florida's Institute of Food and Agricultural Sciences website (<http://edis.ifas.ufl.edu/uw193>), Breeding Bird Atlas, Breeding Bird Survey, FSA, and Cornell's online eBird Program. The FWC will continue to fill in informational gaps as they are identified.

Action 30 In areas with the potential for human disturbance at nest sites, increase public awareness by providing educational information at boat ramps and other suitable locations about buffers and disturbance of breeding colonies.

Disturbance at breeding sites by people, pets, and vessels (motorized or unmotorized watercraft) can cause adult pelicans to flush (Rodgers and Smith 1995), leaving eggs and young vulnerable, and may result in nest failure or abandonment (Kushlan and Frohling 1985, Anderson and Keith

1980). Pelicans have been shown to flush at greater distances in response to disturbance during the non-breeding season (Rodgers and Smith 1997), which could result in lowered fitness and reduced survival rates. Information on human disturbance to seabirds can help to educate partners and the public, and to provide justification for closure of buffers around important breeding, foraging, and roosting areas. It is also important to provide this information to the public, both onsite (e.g., at boat ramps nearby) and through other appropriate means of outreach. Increasing public awareness about impacts of disturbance to coastal wildlife is of paramount importance for brown pelicans and other coastal species. Continuing existing partnerships (such as CWCI, FSA, etc.) is important to successful implementation of this action.

Action 31 Reduce mortality caused by entanglement with fishing line through targeted outreach.

Entanglement in fishing gear (hooks and monofilament or fishing line) is a significant source of mortality of brown pelicans (Schreiber and Mock 1988, Schreiber 1980). Addressing this problem will require outreach to anglers about the impacts of monofilament entanglement, as well as outreach to citizens who are willing to assist with ongoing efforts to remove monofilament from waterways. The FWC promotes responsible monofilament disposal through the [Monofilament Recovery and Recycling Program](#) (MRRP) and should continue to engage partners working on this and related issues (e.g., the Florida Entanglement Working Group, Save Our Seabirds, and others). Many partner organizations promote this message; for the last 20 years, Audubon’s Florida Coastal Islands Sanctuaries has coordinated a fishing gear removal project in the fall when birds are not nesting with Tampa Bay Watch and 5 years with Sarasota Bay Watch. Additionally, other existing FWC outreach and education programs should continue to be used and expanded to promote responsible marine resource stewardship (e.g., [Kids Fishing Clinics](#), [Women’s Fishing Clinics](#), and [Ladies, Let’s go Fishing](#)).

Engage appropriate supply manufacturers in future conservation efforts (e.g., correct monofilament disposal)

Partnering with fishing gear manufacturers to promote and advertise the need for proper disposal is a way to ensure that this important message reaches the target audience. For example, manufacturers could include information on the importance of properly disposing used line directly on the monofilament spools and packaging. Manufacturers may also be willing to sponsor MRRPs in areas that do not already have them, and CWCI partners may be able to assist with finding local volunteers to periodically check and empty recycling containers.

Support and promote coastal clean-up efforts to keep monofilament out of the water and colonies as well as clean up roosting and foraging areas

The FWC and partners will continue to promote and participate in coastal clean-up efforts to remove monofilament from important pelican breeding, foraging, and roosting areas. In addition to the annual Ocean Conservancy’s [International Coastal Clean-Up](#) that attracts volunteers throughout Florida and the world every September, there are many regular and periodic clean-ups organized by local groups around the state. The FWC, through the CWCI, can promote the message that monofilament can be deadly to pelicans and other waterbirds and can educate anglers and recreationists on the proper disposal of monofilament. CWCI can work with partners

to ensure that important pelican breeding foraging and roosting areas are targeted during local clean-up events and that the timing of these events is appropriate (i.e., organize events at important colony locations prior to breeding season).

Develop "Don't cut the line" signs and educate the public on proper disposal of monofilament

The FWC and CWCI should continue to educate the target audience and distribute information about what an angler should do if he or she accidentally hooks a bird (i.e., Save our Seabirds' ["Don't Cut the Line" brochure](#)), using existing materials as appropriate. In addition to signs at fishing piers and marinas, boater's guides, electronic and print media, annual news releases, and information on FWC and partner websites can help disseminate these messages.

