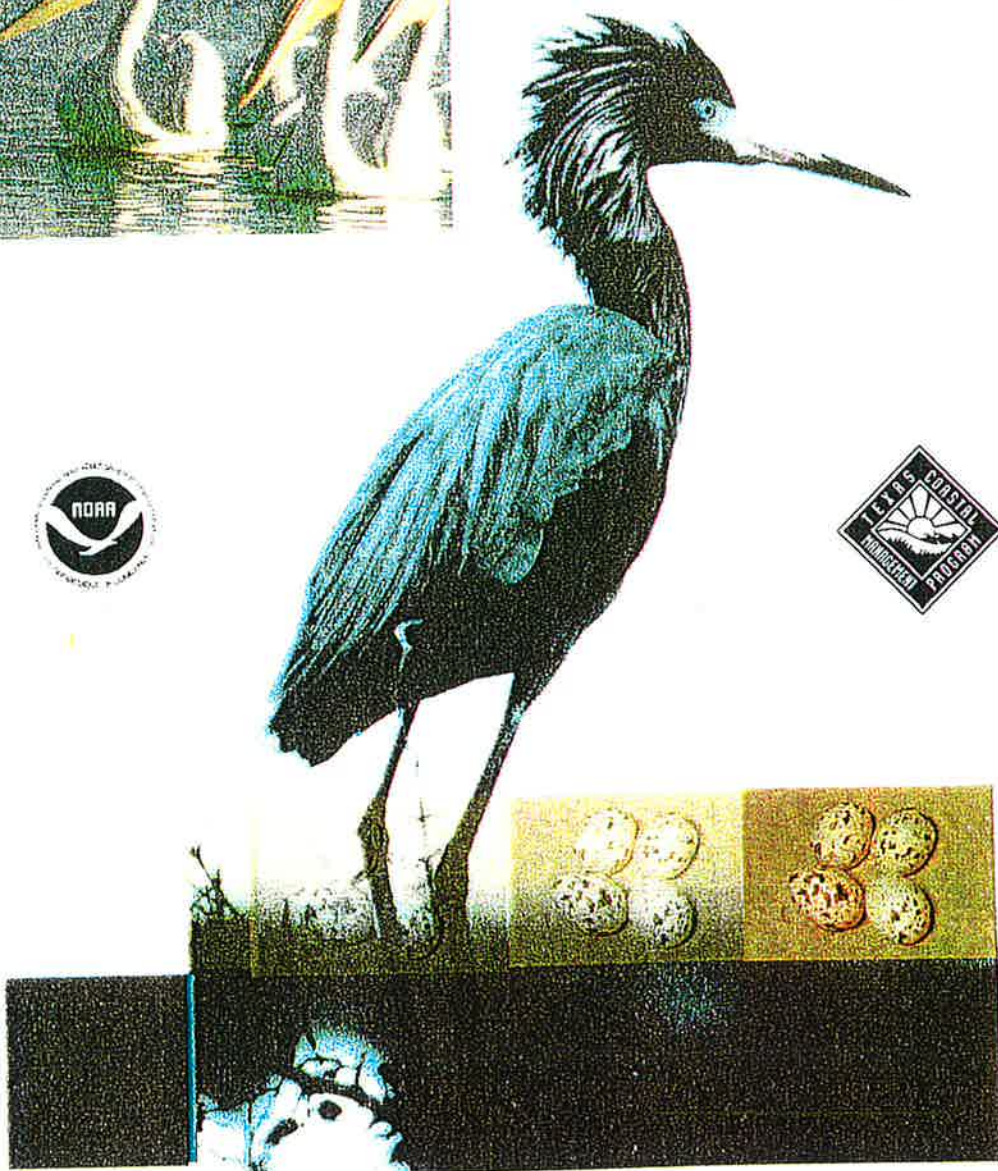


Texas Audubon Society
Colonial Waterbird Survey
Training Manual



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Colonial Waterbird Survey
Training Manual**

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INTRODUCTION

Thanks to the generous support of the Houston Endowment, The Kleberg Foundation, the Coastal Coordination Council, National Oceanic and Atmospheric Administration, and donors, Audubon has initiated an ambitious coast-wide conservation program in Texas called the Audubon Ambassador Program. For many years, Audubon (National Audubon Society, Texas Audubon Society, Houston Audubon Society) has leased coastal islands from the General Land Office (GLO) and the Port of Corpus Christi Authority, as well as maintained its own sanctuaries. In fact, Audubon sanctuaries host some of the largest reddish egret and roseate spoonbill colonies in the world, along with 96 percent of Texas' endangered brown pelicans. At present, between 50,000 and 75,000 nesting pairs of the 24 species of colonial waterbirds can be found on Audubon-managed sanctuary islands. Indeed, the majority of Texas' colonial waterbirds depend on sanctuary islands for their survival. Such a valuable resource merits strong protection and good stewardship. The Audubon Ambassador program was created to help fulfill this goal.

The primary theme of the Audubon Ambassador program is to promote harmonious coexistence between people and the colonial waterbirds that depend on the coast for feeding and nesting. Historically, an Audubon warden's main job was to stop poachers who sought out colorful plumes from nesting waterbirds such as egrets and herons, to sell to the millinery trade for profit. Today the greatest risk to these birds is no longer the depredations of plume hunters, but the multitude of competing uses for coastal habitats. Business activities, recreation, and an ever-growing human population severely threaten these birds' existence. Audubon, through the Ambassador Program, seeks to educate all coastal users about the importance of habitat conservation for colonial waterbirds and all coastal wildlife.

