

**A Species Action Plan for Six  
Imperiled Wading Birds:**

**Little Blue Heron (*Egretta caerulea*)**  
**Reddish Egret (*Egretta rufescens*)**  
**Roseate Spoonbill (*Platalea ajaja*)**  
**Snowy Egret (*Egretta thula*)**  
**Tricolored Heron (*Egretta tricolor*)**  
**White Ibis (*Eudocimus albus*)**

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## EXECUTIVE SUMMARY

This plan details the actions necessary to improve the conservation status of 6 wading birds: the little blue heron (*Egretta caerulea*), reddish egret (*Egretta rufescens*), roseate spoonbill (*Platalea ajaja*), snowy egret (*Egretta thula*), tricolored heron (*Egretta tricolor*), and white ibis (*Eudocimus albus*).

The Florida Fish and Wildlife Conservation Commission (FWC) developed this plan in response to the determination that the little blue heron, tricolored heron, reddish egret, and roseate spoonbill be listed as Threatened and that the snowy egret and white ibis be removed from the Florida Endangered and Threatened Species List. These 6 species are collectively referred to in this plan as the *imperiled wading birds*. The goals of this plan are to improve the conservation status of the little blue heron, reddish egret, roseate spoonbill, and tricolored heron to the point these species can be removed from the Florida Endangered and Threatened Species List; and improve the conservation status of the snowy egret and white ibis so their populations are maintained or improved such that they do not need to be listed in the future.

Objectives are to 1) reverse the decline of the little blue heron and tricolored heron, 2) maintain the populations of snowy egret and white ibis, and 3) increase the population size of the reddish egret and roseate spoonbill, thereby increasing the number of locations in which they occur. In order to achieve these 3 objectives and to provide for migratory populations of these species as well, the final objective (4) is to improve the quality and amount of wading bird habitat. Achieving these objectives will require minimizing the primary causes of decline by slowing the alteration and loss of wetlands. Priority conservation actions that will promote the objectives of this plan include identifying priority imperiled wading bird habitat on public lands and management actions needed to improve its amount and quality, participating in actions that promote careful implementation of Everglades restoration, and planning for climate change impacts (sea level rise, temperature change, and change in rainfall) on the nesting and foraging habitat.

Successful management of the imperiled wading birds through implementation of 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 its successful implementation requires the cooperation of and coordination with other agencies, organizations, private interests, and individuals. Any significant changes to this management plan will be made with the involvement of stakeholders.

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.

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## **GLOSSARY OF TERMS AND ACRONYMS**

Biological Status Review, 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, Florida Administrative Code. These criteria, based on the IUCN criteria and IUCN guidelines, are used to help decide if a species should be added or removed from the Florida Endangered or Threatened Species List. In addition, FWC staff may provide within the report a biologically justified opinion that differs from the criteria-based finding.

Breeding Season: Dates of breeding vary widely between wading bird species and from year to year depending on the availability of suitable conditions. Latitude also affects breeding; generally it begins earlier in Florida Bay and the Florida Keys.

CCB: Cooperative Conservation Blueprint

CERP: Comprehensive Everglades Restoration Plan

Colony: A congregation of 1 or more species of breeding birds that nests in close proximity to a particular location.

DDT: Dichlorodiphenyltrichloroethane. A pesticide that impacted avian populations through reduced and contaminated prey.

DEP: Florida Department of Environmental Protection

DNA: Deoxyribonucleic acid

EWMA: Everglades and Francis S. Taylor Wildlife Management Area

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.

FCCMC: Florida Coordinating Council on Mosquito Control

FIND: Florida Inland Navigation District

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

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

F.S.: Florida Statutes

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

**GIS:** Geographic Information System

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

**Imperiled Wading Birds:** Collectively refers to the 6 species covered in this plan: the little blue heron (*Egretta caerulea*), reddish egret (*Egretta rufescens*), roseate spoonbill (*Platalea ajaja*), snowy egret (*Egretta thula*), tricolored heron (*Egretta tricolor*), and white ibis (*Eudocimus albus*).

**ISMP:** Imperiled Species Management Plan

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

**KOEBCC:** The Kissimmee-Okeechobee-Everglades-Big Cypress Coordination Team. A group composed of FWC staff from different divisions that coordinate, prioritize, and provide comments and technical support specifically related to FWC's mission for the various South Florida Ecosystem Restoration teams.

**MBTA:** Migratory Bird Treaty Act (16 U.S.C. 703–711). The federal statute protecting nearly all native birds, their eggs, and nests. 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."

**MFL:** Minimum Flows and Levels, the minimum water flows and/or levels adopted by the District Governing Board as necessary to prevent significant harm to the water resources or ecology of an area resulting from permitted water withdrawals. MFLs define how often and for how long high, average, and low water levels and/or flows should occur to prevent significant harm. When use of water resources alters the water levels below the defined MFLs, significant ecological harm can occur.

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

**Nest:** A structure created or used by imperiled wading birds for reproduction, whether or not reproduction was successful.

**Nestling:** Young still confined to the nest for protection.

NGO: Non-governmental Organization(s)

NPS: National Park Service

NRCS: Natural Resource Conservation Service, a branch of the United States Department of Agriculture

PDT: Project Development Team

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

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

RECOVER: Restoration Coordination and Verification Team. An interagency team charged with ensuring the landscape-level aspects of CERP are integrated into CERP projects.

Reproductive Success: The number of fledglings produced annually by one breeding pair.

Take: As defined in Rule 68A-27.001(4), F.A.C., pertaining to Threatened species: "To harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in such conduct."

As defined in Chapter 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."

SFWMD: South Florida Water Management District

SOMM: Subcommittee on Managed Marshes

STA: Stormwater Treatment Area

STA/R: Stormwater Treatment Areas and Reservoirs

Successful Nest: A nest that produces at least 1 fledgling.

USACE: United States Army Corps of Engineers

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

WCA: Water Conservation Area

## GLOSSARY OF TERMS AND ACRONYMS

**WCPR:** Wildlife Conservation, Prioritization, and Recovery. A program administered by the FWC on FWC-managed areas to ensure protected lands are managed for the greatest benefit to wildlife.

**WRP:** Wetlands Reserve Program

**WMA:** Wildlife Management Area

**WMD:** Water Management District

## INTRODUCTION

The 6 species covered in this plan are the little blue heron (*Egretta caerulea*), reddish egret (*E. rufescens*), roseate spoonbill (*Platalea ajaja*), snowy egret (*E. thula*), tricolored heron (*E. tricolor*), and white ibis (*Eudocimus albus*). They are collectively referred to in this plan as the *impaired wading birds*. Because of significant overlap in habitat, distribution, and geographic range, as well as shared threats faced by each species, the combined management needs for all six species are addressed in this multi-species plan.

## Biological Background

### *Habitat*

Wading birds depend on healthy wetlands, mangrove and other islands, and vegetated areas suitable for resting and breeding and which are near foraging habitat. The little blue heron, roseate spoonbill, snowy egret, tricolored heron, and white ibis forage in shallow marine, brackish, or freshwater sites, including tidal ponds and sloughs, mudflats, mangrove-dominated pools, freshwater sloughs and marshes, and human-created impoundments (Figure 1). The white ibis and little blue heron rely on freshwater forage sites to raise young until they become more salt tolerant (Frederick 1996, Rodgers 1996). Reddish egrets are restricted to coastal areas of Florida and forage in mostly shallow marine environments such as sandbars and sandy shorelines that are devoid of grass. Nesting occurs on coastal islands near foraging sites.

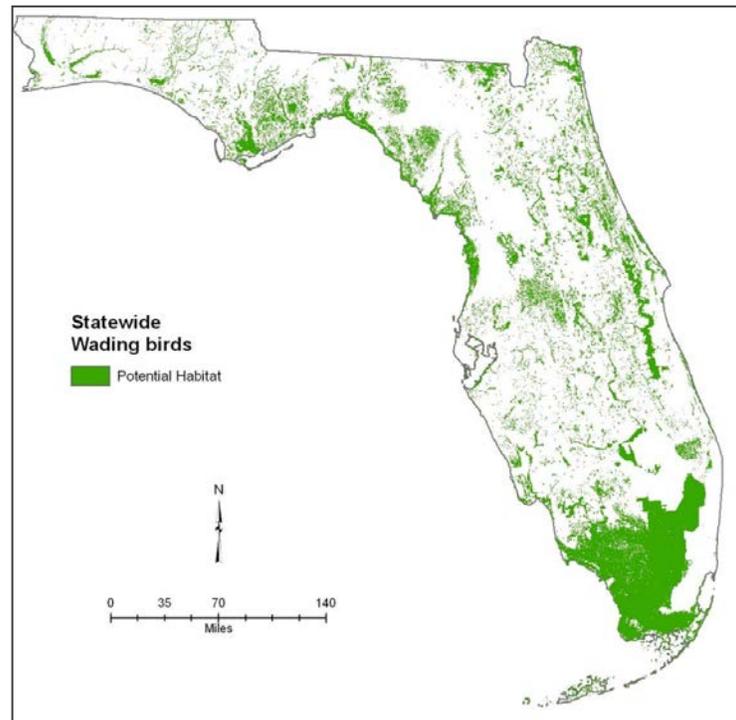


Figure 1. Statewide potential habitat map.

### *Breeding Behavior*

The little blue heron, snowy egret, tricolored heron, reddish egret, and roseate spoonbill typically nest in multi-species colonies of various sizes. Reddish egrets may also occasionally nest in small single-species groups or build solitary nests. Though white ibises often nest with other species, they tend to nest in dense, single-species colonies, sometimes with thousands of birds.

Little blue herons, white ibises, tricolored herons, and snowy egrets nest in a variety of woody vegetation including cypress (*Taxodium distichum*), willow (*Salix* spp.), red maple (*Acer rubrum*), buttonwood (*Conocarpus erectus*), mangroves (most commonly *Rhizophora mangle*), and Brazilian pepper (*Schinus terebinthifolius*) (Ogden 1996a, Rodgers 1996). Tricolored herons

nest in similar conditions, though they are primarily found nesting in coastal habitat (Ogden 1996b). Roseate spoonbills and reddish egrets nest primarily on coastal islands in mangroves or Brazilian pepper but also are found nesting on spoil islands, especially in the Tampa Bay and Mosquito Lagoon regions (Bjork and Powell 1996, Hodgson and Paul 2010).

### *Food*

The reddish egret and tricolored heron feed primarily on small fish. The reddish egret actively pursues its prey by chasing schools of fish in shallow waters, an adaptation that allows it to forage in the shallow flats typical of its coastal habitat (Lowther and Paul 2002). Snowy egrets and tricolored herons are also active foragers, stalking wetland fish and vertebrate and invertebrate prey. The little blue herons are more



Figure 2. Wading birds foraging at St. Marks National Wildlife Refuge. Photograph by Andy Wraithmell.

stealthy hunters and feed on a variety of fish, aquatic crustaceans, insects, small amphibians, worms, or snakes (Ogden 1996a, Rodgers 1996). Roseate spoonbills feed primarily on small fish and other aquatic animals (Lorenz et al. 2009, Lorenz 2013a). The white ibis preys primarily on aquatic crustaceans and insects in both wetland and upland habitats (Bjork and Powell 1996).

### *Distribution*

Little blue herons breed from Maine and California south to northern South America. The species is widely distributed throughout Florida. Reddish egrets are found on coastlines from Columbia and Venezuela north to the Gulf of Mexico and Baja Peninsula, and in the Caribbean. They occur along both the Gulf and Atlantic coasts throughout Florida but nesting is restricted mainly to Florida Bay, Tampa Bay, and Merritt Island. Roseate spoonbills breed in coastal areas throughout South and Central America, the Caribbean, and the Gulf of Mexico. In Florida they nest on mangrove islands and dredge spoil islands from Tampa Bay on the Gulf of Mexico south to Florida Bay and north to Brevard County on the Atlantic coast, including the St. Johns River basin. They also nest inland in the Water Conservation Areas of the Everglades. Snowy egrets are found throughout the western hemisphere, and occur throughout Florida. The breeding range for the tricolored heron extends along the entire U.S. Atlantic and Gulf of Mexico coasts, throughout the Caribbean, and along both coasts of Mexico and coastal areas of northern South America. The species occurs throughout most of Florida in both freshwater and estuarine habitats. The range of the white ibis extends from the mid-Atlantic coast and southern Pacific coast of North America, south into northern South America. The white ibis occurs throughout Florida with large nesting colonies in south Florida and Tampa Bay.

### Conservation History

In the 19<sup>th</sup> century, plume hunting and hunting for food had a devastating impact on wading bird populations, both from direct take and from recurring disturbance at breeding sites that reduced reproductive success. The 1918 establishment of the [Migratory Bird Treaty Act](#) (16 U.S.C. 703–711) provided measures to prohibit the take of birds (and their nests and eggs) native to North America, including the 6 wading birds addressed in this plan. These wading birds also have been afforded protection by their inclusion on Florida’s Endangered and Threatened Species List.