Action 32 Develop "Don't Feed the Pelicans" signs that target small-scale (non-commercial) feeding.

Feeding brown pelicans is more than a casual occurrence; it is a tourist attraction around the state, and many establishments specifically sell food to tourists to feed pelicans. In addition, pelicans are intentionally and unintentionally fed by people at fish-cleaning stations and marinas. Pelicans naturally eat fish that they can swallow whole, and eating scraps of larger fish (e.g., fillet carcasses of sport fish) can result in bones getting lodged in the throat, and ultimately, death. Another danger is puncturing of the throat and upper gastrointestinal tract with spines and large bones of fish exposed by filleting the fish (Fitzgerald 2012). Eating fish they would not normally catch may also expose them to higher levels of environmental contaminants (e.g., toxins can be biomagnified in bottom-dwelling species) (Arcos et al. 2002) and could have a negative effect on survival or productivity of the pelicans (Romano et al. 2006).

Monofilament entanglement is a serious threat to pelicans and other waterbirds (see [Action 31](#), [Action 33](#)). Birds fed by people may become habituated to human activity and are more likely to approach fishermen in search of fish. This could result in birds becoming entangled or tearing their pouches or feet on fishing gear, ultimately resulting in death. For all of these reasons, it is critical that biologists and land managers work together to educate anglers, recreationists, and tourists about the dangers of feeding brown pelicans. Signs and educational kiosks should be placed at appropriate sites including marinas, piers, and cleaning stations. Law enforcement presence should be expanded around the busiest cleaning sites, particularly in marinas with large charter fishing fleets (e.g., Haulover Marina in Miami-Dade County) parallel to any outreach and collaboration with local law enforcement will also be necessary.

Coordination with Other Entities

Many of the actions in this plan involve coordination with other agencies, non-governmental organizations, and local governments. Those actions are included in other sections where they are most relevant.

Action 33 Coordinate with wildlife rehabilitation centers to collect information on pelican injury and mortality.

FWC staff will continue to coordinate with wildlife rehabilitation centers to facilitate information sharing about human-related injuries and episodic mortality events. Wildlife rehabilitation center staff can provide information on tagged birds and data on cause of injuries. This information helps biologists better understand causes and rates of injury and mortality. In turn, FWC staff may be able to assist wildlife rehabilitation center staff with education and outreach efforts and materials for issues such as entanglement. Limited resources for both agency staff and wildlife rehabilitation staff would be more effective and efficient through collaboration. FWC veterinarians at the FWRI are in regular contact with various rehabilitation centers throughout the state and often rely on the rehabilitation center staff to alert the FWC to unusual events or mortalities. To ensure timely response, rehabilitation clinics should be encouraged to report cases of diseased birds on the online wild bird die-off reporting system at <http://legacy.myfwc.com/bird/default.asp>.

Table 1. Brown Pelican (*Pelecanus occidentalis*) Conservation Action Table

NOTE: An explanation of acronyms used is below the table.