While colonial waterbirds do not compete directly with people for food, they do forage extensively on small fish and marine invertebrates. For this reason, they can serve as excellent bio-indicators in the event there is an increase in the level of contaminants or an impending crash in marine life. If colonial waterbird populations cannot find enough food to sustain themselves or their young, all of our coastal wildlife, including Texans, could face comparable shortages. It is, however, an unfortunate misconception that colonial waterbirds like the brown and American white pelicans compete with commercial or sport fisherman for the same game fish on open waters. Studies have consistently shown, to the contrary, that pelicans, cormorants, herons, and ibis feed principally on smaller fish and do not compete directly with humans for food. Most importantly, waterbirds serve as a sensitive barometer to the quality of coastal habitats and waters.

With the ranks of wildlife watchers, birders, and other nature enthusiasts increasing by orders of magnitude throughout the U.S. in recent years, Texas coastal birds serve yet another function that has become increasingly important economically. These highly visible and beautiful

creatures attract innumerable eco-tourists and visitors to our shores throughout the year and that, in turn, brings a tremendous amount of extra revenue to coastal communities.

Audubon has significantly expanded its coastal conservation efforts by deploying more staff along the coast (two new coastal stewards and three new wardens have been added to the three existing wardens) and by starting to build an army of volunteers -- Audubon Ambassadors -- to assist in coastal conservation activities. Indeed, Audubon depends upon one of the most effective methods of conservation there is -- broad community-based support. Like most of the volunteers, wardens live on or near the coast and therefore have a huge investment in their “backyard,” as well as an important relationship with their communities. They are willing not only to actively conserve and protect this valuable resource, they are equally dedicated to educating others. In the end, this is how conservation along the Texas coast will happen – person by person.

THE TEXAS GULF COAST

Half of the Earth’s population lives on just five percent of its land. Coastlines, out of all inhabited areas, have historically been among the most highly valued and hence most densely populated. In recent years major economic and environmental events have raised concerns about the capacity of the coastal environment to sustain human activity. Worldwide, for example, fish provide more than ½ of all animal protein consumed by people, but fish populations have declined in 13 of the world’s 17 principal fishing zones.

The Texas coastline is 367 miles long and consists of 2,125 miles of open Gulf barrier island and estuary-lagoon shoreline. As one of the most biologically rich and ecologically diverse regions in the state, the Texas coast includes more than 611,760 acres of fresh, brackish, and saltwater marshes. From the Louisiana border to Galveston, the coastline consists of marshy plains and low, narrow beach ridges. From Galveston Bay to the border of Mexico, the coastline is characterized by long, barrier islands and large, shallow lagoons. Within this unique estuarine environment are the luxuriant seagrass beds of the Laguna Madre, a rare hypersaline lagoon, and Padre Island, the longest barrier island in the world.

The coast is critical to both the ecology and economy of Texas. Wetlands and estuarine systems ensure water quality because they act as a natural filtering system for pollutants. Moreover, three-fourths of the marine life harvested in the Gulf depend on these wetlands and estuaries for breeding and reproduction. Species that depend upon these estuaries include shrimp, oysters, crabs, and finfish. Without these unique habitats, the fish, birds, and – ultimately -- all Texans would suffer. Estuaries, bays, and related aquatic habitats not only serve as important habitats for marine life and waterbirds, they also contribute significantly to the state’s economy. They allow navigation and provide a base for recreational and commercial fishing and boating. An estimated 1 million recreational fisherman and 20,000 commercial fishermen fish Texas’ coastal waters each year, for an estimated economic impact of \$2.9 billion dollars. The coast also attracts recreationists, bird watchers, sightseers, swimmers, photographers, etc., generating an additional 3 billion dollars per year.

From 1970 to 1990, the population in Texas’ 16 coastal counties and the 13 counties adjacent to them increased by more than 2 million people, or 59 percent. More than one-third of the state’s population now lives within 50 miles of the coast, and by the year 2000, more than 5.3 million

people will reside there. Rapid population growth has meant more intensive use of the bays for recreational boating and sport fishing. This in turn means a greater likelihood of harm to colonial waterbirds from human activity. Recreationists are often unaware that fishing, camping, or picnicking on a sanctuary island can disrupt nesting activities, and even boating or cruising too close to a nesting site may, and often does, reduce bird productivity.

HISTORY OF THE COASTAL SANCTUARIES

The Audubon coastal sanctuaries represent a unique and important relationship between a government agency and a non-profit organization. For over 78 years, Audubon has leased significant coastal habitats from the Texas General Land Office (GLO).

In 1918 and 1920, Gilbert Pearson, a National Audubon staff member, came to Texas and confirmed reports of species that had all but disappeared due to being hunted for their elegant plumes (roseate spoonbills at Matagorda Bay and Port Isabel and reddish egrets at South Bird Island). Interestingly, spoonbills were not particularly targeted for the color of their plumes as the color faded quickly once harvested. Their numbers declined drastically as a consequence of the general havoc plume hunters created as they targeted the others. Pearson was also struck by the vast number of royal terns (70,000), Sandwich terns (18,000), and laughing gulls (20,000) nesting on South Bird Island. Pearson soon received approval from the Texas General Land Office to lease four thousand acres comprising Green Island, North Bird and South Bird islands and their adjacent flats and reefs. Audubon's coastal sanctuaries now encompass over eleven thousand acres. Emilie Payne, one of the pioneer Audubon island sanctuary wardens, played a highly significant role in the recovery of the brown pelican. In the late 60s, she lavished tender care on 30 of them. According to Chester Smith, (pers. comm.), this was one of the first grass-roots efforts in the recovery of the bird. In 1999, the brown pelican was recommended for delisting as an endangered species, thanks in large part to the Audubon sanctuary islands.