Protection of both nesting and foraging habitat has benefitted wading birds. Site-specific habitat protection has been important in protecting colonies where birds return to nest year after year. Audubon’s Florida Coastal Island Sanctuaries program protects the Tampa Bay region’s largest reddish egret, roseate spoonbill, and white ibis colony at Alafia Bank Bird Sanctuary. The 1947 establishment of Everglades National Park implemented significant protection for wading birds that breed and forage in south Florida, especially since the park includes the waters of Florida Bay. The Florida Department of Environmental Protection’s (DEP) [Aquatic Preserve Program](#) offers protections to coastal foraging and breeding habitat. The United States Fish and Wildlife Service’s (USFWS) Florida National Wildlife Refuges and [Important Bird Areas](#) (Audubon Florida) also protect many important wading bird nesting and foraging sites.

Conservation planning has also contributed to wading bird knowledge and protection. [The North American Waterbird Conservation Plan](#) (Kushlan et al. 2002) and the step-down [Southeast United States Waterbird Conservation Plan](#) (USFWS 2006) identified goals and priorities for wading birds and other waterbirds. The USFWS is currently developing a reddish egret conservation plan with the cooperation of partners and experts. The Florida Game and Fresh Water Fish Commission’s (the predecessor to the Florida Fish and Wildlife Conservation Commission [FWC]) Closing the Gaps report (Cox et al. 1994) identified strategic habitat areas in the state most important to wading birds, and the Rare and Endangered Biota of Florida, Volume V: Birds (Rodgers et al. 1996) compiled the conservation needs for all 6 of the wading bird species addressed in this plan. Each of these sources was consulted in the drafting of this plan.

In addition, most wading bird habitat is protected by state and federal regulations that protect wetlands. The federal [Clean Water Act](#) and Florida’s [Wetland Resource Permitting Program](#) each require a permit for dredging and filling activities unless specifically exempted. Both are designed to minimize adverse impacts to wetlands, and where impacts are unavoidable, to provide mitigation that will replace the function and value of the loss. Under state law, fish and wildlife (with emphasis on listed species) use of the wetland is 1 of the 7 factors used in the public interest test portion of evaluating projects prior to permit issuance (see s. 373.414, Florida Statutes [F.S.]).

While heavy metals (e.g., methylmercury) and other contaminants (e.g., pyrethroids, organophosphates) continue to threaten the health of wading bird populations, in 1972 the U.S. Environmental Protection Agency banned all domestic use of dichlorodiphenyltrichloroethane (DDT), and this prohibition allowed wading bird populations to recover from pesticide poisoning. DDT impacted wading birds both through a reduction in reproductive success through eggshell thinning and direct toxicity to their aquatic prey.

### Threats and Recommended Listing Status

Although significant historic threats such as plume hunting and loss of eggs and young to the effects of DDT have been minimized, wading birds are still vulnerable. Key threats to Florida's imperiled wading birds are: loss of suitable foraging and breeding areas due to human disturbance of nesting colonies; elevated populations of native and exotic predators that cause nest failure; and habitat degradation, including altered hydrological regimes, lower water tables, nutrient enrichment of waters, among others.



Figure 3. Tricolored heron on nest. FWC photograph.

Wading birds generally require a variety of wetland sites in order to accommodate the annual variation in rainfall, and flexibility to such conditions has been documented by use of alternative nesting and foraging sites during particularly wet or dry years (Ogden 1996a). However, dredge and fill activities have largely eliminated this natural variability in wetlands.

Water management practices also contribute to increased salinity in estuaries. Altered hydrology and human use of fresh water reduces the amount flowing into Florida's estuaries. Hyper-salinity can cause mangrove die-offs and further reduce breeding habitat (Paul 1996). Higher salinity also reduces the productivity of wading bird prey (Lorenz 1999, Lorenz and Serafy 2006), thereby reducing nesting success (Lorenz 2013a).

Nesting sites must have suitable foraging habitat nearby. Foraging habitat is largely affected by water quality, as pollutants and turbidity may reduce the composition or quality of prey and altered drainage may also impact prey availability (Ogden 1996a). Reproductive success is strongly linked to foraging success (Frederick and Spalding 1994, Frederick 2002), which is tied to water depth, prey density (Gawlik 2002), and vegetation type and density (Lanz et al. 2010). Effects of food supply and food availability are so strong that they can be seen as the most important natural limitations to reproduction and perhaps life history in these birds.

Wading birds are also vulnerable to pesticides, heavy metals, and other environmental contaminants. As top predators in an aquatic food web, these species have high exposure to biomagnified chemicals. The effects of most substances at low, chronic levels or as cocktails of multiple chemicals are largely unknown but may be significant. For example, chronic exposure of white ibises to levels of methylmercury typical in the Everglades resulted in nearly a 50% decrease in reproductive success and caused half of the males to pair with other males (Frederick and Jayasena 2010, Jayasena et al. 2011).

In addition to limited availability of suitable habitat, wading bird populations are threatened by disturbance during key stages in their life cycle. Disruption of incubating birds by marine traffic and incompatible recreation activity at or near breeding sites are examples of human-caused disturbance. In response to disturbance, nesting birds may leave eggs and young unattended,

thereby increasing the risk of loss to waiting predators (Rodgers 1996) and exposing eggs or young to the sun or cold.

The reddish egret and roseate spoonbill face significant species-specific threats. The reddish egret is a habitat specialist restricted to coastal wetlands (Paul 1996) and is especially vulnerable to alteration of coastal habitat through development, recreational use, future sea level rise, and water management practices that impact estuaries and productivity of small prey fish (Lorenz 2013b). Loss of genetic diversity and interchange and increased predator pressure also threaten this population. Roseate spoonbills are restricted to breeding sites free of raccoons (*Procyon lotor*) and depend on gradual dry-down in foraging habitat to concentrate prey (Bjork and Powell 1996). Degradation or loss of habitat due to coastal development, hydrologic alterations to wetlands, and reductions to important prey sources are of primary concern (Lorenz 1999, Lorenz et al. 2002).

In 2010, 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 . The FWC convened a biological review group (BRG) of experts on the imperiled wading birds to assess the biological status of these species by using criteria specified in Chapter 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). The listing status of each of the imperiled wading birds was assessed during the [Biological Status Review](#) conducted by FWC. Four species met criteria for listing as Threatened: the little blue heron, reddish egret, roseate spoonbill, and tricolored heron. Two species did not meet any criteria for listing: the snowy egret and white ibis.

#### *Little Blue Heron*

Met criteria for listing as Threatened:

- Criterion A, Population Size Reduction; an estimated population size reduction of at least 30% over the last 3 generations (one generation=12 years) based on a decline in quality of habitat and a similar reduction projected to occur over the next 3 generations.

#### *Reddish Egret*

Met criteria for listing as Threatened:

- Criterion C, Population Size and Trend; the current population size in Florida is 600 to 800 mature individuals and, based on declines in Florida Bay, an estimated continuing decline of at least 10% is anticipated.
- Criterion D, Population Very Small or Restricted such that it is prone to the effects of human activities or stochastic events; the current population size in Florida is fewer than 1,000 individuals and has a very restricted number of locations (fewer than 5).

#### *Roseate Spoonbill*

Met criteria for listing as Threatened:

- Criterion D, Population Very Small or Restricted such that it is prone to the effects of human activities or stochastic events; actual nesting locations are very restricted and only

4 to 5 locations, each made up of multiple small, closely spaced colonies of various sizes. Most of the population is within 3 locations.

*Snowy Egret*

The snowy egret did not meet any listing criteria and was recommended to be removed from the Florida Endangered and Threatened Species List.

*Tricolored Heron*

Met criteria for listing as Threatened:

- Criterion A, Population Size Reduction; an estimated population size reduction of at least 30% over the last 3 generations based on a decline in the Everglades and a similar reduction projected to occur over the next 3 generations.

*White Ibis*

The white ibis did not meet any listing criteria and was recommended to be removed from the Florida Endangered and Threatened Species List.

## CONSERVATION GOAL AND OBJECTIVES

### Goal

Improve the conservation status of the little blue heron, tricolored heron, reddish egret, and roseate spoonbill to a point these species can be removed from Florida's Endangered and Threatened Species List and will not again need to be listed. Conservation status of the snowy egret and white ibis are to be maintained or improved such that they do not need to be listed in the future.

### Objectives

I. Reverse the decline of little blue heron and tricolored heron in Florida.

II. Increase the population size of the reddish egret and roseate spoonbill in Florida.

#### *Rationale*

All species of wading birds in Florida also occur elsewhere in the temperate regions of the United States and throughout tropical regions of Central and South America (Palmer 1962, Hancock and Kushlan 1984). Florida's resident population of wading birds is augmented by migratory birds from more northern latitudes (especially the Atlantic coastal populations) during the months of October through March (Palmer 1962, Hancock and Kushlan 1984). The focus of these objectives is on actions that will increase Florida's resident populations by improving reproductive output by protecting breeding sites. Breeding sites are impacted by predators, loss of vegetation, altered hydrological regimes, and direct disturbance by humans.

III. Improve the quality and amount of wading bird habitat to support Objectives I and II and to provide winter habitat for migratory populations.

IV. Increase the number of locations of reddish egret and roseate spoonbill.

#### *Rationale*

Degradation and loss of foraging habitat due to development and hydrological alteration of wetlands have been the primary causes of declines in imperiled wading birds over the last 40 years. In order to increase populations of resident imperiled wading birds and provide sufficient habitat for migratory populations, this objective focuses on maintenance and protection of suitable foraging and nesting habitat. Both the reddish egret and roseate spoonbill occur in 5 or fewer locations (Criterion D2); we propose increasing this number of locations by improving the amount and quality of potential habitat within the species' range.

V. Maintain the populations of snowy egret and white ibis.

#### *Rationale*

Although these 2 species did not meet any of the listing criteria, their populations were impacted by the same threats (e.g., the plume trade and DDT) as were other wading birds. Their populations are not declining but they are similarly impacted by alteration and loss of habitat, and will benefit by actions that maintain or improve wetlands. The focus of this objective is on

actions that ensure sufficient quality habitat is available to maintain these populations to avoid the need for future re-listing.

## 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 2](#)) provides information on action priority, urgency, potential funding sources, likely effectiveness, identified partners, and leads for implementation.

### Habitat Conservation and Management

Wading bird populations are dependent upon quantity and quality of nesting and foraging habitat, both of which have declined considerably over the past century in Florida. Additionally, much of the remaining wetland habitat has been altered through changes in water quality, water quantity, and seasonality of flooding (Mitsch and Gosselink 2000, FWC 2012a), all of which can affect wading bird prey community composition and abundance (Frederick 2002, Trexler et al. 2005, Dorn and Trexler 2007). Foraging success and energy intake have been strongly linked to reproductive success in wading birds (Powell 1983, Frederick and Spalding 1994, Frederick 2002, Herring et al. 2010a, 2010b), therefore many of the conservation actions in this plan focus on the conservation and restoration of foraging habitats.

The largest tract of wading bird habitat in Florida is the Greater Everglades, and the success of the ongoing conservation and restoration effort of this ecosystem will play a large role in determining the fate of the species addressed in this plan. Therefore, the first several actions below are specifically related to Everglades habitats and are followed by those with statewide inference. Nesting habitat conservation is also important (see Objectives [I](#) and [II](#)), and is primarily addressed in the [Population Management](#), and [Rule and Permitting Intent](#) sections. Collectively, these actions will contribute to achieving plan objectives by reducing population loss, promoting future population growth, and providing the potential for adding new locations where these species can breed and forage. Some additional specific management practices that benefit imperiled wading birds are included in [Appendix 1](#).

**Action 1** Participate in Comprehensive Everglades Restoration Plan (CERP) Project Development Teams (PDTs), periodic scientist conference calls, and other agency meetings to ensure Everglades restoration plans restore sufficient foraging and nesting wading bird habitat (freshwater and estuarine areas) to meet established performance measures.

The efficacy of CERP implementation is assessed through performance measures established for various targets through analysis of historical data and/or expert opinions ([Action 3](#)). FWC's continued involvement in CERP projects can help ensure the targets established for wading bird foraging and nesting are met. The general method for agency contribution under CERP is through participation on PDTs, which are initiated for individual CERP projects by the U.S. Army Corps of Engineers (USACE) and the South Florida Water Management District (SFWMD). FWC staff participation on PDTs is determined through an FWC team assembled specifically to monitor, prioritize, and coordinate FWC's involvement with restoration projects in south Florida; this team is called the Kissimmee-Okeechobee-Everglades-Big Cypress Coordination (KOEBCC) team. Continued participation on PDTs is important, and in some cases more staff time may be needed to ensure FWC's concerns are known and addressed during CERP implementation in general and imperiled wading bird habitat in specific.

While CERP in general will improve wading bird habitat throughout southern Florida, FWC’s priority projects involve restoring estuarine habitats (they historically supported some of the largest colonies in south Florida) as well as freshwater foraging and/or nesting habitat throughout the Greater Everglades region. Estuarine habitat will be restored primarily through reservoir construction upstream of the northern estuaries, which will reduce harmful freshwater flows during floods and reduce salinity spikes during droughts. While both floods and droughts occur naturally, these reservoirs are specifically designed to reduce human-caused extremes of water management and thus mimic the historic condition. Participation on PDTs will focus on restoring conditions to downstream estuaries for salinity, freshwater flow volumes and timing, duration of flooding, and depth of water.