Objective(s) Addressed	Team Assigned Priority Level	Action Item Number	Action Items	Conservation Action Category	Ongoing, Expanded or New Effort?	Authority	Man Power	Estimated Cost To Implement	Funding Source(s)	Lead for Implementation: FWC Program(s) and/or Section(s)	External partners	Likely Effectiveness	Feasibility	Urgent?
2	2	1	Promote and utilize shoreline stabilization activities in and around colonies.	Habitat Conservation & Mgmt	EXPANDED	NO	NO	TBD	Grants, AHRE funds, others	SCP/AHRE	WMDs, federal and state land managers/ agencies/ Army Corps	High.	Moderate. Many agencies are already doing this work, but more funding and focus on colonies will be necessary to fully implement.	NO
2	1	2	Work with partners to restore, protect, improve, or create suitable breeding habitat on spoil islands.	Habitat Conservation & Mgmt, Coordination with Other Entities	EXPANDED	NO	YES	TBD	Grants, AHRE funds, others	SCP/AHRE/ Invasive Plant Management/ Exotic Species Coordination	WMDs, federal and state land managers/ agencies/ Army Corps	Moderate.	Moderate. Will require further funding and cooperative partners.	NO
2	3	3	Eliminate non-native plant species in and around colonies.	Habitat Conservation & Mgmt	EXPANDED	NO	NO	TBD	Existing funds	Invasive Plant Management/ SCP	All land managers/ agencies	Moderate.	Moderate. There are many programs and agencies in place to implement this action, but removing nonnative species will likely never be fully accomplished.	NO
1,2	4	4	Work with partners to ensure continued water quality monitoring, estuary health assessments, etc. and assist and advise where water quality is poor in order to improve conditions for brown pelicans.	Habitat Conservation & Mgmt, Coordination with Other Entities	ONGOING	NO	NO	TBD	Unknown	AHRE/Marine Fisheries/FWRI	All land managers/ agencies	Low.	Moderate - this is ongoing.	NO
2	4	5	Encourage private landowners to manage for brown pelicans and potentially acquire private lands where brown pelican colonies are located if it is determined that further management and protection is necessary.	Habitat Conservation & Mgmt, Coordination with Other Entities	NEW	NO	NO	TBD	Grants	WHM/land acquisition and planning	Private landowners	Low.	Moderate.	NO
1	2	6	Identify brown pelican colonies where predation is a threat and manage according to established predator control recommendations for that area.	Population Mgmt	EXPANDED	NO	NO	TBD	Grants, existing funds	Exotic Species Coordination/SCP (Regional Biologists)	All land managers/ agencies, USDA	High.	Moderate - predator control is expensive and, usually, controversial. Will require additional funding and potential outreach and education for the public to support this action.	NO
1	1	7	Post brown pelican colonies where feasible and appropriate.	Population Mgmt	EXPANDED	NO	YES	TBD	Grants, existing funds	SCP	All land managers/ agencies, FSA	High.	High.	YES
1,2	1	8	Establish new Critical Wildlife Areas for important colonies and continue management of existing CWAs that support brown pelicans.	Population Mgmt	EXPANDED	NO	YES	TBD	Existing funds	SCP/ Law Enforcement/ Regional Directors	All land managers/ agencies	Moderate.	High - CWAs, though not easy to establish, give agency staff a strong tool in the conservation of this species.	YES
1	1	9	Ensure that the brown pelican is included and considered in U.S. Coast Guard Area Contingency Plans and FWC Oil Spill Response Plans.	Population Mgmt, Coordination with Other Entities	ONGOING	YES	YES	TBD	Existing funds	FWRI/SCP	US Coast Guard/NOAA	High.	Moderate - this is already occurring.	NO
1	1	10	Develop and implement a statewide monitoring protocol.	Monitoring & Research	EXPANDED	NO	YES	TBD	Unknown	FWRI	Universities/FSA partners	High.	High - the development of a monitoring strategy is highly feasible with collaboration with partners within the FSA.	NO
1	1	11	Determine statewide population and trends of breeding brown pelicans.	Monitoring & Research	EXPANDED	NO	YES	TBD	Unknown	FWRI/SCP	Universities/FSA partners	High.	High - this can be achieved with a coordinated effort through partners and is critical to determine if we are meeting the goals and objectives of this plan.	NO
1	2	12	Determine breeding productivity for a subsample of brown pelican colonies.	Monitoring & Research	NEW	NO	NO	TBD	Unknown	FWRI	Universities/FSA partners	High.	Moderate - selecting a subsample of colonies to collect this information makes this action feasible although labor intensive and time consuming.	NO
1	2	13	Document distribution of brown pelican nesting colonies.	Monitoring & Research	EXPANDED	NO	YES	TBD	Unknown	FWRI	Universities/FSA partners	High.	High - this is ongoing, we currently know the distribution of nesting colonies and monitoring when new colonies show up will be possible through monitoring. Many larger colonies have persisted >40 years.	NO

