Colonial Waterbirds in the Charleston Harbor Estuary

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South Carolina Department of Health and Environmental Control

STATUS

Colonial waterbirds are a conspicuous and important component of coastal wetland ecosystems. Because of their diverse foraging and nesting habitat requirements, they serve as valuable indicators of the health of South Carolina's wetlands. In addition, their tendency to nest in groups facilitates the gathering of census information normally not available for most wildlife species. Finally, waterbirds are important symbols commonly used by organizations and individuals to represent the high quality of life found on the South Carolina coast.

Thirteen species of wading birds, eleven species of seabirds, and four species of shorebird have been documented nesting in the tri-county area ***(see Table 1)***. During a statewide survey of waterbird colonies in 1994, the South Carolina Department of Natural Resources (SCDNR) located 59 wading bird and 29 seabird colonies in Charleston and Berkeley counties containing a total of 11,520 and 19,800 nests respectively.

Seabirds and shorebirds nest primarily on the ground on offshore sandbars, barrier island beaches, man-made dredge spoil islands, and shell banks. However, Least Terns also nest on large flat rooftops located near foraging sites. Wading birds are more versatile, building nests in vegetation on sandbars and man-made spoil islands, as well as in emergent aquatic shrubs and trees in swamps, ponds, and man-made impoundments. In addition, Great Blue Herons nest as a single pair or in small groups in mature pines on small hammocks (tracks of forested land that rise above an adjacent marsh) or along the marsh-upland edge.

Colonial waterbirds exhibit a large range of habitat and prey preferences. Wading birds generally forage by standing in shallow water (5-40 cm) along creek, river, and bay shorelines. By contrast, seabirds feed primarily on the wing, often diving into the water or skimming across the surface to catch their prey.

Historically, the Charleston Harbor Estuary (an estuary is a place where inflowing salt water from the ocean meets fresh water from rivers and streams) has supported a high density of waterbird nesting. In 1975, Drum Island was the largest wading bird colony on the Atlantic Coast and contained approximately 24,450 wading bird nests, while one of the largest Eastern Brown Pelican colonies in the United States was located at Stono Inlet. Unfortunately, due to man's activities, neither of these colonies are presently occupied.

Although the Charleston Harbor Estuary still supports substantial waterbird foraging and nesting populations, recent surveys suggest that population size has been reduced from historic levels.

White Ibis colony

Table 1. Waterbird species nesting in Charleston, Berkeley, and Dorchester counties, 1988-96.

Common name	Scientific Name	Nesting[1] Substrate	Status[2]
Wading Birds			
Anhinga	*Anhinga anhinga*	A	
Black-crowned Night-Heron	*Nycticorax nycticorax*	A,G	
Cattle Egret	*Bubulcus ibis*	A	
Glossy Ibis	*Plegadis falcinellus*	A,G	
Great Blue Heron	*Ardea herodias*	A	
Great Egret	*Casmerodius albus*	A,G	
Green Heron	*Butorides striatus*	A	
Little Blue Heron	*Egretta caerulea*	A	
Snowy Egret	*Egretta thula*	A,G	
Tricolored Heron	*Egretta tricolor*	A,G	
White Ibis	*Eudocimus albus*	A,G	
Wood Stork	*Mycteria americana*	A	FE, SE
Yellow-crowned Night-Heron	*Nyctanassa violacea*	A	
Seabirds			
Black Skimmer	*Rynchops niger*	G	
Common Tern	*Sterna hirundo*	G	
Double-crested Cormorant	*Phalacrocorax auritus*	A	
Eastern Brown Pelican	*Pelecanus erythrorhynchos*	G	
Forster's Tern	*Sterna forsteri*	G	
Gull-billed Tern	*Sterna nilotica*	G	
Laughing Gull	*Larus atricilla*	G	
Least Tern	*Sterna antillarum*	G,R	ST
Royal Tern	*Sterna maxima*	G	
Sandwich Tern	*Sterna sandvicensis*	G	
Sooty Tern	*Sterna fuscata*	G	
Shorebirds			
American Oystercatcher	*Haematopus palliatus*	G	
Killdeer	*Charadrius vociferous*	G,R	
Willet	*Catoptrophorus semipalmatus*	G	
Wilson's Plover	*Charadrius wilsonia*	G	ST

[1] A = arboreal nesting, G = ground-nesting, R = roof nesting.
[2] FE = Federally endangered, SE = State Endangered, ST = State threatened.