Besides the benefits associated with properly managed river flows to estuaries, wading birds can potentially benefit from the reservoirs themselves. There are over 621.6 km<sup>2</sup> (240 mi<sup>2</sup>) of wetlands being constructed as part of CERP implementation, and many of these reservoirs or Stormwater Treatment Areas (STAs) can serve as potential nesting/foraging habitat for wading birds and other wildlife, provided they do not compromise primary treatment or storage purposes. Sites having contaminant levels that are clearly a risk to fish and wildlife are not suitable for CERP Stormwater Treatment Areas and Reservoirs (STA/Rs) or the incorporation of wildlife features. Both the SFWMD and the USFWS work to identify, evaluate, and recommend actions to correct existing or future contamination problems and to provide long-term monitoring of facility operation and maintenance impacts on wildlife resources. Particularly when large reservoirs are created, early involvement by FWC will increase flexibility in design and maximize potential benefits to wading birds and other wildlife.

FWC also provides input on water management in the Everglades region through participation on periodic scientist conference calls, conferences, and impromptu meetings with the USACE, SFWMD, the National Park Service (NPS), USFWS, and other entities. Maintaining positive working relationships with such agencies that both monitor wading birds and regulate or influence water levels is a critical component of FWC participation in restoration of the central Everglades and its wading bird populations.

**Action 2** Restore nesting sites on important wading bird colony islands in the Everglades and Francis S. Taylor Wildlife Management Area (EWMA) where woody species have been impacted by extreme high water depths and durations by re-establishing appropriate wetland tree species that best support nesting. Some experimental work may be necessary to determine the most effective techniques and best complement of tree species.



Figure 4. Tree islands in the Everglades. FWC photograph.

Tree island conservation and restoration is another primary focus for FWC in CERP projects because of their importance as

nesting sites in the Everglades ecosystem. Over the last half century, the number and size of tree islands have declined considerably in the EWMA. There was a 61% decline in total tree island area from 1940 to 1995 in Water Conservation Area (WCA) 3 alone (Patterson and Finck 1999), constituting a loss of 5,463.2 ha (13,500 ac). The total number of tree islands in WCA-3 also declined from 1,041 to just 577 over the same period (Patterson and Finck 1999). These declines in tree islands in the EWMA have been attributed to rapid increases in water depth and changes in hydroperiod (McPherson 1973, Dineen 1974, Alexander and Crook 1975, Frederick 1995, Sklar and Van der Valk 2002), and constitute a major loss of wading bird nesting habitat from pre-drainage conditions.

Large willow strand communities are especially important as nesting sites for colonial wading birds in the EWMA, though the majority that remain occur in deeper-water portions of eastern WCA 3A and remain vulnerable to high-water events. Such colony sites often support more than 90% of wading bird nests in the Everglades in a given year (Cook and Call 2005) but may actually become wetter after Everglades restoration efforts. Even though most willow species are fairly tolerant of some flooding (Conner et al. 2002), FWC documented extensive mortality of Carolina willow (*Salix caroliniana*) at historic rookeries (e.g., Andytown, L-67 colony) in WCA-3A following high water levels in 1994 to 1995.

FWC is actively involved in upland tree island restoration in the EWMA through exotic plant control, prescribed fire, native tree and shrub plantings, and the maintenance of planted trees and shrubs; these activities can be expanded to include strand islands dominated by water-tolerant species such as Carolina willow and pond apple (*Annona glabra*). Additionally, tree island management should account for predicted changes in hydrology as CERP projects are implemented. Focus should be on islands of historical importance to wading birds and/or areas with sufficient local foraging habitat and on protection from terrestrial predators (see [Action 23](#)).

**Action 3** Work with CERP’s Restoration Coordination and Verification (RECOVER) Regional Evaluation Team to ensure there is a long-term monitoring plan and a suitable model evaluation tool for assessing the effects of various CERP hydrological restoration plan alternatives on the foraging habitat of short-legged wading birds (tricolored herons, little blue herons, white ibis, and snowy egrets) throughout the Greater Everglades hydrologic model domain.

CERP coordination, implementation, and performance evaluation is conducted through a RECOVER team designed to conduct scientific and technical evaluations of CERP and to refine and improve plans. There are many different performance measures used in CERP to assess various responses, and some of these measures are directly related to wading birds. For example, there are performance measures for wading bird foraging, wading bird nesting, spoonbill-specific nesting, and even prey (fish and macro-invertebrate) performance measures, all developed through analysis of historical data and/or expert opinions. These performance measures attempt to quantify impacts to specific targets but are not fully developed for wading bird foraging. As of 2006, the wading bird foraging performance target was “to achieve foraging distributions consistent with the expectations for pre-drainage distributions.” Working with regional RECOVER teams is a valuable way for FWC to contribute to the development of various performance measures and will be important as a suitable model evaluation tool as wading bird foraging habitat is developed in the future.

**Action 4** Provide technical assistance and guidance to lead water management agencies (USACE and SFWMD) during early stages of water reservoir and STA design to incorporate favorable imperiled wading bird foraging habitat and nesting habitat associated with CERP when doing so does not severely compromise their primary function.

The USFWS (CERP STA/R team) leads the development of fish and wildlife recommendations for CERP STA and reservoir operation and design, which has resulted in 24 recommendations for fish and wildlife (USFWS 2005). They address many important issues for freshwater reservoirs and impoundments, including contaminants, location, habitat diversity, exotic species, topography, water levels, hydroperiods, and drying and/or flooding rates. Promoting these recommendations is an important step in improving management of virtually any STA or reservoir project where wading bird use is compatible with the primary function.

**Action 5** Provide technical assistance and guidance to lead water management agencies (USACE and water management districts [WMDs]) and partnering natural resource agencies (USFWS and DEP) during the early stages of planning for changes to regulation schedules of large state waterbodies, such as the Everglades WCAs, Lake Okeechobee, and the Kissimmee Chain of Lakes, that are important to imperiled wading birds. For other waterbodies, continue to provide technical assistance to water management agencies through agency commenting on proposed changes to water management regulation schedules and restoration projects that will affect wetlands used by imperiled wading birds.

Water regulation schedules are developed by the WMDs and partners to conserve adequate water supply for natural systems and consumptive use, to minimize flooding, and to improve navigation opportunities (SFWMD 2012). According to state law, all WMDs prepare an annual 5-Year Water Resource Development Work Program to update their implementation strategy for the water resource development component of each approved regional water supply plan (SFWMD 2012). The USACE organizes PDTs with representatives from all relevant agencies to assist with their water regulation planning processes with respect to flood control.

FWC has the opportunity to be involved in both WMD and USACE planning processes, either by commenting on a near-final plan or by participating from the beginning. Participation early and throughout the planning process is usually much more effective in ensuring FWC's recommendations are fully considered, but it is also much more resource-intensive than commenting on a near-final plan. The FWC's KOEBCC Team reviews all projects, decides whether the FWC should participate in the planning (early) or commenting (later) process, and coordinates those efforts. KOEBCC considers the needs of wading birds to be of primary interest.

It is important for the FWC to be involved in the early stages of planning for changes in regulation schedules to large waterbodies important to imperiled wading birds in order to ensure imperiled wading bird needs are met. For example, in the EWMA, an increased demand for flood control and water supply has resulted in a greater frequency of damaging high water depths in wet years as well as extreme low water depths in drought years. Both situations greatly reduce foraging habitat and reproductive success of imperiled wading birds. Conversely, in lake systems, water regulation schedules significantly reduce fluctuations in water levels and alter the

timing of discharges, thereby resulting in the build-up of tussock communities and organic berms along shorelines that block water movement and degrade littoral habitat important to wading birds. FWC works with DEP, SFWMD, and the USACE to cooperatively fund and implement aquatic plant management and environmental enhancement projects to address these issues, but working within water regulation schedules can limit their success. While temporary deviations may be granted for these projects, the extremely low water levels necessary for the mechanical removal of organic sediments, for example, may impact user groups, businesses, and federally Endangered Species, making these deviations difficult to implement.

For many smaller waterbodies of less importance for imperiled wading birds, providing technical assistance through agency commenting, rather than throughout the planning process, is sufficient. The FWC reviews all plans related to changes in water management regulation schedules, as well as restoration projects. FWC currently does and will continue to provide technical assistance to water management agencies through agency commenting on proposed changes to water management regulation schedules and restoration projects.

**Action 6** Identify management actions needed to improve or maintain priority imperiled wading bird habitat on public lands, including cooperatively managed wetlands and large waterbodies.

Wading bird management strategies can be employed in many large, managed wetlands throughout the state in order to increase habitat quality. FWC currently provides technical assistance on wetland conservation and management issues around the state, working with many agencies, organizations, and private landowners to cooperatively manage wetlands. Opportunities to improve wading bird habitat should be considered when designing or reviewing management plans for cooperatively managed wetlands.

Many public conservation lands are required to have a management plan approved by the Acquisition and Restoration Council or the agency's governing board. Specifically, s. 253.034(5), F.S., says in part that all land management plans shall include an analysis of the property to determine if significant natural resources, including listed species, occur on the property. If significant natural resources occur, the plan shall contain management strategies to protect the resources. The Florida Forever Act (s. 259.105, F.S.) adds that all state lands that have imperiled species habitat shall include, as a consideration in the management plan, restoration, enhancement, management, and repopulation of such habitats. For lands identified as priority imperiled wading bird habitat ([Action 20](#)), FWC should be consulted (as statutorily required), and the lead management agency is encouraged to include FWC as part of the management plan advisory group. Recommended management actions that may benefit wading birds are included in [Appendix 1](#).

**Action 7** Participate in saltmarsh restoration planning, develop management recommendations for impoundments, and encourage impoundment managers to include imperiled wading bird habitat needs in their management regimes, particularly during the nesting season (e.g., implementing spring draw-downs prior to summer flooding for mosquito management).

Much of the saltmarsh habitat along the Atlantic coast of Florida was impounded for mosquito control beginning in the 1950s. Many of those impounded salt marshes have since been

reconnected to the lagoon system through the installation of culverts with flashboard risers on the dikes to re-establish tidal exchange during the non-mosquito production season. Dedicated pumps are used to keep the impoundments flooded during the mosquito production season. This technique, known as Rotational Impoundment Management, is the primary management strategy employed along the Indian River Lagoon, with a focus on restoring sportfish populations and, to a certain extent, waterfowl. A few mosquito impoundments have been restored to more natural conditions. Restoration benefits many species of birds and other wildlife; however, properly managed impounded marshes can also provide good habitat for wading birds. Wading birds use many impounded wetlands throughout Florida, though few are managed primarily for wading bird use. While these impoundments and the more recent hydrologic restoration efforts do provide habitat, there have been numerous studies in the Indian River Lagoon outlining ways to increase wading bird use through various management strategies (Breininger and Smith 1990). Altering the timing or frequency of dry-downs, for example, may greatly increase wading bird use without affecting waterfowl habitat or mosquito control during the winter. Vegetation management such as prescribed fire and exotic plant control may also be beneficial.

FWC holds a seat on both the Florida Coordinating Council on Mosquito Control (FCCMC) and the Subcommittee on Managed Marshes (SOMM). Government agencies and private developers are encouraged to adopt optimal management techniques for specific marshes targeted for management (Connely and Carlson 2009). Encouraging impoundment managers to adopt draw-down schedules and vegetation management that will benefit wading birds further should be coordinated through participation on FCCMC and SOMM.

**Action 8** Coordinate with other state agencies and local governments to promote water quality in stormwater retention facilities, especially to minimize toxic effects to imperiled wading birds.

Large reservoirs and STAs, including, but not limited to, those that will be or have already been constructed as part of CERP, have the potential to provide wading bird habitat if they are designed or managed considering wading bird needs. Sites having contaminant levels that are clearly a risk to fish and wildlife are not suitable for CERP STA/Rs or the incorporation of wildlife features. Both the SFWMD and the USFWS work to identify, evaluate, and recommend actions to correct existing or future contamination problems and provide long-term monitoring of the impacts of facility operation and maintenance on wildlife resources. These recommendations can also be applied to reservoirs constructed outside of the Everglades region, unless contaminants pose a threat. When new reservoirs or water treatment areas are being planned, early consultations can identify changes in design and management that improve wading bird habitat while meeting the primary purpose of the project. This will likely involve coordination with DEP, WMDs, USACE, USFWS, local governments, or private landowners to ensure secondary habitat values can be met without compromising primary treatment or storage purposes.

**Action 9** Identify opportunities to improve wading bird habitat when designing and reviewing management plans for FWC-managed areas.

The FWC includes the needs of wading birds in the management of lands that it owns or cooperatively manages. Wading birds, including the imperiled wading birds, are a focal suite of

species in FWC's Wildlife Conservation Prioritization and Recovery (WCPR) program. The goal of the WCPR program is to provide proactive assessment, planning, and restoration support for FWC-managed lands in order to facilitate recovery of listed species. Each wildlife management area (WMA) has, or will soon have, a WCPR Strategy that includes specific management practices to be undertaken for the benefit of focal species, including wading birds. WCPR Strategies will be reviewed and updated at 10-year intervals.

Wading bird habitat needs are also included in the FWC management plans for large waterbodies, including Kissimmee Chain of Lakes, Lake Okeechobee, Lake Istokpoga, and Orange Lake. A review of all these FWC plans should be conducted to identify alterations that would improve conditions for imperiled wading birds.