The Audubon Coastal Islands might be described as a loosely arranged "sprinkling" of small islands, spanning all the major bay systems in Texas -- about twenty different islands or groups of islands in all -- that support most of the coastal waterbirds breeding along the 367 miles of Texas coastline. Most of the islands are leased, some from industrial groups or navigation districts like the Port of Corpus Christi, others from the General Land Office, the state agency responsible for most of the public coastal and submerged lands. For example, Green Island sanctuary is one of the greatest wading bird rookeries in North America. Its greatest claim to fame is perhaps the very large numbers of nesting reddish egrets. Moreover, Pelican Island is home to the state's largest nesting colony of the once endangered brown pelican. Not only that, every year, more than 20 species of tern, gulls, and colonial waterbirds raise their young on the rookery islands all along the Gulf Coast. These islands are ideal nesting habitats, as they provide the security and isolation these breeding birds need to successfully rear their hungry, defenseless broods. And while the islands do not offer direct sustenance, they are within short flying distance to the shallow bay waters and productive saltmarshes that teem with an abundance of foraging material throughout the extended nesting season. More than just places on a map, Audubon's Coastal Islands can boast a long history and successful track record in bird conservation.

AUDUBON AMBASSADORS

Audubon Ambassadors are not just volunteers but a diverse group of concerned citizens dedicated to the conservation of Texas' important coastal resources. People of all ages and from all walks of life, from fishermen to executives, senior citizens to college students, all make up the core of the Audubon Ambassadors program. There are many activities that Audubon Ambassadors can participate in, including:

- Helping Audubon wardens, stewards and staff members conduct the Annual Colonial Waterbird Survey.*
- Helping to organize and participate in beach and island clean-up projects.
- Helping wardens to plant native nesting trees and shrubs on the islands where appropriate.
- Helping wardens to control or remove mammalian and insect predators from the islands.
- Posting informational and/or warning signs on and around island sanctuaries, as well as near heavily used piers, boat-docks and ramps.
- Serving as Audubon “sentinels” or “trouble-shooters” by monitoring the islands from boats and from the mainland for problems, such as human intrusion, signs of predation, and oil or chemical spills, and reporting them to the proper authorities.
- Participating actively in city council meetings and other policy meetings than can affect the wellbeing of coastal habitat and wildlife.
- Participating in large group projects, such as fencing islands, and building various essential structures as well as any other activity that entails a large working group.
- Handing out or placing brochures in tourist offices and other key distribution points.
- Educating and informing local council members about the importance of coastal waters and habitats to birds and other wildlife.

All of these activities are equally vital to the continuing health and productivity of colonial waterbirds and the habitats they depend on. Finally, Audubon Ambassadors serve as important links to the communities they represent. We thank and salute the efforts of our volunteers without whom this program would not succeed.

*Due to the sensitive nature of censusing activities performed during the breeding season, Audubon Ambassadors will assist with the survey under Audubon staff supervision only.

AUDUBON COASTAL SANCTUARY STAFF

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WARDENS

Bob Gallaway	Warden of Audubon-owned North Deer Island in Dickinson Bay and watches over Atkinson Island, Moses Lake Spoil Islands, Swan Lake, South Deer Island, Jig Saw Island and Little Pelican
Joe Whitehead	Warden of Audubon-leased Vingt-Et-Un Islands, Smith Point Island and Rollover Island Spoil and Hannah Reef
Chester Smith	Warden of Audubon-leased Sundown Island in Matagorda Bay
To be filled	Warden of Pelican Island, South Bird Island, Lydia Ann Island. He also patrols Second Chain of Islands, Dead Man Island, Dunham Point, Rattlesnake Island, Ayres Island, and Roddy Island
LeRoy Overstreet	Warden of Audubon-leased Green Island, Three Spoil Island Manager of East Rattlesnake Spoil Island, Laguna Vista, Arroyo Colorado Int. Spoil Island, E. Arroyo Spoil Island
Winnie Burkett	North Coast Steward and Manager of Houston Audubon-owned High Island and Bolivar Flats sanctuaries. Assists Audubon wardens with Travis and Houston Audubon-owned North Deer Island

**THREATS TO COASTAL BIRDS AND THEIR HABITAT:
CONSERVATION STEPS TAKEN**

There are many factors, both natural and manmade, that can negatively affect colonial waterbird populations and reproduction success. Spring storms with high winds can blow nests out of trees and shrubs. Extremely high tides will flood ground nests, drowning chicks and washing eggs away. Droughts can dry up wetlands where many waterbirds feed, leaving insufficient food to raise the chicks. Floods can also wash fish and invertebrates out of the wetlands, leaving a serious shortage of food. Various aerial and terrestrial predators also prey on eggs and young. Rats, snakes, and, where fresh water is available, coyotes, raccoons and opossums may cause havoc to nesting birds, their eggs and young. Although nature can be very destructive, man still poses the biggest threat to the colonial waterbirds.

The tremendous growth of human population along the coast has led to significant loss of Texas' wetlands and habitats. Many wetlands have been filled in for development while others have been destroyed by subsidence, dredging, and erosion. In the Galveston Bay system, extraction of water and petroleum products from under the bays has accelerated subsidence (when the ground sinks because of compaction of soils), causing marshes and nesting islands to sink, making them more susceptible to erosion. In all Texas bays, dredging channels has altered water currents, causing damage to marshes and erosion of many natural nesting islands. Wakes from large ships traveling these channels also erode and damage the marshes.

People pose major threats to colonial waterbirds, in particular by interfering and disturbing them during the nesting period. This human intrusion reduces reproductive success of colonies in several ways.