THREATS

- ***Habitat loss and degradation***

Although there are numerous threats to the health of waterbird populations, the greatest overall threat is the reduction in the quantity and quality of habitat. Wetlands are being altered or destroyed due to increasing residential and industrial development as well as changing forestry practices. The reduction in nesting, roosting (sleeping/resting) and foraging habitats limits the number of waterbirds that can be sustained within the Charleston Harbor Watershed.

Coastal urban development

- *Nesting & Roosting Habitat*

Seabirds roost and nest on isolated barrier island beaches, sand bars and oyster banks. Channel dredging and beach renourishment projects threaten to degrade or eliminate many of these ground nesting and roosting sites. In addition, roof-nesting Least Terns may lose a significant amount of nesting habitat through reroofing after a major hurricane.

Wading birds often use dead snags or mature trees with large lateral limb structures for roosting and nesting. These stands of mature trees are being destroyed by lumbering and residential and commercial development. For example, timber in hardwood swamps is increasingly harvested as woodchips. In addition, shrub habitat on pond or impoundment edges is often eliminated for aesthetic reasons.

- *Foraging Habitat*

South Carolina has been relatively successful in protecting its wetland resources which are an important foraging habitat for wading birds. Although tidal wetlands have been relatively well protected, significant losses have occurred in freshwater non-tidal wetlands. Loss or alteration of non-tidal freshwater wetlands will likely result in a reduction in nesting populations of species specializing in these habitats, such as the Little Blue Heron or White Ibis.

- ***Human Disturbance***

Human disturbances that affect waterbird roosting, feeding and nesting ranges from activities to which the birds may easily acclimate to those which result in complete abandonment of these important habitats. Short-term disturbances, such as airplanes, boats and vehicles may cause the birds to fly from their nests and reduce their reproductive success. Lengthy disturbances, such as unleashed dogs and human intrusion in a colony may result in adults leaving eggs or chicks exposed to predators or inclement weather, and ultimately complete colony abandonment.

Unfortunately, literature documenting the effects of human disturbance on foraging waterbirds is lacking. The projected increases in human population in the tri-county area within the

Counting Royal and Sandwich Tern nests, eggs and chicks

next 10 years will more than likely lead to increases in human disturbance at waterbird foraging sites through increased shoreline development, dock structures, and boat traffic. The point at which human disturbance begins to effect the foraging efficiency of waterbirds is unclear and is a high priority for future research.

- ***Alteration of Food Webs***

Estuarine-dependent waterbirds and humans often feed on the same prey species. Numerous examples of overharvesting fish stocks leading to major declines in bird populations have been documented worldwide. The health of waterbird populations depends on the maintenance of estuarine fish and shrimp stocks.

- ***Environmental Contamination***

Four major groups of contaminants are known to negatively affect waterbirds.

Petroleum contamination such as plumage oiling and reproductive failure is a high concern because of Charleston's status as a major shipping port as well as the numerous refining and petroleum storage facilities located within the tri-county area.

Organochlorine contaminants such as DDT, PCB's and dioxins are not widespread but may still be detrimental to reproductive success.

Organophosphorus pesticides are widely used in agricultural fields and golf courses but pose a relatively small threat to wading birds in the Charleston Harbor Estuary.

Metals that reach concentrations known to affect survival or reproductive success are mercury, lead and arsenic.

Black Skimmer chick

- ***Diseases and Parasites***

The coloniality of waterbirds make them particularly susceptible to the spread of diseases and parasites, including avian cholera, botulism and fowl ticks (*Ornithodoros capensis*).

- ***Human Caused Mortality***

Powerline collisions - Powerlines pose a moderate threat to waterbirds, particularly where they cross migratory routes or bisect feeding/ roosting sites.