**Action 10** Identify important wetlands and streams where minimum flows and levels (MFLs) are a concern and work with WMDs to ensure imperiled wading bird habitat needs are included in the process of setting MFLs.

The WMDs have several programs related to ensuring water supply needs of both people and natural systems are met. MFLs are established for lakes, streams, rivers, wetlands, springs, and aquifers in order to prevent significant harm to the water resources or ecology of an area resulting from permitted water withdrawals. They identify a range of water flows and/or levels above which water might be permitted for consumptive use. State law requires the establishment of MFLs as well as the annual lists of specific waterbodies for which MFL rules will be established during the next 5 years.

Within FWC, each administrative region currently has or is developing an MFL Team (FWC 2009) responsible for providing comments on MFL plans within their region. MFL Teams should include biologists with a diversity of expertise representing all aquatic wildlife guilds, including imperiled wading birds. In some cases, these teams may have the opportunity to participate earlier during MFL development or modification, rather than by commenting on a near-final product. FWC recommendations are more likely to be included in the final plan if provided early in the development process. Regional MFL Teams will, at a minimum, provide technical assistance to WMDs through agency commenting on the development or modification of MFLs. For waterbodies prioritized as important to wading birds, MFL Teams will also provide technical assistance and guidance, including information regarding specific habitat and water quality needs of imperiled wading birds, to WMDs during the early stages of developing or modifying MFLs.

**Action 11** Work with the Florida Inland Navigation District (FIND) and DEP to improve or create suitable foraging and nesting habitat on spoil islands, continue participation in the Spoil Island Working Group (east coast), provide technical assistance (south), and promote creation of a new working group (west coast).

Spoil islands have been created along much of Florida's coast as a byproduct of creating and maintaining navigable waterways, and have a long history of providing wading bird nesting habitat. Various entities around the state, including DEP, FIND, county governments, Audubon Florida, and others, collaborate to manage the habitats and recreational use of these islands.

Management activities typically include shoreline stabilization, exotic species removal, native vegetation restoration, and reducing disturbance from recreational activities. The Spoil Island Working Group developed by DEP and FIND has successfully managed 137 spoil islands on the east coast. Development of a west coast spoil island working group modeled after this one is recommended in order to improve coordination among the various entities involved in managing spoil islands on the west coast. The new working group could cooperatively facilitate needed management actions such as shoreline stabilization for spoil island maintenance on the west coast. Spoil island management plans should consider the impacts of projected sea level rise as well. See [Appendix 2](#) for more detail on the regional differences in spoil island management.

**Action 12** Protect and/or construct shallow tidal flats for foraging reddish egrets.

Spoil islands have a long history of providing wading bird nesting habitat, but they may also provide foraging benefits if constructed appropriately. For example, additional foraging habitat may be created when protecting natural or spoil islands from erosion by placing breakwaters offshore and protecting shallow flats around the islands (Hodgson and Paul 2011). Erosion of natural or spoil islands is an ongoing issue as it reduces nesting habitat and the eroding material can cause siltation in other communities. Placing breakwaters near spoil islands may help offset some of the shallow-water foraging losses caused by dredging and development, as well as reduce the potential for those islands to degrade surrounding communities.

When coastal wetlands are developed or impacted, mitigation options should include creation of shallow tidal flats and be of high priority in areas near imperiled wading bird colonies, potential colony sites, or those historically important to reddish egrets in particular. Because of the magnitude of shallow foraging habitat lost to development and coastal changes over the last century, proactive restoration may be the best method for large-scale restoration.

**Action 13** Promote acquisition and management of additional wetland habitat statewide, especially in the Everglades Headwaters National Wildlife Refuge, by coordinating with state and federal agencies and non-governmental organizations (NGOs).

The Everglades Headwaters National Wildlife Refuge and Conservation Area was officially established on January 18, 2012 (Federal Register 2012). This refuge and conservation area is expected to protect approximately 60,700 ha (150,000 ac), including wading bird habitat, in Polk, Osceola, Highlands, and Okeechobee counties. Of this area, 40,500 ha (100,000 ac) will be protected by conservation easements or other less-than-fee-title means in cooperation with willing landowners, and 20,200 ha (50,000 ac) will be owned and protected as a National Wildlife Refuge.

FWC and partners have been working on the creation of a Cooperative Conservation Blueprint (CCB) that will create a common vision for important conservation lands in Florida. It is important this vision include incentives and policies that make it acceptable to all partners. This effort has been coordinated with the USFWS Everglades Headwaters National Wildlife Refuge project through multiple meetings and use of common data sources such as the Critical Lands and Waters Identification Project. These efforts continue to be coordinated as they evolve with

the CCB providing more regional data and partner context to the new refuge, and the new refuge providing a source of incentive funding and opportunity to the CCB.

While currently there is much opportunity to acquire wetland habitat in the Everglades Headwaters region compared to many other areas of the state, effective management of additional wetland habitat across Florida will contribute to meeting the objectives of this plan.

**Action 14** Prioritize coastal wetlands for acquisition and easements and include consideration of sea level rise as a prioritization criteria.

Coastal wetlands are important to all imperiled wading birds, particularly reddish egrets and roseate spoonbills. Prioritization of coastal wetlands for acquisition will focus on active or recently active breeding colonies and/or foraging habitat to support breeding colonies. FWC can accomplish this by working with state and federal land acquisition programs such as Florida Forever, USFWS's Coastal Program, and DEP's Coastal Program. Direct purchase of coastal properties can be cost prohibitive and economically impractical for land acquisition programs. For this reason, conservation easements have become an important tool for protecting coastal lands. Florida provides tax incentives, including property tax exemptions, for landowners who put a perpetual conservation easement on their land. This allows landowners who commit to maintaining their current conservation or agricultural practices into the future the opportunity to receive a break from property taxes for excluding additional development on their property.

When considering new easements or other forms of land acquisition, particularly in coastal areas, the emerging threat of climate change must also be considered. Much of Florida's coastline is very flat, such that a moderate rise in sea level would inundate a substantial portion of coastal habitat. Of more immediate concern is saltwater intrusion into estuaries and coastal marshes, which alters vegetation composition and prey base for wading birds (Finlayson et al. 2006). In some cases coastal marsh habitat may be able to migrate inland in response to sea level rise and saltwater intrusion, but development limits this opportunity. Therefore, in addition to conducting a general climate change vulnerability analysis (Dubois et al. 2011) for all imperiled wading birds (see [Monitoring and Research](#)), a risk assessment should be performed for any new coastal properties being considered for acquisition. This risk assessment should include an evaluation of connectivity with higher-elevation habitat, and the potential for coastal zones to move inland effectively as sea level rises.

### **Population Management**

Colonial wading birds often nest in high-density, conspicuous colonies in waterways busy with boat traffic and recreational activity. Because of this, they are vulnerable to human disturbance, which can cause egg loss, chick mortality, nest abandonment, nest site abandonment, premature fledging, slowed growth, underweight nestlings, and altered behavior. Any of these effects can in turn result in overall lower reproductive success (USFWS 2006). The severity of response to disturbance depends on the species and nesting site. Some species at some locations have demonstrated an ability to tolerate or habituate to human activity.

**Action 15** Post buffer zones around priority nesting colonies.

Posting signs around high-priority nesting colonies is desirable when disturbance is significant; however, land managers must balance the risk with the costs of installing and maintaining posting. [Action 20](#) proposes a method for prioritizing colonies for posting and other management actions. FWC studies have recommended buffer distances for each of the imperiled wading birds for a variety of human-related disturbance variables (Rodgers and Smith 1995a, 1997; Rodgers and Schwikert 2002, 2003). While a buffer distance customized for the individual species nesting in a colony is possible, it may be impractical to annually adjust the buffer based on the species composition of a colony. Therefore, a more reasonable approach is to use a standardized distance that would buffer most species in all colonies: 91 m (300 ft) (Rodgers and Smith 1995a). Smaller buffer distances may be possible when dense vegetation prevents direct visual contact between wading birds and disturbances with low noise levels. Some evidence suggests a tangential approach by a disturbance may also allow for a shorter buffer distance. The perimeter of breeding colonial wading birds should be monitored annually so that the buffer distance reflects changing nesting boundaries. If birds begin nesting with a prior disturbance or other anthropogenic factor in place, the 91-m (300-ft) buffer distance should not be imposed retroactively. Recommendations for posting colonies are provided in [Table 1](#).

Table 1. Posting protocol. Posting dates and distances are provided as general guidance and may need to be adjusted based on local conditions.

Recommendations for Posting Colonies	Nesting sites with high risks of human disturbances should be posted and should be visited regularly to maintain posting.
	Colonies should be posted 30 days prior to the closure dates below to inform the public of the closure.
	Signs should be highly visible and placed at intervals no more than 152 m (500 ft) apart.
	Signs should be placed 91 m (300 ft) from the nearest nest. Signs posted in navigable waters should adhere to <a href="#">U.S. Coast Guard recommendations</a> and <a href="#">FWC Uniform Waterways Guidance</a> regarding colors and reflective materials to reduce boat collisions.
	Closure dates for individual colonies should be clear on each sign. Closure dates for south Florida below a line from Tampa to Melbourne should be March 1 to August 1; closure dates for north Florida should be March 15 to August 15. Nesting activity for representative colonies should be monitored for annual adjustments to these closing dates. For example, warm weather and early recession of water levels in wetlands may shift nesting to earlier in the year and require shifting the closure dates 2 or more weeks earlier than the above dates. In some instances, shorter buffer distances (<91 m [300 ft]) may be appropriate based on a lower amount of traffic, low noise emissions (<55 db to point source), and the presence of a dense vegetation barrier that precludes the birds from observing the source of disturbance.

**Action 16** Control mammalian predation at priority nesting colonies when identified as a significant threat (identified through [Action 20](#)).

When predators have been identified as a significant threat to a colony, and when that threat cannot be reduced sufficiently through management of water level and vegetation (both of which can create connection to the main land), then predator control should be employed. Predator populations can be reduced by managing access to trash and other food sources nearby or by direct removal. Though non-mammalian predators (e.g., snakes, alligators, raptors, fire ants, etc.) also pose a threat, mammalian predators appear to be the greatest predatory threat to nesting wading bird colonies in the southeast (USFWS 2006). Wading birds often react to mammalian predation by abandoning en masse, particularly when predation is nocturnal.

**Action 17** Continue posting signs, patrolling, and enforcing rules for designated Critical Wildlife Areas (CWAs) where imperiled wading bird colonies are located.

[Critical Wildlife Areas](#) are established by the FWC under Rule 68A-14.001, Florida Administrative Code (F.A.C.), to protect important wildlife concentrations from human disturbance during critical periods of their life cycles, such as nesting. The goal is to establish CWAs, whenever necessary and appropriate, for effective conservation of wildlife species by minimizing take or disturbance to important aggregations of individuals or populations. The 5 regional biologists in FWC's Species Conservation Planning Section evaluate the need for potential CWAs, develop or revise establishment orders, manage the posting of appropriate signage, and coordinate monitoring of the wildlife on those areas. CWAs are monitored by FWC, and protection efforts are coordinated with local government, other agencies, non-governmental organizations, and FWC law enforcement personnel, as appropriate.

Six of the 21 existing CWAs in Florida provide foraging and/or nesting habitat for wading bird species, and most of these CWAs are posted with agency (e.g., FWC, DEP) signage. Regional biologists work with land managers and other agency staff to ensure CWAs are posted and patrolled, to protect nesting and foraging imperiled wading birds.

**Action 18** Establish new CWAs for high-priority colonies that are subject to disturbance.

The CWA Coordinator is responsible for organizing and standardizing existing and new CWAs. Processes for establishing new CWAs and managing all CWAs will include partners and stakeholders. FWC staff will identify and work with stakeholders to review and discuss recommendations for CWA establishment.

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 19** Develop management recommendations to protect and manage nesting colonies.

Working with experts from academia, organizations, and other agencies, a set of generalized protection and management recommendations should be developed for staff, other agencies, private landowners, and volunteers who are involved in managing wading bird colony sites. It will provide practical information on the methods used for colony protection, signage techniques, survey methods, predator control, and other management activities. Recommendations may include sections on general ecology, threats to breeding colonies and foraging habitats, management recommendations for colony sites and foraging habitats, and colony monitoring (Douglass et al. 1993).

**Monitoring and Research**

**Action 20** Re-evaluate and prioritize the top nesting colonies and associated foraging habitat based on the need for protection and management.

In the early 1990s, FWC staff developed a system for classifying wading bird colonies for protection and management (Douglass et al. 1993). Because of the limitation of staff time and funding, there is a need to prioritize conservation, restoration, or acquisition of interior and coastal habitats in order to ensure the most important colony sites are protected and managed for short-term and long-term imperiled wading bird use. Using information on colony variables derived from [Action 29](#) in association with current Geographic Information System (GIS) landcover data, it should be possible to rank wading bird colonies in order of biological importance.

Recommended variables used to rank each colony should have the following components:

- Colonies should be ranked based on species richness (i.e., number of species and the number of nests/species) and other biological variables.
- The current Millsap et al. (1990) biological and action scores, location relative to other colonies (i.e., if a colony with large number of species and nests is located in a region of the state with few colonies), longevity (i.e., a colony active for >10 years), and imminent threats (e.g., status of nesting substrate, degradation of water quality, alteration of hydrology, disturbance) to the colony also can be used for additional ranking factors.