1. Predatory birds, like black-crowned night-herons, laughing gulls, grackles, and crows constantly patrol waterbird colonies, ever on the alert to untended nests and young. When adult birds are flushed from their nests by human activity, these wily predators will instantly snap up unguarded eggs and chicks.
2. Eggs and chicks can cook in the scorching Texas sun if the parents are frightened away from the nest for long periods of time. Sometimes it only takes a matter of minutes for young to die from the heat.
3. Many waterbirds nest directly on the beach and, because their eggs and young are so well camouflaged, unwary visitors can step on them without even knowing it.
4. Vehicles driving on beaches can destroy whole colonies of beach nesting birds like black skimmers and least terns.

It is essential to try to keep human activity to a minimum on and around the islands, especially during the breeding season (Feb.- Aug.). Anything, from boating and fishing too close to shore to actually going onto the islands to have a picnic, can substantially undermine the birds' reproductive efforts. For this reason, widespread public education can be one of the most effective ways to protect birds and their offspring. All coastal users impact birds in some way, and need to learn how best to coexist.

Shoreline development can also produce serious problems, such as habitat alteration and destruction, pollution, and consequent loss of fish and wildlife diversity. While point-source pollution can cause major damage (wastewater treatment out-falls and brine discharges), the source is known in advance and damage can sometimes be minimized. The same is not true with non-point source pollution, which is becoming a problem of increasing concern. Point source problems can be addressed by improving monitoring, refurbishing ineffective wastewater treatment plants, and reducing brine discharges from petroleum extraction and implementing storm-water management programs. Non-point source is much harder to manage as it comes from everywhere but nowhere in particular, from dumping oil from vehicular oil changes into the streets to pesticides used on farmlands washing into the rivers and the water-table. Strong legislation has been implemented to substantially reduce these problems, and needs to be enforced. It is, of course, imperative that these laws not be weakened or diluted with loopholes pandering to special interests or chronic offenders.

Diversions of fresh water for use by the expanding population alter circulation and salinity patterns, affecting the abundance and distribution of fish species and deteriorating the condition of coastal habitats. Limiting fresh water inflow to the bays changes the salinity of the bay water, changing the plants and animals that can live there. Open bay disposal of dredge spoil also reduces the productivity of bays by covering aquatic plants and animals with sediments and reducing the amount of sunlight traveling through the water. Frequent dragging of shrimp nets and oyster trawls may similarly impact submerged habitats.

The most significant problem for the health of the coast is the tremendous amount of habitat destruction. The most critical habitats, such as coastal wetlands and seagrass meadows, are those responsible for the great productivity of commercially and recreationally valuable fish and

shellfish, and are at the greatest risk. Water quality and habitat loss are being addressed by Audubon staff and volunteers, on both regional and national scales, by advocating laws to protect and improve water quality and fresh-water inflow to bays and estuaries, and by encouraging enforcement of laws already in place.

Erosion is also a major problem for island habitats. In fact, only a few of the islands along the Texas coast are naturally occurring, the majority being man-made dredge spoil islands. The original islands have nearly all been destroyed by erosion. Man has caused much of the erosion that has plagued these islands. Extensive dredging, moreover, has caused shifts in water currents that help to deteriorate the islands even further. Many islands, even dredge islands, have been almost totally eroded. Audubon staff, wardens, and volunteers monitor erosion and, occasionally, counter the erosion process by coordinating with the Army Corps of Engineers to use dredge spoil to enlarge the islands. Riprap and geotubes have been used to shield some areas from erosion, but at considerable expense.

Mammalian and insect predators can seriously limit the reproductive success of waterbird colonies, as well. Coyotes, opossums, raccoons, rats, and even the occasional feral hog will swim to the island sanctuaries and eat eggs and chicks. This can cause nesting birds to abandon an island completely. Audubon wardens attempt to minimize the impact of these predators where possible. Laughing gulls are likely the most serious predators of colonial waterbird eggs and young, yet they are themselves colonial nesters. Non-native fire ants have floated out to the islands and on some islands, have established large colonies. Fire ants attack the chicks during development, their most vulnerable stage, and proceed to eat them alive. Wardens attempt to control fire ants with Logic, a target-specific synthetic pesticide that inhibits reproduction, thereby destroying ant colonies. Unfortunately, native ants are also affected. Moreover, the treatment is labor intensive, must be repeated throughout the year, is dependent on weather and is not wholly effective.

Audubon wardens and volunteers continuously assess the condition of the islands and do what is necessary to enhance bird populations. Wardens have started to plant native shrubs, trees, and forbs that the birds need for nesting material and substrate, removing troublesome exotics where possible. On islands without adequate nesting sites, wardens are experimenting with “artificial trees” or nesting platforms to take the place of trees. Artificial nesting sites are beginning to attract a few more species of birds, even though great blue herons were the only bird that used them with regularity at first. Signs are posted on and around our islands, designating them as Audubon sanctuaries and emphasizing the importance of giving these islands a wide berth during the breeding season from February to August. It is essential to take these precautions as colonial waterbirds are extremely sensitive to disturbance, and the birds must be watched closely during this critical period.

Finally, one of the most effective ways Audubon is addressing the long-term survival of waterbird populations is by educating the public about the needs of the birds and how birds and people can best coexist in our coastal areas. Audubon staff and volunteers are erecting educational signs at boat ramps and docks; distributing brochures about colonial waterbirds and their conservation; and speaking to various civic groups about the value of our birds and the productive coastal habitats they depend on.

THE NESTING HABITS OF COLONIAL WATERBIRDS

Most birds breed in the spring, and colonial waterbirds found along the Texas Coast are no exception. The breeding season coincides with the time of year when food is plentiful so there is a ready supply for chicks. On the Texas Coast, the birds' nesting year starts in February, increases during March and April, and reaches a high point around the first of June. For all practical purposes it declines and comes rapidly to an end in July and August. Thus we see an extended nesting period assuming a bell-shaped curve spanning several months. As early as mid-January, gulls, terns and egrets assume full breeding plumage, indicating the nesting season is about to start. For some, the availability of food influences the clutch size and the number of broods the parents rear during each breeding season, but other factors also come into play. Most colonial waterbirds, however, produce only one brood, except when the first clutch is destroyed early on.