Bird entanglements - In the Charleston Harbor Estuary birds have been recovered tangled in gill nets, drift nets, fishing line, discarded shrimp nets, and various forms of plastics.

This list represents current threats to wading bird populations in the tri-county area; however, it is by no means comprehensive. Future monitoring of waterbird populations is necessary to ensure the timely identification of unforeseen threats.

Ring-Billed Gull tangled in garbage

Eastern brown pelican colony

Man-made Least Tern nesting site/shade structure

MANAGEMENT NEEDS

Degradation and loss of habitat

- *Ground-nesting colonies*

Major threats to wading bird habitat can be managed with careful planning and implementation. All dredging activities including maintenance dredging in ship channels, beach renourishment and the redirecting of inlets must be closely monitored for possible effect on waterbird nesting. The management of vegetation may be necessary to provide a diversity of nesting substrates for the birds. Planting of small shrubs will increase use of ground-nesting sites by wading bird species. An alternative to establishing shrub habitat would involve the construction of nesting platforms. Alterations to nesting sites must be conducted during the non-nesting season *(see Table 2)*.

- *Rooftop colonies*

Rooftop colonies, used mainly by Least Terns, present unique problems for management. All active colonies should be evaluated for the presence of perimeter barriers, shade structure, drainage and presence of exposed tar. Provision of suitable nesting substrate is critical. As rooftop habitat is lost to reroofing, additional nesting habitat may be provided by placing pea-gravel on existing predator-free structures in the Charleston Harbor Estuary. Possible sites include partially sunken ships/barges or the Castle Pinckney ruins. If existing structures are not available, it may be necessary to provide nesting habitat by constructing nesting platforms.

For most seabird species, newly created nesting habitat is quickly located and utilized. For wading birds, it is advisable to attempt to re-establish wading bird colonies in sites with a history of use.

- *Arboreal nesting colonies*

In unimpounded river swamps, nesting sites are generally concentrated in low elevation areas which have consistently high water levels during the nesting season. If timber harvesting must be done in the river swamps, it should be restricted to high elevation areas away from deep water channels. Alterations to natural hydrologic patterns in river swamps may effect water levels at colony sites and should be prohibited. Water releases from hydro-electric facilities should be adjusted to mimic natural hydrologic patterns. Depression wetlands located near industrial or residential areas should be monitored to ensure excessive use of water (e.g. golf course irrigation) does not effect colony water levels.

Table 2. Colony occupation dates for colonial waterbirds in South Carolina. (S. C. Colonial Waterbird Database 1996).

Species	Nesting Dates[1]
Great Blue Heron	February 1- September 1
Wood Stork	February 15 - September 1
Great Egrets Anhinga	March 1- September 1
Eastern Brown Pelican	April 1- November 20
White Ibis	April 15 - September 15
Least Terns	April 1 - August 15
All other waterbird species	April 15 - September 1

[1] Dates represent approximations of colony occupation. Ground checks are necessary to confirm activity.

For colonies located in impounded wetlands, a minimum flooding of nest trees is important. Drawdowns (lowering of the water level in a body of water) every 3-4 years during the non-nesting season would encourage recruitment of new trees and promote tree growth.

New pond construction resulting from residential or commercial development should be designed with island habitat to provide potential nesting sites. Islands should be relatively small and centrally located in order to avoid invasion by mammalian predators. Trees and shrubs should be left during construction if possible.

Landfills should be at least 3 km (~1.9 miles) from waterbird nesting sites and covered continuously to reduce the possibility of concentrating predators near colony sites.

Monitoring of Local Nesting Populations

- *Seabirds*

Managers should attempt to maintain approximately 25,000 nesting pairs in the tri-county area. Following the loss of Bird Key-Stono in 1994, total colonial seabird nesting dropped to an 8-year low of 17,947 nests. Because of the limited number of nesting sites in the tri-county area, the formation of an additional seabird colony is necessary to restore historic nesting levels.