Figure 5. Aerial view of wading bird nesting colony. Photo by Peter Frederick.

**Action 21** Design and implement an annual statewide monitoring program for the highest-priority wading bird colonies.

Along with the development of an accurate and cost-effective survey method ([Action 31](#)) and a protocol to prioritize wading bird colonies ([Action 20](#)), monitor the highest ranked colonies of wading birds on an annual basis. This will allow determination of population trends and development of management priorities for the expenditure of funds and staff time for these species for land managers across the entire state. This action would be facilitated by partnering with other agencies (e.g., USFWS, NPS) and NGOs (e.g., Audubon chapters, Tampa Bay sanctuaries). Because it might be cost-prohibitive to survey all top 100 colonies across the state each year, it may be necessary to implement a stratified annual survey design.

**Action 22** Design and implement a statewide monitoring program at 10-year intervals for the non-nesting distribution of imperiled wading birds to determine important wetlands used for foraging by migratory and resident populations.

With the exception of south Florida (Smith et al. 1995, Cook and Kobza 2011), we lack information on the important wetlands used for foraging by all 6 imperiled wading bird species in Florida. Knowledge of the types of foraging habitat used and the locations of these habitats is critical for the preservation of these wetlands and the survival of both resident and migratory wading birds in Florida. The development of a GIS-based survey of wading bird populations and important types of wetland classes used as foraging sites also would provide trends in populations for land managers in order to develop management priorities for expenditure of funds and staff time.

Because wading birds and their foraging habitat occur statewide, it would be cost prohibitive to survey all freshwater and marine–estuarine wetlands across the entire state each year. Therefore, a stratified annual survey design would cover a subset of the total wetlands during an individual year and employ a random selection of representative wetland habitats to avoid biases that may result in over or under estimates of wading bird use of wetland types.

**Action 23** Monitor the condition and size of the most important tree islands used by imperiled wading birds for nesting in the Everglades on an annual basis.

Tree islands in the Everglades are important nesting sites for wading birds. However, over half of the tree islands have disappeared due to hydrological changes (FWC 2012a, 2012b). FWC has worked to restore many damaged tree islands located within the northern portion of WCA 3A (i.e., through exotic plant control, prescribed fire, native tree and shrub plantings, and the maintenance of planted Presently, 267 tree islands totaling 196 ha (484 ac) are in various stages of restoration. In contrast, pooled water and increased hydroperiods have resulted in loss of tree islands in the southern portion of WCA 3A.

Currently there are about 280 ha (700 ac) of natural tree islands and woody vegetation areas managed on the Miami Canal spoil islands and along the levees through FWC-funded contracts and/or by FWC area staff. Planting native trees and shrubs on degraded natural tree islands and spoil islands promotes the establishment of diverse native plant communities and provides wildlife habitat including wading bird nesting sites. Over 21,000 trees and shrubs have been planted on over 80 natural tree and spoil islands to date.

Vegetation-monitoring protocols, which include photo-points and planted tree survival rates, are used to monitor and evaluate re-vegetation after management activities such as prescribed fire, exotic plant control, and planting of native vegetation, especially woody species capable of supporting wading bird nests. These data are used in management decisions for future plantings. Selecting tree and shrub species that prosper in diverse tree island conditions and are able to withstand nesting by wading birds (i.e., guano deposition, alteration of soil pH, and pruning of the terminal branches by wading birds for nest material) is important for future survivability and effectiveness of tree island restoration, especially for colony sites. Currently, survival of planted trees is estimated to be 75%, and there are 4 photo-point monitoring sites within the EWMA. These monitoring protocols can be applied to the highest-priority wading bird colonies on tree islands in the Greater Everglades.

Specific vegetation management objectives and monitoring protocols are still in development for the EWMA under FWC's Objective-based Vegetation Monitoring Program. However, some parameters, such as tree densities and species richness, have been identified for tree islands. It will be important to incorporate needs for nesting substrate by wading birds based on desirable plants species and size classes to support their nests.

With the development of an accurate and cost-effective survey method from [Action 31](#) and use of the protocol to prioritize colonies from [Action 20](#), it should be possible to rank wading bird colonies in the Everglades in order of biological importance. The highest ranked colonies on tree islands in this region should be monitored for number of species and nests of imperiled wading birds. These data could be used to make recommendations for water-level management based on long-term trends in populations of wading birds and the quality of the nesting habitat.

**Action 24** Monitor the mercury concentrations in wading bird nestlings in the Everglades.

During the 1980s and 1990s, there was concern about methylmercury concentrations in fish and wildlife in the southern region of the Everglades, and the threshold for impaired reproduction had been exceeded in some individuals of some wading bird species (Frederick et al. 1999, 2002). Although these concentrations appear to have decreased in the latter 1990s (Rumbold et al. 2001, Frederick 2002), periodic monitoring of selected species in WCA 3A and WCA 3B is still warranted. The SFWMD currently is monitoring mercury concentrations in great egrets, 3 trophic levels of fish (mosquito fish [*Gambusia affinis*], sunfish, and bass [*Centrarchidae*]), and selected invertebrates (SFWMD 2012). Recently, there is some concern for fish-eating birds regarding higher exposure to methylmercury in the coastal regions than in the central freshwater marshes (Adams et al. 2003, Adams and Paperno 2012). Although information on mercury concentrations in wading birds has been collected since the 1980s, information is still needed on the current and future mercury loads in wading birds in the Everglades and nearby estuarine wetlands used for foraging, including by roseate spoonbills and reddish egrets. These data can be compared with historic data to provide insight into the trend in mercury contamination in southern Florida.

**Action 25** Develop and maintain a statewide database for wading bird data.

Data from previous wading bird surveys during 1978 to 1979 and 1989 to 90 originally were available only as hardcopy publications (Nesbitt et al. 1982, Runde et al. 1991). The 1999 statewide survey was the first to be available only in electronic format. Currently, all 3 surveys are available on the [FWC Water Bird Locator](#) webpage (FWC 2011). This tool can be expanded to include future web pages containing other wading bird databases. A needed preliminary step is the development of an accurate and cost-effective survey method (see [Action 31](#)).

**Action 26** Model the impact of climate change (sea level rise, temperature change, and change in rainfall) on the nesting and foraging habitat of imperiled wading birds.

Most species of wading birds will experience temporal climate variability and possible shifts in breeding seasons and food availability as the climate changes (Butler and Vennesland 2000). It is unclear if the imperiled wading birds will be able to acclimate to these changes in sea level rise and rainfall patterns. The first step would be to identify the current nesting colonies and foraging habitats used by the imperiled wading birds in Florida. Colony locations can be derived from [Action 21](#). Information is available from literature on general foraging habitat and prey preferences for all 6 species (Kushlan and Bildstein 1992, Rodgers and Smith 1995, Frederick 1997, Dumas 2000a, 2000b, Parsons and Master 2000, Lowther and Paul 2002). However, specific requirements such as the distances flown from a colony to foraging sites and preferred habitat characteristics (e.g., responses to variation in water depths associated with tidal fluctuations and recession rates, habitat type, and prey concentrations) is required to prioritize the conservation, restoration, and/or acquisition of interior and coastal habitats in order to ensure the important areas are protected for short- and long-term wading bird use. It also is important to identify and protect these foraging sites from human disturbance.

This information is needed for short-term and long-term management actions, with the latter actions aimed more specifically at identifying habitats that may not currently be important wading bird foraging habitat but might become important foraging sites with higher sea levels and regional changes in rainfall. It probably is unrealistic and cost prohibitive to prioritize all wetlands used for foraging in the state; thus, identifying foraging habitat associated with the top 100 colonies identified in [Actions 20](#) and [21](#) may be a first step to identify priority foraging areas and habitat types for management actions. A method to identify the important foraging areas is described in [Action 22](#).

Using the information derived from the above study, the next step would be to model the impact of climate change on current foraging habitat at coastal (due to sea level rise and higher tidal inundation) and interior (lower rainfall and higher evapotranspiration due to higher temperatures) wetlands used by wading birds. These modeling results may provide predictions for future management actions to prioritize the conservation, restoration, and/or acquisition of interior and coastal habitats in order to ensure important areas are protected for wading bird use in the long term. It also is important to identify and protect these foraging sites as the human population shifts away from the coastlines due to sea level rise and coastal flooding. A method to identify the important foraging habitat is described in [Action 22](#).

**Action 27** Model the demographic parameters (population growth, predation vulnerability, annual post-fledging survival rate, sources of mortality outside nesting season) of imperiled wading birds.

The basic breeding variables needed to model the demography of the imperiled wading birds are relatively well known (Kushlan and Bildstein 1992, Rodgers and Smith 1995*b*, Frederick 1997, Dumas 2000*b*, Parsons and Master 2000, Lowther and Paul 2002). Much information on these species is available from Florida-based studies. Thus, sufficient information is available to estimate population trends and survival rates for a population viability analysis with a Florida-centric perspective on these species similar to what is done for Breeding Bird Survey data. Modeling parameters should also include both current and future threats (e.g., climate change impacts [Butler and Vennesland 2000]). These analyses are needed to evaluate the success of management actions on the population trends of all 6 imperiled wading bird species in Florida.

**Action 28** Determine the likelihood of imperiled wading birds to return to their natal colony to nest.

Despite the large number of wading birds banded or radio-instrumented during the last 4 decades, we lack a basic understanding of where the 6 imperiled wading bird species nest once they attain reproductive maturity. We need information on the probability of individual birds returning to nest at their natal colony, under what ecological conditions they breed at another colony, longevity of individual colonies, and whole-colony turnover rates on a regional and statewide basis. Wading bird philopatry (behavior of returning to natal site) may be especially important for coastal colonies with the advent of sea level rise and the flooding of colonies and associated foraging habitat. This information would provide insight into the timeframe for management plans in order to protect, monitor, buffer, and/or purchase these colony sites on a regional and statewide basis. Note: the monitoring of radio-instrumented birds also should provide information to address some information needs for [Actions 27](#) and [29](#).

**Action 29** Determine if imperiled wading birds from outside sources immigrate to Florida to breed.

Knowledge of inter-regional movements of individual wading birds and species is important for wading bird management. In addition, the frequency of immigration to Florida is important to determine whether populations outside Florida can rescue resident populations if and when resident birds experience decreased numbers or extirpation from Florida. If the population in Florida is a demographic sink (Pulliam 1988) that is unable to sustain itself without immigration from populations outside the state, the risk of extirpation may be underestimated. The IUCN assessment procedure for regional populations has a criterion for evaluating this rescue effect (IUCN 2003).

Indirect evidence of past and current immigration of wading birds into Florida may be derived from the analysis of banding data using recovery rates of non-Florida birds recovered in the state during the breeding season. However, there tends to be a bias toward the recovery of banded, non-breeding first-year birds. Genetic relationship information on gene flow from [Action 30](#) might provide insight into the relationship and degree of inter-regional movement by wading

birds. However, a definitive answer to the immigration question probably requires a multi-state (southeastern U.S. states) and multi-country (U.S., Bahamas, Cuba) cooperative effort. One strategy might be to go through the North American Migratory Bird Joint Venture/Atlantic Coast Joint Venture program of the USFWS.

**Action 30** Measure the population genetics of resident imperiled wading birds to determine gene flow and movement of wading birds between Florida and other states or regions of the U.S.

Estimates of genetic diversity and gene flow can indicate movement among populations within and outside Florida or the degree of isolation of resident wading birds. These estimates allow for assessment of isolation and/or relatedness of resident birds to other populations in the U.S. and West Indies. This baseline information also can be used for future translocation programs and identification of donor sites if needed to supplement resident birds.

Levels of genetic differentiation and levels of genetic exchange between Florida and other possible origins for the imperiled wading birds might be possible using microsatellite DNA markers (Williams et al. 2002, 2005). Genetic analysis also may require mitochondrial DNA and haplotype information. Two Florida laboratories, Biotechnologies for the Ecological, Evolutionary, and Conservation Sciences Lab at the University of Florida or the Genetics Lab at FWC's Fish and Wildlife Research Institute in St. Petersburg, perform this type of genetic analysis and could generate the desired genotypic data.

Periodic reassessment of genetic exchange will allow for detection of changes in immigration into Florida. A plan for reassessment should be developed and should include a detailed sampling protocol and timetable (see [Action 29](#)).

**Action 31** Develop a technique to improve accuracy of nest counts during colony surveys.

Accurate and current data are needed to determine the number of nests, range, and population trends for imperiled wading birds in Florida. FWC and other agencies have been conducting wading bird surveys in Florida since the 1970s (Nesbitt et al. 1982, Runde et al. 1991, Rodgers et al. 1995, Nesbitt and Rodgers 2002). Currently, annual surveys are only conducted in the Everglades region of south Florida (Cook and Kobza 2011). However, there is no method available to accurately survey nesting wading birds over a large area. The most accurate method uses systematic transects conducted "on the ground" within a colony with multiple observers (Erwin 1980), which is time consuming, laborious, and can result in disturbance issues for multiple species colonies spread out over a large area. Most past surveys relied upon fixed-wing aircraft, which are relatively inexpensive and can fly long distances more quickly than rotary-winged aircraft. The last statewide survey was conducted in 1999 using fixed-wing aircraft, but it resulted in species detection rates of only 0 to 50% compared to a ground count and a colony detection rate of 71% (Rodgers et al. 2005). This discrepancy is due to the birds' sub-canopy nesting habits, which reduce the visual detectability of most species of intermediate-sized wading birds. This is especially true for the dark-plumaged species (little blue heron, tricolored heron, and reddish egret), where the detection probability is almost 0%. Even for large species of wading birds such as wood storks, an aerial estimate of the number of nests is only accurate to within plus or minus the actual number of nests (Rodgers et al. 1995).