Colonial waterbirds are so named because they tend to nest in colonies and travel in large flocks. Nesting colonies range from a half-dozen to tens of thousands or more. Colonial waterbirds often select nest sites that are shared with different species, so it is not unusual to find reddish egrets, cattle egrets, and brown pelicans all nesting within sight of one another. Some waterbirds, such as the royal tern, nest on small islands just inches away from one another, closely interspersed with other species of terns. In contrast, the Caspian tern is a bit less gregarious, preferring to nest on isolated shell banks in discrete groups, well away from other species of waterbirds on the upper Texas Coast. When they find it necessary to nest on larger islands, they will gather in close-knit colonies and avoid mingling with the other nesting waterbirds (Dyes 1993). On the central coast they tend to be more social and nest together in mixed groups of terns (Lee Elliott, pers. comm.)

Different bird species tend to have different incubation periods for eggs. As the table below shows, compared to the black and turkey vultures, the amount of time that most colonial waterbirds need to hatch their young is significantly shorter, but compared to a rufous hummingbird or a red-winged blackbird, much longer.

Colonial Waterbirds	Incubation Time
Brown Pelican	28-30 days
Cattle Egret	21-25 days
Great Blue Heron	28 days
Am. White Pelican	29-30 days
Roseate Spoonbill	23-24 days
Other Species	Incubation Time
Black Vulture	32-39 days
Turkey Vulture	38-41 days
Rufous Hummingbird	13-14 days
Red-winged Blackbird	10-12 days

While all birds are dependant on their parents after hatching, some species are more so than others. **Precocial** young hatch fully feathered, can feed themselves and walk around or swim

almost immediately, thus gaining early independence from their parents. **Altricial** young are born featherless, need to be brooded for warmth and fed by their parents for longer periods of time, thus spending more time in the nest before fledging. Unlike waterfowl most colonial waterbird young are generally altricial or semi-altricial, born helpless and featherless. Almost totally dependent on their parents at hatching, altricial young are tended by both parents until they are about 3 to 4 weeks old. The cormorant, pelican, and anhinga hatchlings are more nearly altricial than those of herons, ibis, and spoonbills, which tend to be semi-altricial and slightly less helpless at birth. Gulls and terns, on the other hand, tend to be semi-precocial and gain their independence much more quickly.

Compared to many other species of birds, colonial waterbirds generally nest later in life, breeding for the first time between 3 and 4 years old. Males generally help with the young in some way. Most help build the nest and some help incubate the young, as well as taking a major role in defending the nest site. The male black-crowned night heron, brown pelican, and cattle egret, among others, gather the nesting material while the female builds the nest. The white ibis male establishes the territory and gathers nesting material while the female selects the nest site and does most of the building. The white-faced ibis male incubates the eggs during the day while the female takes the night shift.

Most birds form single season monogamous pair bonds, although cattle egret males may occasionally be polygynous (have more than one female partner). Generally, colonial waterbirds produce only one brood each season. If, however, nests are predated early on, second nesting attempts are not uncommon. Some species of colonial waterbirds, like the great blue heron and reddish egret, nest in low shrubs or trees along the shores of the mainland or on islands. When stick nests are lined, small twigs, leaves, Spanish moss, and sometimes bits of rubbish are used. Other island nesting species, such as the royal and Caspian terns, prepare minimal nests called **scrapes**, which are shallow indentations in the sand or on shell banks on islands. Nest size varies depending on the bird, as does the form of the nest. Whether nests are stick platforms or well-constructed cups made of grasses and twigs or just shallow depressions in the sand is, of course, species-dependent. In fact, the Sandwich tern doesn't even make a scrape, but lays its eggs directly on the sand. The "minimalist" architecture of the Sandwich tern's nest does not appear to make it any more vulnerable to predation. Scavenging unguarded nests is not uncommon on breeding islands and has more to do with parental vigilance than nest construction (Lee Elliott, pers. comm.).

Many colonial waterbirds, especially terns, quite actively defend their nests and territories from intruders. The black skimmer dives at the head of interlopers "barking" at them aggressively until they leave. Caspian terns are also very feisty defenders of the nesting colony.

Many colonial waterbirds display a certain number of similar, if not almost identical, traits and behaviors. For example, snowy egret, little blue, and tricolored heron eggs and nests are so similar in appearance they are almost impossible to tell apart without seeing an adult bird on the nest. On the other hand, many species display highly distinctive behavioral traits. For example, the least tern and the black skimmer are known to leave the nest, plunge into the water, and return to the nest, shaking water drops over the eggs to cool them on hot summer days. In addition, black skimmers will always sit on their nest facing the wind, ready for immediate take-off.

BEACH NESTERS

Waterbird colonies are not restricted to islands in the bay. Coastal wetlands along the Texas' mainland and barrier islands also support breeding waterbirds. Among these are a special group of birds that nests in open, sparsely vegetated habitats such as beaches, washover passes, and tidal flats. This "flat-nesting guild" (FNG) includes such species as the least tern, snowy plover, Wilson's plover, killdeer, black skimmer, black-necked stilt, American avocet, and horned lark, a shortgrass beach edge and airport-loving passerine.