- *Wading birds*

Wading bird nesting (excluding White Ibis and Cattle Egrets) has been found to be significantly and positively correlated with wetland area in South Carolina. Based on the statewide average (0.065 nests/2.5 acres),

Spoil site

managers should attempt to maintain approximately 7,000 wading bird nesting pairs within the tri-county area. This rough estimate of carrying capacity (number needed to maintain a healthy local population) may be used to judge the overall health of wading bird populations in the tri-county area. As stated earlier, current nesting density within the tri-county area is approximately 1,000 nests below the estimated carrying capacity, so the formation or enlargement of one or more nesting colonies will be necessary to increase nest totals.

In 1994, wading bird colony locations appeared to be well spaced according to wetland distribution ***(see Figure 1)***. However, the loss of Bird Key-Stono in 1995 resulted in a large wetland foraging site that had no corresponding nesting habitat. Highest priority should be given to re-creating and maintaining a ground-nesting waterbird colony of significant size in the Stono Inlet area. Second priority should be given to the maintenance and enlargement of Crab Bank in Charleston Harbor. Carrying capacity for the tri-county area may be reached for both seabirds and wading birds by carefully manipulating island size and nesting substrate at these two sites. Spoil islands should be constructed to provide bare-sand and grassy dunes for seabirds and shrub habitat for wading bird nesting.