## Rule and Permitting Intent

The reddish egret, roseate spoonbill, little blue heron, and tricolored heron will be listed as Threatened species in Florida, Rule 68A-27.003(2)(e), F.A.C. The white ibis and snowy egret will be removed from Florida's Endangered and Threatened Species List, although they will remain protected under FWC's general prohibitions (Rule 68A-4.001, F.A.C.).

The imperiled wading birds are also protected under the federal [Migratory Bird Treaty Act](#). Under the Act it is unlawful to pursue, hunt, take, capture, kill or sell migratory birds, including their feathers, eggs, and nests. In addition, most wading bird habitat is protected by state and federal regulations that protect wetlands. Both the federal [Clean Water Act](#) and Florida's [Wetland Resource Permitting Program](#) require a permit for dredging and filling. Under state law, fish and wildlife (with emphasis on listed species) use of wetlands is considered in the evaluation of projects prior to permit issuance. Florida's WMDs provide notices for permit applications to FWC for review and comment. In addition, the WMDs' assessment of impacts of proposed activities on the wildlife value provided is based on a review of pertinent scientific literature, ecologic and hydrologic information, and field inspection.

**Action 32** Develop necessary guidelines for determining take and activities exempt from take.

The decline in Florida's resident populations of the little blue heron, reddish egret, roseate spoonbill, and tricolored-heron is due largely to the loss of quality breeding and foraging habitat. The existing protections listed above have ameliorated this loss. Nevertheless, these species have continued to decline at a rate reflected by their current level of imperilment. These species will return to use the same breeding sites year after year. In order to halt the decline (for the little blue and tricolored heron) and increase populations (for the reddish egret and roseate spoonbill), we propose protecting breeding sites until wading birds abandon the sites on their own. Guidelines should be developed that provide specifics on how to avoid disturbance of nesting and roosting wading birds, including activities likely to cause take and modifications that will minimize that likelihood.

## Law Enforcement

**Action 33** Annually identify sites for inclusion into FWC law enforcement officer work plans.

The enforcement goal is to reduce take, including disturbance. Proactive law enforcement (i.e., educating the public), combined with prosecution of violators when appropriate, can reduce take, contribute to increased productivity, and foster recreational practices compatible with wildlife. One means to accomplishing this goal is to include patrol of important wading bird nesting sites into officers' annual work plans. A list of the sites recommended by FWC biological staff identifying location, peak disturbance times, site contact, site access information, and enforcement needs can be provided to the FWC's Division of Law Enforcement as necessary. Officer presence at these sites is especially important during special events, holiday weekends, and other times when the opportunity for disturbance is highest.

**Action 34** Provide training opportunities specific to imperiled wading bird conservation for law enforcement officers.

Law enforcement workshops may include local, state, and federal law enforcement agencies and partners who manage important imperiled wading bird nesting sites. It is recommended that workshops be held annually so newly identified sites and circumstances may be discussed, new officers can be trained and strategies for site protection (including defining roles for law enforcement and partners) may be created. These workshops are an opportunity for training, communication of issues, and creating strategies for improved protection.

### **Incentives and Influencing**

Implementation of this plan will require the cooperation of many agencies and partners outside of FWC. One of the greatest challenges to maintaining or increasing current populations of imperiled wading birds is a shortage of adequate foraging and nesting habitat in key areas. Public lands alone cannot meet this demand; it will take the collaboration of private property owners. The plan is structured to provide incentives to partners to encourage their action and participation. These incentives are intended to promote an increase in the acreage of protected and managed wading bird habitat. Available incentives would come largely through the existing state and federally administered [Landowner Assistance Programs](#) and minor changes to those programs to include criteria and projects that benefit wading birds specifically.

**Action 35** Protect and restore coastal and freshwater wetlands from siltation and non-point source pollution by using existing Natural Resource Conservation Service (NRCS) Farm Bill programs (Wetlands Reserve Program [WRP], Wildlife Habitat Incentives Program, Environmental Quality Incentives Program) and their associated cost-share conservation practices to undertake conservation measures such as fencing livestock and providing bank stabilization through aquatic and bank vegetation plantings that will benefit wading bird habitat.

FWC administers or assists other agencies with the application of several landowner incentive programs for wildlife conservation. These programs are voluntary and some may provide financial incentives, depending on annual appropriation, for wildlife conservation and/or habitat management on private lands. FWC provides technical guidance and review to focus and approve the distribution of these cost-share funds for specified wildlife management activities. FWC can coordinate internally with its Landowner Assistance Program to enhance the application of these programs on appropriate privately owned wetlands for imperiled wading bird conservation. This program will include technical advice and outreach to landowners on opportunities for improving quality foraging habitat, enhancement of existing nesting colonies, and technical and financial assistance with habitat management (e.g., prescribed fire, vegetation management). Wading bird conservation goals and objectives will be integrated into this program.

**Action 36** Partner with NRCS, USFWS Coastal Program, and other partners to develop incentives to maintain buffer areas around privately-owned riparian or coastal areas.

FWC should collaborate with NRCS, USFWS, and other partners to develop incentives for maintaining buffer areas around privately-owned riparian or coastal areas. For example, [a new](#)

[objective of FWC's Legacy Initiative for 2012-2017](#) is to increase the length of adequate (>30 m [98 ft]) riparian buffer in high-ranking basins on public and/or private lands by 24 stream km (15 stream mi) by 2017. This will be accomplished by working with private landowners in areas where land use is having a demonstrated impact on priority wading bird habitat.

**Action 37** Partner with the USFWS Coastal Program to focus funding on habitat enhancement projects that benefit imperiled wading birds.

The South Florida Coastal Program, administered by the USFWS, has identified saltwater and freshwater herbaceous marsh as targeted ecological communities. This program, operated under the umbrella of the National Coastal Wetlands Conservation Grants Program, provides technical and financial support to local conservation groups to accomplish on-the-ground projects such as exotic and invasive vegetation management, hydrological restoration, and water quality enhancement. In Florida, FWC is the primary agency receiving these grants, and can also serve as a conduit for other conservation organizations. Funding from this program can be used to restore coastal wetland hydrology by plugging drainage ditches, installing water-control structures, constructing dikes, and/or re-establishing historic connections with waterways to benefit imperiled wading birds. In addition, projects that include planting native vegetation and removing invasive species could also benefit wading birds. Ranking criteria for this program include whether the project will provide, restore, or enhance important habitat for coastal-dependent or migratory birds, and whether the project will benefit any state-listed species in addition to federally-listed species. FWC can coordinate with the USFWS to determine whether these criteria for state-imperiled wading bird species could be strengthened to achieve even greater benefits.

**Action 38** Encourage NRCS and USFWS to incorporate the recovery needs of imperiled wading birds when prioritizing private conservation lands to be funded for wetland restoration through WRP or the National Coastal Wetlands Conservation Grants Program.

The WRP is a voluntary easement program offering landowners the opportunity to protect, restore, and enhance wetlands on their property. The U.S. Department of Agriculture's NRCS provides technical and financial support to help landowners with their wetland restoration efforts. The NRCS goal is to achieve the greatest wetland functions and values, along with optimum wildlife habitat, on every acre enrolled in the program. The landowner has the option to choose between a 10-year or 30-year cooperative agreement, and a permanent conservation easement. For the permanent conservation easement, NRCS can pay 100% of the restoration and legal costs.

Through an interagency cooperative agreement, FWC currently provides expert technical assistance to NRCS regarding wetland wildlife needs from the initial ranking process to the monitoring of completed projects. FWC could collaborate with NRCS to develop additional ranking criteria that would increase benefits for imperiled wading birds. For example, a project currently receives extra points if the proposed easement lies within the core foraging area of a known wood stork colony. A similar criterion could be used to accrue extra points for a project that lies within the core foraging radius of a colony harboring state-imperiled wading bird species.

**Action 39** Increase natural water retention on private lands within watersheds by restoring stream connectivity to the floodplain as a means of increasing wetland protection and restoration (and restoring natural hydrology to streams) without the need for additional acquisition.

Several programs pay landowners in south Florida for retaining water on their lands for a specified period of time, a practice commonly referred to as water farming or dispersed water management. Landowners may participate through 3 approaches: cost-sharing, easements, or payment for environmental services. One of the principal programs located in the St. Lucie, Caloosahatchee, and Kissimmee watersheds is known as the Northern Everglades Payment for Environmental Services Program. It is a collaborative effort between SFWMD, Florida Department of Agriculture and Consumer Services, and NRCS and is implemented under a USACE Wetlands Regional General Permit. This program pays private landowners of working agricultural lands to store water at shallow depths across their properties.

An advantage of these smaller-scale projects is that they optimize the use of existing facilities and require little construction (i.e., simply filling ditches) to retain significant volumes of water on the landscape. Program participants are encouraged to retain excess water on some portion of their property over multiple years to provide a better prey base for greater wading bird use. However, the greatest benefits of these water retention programs for wading birds is derived from retaining nutrients on site and reducing the quantity of water discharged into the estuaries and Lake Okeechobee at times when the water is not needed there.

### **Education and Outreach**

**Action 40** Design an Education and Outreach plan to educate the public about the importance of avoiding disturbance of imperiled wading birds.

In areas where there is a high risk of human disturbance, increase public awareness by providing information at boat ramps and other suitable locations about buffers around nesting colonies and roosting and foraging areas. This plan should include targeted education of user groups including fishermen, boaters, eco-tour operators, bird conservation groups, and wildlife photographers.

Key messages for education and outreach efforts include:

- Disturbance of imperiled wading birds at their nesting sites can prevent them from nesting successfully.
- Florida's populations of reddish egrets and roseate spoonbills are so small that every nest is important.
- Recovery of Florida's imperiled wading birds depends on appropriate management of the Everglades and Florida's other important waters.

### **Coordination with Other Entities**

Many of the actions in this plan involve coordination with other agencies, NGOs, and local governments. Those actions are included in other sections where they are most relevant (see [Habitat Conservation and Management](#), [Population Management](#), etc.).

**Action 41** Establish a statewide wading bird working group.

In order to promote the goal and objectives of this plan and effectively coordinate the conservation actions identified here, a statewide wading bird working group will be developed with internal and external partners. This working group would function according to the needs of the partners and may include regular conference calls and/or in-person meetings whose location would likely change annually to accommodate partners around the state. In addition to increasing communication among partners and coordinating management actions, this group could also focus on developing many of the products included in this management plan (e.g., management guidelines, posting recommendations). As previous partnerships have demonstrated, including external agencies and organizations in the development of such products increases partner buy-in and the likelihood of adopting a common vision for wading birds in Florida.

**Table 2. Imperiled Wading Birds Conservation Action Table**  
*Little Blue Heron, Reddish Egret, Roseate Spoonbill, Snowy Egret, Tricolored Heron, White Ibis*