Perhaps the most disturbing problem for the FNG is how accessible their nesting colonies are to the general public. In Texas, the guild has been reduced in species and populations numbers on the upper and central coast, with Bolivar Flats, the beaches of St. Jose Isle, Matagorda Island and other sites on the mainland in Rockport and Aransas Pass being exceptions. By contrast, the entire guild nests in abundance on the still relatively undisturbed beaches just south of the Rio Grande in Tamaulipas.

The FNG can still be found in Texas, however, at the more sheltered habitats such as tidal flats and washover passes. Some of the recognizable sites that regularly support FNG colonies include:

- Upper Texas Coast: Bolivar Flats, Big Reef, and San Luis Pass
- Coastal Bend: Mustang Island State Park, Sunset Lake, Tule Lake, and the Kennedy Causeway
- Lower Texas Coast: Laguna Atascosa National Wildlife Refuge and the tidal flats along South Bay

Unfortunately, like its once unspoiled beaches, Texas' tidal flats and washover passes are suffering from increased levels of human pressure, as well. FNG colonies in washover passes are particularly threatened by human disturbance. Drivers of off-road vehicles damage FNG nesting sites every year at many of Texas' washover passes. In 1998, an estimated 30 least tern nests were destroyed on Memorial Day at Newport Pass, an important washover pass in Nueces County, as beach visitors drove through the pass and crushed all of the nests and eggs in the front portion of the pass. Similar horror stories might be told about the many Snowy plover nests destroyed in washover passes, or the terrible sight of dozens of black skimmer chicks flattened by vehicles, which happens every year at San Luis pass and other FNG colonies.

Least terns arrive in mid-March and may nest in colonies of a few birds to as many as 80 to 100 pairs. The terns lay their eggs in small depressions or scrapes in the sand. The eggs are extremely well camouflaged, making them unlikely to be noticed by casual beachcombers. High tides frequently wash out nesting attempts, and predators sometimes find their eggs or chicks. People, cars and dogs also prevent these birds from nesting successfully. The assertive least tern will dive-bomb and shriek loudly when you approach their nesting areas. Because the chicks are sensitive to excessive heat, it is important to avoid these nesting areas so that the parents are not forced to leave their chicks unprotected and exposed to the scorching sun. If you hear them just above your head, turn and carefully retrace your steps until you are out of the colony, watching closely where you step. Keeping dogs on leashes (or better yet, at home) is essential so they won't chase or harass the terns. Beach buggies are positively lethal at tern nesting colonies and need to be banned where there are known nesting sites.

Black skimmers also nest on bare to slightly vegetated sand flats. Their nesting seasons are frequently unsuccessful because they tend to nest in low areas. Chicks are a pale beige with darker specks, making them very difficult to see, especially when they crouch down and dust themselves with sand. On some parts of the coast, skimmers are highly vulnerable to car traffic. If fear drives the adult skimmers from their nests, the chicks may dehydrate and die from heat exhaustion.

ANNUAL COLONIAL WATERBIRD CENSUS

For more than 26 years, the Audubon Society, in partnership with state and federal agencies, universities, and local birders, has participated in the annual Texas Colonial Waterbird Census (TCWC). Working closely with the former Texas Colonial Waterbird Society, a loose consortium of individuals/ agency and nonprofit organization staff, TxAS has been gathering important data on population size of colonial waterbird species and sharing the data with said agencies and other interested parties. The TCWC is intended as a tool to monitor the long-term health of colonial waterbird populations and, indirectly, the health of our coastal system. Each year from late May to mid-June, the Audubon Society and other groups have conducted this census of the populations of colonial waterbirds all along the Texas coast. Participating experts include employees from the U.S. Fish and Wildlife Service, Texas Parks and Wildlife Department, the GLO, university-based wildlife specialists, and interested volunteers. This bird count is an important tool for assessing the health and productivity of the bird populations: it can alert local officials and environmental agencies to the need to alter land-use practices or take other measures to protect vulnerable species.

While the count is an important assessment tool, it is also important to keep disturbance of the birds and their nests and young down to a minimum. This is why all surveys are conducted with the assistance of experts during the peak of the breeding season between the end of May and beginning of June, when most of the colonial waterbirds are breeding. The count is evaluated yearly as climatic conditions can affect time of breeding. The census is conducted at the peak of the breeding season.

Historically, there has been no one standard method established throughout the Texas Coast for gathering the data for this waterbird census. This represents a serious problem for evaluating yearly changes in populations. Currently, the counting techniques are passed down from “generation to generation” of censusers (Lee Elliott, pers. comm.). Techniques have varied with the island, habitat, individual species of waterbird, and censusing team. One of the main objectives of this manual is to attempt to provide the standardization the census really needs. A standard procedure would help to make the accounts geographically and temporally consistent and the data more reliably comparable. On the other hand, there is 26 years of data collecting history that has been fairly consistent on a site per site basis. Adding to the challenge, there are various methods available in the literature to count colonial waterbirds that are more or less suitable to particular species, habitat types, breeding phenologies, problems with access, etc.

For a more accurate count, it is always better to count nests, rather than individual birds. However, if counting nests will create too much disturbance and harm eggs or fledglings, then an individual bird count is preferred. Choice of method may depend on some of the following:

- 1) Presence of predators, such as grackles or laughing gulls in the vicinity
- 2) Climatic conditions, extreme heat, downpours, high winds, etc.
- 3) Reproductive stage of adults, (nest building, egg laying, incubation, nestling stage, relative age of the chicks)

Some of the different survey strategies used are described below:

On the smaller islands it is possible to count the birds from the water so it is not necessary to go on land. On some islands with low vegetation, it is possible to count the heads of the curious nesting birds as they look up from the shrubbery. Snowy egrets and tricolored herons are particularly easy to count this way. When it is not clear that the bird heads counted are on separate nests, the total is then multiplied by 0.7. Different species have different multipliers. Great blue herons and great egrets build very substantial nests, making the nests themselves easy to count. In cases where the islands are large and/or heavily vegetated, it is necessary to count the nests from land.