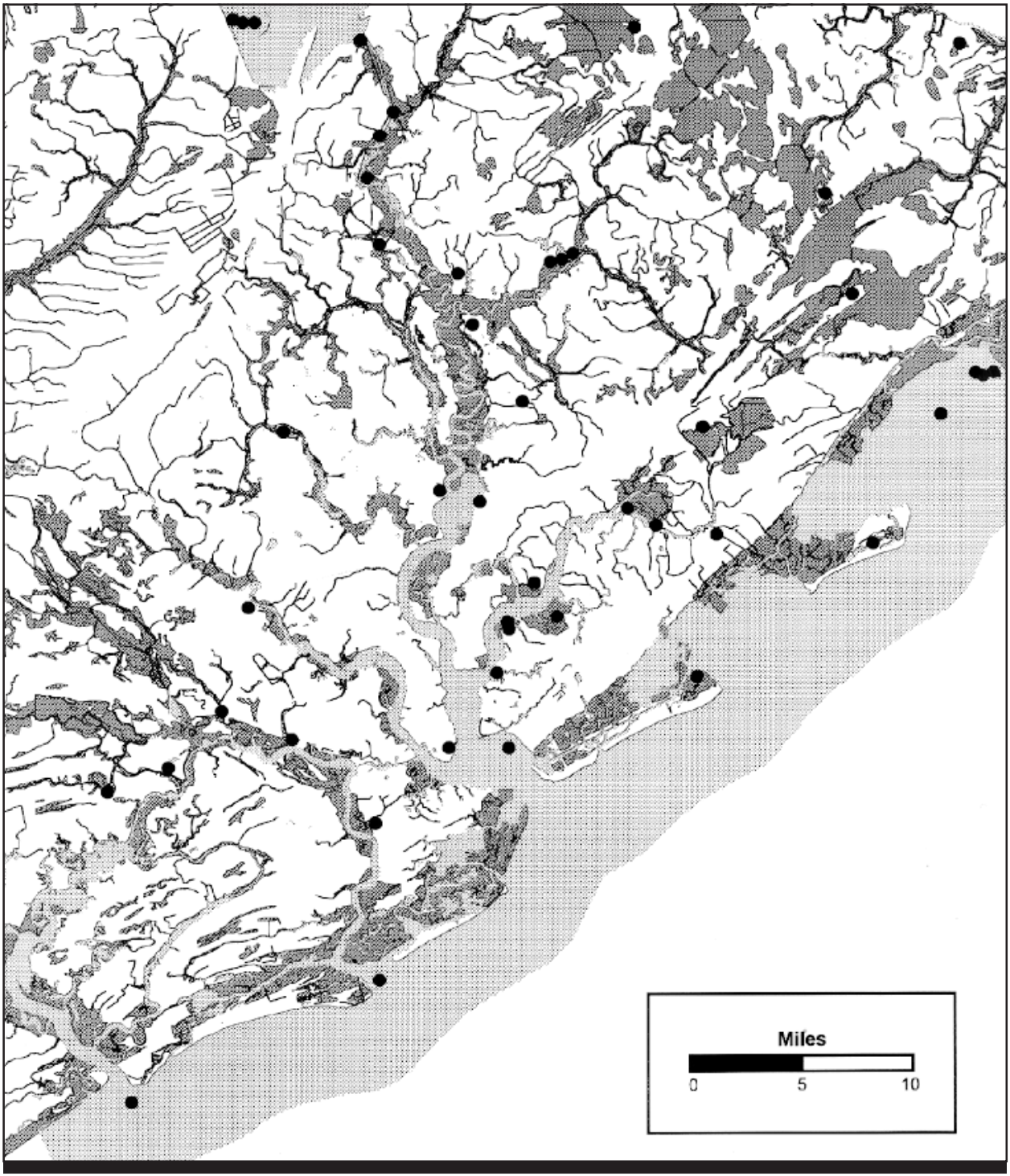

Figure 1. Waterbird nesting locations in the CHP study area, 1995.

- *Roosting Habitat*

Roost site habitat should be maintained by establishing a 30 m (~100 ft.) buffer along the marsh-upland interface throughout the estuary system. Within the buffer, mature trees (particularly those with large lateral limb structures) and dead snags must be protected. The clearing of understory trees and shrubs should be kept to a minimum. If some clearing is necessary, it should be in one or more corridors to provide viewing and access to dock structures.

- *Foraging Habitat*

Currently, tidal wetlands used by foraging birds are not significantly threatened. However, ephemeral (seasonally flooded) freshwater wetlands used by the Little Blue Heron and White Ibis should be carefully protected.

Working rice field (brackish impoundment) used as a foraging habitat for colonial waterbirds

Human Disturbance

- *Nesting Habitat*

Human activity must be minimized at colony sites during the nesting season. A set-back distance of 100 m (~330 ft.) for arboreal nesting sites and 180 m (~600 ft.) for ground-nesting colonies is recommended to buffer sites from human disturbances. There should be no human activity within the buffer zone during the nesting season, and activities which will be detrimental to the colony should be restricted during the non-nesting season. These activities include removal of vegetation; construction of roadways, towers or powerlines; or any activity which changes area, depth, or length of flooding of wetlands. Exceptions include water manipulations necessary to maintain the health of woody vegetation in the colony site. If federally endangered Wood Storks, which call for larger protective buffers, are present in nesting colonies, federal guidelines for Wood Stork nesting should be followed.

Colony sites within public access areas should be posted during the nesting season. A regular law enforcement presence may be necessary to ensure people comply with restrictions during high-use periods such as holidays and weekends.

- *Roosting Habitat*

For established roost sites, set-back distances of 100 m for arboreal roosts and 180 m for barrier island beach and sandbar sites are recommended. If 25 or more Wood Storks are present annually at a roost site, federal guidelines should be followed.

- *Foraging Habitat*

Mudflats, small creeks and ricefields were used at higher densities than other habitats, but since they represent only a portion of the total shoreline habitat, protecting these habitats alone is probably not sufficient to maintain current minimum wading bird populations. Although prioritizing by

habitat type is recommended, some level of protection must be applied to all wading bird foraging habitats to maintain current densities of wading birds.

Habitats used at relatively higher densities, like mudflats, brackish-marine small creeks and formerly impounded ricefields should be targeted for protection from human disturbance. Although it is unclear to what extent wading birds could acclimate to increasing boat traffic, a strategy for placement of boat ramps, dock structures and marinas should attempt to minimize boat traffic in small tidal creeks (< 28 m maximum width), mudflats, and formerly impounded ricefields. It is suggested that docks should be placed primarily along wide channels (> 50 m) and bay shoreline, while avoiding large mudflats and formerly impounded wetlands. Community docks are preferable to numerous single-dwelling dock structures in order to conserve available foraging habitat for wading birds.