Table 1. Brown Pelican (*Pelecanus occidentalis*) Conservation Action Table

Objective(s) Addressed	Team Assigned Priority Level	Action Item Number	Action Items	Conservation Action Category	Ongoing, Expanded or New Effort?	Authority	Man Power	Estimated Cost To Implement	Funding Source(s)	Lead for Implementation: FWC Program(s) and/or Section(s)	External partners	Likely Effectiveness	Feasibility	Urgent?
1	4	14	Determine the nesting chronology of brown pelicans nesting in Florida.	Monitoring & Research	NEW	NO	YES	TBD	Unknown	FWRI/SCP	Universities/FSA partners	Moderate.	Moderate - because of the potential for colonies to be active year-round this information will potentially be difficult to obtain and highly variable from year to year.	NO
1	3	15	Monitor and assess health of brown pelicans at selected colonies to determine effects of toxins, oil spill, disease, ectoparasites, etc.	Monitoring & Research	NEW	NO	NO	TBD	Unknown	FWRI	Universities	Moderate.	Low - this is expensive and labor intensive work. Without additional funding, it wouldn't be possible. Though it isn't urgent, there is very little known about the health of colonies in FL and how it may affect the population.	NO
1	3	16	Monitor rates and causes of mortality.	Monitoring & Research	EXPANDED	NO	YES	TBD	Unknown	FWRI	Universities/FSA partners	High.	Moderate. This is already occurring at some level but there needs to be more communication with rehabbers to report mortality online.	NO
2	4	17	Identify coarse and fine-scale features of active brown pelican colonies.	Monitoring & Research	NEW	YES	YES	TBD	Grants, unknown	FWRI	Universities/FSA partners	Moderate.	High. This analysis is already in process.	NO
1	2	18	Investigate changes in water quality near historical pelican colonies that have been abandoned.	Monitoring & Research	ONGOING	YES	YES	TBD	Unknown	FWRI/SCP	Universities/FSA partners	High.	High - Resources available for conducting aerial surveys can develop methods for counting ground colonies.	NO
1	4	19	Determine diet composition and prey availability for breeding brown pelicans.	Monitoring & Research	NEW	NO	NO	TBD	Unknown	FWRI	Universities/FSA partners	Low.	Low - this is expensive and labor intensive work involving many organizations and agencies. Without additional funding, it would not be possible.	NO
1,2	4	20	Determine nest-site fidelity, movement patterns, and turnover rate for pelican colonies within and among years.	Monitoring & Research	NEW	NO	YES	TBD	Unknown	FWRI	Universities/FSA partners	High.	Moderate - A study design geared at long term monitoring at the appropriate scale would provide useful information.	NO
2	5	21	Model the impact of climate change (sea-level rise, temperature change, and change in rainfall) on the foraging and breeding habitat and nesting distribution of pelicans.	Monitoring & Research	ONGOING	YES	NO	TBD	Grants, existing budgets	FWRI/Information Science Management section	Climate Change Centers/ NOAA/ LCCs	Moderate.	High - this is ongoing.	NO
1	1	22	Protect active brown pelican colonies from disturbance.	Protections & Permitting	ONGOING	YES	YES	TBD	Existing budget	SCP/LE/Legal Office	Not Applicable	Low.	Moderate - this is the single most important action in protecting this species.	YES
1	1	23	Protect brown pelicans from the threats associated with intentional feeding.	Protections & Permitting	EXPANDED	YES	YES	TBD	existing budget	SCP/LE/Legal Office	Not Applicable	Moderate.	High.	YES
1,2	3	24	Develop a training module for the Law Enforcement Academy on the rules and regulations associated with the protection of brown pelicans.	Law Enforcement	NEW	YES	YES	TBD	Existing budget	SCP/CWCI	FSA partners	High.	Moderate.	NO
1,2	3	25	Collaborate with partners, land managers, and FWC staff to develop and implement management recommendations and author white papers and/or agency position papers on brown pelican conservation and management issues.	Incentives & Influencing, Coordination with Other Entities	EXPANDED	NO	YES	TBD	Grants, existing budget	SCP/CWCI/WHM/FWRI	All land managers/ agencies	High.	Moderate - ongoing to a certain extent but will require more staff time and resources.	NO
2	5	26	Encourage and influence site management through management plan review and group advisory process on state and federal lands important for pelicans.	Incentives & Influencing, Coordination with Other Entities	ONGOING	YES	YES	TBD	Existing budget	SCP/Habitat Conservation Scientific Services	DEP/ Department of Defense	Low.	High - FWC in reviews is ongoing, staff should consider brown pelican requirements when providing feedback.	NO