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?
1, 2, 3, 5	2	1	Participate in Comprehensive Everglades Restoration Plan (CERP) Project Development Teams (PDTs), periodic scientist calls, and other agency meetings to ensure that Everglades restoration plans restore sufficient foraging and nesting wading bird habitat (freshwater and estuarine areas) to meet established performance measures.	Habitat Conservation & Mgmt, Coordination with Other Entities	ONGOING	NO	YES	\$0-25k	Existing budget	KOEBCC	SFWMD, USACOE, USFWS, ENP	High	Yes, FWC participation in these teams is ongoing.	YES - Projects are in planning/commenting phase, need action ASAP.
1, 2, 3, 4, 5	5	2	Restore nesting sites on important wading bird colony islands in the Everglades and Francis S. Taylor Wildlife Management Area (EWMA) where woody species have been impacted by extreme high water depths and durations by re-establishing appropriate wetland tree species that would best support nesting. Some experimental work may be necessary to determine the most effective techniques and best complement of tree species.	Habitat Conservation & Mgmt, Coordination with Other Entities	EXPANDED	YES	NO	\$50-100k	Existing budget, additional funds needed but source unknown	HSC	Unknown	High	Yes, this is an expansion of an existing program.	NO- This is a high priority, long term project but is not critical to the immediate survival of the species
1, 3, 5	2	3	Work with CERP's Restoration Coordination and Verification (RECOVER) Regional Evaluation Team to ensure there is a long-term monitoring plan and a suitable model evaluation tool for assessing the effects of various CERP hydrological restoration plan alternatives on the foraging habitat of short-legged wading birds (tricolored herons, little blue herons, white ibis, and snowy egrets) throughout the Greater Everglades hydrologic model domain.	Habitat Conservation & Mgmt, Coordination with Other Entities	EXPANDED	NO	YES	\$0-25k	Existing budget, additional funds needed but source unknown	KOEBCC	SFWMD, USACOE, USFWS, ENP	Moderate	Yes, this is an expansion of an existing program.	YES - Projects are in planning/commenting phase, need action ASAP.
3, 4	3	4	Provide technical assistance and guidance to lead water management agencies (USACE and SFWMD) during early stages of water reservoir and stormwater treatment area (STA) design to incorporate favorable imperiled wading bird foraging habitat and nesting habitat associated with CERP when doing so does not severely compromise their primary function.	Habitat Conservation & Mgmt, Coordination with Other Entities	EXPANDED	NO	YES	\$0-25k	Existing budget, additional funds needed but source unknown	KOEBCC, Regional Directors	USACOE, USFWS, WMD's, NGOs, local governments	Moderate	Yes, this is an expansion of an existing program.	Yes - Projects are in planning/commenting phase, need action ASAP.
3, 4	3	5	Provide technical assistance and guidance to lead water management agencies (USACE and water management districts [WMDs]) and partnering natural resource agencies (USFWS and DEP) during the early stages of planning for changes to regulation schedules of large state waterbodies, such as the Everglades WCAs, Lake Okeechobee, and the Kissimmee Chain of Lakes, that are important to imperiled wading birds. For other waterbodies, continue to provide technical assistance to water management agencies through agency commenting on proposed changes to water management regulation schedules and restoration projects that will affect wetlands used by imperiled wading birds.	Habitat Conservation & Mgmt, Coordination with Other Entities	ONGOING	NO	YES	\$0-25k	Existing budget	HSC, CPS, AHRE, IPMS, WHM, FFM, AHRE, KOEBCC	Army Corps of Engineers, Water Management Districts, DEP	Low	Yes, this is an expansion of an existing program.	Yes - Projects are in planning/commenting phase, need action ASAP.
3	1	6	Identify management actions needed to improve or maintain priority imperiled wading bird habitat on public lands including cooperatively managed wetlands and large waterbodies.	Habitat Conservation & Mgmt, Coordination with Other Entities	EXPANDED	NO	YES	\$0-25k	Existing budget, additional funds needed but source unknown	HSC, WHM, CPS, AHRE, FFM, KOEBCC	All public land managers	High	Yes, identification of management actions needed is feasible. Implementation will require partnering.	Yes - Most wading bird habitat is on public lands. Mostly in Everglades area, which is already focused on wading birds.
3, 4	4	7	Participate in saltmarsh restoration planning, develop management recommendations for impoundments, and encourage impoundment managers to include imperiled wading bird habitat needs in their management regimes, particularly during the nesting season (e.g., implementing spring draw-downs prior to summer flooding for mosquito management).	Habitat Conservation & Mgmt, Coordination with Other Entities	EXPANDED	NO	YES	\$25-50k	Existing budget, additional funds needed but source unknown	HSC, CPS & AHRE	WMD's, DEP	High	Yes, it can be done, yes it is practical, yes relationships already exist.	No- This is a high priority, long term project but is not critical to the immediate survival of the species
3, 4	4	8	Coordinate with other state agencies and local governments to promote water quality in stormwater retention facilities, especially to minimize toxic effects to imperiled wading birds.	Habitat Conservation & Mgmt, Coordination with Other Entities	NEW	NO	YES	\$25-50k	Unknown	HSC, CPS, AHRE, IPMS, WHM, FFM, KOEBCC	DEP, WMDs, Counties	Unknown	Yes this is feasible but requires new relationships, funding, and other resources.	No- This is a moderate priority, long term project but is not critical to the immediate survival of the species

**Table 2. Imperiled Wading Birds Conservation Action Table**  
*Little Blue Heron, Reddish Egret, Roseate Spoonbill, Snowy Egret, Tricolored Heron, White Ibis*

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?
3, 4	2	9	Identify opportunities to improve wading bird habitat when designing and reviewing management plans for FWC managed areas.	Habitat Conservation & Mgmt, Coordination with Other Entities	EXPANDED	YES	YES	\$0-25k	Existing budget	HSC, CPS, AHRE, IPMS, WHM, HSC, FFM, KOEBCC	Army Corps of Engineers, Water Management Districts, DEP	High	Yes, FWC can adjust management on lands it manages.	No- This is a moderate priority, long term project but is not critical to the immediate survival of the species
3, 4	3	10	Identify important wetlands and streams where minimum flows and levels (MFLs) are a concern and work with Water Mgmt Districts to ensure imperiled wading bird habitat needs are included in the process of setting MFLs.	Habitat Conservation & Mgmt, Coordination with Other Entities	EXPANDED	NO	YES	\$0-25k	Existing budget, additional funds needed but source unknown	HSC, CPS, AHRE, IPMS, WHM, HSC, FFM,	Water Management Districts	Moderate	Identification - feasible. Implementation - moderate.	Yes, MFL schedules dictate urgency
1, 2, 3, 4, 5	1	11	Work with the Florida Inland Navigation District (FIND) and DEP to improve or create suitable foraging and nesting habitat on spoil islands, continue participation in the Spoil Island Working Group (east coast), provide technical assistance (south), and promote creation of a new working group (west coast).	Habitat Conservation & Mgmt, Coordination with Other Entities	EXPANDED	NO	NO	\$25-50k	Existing budget, additional funds needed but source unknown	HSC, CPS, AHRE, IPMS, WHM, FFM, KOEBCC	DEP, FIND, Audubon Florida, Miami-Dade and Palm Beach Counties	Unknown	Yes this is feasible but requires new or expanded relationships, funding, and other resources.	No- This is a high priority, long term project but is not critical to the immediate survival of the species
4	3	12	Protect and/or construct shallow tidal flats for foraging reddish egrets.	Habitat Conservation & Mgmt, Coordination with Other Entities	NEW	NO	NO	\$25-50k	Unknown	HSC, CPS, AHRE	DEP, FIND	High	Yes, this can be done, it is practical since ACOE often permits dredging and dredge spoil must be placed somewhere. FWC staff do not normally influence placement of dredge spoil but could.	No- This is a moderate priority, long term project but is not critical to the immediate survival of the species
3, 4	3	13	Promote acquisition and management of additional wetland habitat statewide, especially in the Everglades Headwaters National Wildlife Refuge, by influencing and coordinating with state and federal agencies and non-governmental organizations (NGOs).	Habitat Conservation & Mgmt, Coordination with Other Entities	ONGOING	NO	YES	\$0-25k	Existing budget	HSC, CPS, WHM, Florida Wildlife Legacy Initiative	USFWS	Too early to know	It's being done, practical, and relationships are already there, but too early to tell if it will work.	N/A, ongoing program
3, 4	3	14	Prioritize coastal wetlands for acquisition and easements and include consideration of sea level rise as a prioritization criteria.	Habitat Conservation & Mgmt, Coordination with Other Entities	EXPANDED	NO	YES	\$25-50k	Existing budget, additional funds needed but source unknown	HSC, CPS, WHM	Florida Forever, USFWS, DEP's Coastal Program	Moderate	Low. Current economy leaves few funds for land acquisition.	No, most land acquisition programs are on hold
1, 2, 5	4	15	Post buffer zones around priority nesting colonies.	Population Mgmt	EXPANDED	NO	YES	\$50-100k	Existing budget, additional funds needed but source unknown	HSC, WHM	Land Managers-All agencies	High with enforcement	Yes but require cooperation with partners	Urgent in spoonbill colonies
1, 2, 5	5	16	Control mammalian predation at priority nesting colonies when identified as a significant threat (identified through Action 20).	Population Mgmt	EXPANDED	NO	NO	\$100k+	Existing budget, additional funds needed but source unknown	HSC, WHM	Land Managers-All agencies	High	Yes but require cooperation with partners	No. Predation is one of many contributing factors impeding reproduction
1, 2, 5	4	17	Continue posting signs, patrolling, and enforcing rules for designated Critical Wildlife Areas (CWAs) where imperiled wading bird colonies are located.	Population Mgmt, Law Enforcement	ONGOING	YES	YES	\$0-25k	Existing budget	HSC, SCP	DEP-FPS, Audubon, other public land managers	High	Yes, ongoing program	N/A, ongoing program
1, 2, 5	3	18	Establish new Critical Wildlife Areas for high priority colonies that are subject to disturbance.	Population Mgmt, Habitat Conservation & Mgmt	EXPANDED	YES	YES	\$50-100k	Existing budget, additional funds needed but source unknown	HSC, SCP	Land Managers-All agencies	High	Yes, full time grant funded position working on this issue currently.	N/A, ongoing program
1, 2, 5	3	19	Develop management recommendations to protect and manage nesting colonies.	Population Mgmt, Habitat Conservation & Mgmt	NEW	YES	YES	\$0-25k	Apply for grant	HSC, SCP, FWRI	Land Managers-All agencies	Moderate	Yes but require cooperation with partners	No- This is a moderate priority, long term project but is not critical to the immediate survival of the species

**Table 2. Imperiled Wading Birds Conservation Action Table**  
*Little Blue Heron, Reddish Egret, Roseate Spoonbill, Snowy Egret, Tricolored Heron, White Ibis*

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, 2, 5	4	20	Re-evaluate and prioritize the top nesting colonies and associated foraging habitat based on the need for protection and management.	Monitoring & Research	EXPANDED	YES	NO	\$0-25k	Existing budget, additional funds needed but source unknown	HSC, SCP, FWRI	Land Managers-All agencies	High	Yes, this is a re-working of a previous agency effort.	No- This is a moderate priority, long term project but is not critical to the immediate survival of the species
1, 2, 5	3	21	Design and implement an annual statewide monitoring program for the highest-priority wading bird colonies.	Monitoring & Research	NEW	YES	NO	\$100k+	Apply for grant	FWRI	Land Managers-All agencies	High- monitoring	Yes, but may be expensive.	Yes - we have no monitoring program in place for wading birds statewide.
1, 2, 5	3	22	Design and implement a statewide monitoring program at 10-year intervals for the non-nesting distribution of imperiled wading birds to determine important wetlands used for foraging by migratory and resident populations.	Monitoring & Research	NEW	YES	NO	\$100k+	Apply for grant	FWRI	Unknown	High - monitoring	Yes, but may be expensive.	No - although we have no monitoring program for non-nesting waders, monitoring nesting waders is more important.
3, 4	1	23	Monitor the condition and size of the most important tree islands used by imperiled wading birds for nesting in the Everglades on an annual basis.	Monitoring & Research	NEW	YES	YES	\$25-50k	Apply for grant	HSC, WHM	None	High	Yes, since many of the tree islands are managed by FWC	Yes - because Everglades restoration is ongoing and islands are disappearing, this is the time to ensure there is no further loss.
1, 2, 5	5	24	Monitor the mercury concentrations in wading bird nestlings in Everglades.	Monitoring & Research	ONGOING	NO	NO	\$50-100k	Existing budget	FWRI	WMDs	Moderate	Yes, there is ongoing monitoring through SFWMD which we can expand.	No - this has been ongoing and indications are that Hg in waders is decreasing.
1, 2, 5	1	25	Develop and maintain a statewide database for wading bird data.	Monitoring & Research	NEW	YES	NO	\$25-50k	Apply for grant	FWRI	Land Managers-All agencies	High	Yes	No - this is part of the monitoring project, not stand alone.
3	1	26	Model the impact of climate change (sea-level rise, temperature change, and change in rainfall) on the nesting and foraging habitat of imperiled wading birds.	Monitoring & Research	NEW	YES	NO	\$25-50k	Apply for grant	FWRI	Universities, other researchers	Moderate	Yes. Many states have conducted similar modeling exercises.	No- This is a high priority project but is not critical to the immediate survival of the species
1, 2, 5	3	27	Model the demographic parameters (population growth, predation vulnerability, annual post-fledging survival rate, sources of mortality outside nesting season) of imperiled wading birds.	Monitoring & Research	NEW	YES	NO	\$50-100k	Apply for grant	FWRI	Universities, other researchers	Moderate	Yes but can be costly to determine demographic parameters for all 6 species.	No- This is a moderate priority project but is not critical to the immediate survival of the species
1, 2, 5	3	28	Determine likelihood of imperiled wading birds to return to their natal colony to nest.	Monitoring & Research	NEW	YES	NO	\$50-100k	Apply for grant	FWRI	Universities, other researchers	Moderate	Yes. Radio instrumenting waders is feasible and should provide the needed information.	No- This is a moderate priority project but is not critical to the immediate survival of the species
1, 2, 5	4	29	Determine if imperiled wading birds from outside sources immigrate into Florida to breed.	Monitoring & Research	NEW	YES	NO	\$50-100k	Apply for grant	FWRI	Universities, other researchers	Moderate	Yes, but will likely need to be a multi-state and multi-country effort and will therefore be costly.	No- This is a moderate priority project but is not critical to the immediate survival of the species
1, 2, 5	5	30	Measure the population genetics of resident imperiled wading birds to determine gene flow and movement of wading birds between Florida and other states or regions of the U.S.	Monitoring & Research	NEW	YES	NO	\$50-100k	Apply for grant	FWRI	Universities, other researchers	Moderate	Yes, techniques are well developed for such an analysis.	No- This is a lower priority project but is not critical to the immediate survival of the species
1, 2, 5	1	31	Develop a technique to improve accuracy of nest counts during colony surveys.	Monitoring & Research	EXPANDED	YES	NO	TBD	Unknown	FWRI	Universities, other researchers	If a technique could be easily developed, we would have already done so. We nevertheless need a way to monitor dark herons in order to know if we are achieving our objectives.	This is a challenging practical problem with monitoring dark herons which hasn't been solved yet and may be difficult to solve.	No- This is a high priority project but is not critical to the immediate survival of the species
1, 2, 5	1	32	Develop necessary guidelines for determining take and activities exempt from take.	Protections & Permitting	NEW	YES	YES	\$0-25k	Existing budget	HSC, SCP	Development of regulations and associated guidance will	High	Yes	Yes - if permits will be issued, guidelines will be necessary