Alteration of Food Webs

The health of waterbirds in the Charleston Harbor Estuary are ultimately dependent on the health of estuarine fish and shrimp stocks. Maintenance of these resources will be addressed by other research groups participating in the Charleston Harbor Project.

Environmental Contamination

Detection of various levels of contaminants will require close monitoring by state (DHEC) and federal (EPA) agencies. Organophosphorus can be controlled by the management of their application. Control of catastrophic petroleum spills depends on the maintenance of an updated contingency plan. Currently the U.S. Coast Guard coordinates a multi-agency effort to contain and clean-up catastrophic oil spills in the Charleston Harbor Estuary.

Brackish impoundment with birds feeding

Diseases and Parasites

Infestations of fowl ticks in pelican colonies may be controlled with the limited application of biodegradable pesticides.

Human Caused Mortality

Bird mortality in gill nets can be reduced by limiting net size and requiring nets be attended at all times. Careful placement of landfills away from wetland areas should reduce the incidence of plastics and other products in which birds become entangled in the marine environment.

Avian mortality due to powerline collisions can be minimized with the following recommendations: 1) Place powerlines underground where possible, 2) Avoid placing powerlines across migratory corridors or near nesting colonies or roost sites containing threatened or endangered species; 3) Place powerlines on existing structures and eliminate static wires where possible; 4) If possible, place all lines in a single plane; 5) Mark static wires with yellow aviation balls to increase the birds' visibility of the lines.

CONSEQUENCES OF INACTION

Inaction, particularly in the re-establishment of nesting colonies, will lead to the continued decline and possible loss of colonial waterbird nesting in the Charleston Harbor Estuary. Ultimately, declines in waterbird nesting are a warning of possible danger to human populations. The changes in human use patterns necessary to maintain wading bird populations will result in a continuation of the high quality of life we have grown accustom to on the South Carolina coast.

LONG-TERM MONITORING NEEDS

Decisions regarding the time interval between monitoring of waterbird colonies must be based on the current species status and the variability in annual nesting totals. If a large proportion of the population is concentrated in a few sites (e.g. seabirds), nesting effort should be monitored more frequently. Because wading bird nest totals are relatively stable, a complete ground census of wading bird colonies should be conducted every 5 years. However, colonies known to contain federally endangered species should be monitored on an annual basis. Aerial surveys of known colony sites should be conducted on an annual basis to gather activity information for permitting agencies. Because of the variability in annual nest totals and the small number of colonies, seabird colonies should be censused on an annual basis.

Snowy Egret

RESEARCH NEEDS FOR THE CHARLESTON HARBOR ESTUARY

1. Determine the effects of human activity on waterbird foraging efficiencies.
2. Compare Least Tern nesting success at rooftop and ground-nesting colonies.
3. Determine the importance of roost sites and their relationship to available foraging habitat.
4. Quantify seabird mortality rates associated with offshore gill net fishery.

Wood Stork nest

Tri-colored Heron chick

Black Skimmers

Summary of Recommendations for Colonial Waterbirds in the Charleston Harbor Estuary

Maintain suitable nesting sites through the deposition of dredge spoil and management of currently impounded wetlands.

Establish buffer zones of 100 m to protect tree and shrub nesting colonies and 180 m to protect ground-nesting colonies in which no human disturbance is allowed during the nesting season.

Establish a buffer zone of 30 m along the marsh/upland interface on the shoreline to protect roosting and foraging sites. Mature trees, snags and shrubs should be maintained within this zone.

Minimize boat traffic in small creeks, mudflats and formerly impounded rice fields to protect foraging habitat. Docks should be placed along wide channels and bay shoreline. Community docks are preferable to single-dwelling docks to conserve available shoreline foraging habitat.

Include island habitat suitable for nesting wading birds in new pond construction. Islands should be located near the pond center to discourage mammalian predators.

Place landfills, powerlines and towers away from colonies and wetland areas.

Restrict development of small marsh islands or hammocks (< 12 acres).

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Nesting Great Blue Herons in marsh island hammock

Borrow pit with a man-made island for bird habitat

Double-crested Comorants

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