Table 1. Brown Pelican (*Pelecanus occidentalis*) Conservation Action Table

Objective(s) Addressed	Team Assigned Priority Level	Action Item Number	Action Items	Conservation Action Category	Ongoing, Expanded or New Effort?	Authority	Man Power	Estimated Cost To Implement	Funding Source(s)	Lead for Implementation: FWC Program(s) and/or Section(s)	External partners	Likely Effectiveness	Feasibility	Urgent?
1	5	27	Work with partners to promote birding tourism and awareness of its economic impact.	Incentives & Influencing, Coordination with Other Entities	ONGOING	NO	YES	TBD	Existing budget	SCP/OPAWVS	Audubon/ FOS/ wildlife agencies	Low.	Low.	NO
2	2	28	Support conservation easements as a means for protecting pelicans.	Incentives & Influencing	ONGOING	YES	YES	TBD	Existing budget	Habitat Conservation Scientific Services/Private Lands	NRCS/other federal agencies that provide incentives	Low.	Low.	NO
1	5	29	Develop and maintain a web page that contains popular, scientific, legal, and permitting information for brown pelicans.	Education & Outreach	ONGOING	YES	YES	TBD	Existing budget	Office of Information Technology/SCP	Not Applicable	Moderate.	Moderate.	NO
1,2	1	30	In areas where there is a high risk of human disturbance at nest sites, increase public awareness by providing information at boat ramps and other suitable locations about buffers around breeding colonies.	Education & Outreach	EXPANDED	YES	YES	TBD	Existing budget, grants	SCP/CWCI/FSA/ Marine Fisheries	Anglers/ Recreationists, land managers	Moderate - some of this is ongoing though we propose to expand the effort, which would require extra staff and resources.	Moderate.	YES
1,2	1	31	Reduce mortality caused by entanglement through targeted outreach.	Education & Outreach	EXPANDED	NO	NO	TBD	Existing budget, grants	SCP/CWCI/FSA/ OCR/Legal office	Fishing Equipment Industry/ manufacturing/ wildlife rehabilitation centers/ Anglers/ Recreationists	High.	Moderate - some aspects are already occurring more focus on working with manufacturers and on clean-up efforts in/around colonies are necessary. Signs do not guarantee compliance, but coupled with redefining the pelican feeding rule, this could be an effective way to minimize interaction between pelicans and fishing line. In the event that pelicans do become entangled, anglers will have a better understanding of the appropriate actions to take rather than cutting the line.	YES
1	1	32	Develop "Don't feed the Pelicans" signs that target small-scale (non-commercial) feeding.	Education & Outreach	NEW	YES	YES	TBD	Existing budget	SCP/OCR/Legal office	Wildlife rehabilitation centers/Boat marinas, Anglers/ Recreationists	High.	Moderate - signs do not guarantee compliance, but coupled with redefining the pelican feeding rule, this could be an effective way to minimize interaction between pelicans and fishing line.	YES
1	3	33	Coordinate with wildlife rehabilitation centers to collect information on pelican injury and mortality.	Coordination with Other Entities	ONGOING	YES	YES	TBD	Existing budget	SCP and FWRI's Fish and Wildlife Health section	All wildlife rehabilitation centers	High.	High - this is already occurring to a certain degree; we would just like to expand upon it.	NO

Acronyms used in this table:

AHRE:	Aquatic Habitat Restoration and Enhancement
CWA:	Critical Wildlife Area
CWCI:	Coastal Wildlife Conservation Initiative
DEP:	Florida Department of Environmental Protection
FOS:	Florida Ornithological Society
FSA:	Florida Shorebird Alliance
FWC:	Florida Fish and Wildlife Conservation Commission
FWRI:	Fish and Wildlife Research Institute, the research branch of the Florida Fish and Wildlife Conservation Commission
LCC:	Landscape Conservation Cooperative
LE:	Law enforcement
NOAA:	National Oceanic and Atmospheric Administration
NRCS:	National Resource Conservation Service
OCR:	Office of Community Relations, administered by the Florida Fish and Wildlife Conservation Commission
OPAWVS:	Office of Public Access and Wildlife Viewing Services, administered by the Florida Fish and Wildlife Conservation Commission
SCP:	Species Conservation Planning, a Section of the FWC's Division of Habitat and Species Conservation
TBD:	To be determined
USDA:	United States Department of Agriculture
WHM:	Wildlife and Habitat Management, a Section of the FWC's Division of Habitat and Species Conservation
WMD:	Water Management District(s)

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