Timing is extremely important, as older chicks tend not to be so vulnerable to predators and disturbances. Birds that are not nesting can be counted, but should not be included in the study. However, mention should be made in the **Notes** section on back of the form as non-nesting birds may indicate low food resources or failed nests.

Other species are counted in unique ways. Nocturnal foragers, nesting skimmers are determined by counting individual adults and then dividing by 2, particularly during the day, as both adults are usually present. Gulls are usually estimated in the air when disturbed by the approaching boat. Terns are usually counted by recording each adult. For small colonies, it is often possible to count individual tern nests **without** disturbing the colony.

Audubon is hoping to include some additional reproductive information in the survey, counting clutch size where this method will not be hazardous to the health of the nesting colonies. One way to accomplish this is to track smaller sections of different colonies, about 20 nests of the same species, doing so on islands with different habitats. These selected nests should be marked and studied throughout the nesting period, 2-4 weeks, as many birds do not lay the entire clutch at the same time. This sampling procedure can provide reliable indices of population trends. Clearly, reproductive success can only be evaluated by monitoring the birds throughout the reproductive cycle (Lee Elliot, pers. comm.).

Aerial surveys have been conducted about every 2 years, usually by the Texas Parks and Wildlife Department. Aerial surveys can be very useful in surveying colonies in areas that are extremely difficult to access otherwise. Indeed, the reason TPWD carried out these aerial surveys was precisely because of the extreme inaccessibility of some of the colonies (Lee Elliott, pers. comm.). Aerial surveys can also be useful in surveying the interior of some islands, checking out new areas, and marking any erosional changes to the islands. While aerial surveys are not essential, the gathering of reproductive data is highly important. Elliott (pers. comm.) suggests that aerial surveys might better be performed by an organization or agency not so heavily constrained by the need for written permission from every private landowner that owns land to be flown over. Regardless, anyone collecting data on or over private property, no matter what their organizational affiliation, should **always** obtain written permission **before** the survey begins. Finally, whether aerial surveys continue, or ground surveys, nest surveys, or

photographic surveys are done, count coverage and yearly repetition is of the utmost importance for this type of long-term database (Phil Glass, pers. comm.).

TECHNIQUES IN CENSUSING COLONIAL WATERBIRDS

For a number of bird species the “standard” methods for counting breeding populations such as territory mapping, point counts, or line transects are not very effective. Low breeding density, secretive nesting habits, nocturnal ecology, or semi-colonial to colonial nesting behavior can be the reason for this. For such species, other methods have been developed. In any census effort, it is important to use standardized procedures each time the count is performed. Standardization of survey techniques facilitates comparisons of populations between years and sites. For colonial waterbirds direct and indirect counting and “look-see” counting methods have proven very efficient (Bibby *et al.*, 1995).

Direct counting: Direct counting of colonial waterbirds entails selecting a suitable vantage point and counting all visible birds. The method is particularly useful when all the birds can be easily seen, especially where waterbirds breed on small islands, congregate at loafing roosts, or form a part of smaller colonies in fairly open habitat. To avoid bias, you must ensure even effort and coverage between sites and/or years, so that data can be readily compared. Other factors also come into play such as the weather during the counting, the people undertaking the counts and whether the naked eye, binoculars or telescopes are used. These will all influence the accuracy and comparability of the counts in one way or another (Bibby *et al.* 1995).

Look-see counting: The look-see method relies on a prior knowledge of the habitat preferences of the bird, and, more than any of the previous methods, requires the observer to know well the bird’s habits and natural history. First identify potentially suitable habitat for the species 1) from a map of the area, 2) from an aerial photograph of the area, or 3) or through contact with local experts. Once suitable areas are identified, a program of site visits is arranged at the appropriate time and using appropriate methodology to count any birds present. From such counts, population estimates can be made.

Nest Counts: Nest counts are generally accepted as the most accurate indicator of nesting pairs but are very disturbing to the birds as well as being very time-consuming (Kohlhaas 1985). Ground counts are the most practical method of performing nest counts for both economic and logistical reasons.

Photographic Counts: Spinner in his 1946 study reported improved accuracy of photograph counts over aerial visual estimates of waterfowl. Photograph counts estimates are generally more reliable indicators of numbers of nests than aerial counts (Kohlhaas 1985), though constraints of white birds and vegetation density hold for photographic counts, as well, but to a lesser degree.

Aerial Counts: Stott *et al.* (1972) found great variability in aerial visual estimates when censusing offshore waterfowl even when using two highly experienced observers. Aerial counts are not effective means of observing nests. Aerial counts using helicopters and fixed winged aircraft are better able to count large white or pink birds than the smaller darker herons (Kohlhaas 1985). Vegetation density will also effect accuracy in estimating colonial waterbirds from aircraft.

It must be kept in mind that no matter what method is used, accuracy in estimation will always vary depending on observer variability, experience, nesting progress on the census day, time of day, weather, vegetation density, colony size and special behaviors of particular species concerned.

COUNT PROTOCOL

DESCRIPTION OF STUDY AREA

Before any count takes place, the islands to be surveyed should be visited and the position of all bird colonies and other breeding areas marked on a base-map at 1:10,000 scale. If these maps are not available, 1:24,000 USGS quads will be provided. If colonies are spread along an extensive length of beach or an entire colony cannot be viewed from one site, or if breeding density is high, the study area should then be divided into counting sections dependent on the availability of suitable vantage points (Bibby *et al.* 1995).

DESCRIPTION OF BREEDING COLONY

A colony is defined as a concentration of breeding birds separated from others by expanse of water, land, or other open space. If in doubt, it is usually best to sub-divide a colony.