**Table 2. Imperiled Wading Birds Conservation Action Table**  
*Little Blue Heron, Reddish Egret, Roseate Spoonbill, Snowy Egret, Tricolored Heron, White Ibis*

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, 2, 5	2	33	Annually identify sites for inclusion into FWC law enforcement officer work plans.	Law Enforcement	NEW	YES	YES	\$0-25k	Existing budget	FWC LE & HSC SCP	LE in other state and local agencies	This is expected to be highly effective assuming that there is sufficient manpower to protect important sites particularly during holidays.	Yes	No- This is a high priority project but is not critical to the immediate survival of the species
1,2,5	2	34	Provide training opportunities specific to imperiled wading bird conservation for law enforcement officers.	Law Enforcement	NEW	YES	YES	\$0-25k	Existing budget	FWC LE & HSC, SCP	LE in other state and local agencies	High	Yes, but many of the Species Action Plans have identified this need and collectively would be a lot of training time.	No- This is a high priority project but is not critical to the immediate survival of the species
3, 4	4	35	Protect and restore coastal and freshwater wetlands from siltation and non-point source pollution by using existing Natural Resource Conservation Service (NRCS) Farm Bill programs (Wetlands Reserve Program [WRP], Wildlife Habitat Incentives Program, Environmental Quality Incentives Program) and their associated cost-share conservation practices to undertake conservation measures such as fencing livestock and providing bank stabilization through aquatic and bank vegetation plantings that will benefit wading bird habitat.	Incentives & Influencing, Habitat Conservation & Mgmt, Coordination with Other Entities	ONGOING	YES	YES	\$0-25k	Existing budget	HSC, CPS	Private landowners	Moderate	Yes, since it only requires adjustments to existing programs already implemented by FWC.	N/A, ongoing program
3, 4	3	36	Partner with NRCS, USFWS Coastal Program, and other partners to develop incentives to maintain buffer areas around privately-owned riparian or coastal areas.	Incentives & Influencing, Coordination with Other Entities	NEW	NO		\$50-100k	Unknown	HSC, AHRE, CPS	NRCS, USFWS, DEP'S Coastal Program	Moderate	Yes, but requires support from partners. This would be a new practice added to existing programs or a new program.	No- This is a moderate priority project but is not critical to the immediate survival of the species
3, 4	4	37	Partner with the USFWS Coastal Program to focus funding on habitat enhancement projects that benefit imperiled wading birds.	Incentives & Influencing, Coordination with Other Entities, Habitat Conservation & Mgmt	ONGOING	NO	YES	\$50-100k	Existing budget	HSC, AHRE, CPS	NRCS	Moderate	Yes, since this is an ongoing program.	N/A, ongoing program
3, 4	3	38	Encourage NRCS and USFWS to incorporate the recovery needs of imperiled wading birds when prioritizing private conservation lands to be funded for wetland restoration through WRP or the National Coastal Wetlands Conservation Grants Program.	Incentives & Influencing, Coordination with Other Entities, Habitat Conservation & Mgmt	NEW	NO	YES	\$0-25k	Existing budget	HSC, AHRE	NRCS, USFWS, DEP'S Coastal Program	Moderate	Yes but requires cooperation of partners.	No- This is a moderate priority project but is not critical to the immediate survival of the species
3, 4	3	39	Increase natural water retention on private lands within watersheds by restoring stream connectivity to the floodplain as a means of increasing wetland protection and restoration (and restoring natural hydrology to streams) without the need for additional acquisition.	Incentives & Influencing, Habitat Conservation & Mgmt	EXPANDED	NO	NO	\$25-50k	Existing budget, additional funds needed but source unknown	HSC, AHRE, CPS	NRCS, USFWS, DEP'S Coastal Program	Moderate	Yes, but requires cooperation of partners.	No- This is a moderate priority project but is not critical to the immediate survival of the species
1, 2, 5	3	40	Design an Education and Outreach plan to educate the public about the importance of avoiding disturbance of imperiled wading birds.	Education & Outreach	NEW	YES	NO	\$0-25k	Existing budget	HSC	Unknown	Moderate	Yes	No- This is a moderate priority project but is not critical to the immediate survival of the species
1, 2, 3, 4, 5	2	41	Establish a statewide wading bird working group.	Coordination with Other Entities	NEW	YES	NO	\$25-50k	Apply for grant	HSC, SCP	Researchers, Land Managers-All agencies, NGOs	Moderate	Yes. However, many of the SAPs have identified the need for working groups, which may spread partners too thin.	No- This is a high priority, long term project but is not critical to the immediate survival of the species

**Acronyms used in this table:**

AHRE: Aquatic Habitat Restoration and Enhancement  
ASAP: As soon as possible  
CERP: Comprehensive Everglades Restoration Plan  
CPS: Conservation Planning Services, a Section of the Florida Fish and Wildlife Conservation Commission's Division of Habitat and Species Conservation  
DEP: Florida Department of Environmental Protection  
ENP: Everglades National Park  
FIND: Florida Inland Navigation District  
FPS: Florida Park Service  
FWC: Florida Fish and Wildlife Conservation Commission  
FWRI: Fish and Wildlife Research Institute, the research branch of the Florida Fish and Wildlife Conservation Commission  
HSC: Habitat and Species Conservation, a Division of the Florida Fish and Wildlife Conservation Commission  
IPMS: Invasive Plant Management, a Section of the Florida Fish and Wildlife Conservation Commission's Division of Habitat and Species Conservation

KOEBCC: Kissimmee- Okeechobee- Everglades- and Big Cypress Coordination Team  
LE: Law enforcement  
NGO: Non-governmental organization(s)  
NRCS: National Resource Conservation Service  
SCP: Species Conservation Planning, a Section of the Florida Fish and Wildlife Conservation Commission's Division of Habitat and Species Conservation  
SFWMD: South Florida Water Management District  
TBD: To be determined  
USACE: United States Army Corps of Engineers  
USFWS: United States Fish and Wildlife Service  
WCA: Water conservation area  
WHM: Wildlife and Habitat Management, a Section of the Florida Fish and Wildlife Conservation Commission's Division of Habitat and Species Conservation  
WMD: Water Management District(s)

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**APPENDICES****Appendix 1. Recommended management practices to benefit imperiled wading birds.**

The Florida Fish and Wildlife Conservation Commission (FWC) encourages land management practices that benefit wading birds. Land management activities should incorporate the appropriate protections outlined in the [Rule and Permitting Intent](#) section of this document. FWC provides technical assistance in managing habitats within nest buffers, and also includes, in Conceptual Management Plans of lands managed by FWC, a component that follows recommended management practices for both nesting and foraging habitat near wading bird colonies. The following list includes some management practices that can benefit imperiled wading birds; this list will be expanded and revised as a component of [Action 19](#):

- Protect and maintain large forested tracts to promote cover for colonial nesters.
- Maintain a 100-m (328-ft) buffer around colonies during nesting seasons (dates identified in [Table 1](#)).
- Protect and restore willow strands and other low-elevation native tree islands used by wading birds, particularly in the Everglades ecosystem. Restoration includes providing more natural hydrological conditions, exotic plant control, prescribed fire, native tree and shrub plantings, and the maintenance of planted trees and shrubs.
- Provide suitable foraging habitat within an 11.3- to 14.5-km (7- to 9-mi) radius from active nesting colonies during the nesting season.
- When possible, maintain water depths between 15 and 35 cm (6 and 14 in) for a minimum 90-day period from January through May, either through variable topography or water management.
- Maintain a matrix of wetland types with variable water levels to provide accessible foraging for all species of wading birds throughout the range of water-level fluctuations.
- Maintain some acreage of long-hydroperiod marsh (inundated 3 to 5 years between dry-downs) to stabilize food webs.
- Maintain high water levels immediately surrounding nesting colonies to reduce accessibility to predators.
- Allow water to flood upper marshes/littoral zones during the wet season to enhance prey populations.
- When conducting management activities near known nest colonies, plan mechanical and/or chemical treatments of aquatic vegetation for the non-breeding season when the colony is inactive; avoid damaging the plants in which wading birds construct nests; allow vegetation in the immediate vicinity of nest trees to remain dense if possible and protect neighboring tall trees.

**Appendix 2. Spoil island management (see [Action 11](#)).**

Spoil islands have been created along much of Florida's coast as a byproduct of creating and maintaining navigable waterways. These islands are typically owned by the state or county, and the Department of Environmental protection (DEP) has management authority for most; however, the management approach differs regionally. On the east coast, DEP and the Florida Inland Navigation District created the Spoil Island Working Group to manage 137 spoil islands included in the Indian River Lagoon management plan. Working Group membership currently includes FWC, other state agencies, counties agencies, and non-governmental organizations. Working Group members cooperatively manage recreational and habitat management activities such as treating invasive plants, restoring native vegetation, and stabilizing the shoreline. FWC continues to actively participate in the Spoil Island Working Group on the east coast to ensure wading bird habitat, particularly in and near nesting 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.

On the west coast, Audubon of Florida (Audubon) has management agreements for most of the spoil islands from Charlotte Harbor to the Big Bend region. Some of these islands also have a long history of wading bird nesting, including reddish egrets and roseate spoonbills, and Audubon has many years of monitoring data. Audubon works cooperatively with DEP, the West Coast Inland Navigation District, and Tampa Bay Port Authority, DEP's Coastal and Aquatic Managed Areas, and others to manage both natural and spoil islands. Management activities include conducting surveys and posting important breeding bird colonies (including imperiled wading birds) to reduce disturbance. Many of these islands are in need of shoreline stabilization. Shoreline plantings or offshore wave breaks are recommended to maintain living shorelines. Development of a west coast spoil island working group, modeled after the one on the east coast, would improve coordination among the various entities involved in managing spoil islands on the west coast. This working group could cooperatively facilitate needed management actions such as shoreline stabilization for spoil island maintenance.

**Appendix 3. Waterbird colony ranking protocol scoring sheet.**

Full Waterbird Colony Ranging Protocol available on the Florida Fish and Wildlife Conservation Commission's Imperiled Species [webpage](#).

WATERBIRD COLONY RANKING PROTOCOL						
Variable					Points	
<b>Species Richness<sup>1</sup></b>	<b>Species</b>	<b>Number of Nests</b>				
		<b>&lt;50</b>	<b>50-250</b>	<b>251-500</b>	<b>501-1000</b>	
	Brown Pelican	1	2	3	4	5
	Double-crested Cormorant	1	2	3	4	5
	Anhinga	1	2	3	4	5
	Great Blue Heron	1	2	3	4	5
	Great Egret	1	2	3	4	5
	Tricolored Heron	1	2	3	4	5
	Little Blue Heron	1	2	3	4	5
	Snowy Egret	1	2	3	4	5
	Reddish Egret	1	2	3	4	5
	Cattle Egret	1	2	3	4	5
	Black-crowned Night Heron	1	2	3	4	5
	Yellow-crowned Night Heron	1	2	3	4	5
	White Ibis	1	2	3	4	5
	Glossy Ibis	1	2	3	4	5
	Roseate Spoonbill	1	2	3	4	5
	Wood Stork	1	2	3	4	5
					<b>SR total =</b>	_____
<b>Biological Score<sup>1</sup></b>	<b>Weighted Score</b>	<b>Points</b>				
	<6	1				
	6-12	2				
	>12-18	3				<b>BS weighted score =</b> _____
	>18-24	4				
	>24	5				
<b>Action Score<sup>1</sup></b>	<b>Weighted Score</b>	<b>Points</b>				
	<5	1				
	5-10	2				
	>12-15	3				<b>AS weighted score =</b> _____
	>15-20	4				

	>20	5
<b>Longevity<sup>1</sup></b>	<b>Known Years of Breeding Activity</b>	
		<b>Points</b>
	Unknown age	0
	2-5 years	1
	5-10 years	2
	11-15 years	3
	16-20 years	4
>20 years	5	
<b>Threats<sup>1</sup></b>	<b>Degree of Threat</b>	
		<b>Points</b>
	Public land, no threats	0
	Public land, low-moderate threat level	1
	Public land, moderate-high threat level	2
	Private land, low threat level	3
	Private land, moderate threat level	4
	Private land, high threat level	5
<b>Location<sup>1</sup></b>	<b>Distance to nearest large colony<sup>2</sup></b>	
		<b>Points</b>
	<25 miles	0
	25-50 miles	1
	>50-75 miles	2
	>75-100 miles	3
	>100-125 miles	4
>125 miles	5	
<b>Total Score Out of Possible 105</b>		
<b>Colony Rank</b>	<b>Total Points</b>	
		<b>Category</b>
	>80	1
	>60-80	2
	>40-60	3
	20-40	4
<20	5	
<sup>1</sup> See definitions.		
<sup>2</sup> Colony with a species richness value of ≥40 points.		