For each colony, the following should be recorded:

- 1) **Colony name.** Should be consistent with names and codes maintained by the Texas Colonial Waterbird Society. Counts may include sub-colonies and such sub-colony counts should be maintained separately.
- 2) **Location.** Should include a short verbal description. Give Lat. Long. (deg., min., sec.) or six figure grid references from the base-map for the start and finish of the island section.
- 3) **Status.** National Wildlife Refuge, WMA, NGO sanctuary, private landowner (specify owner, if possible).
- 4) **Description.** Details of island and orientation, shore slope, rock type, substrate, vegetation cover (type and amount), or main habitats if a flatter site or an island. If possible sketch these details in the field and take photographs as a permanent record (writing date and details of colony on back of photograph). Data could be transferred to photos from detailed field notes recorded for each frame. Digital photos may even become more feasible as time goes on. Location of counting positions and direction of view should also be marked. It is important that the boundaries of the colony or sample plots are shown in relation to the main features of the region, streams, gullies, etc. so that they can be located exactly in the future.
- 5) **Access.** How to get to the site, boat handler's name and address, landowner's name and address, etc.
- 6) **History.** Counting history, if known, with bibliography where possible.

- 7) **Counting problems.** Indicate approximately what percentage of the colony can be counted from land, how much can be seen from the sea and any particular counting, e.g., birds nesting in caves, counted while looking up, tall vegetation hiding birds, restricted view of colony, disturbance of colony by the observer.
- 8) **Other notes.** Any relevant information on the colony, e.g., site of annual population monitoring, etc.
- 9) **Bibliography.** Any details of books, scientific papers, reports, etc., that mention the colony.

SELECTION OF COUNTING METHOD

The aims of the count and the species present will largely determine the methods used. A rough estimation of breeding numbers of some seabird species over a large geographical region can be achieved using rapid and relatively crude methods such as aerial surveys. However, full population estimates for a defined study area usually require more detailed and time-consuming methods. For example, counting populations of ground-nesting species such as laughing gulls and terns may involve counting nests in quadrats located in a colony. Counting populations of island nesting birds may involve several counts of individual birds in well-defined areas of the island at particular stages in the breeding cycle (Bibby et al. 1995).

COUNTING THE BIRDS

To obtain the most accurate counts on heavily-vegetated island colonies, the position of the observer is extremely important. Ideally, observers should be at the same level, or slightly above, the birds and should be looking directly at or down on the colony. If the preferred position cannot be obtained, the observer will be forced to count the birds from what locations are available. As islands may have rattlesnakes and other potential hazards, observer safety should be considered an overriding priority in the selection of the counting position.

Divide the coastline study area into easily countable sections. When colonies of gulls and terns are distributed along extensive shorelines, it will be necessary to divide the cliff or shore into easily countable sections. These are best defined by:

- 1) Special features of the area (hillocks, signs, sandy beaches, distinctive landmarks, etc.)
- 2) Availability of vantage points from which the birds can be counted
- 3) Sections that can be counted easily in one go.

It is essential that all sections and vantage points be marked on the base-map of the study area, and the results of the counts be presented according to the various sections. It is always better to count the sections in the same sequence, or randomly, to minimize bias caused by colony attendance changing over the counting period (Bibby et al. 1995).

METHODS OF ESTIMATING NUMBERS OF BIRDS IN FLOCKS (Modified From Howe 1987):

1. In small roosts and feeding flocks, the number of birds can be counted directly.

2. For small flying flocks of even density, the birds can be counted individually (1,2,3,4, etc.) to produce an accurate total. If a suitable landmark is present it can be used to help count the birds.
3. In unevenly distributed flocks with small groups of varying size, each group of birds should be rapidly counted and added together.
4. For larger numbers of birds in evenly distributed flocks, the birds should be counted in multiples e.g. 2,4,6,8, or 3,6,9,12, etc. Again, if landmarks are present they can be used to divide the flocks in order to count them more accurately.
5. For densely packed flocks in flight or at a roost, the birds should be counted in estimated blocks. The size of the blocks used (10, 100, 1000, etc.) varies according to the size of the flock. The largest flocks of 10,000 birds or more present the biggest counting problems with even the block method giving a very rough estimate of numbers.
6. Flying flocks often bunch in the center. In this case it is important that the blocks are closer together in the center of the flock than toward the edges, but in practice this may be difficult to achieve.

TRENDS IN THE ACCURACY OF DIFFERENT OBSERVERS IN COUNTING FLOCKS

Individual observers vary in their ability to estimate numbers of birds. Some show a tendency to overestimate and others are likely to underestimate numbers. Some folks tend to overestimate slightly 10-20% the number of birds in small flocks, but to increasingly underestimate numbers in larger flocks. The accuracy of different observers is highly variable and needs to be checked in any formal counting program. Often, individual counts of separate observers are recorded and an average is taken. This is dependent on the level of expertise of the observers, of course. Often, no binoculars are necessary since these are fairly large birds and relatively easy to identify. Use of binoculars may restrict the view of sections of the colony.

USE OF STANDARDIZED CENSUS FORMS

As with any census method, standardization of approach and accurate recording are vitally important when counting colonial waterbirds. Standard forms have been produced by many federal and state wildlife agencies for many purposes. These forms stress the importance of recording the year, month, date and phase of the breeding cycle (pre-laying, incubation, chick-rearing) when the counts are made. Standardization of data enables them to be compared with those from other areas and between years.

COMMON PROBLEMS

Counting colonially breeding waterbirds presents special problems that must be addressed in order to obtain accurate counts. Some of the main problems include:

- 1) difficulties in assessing the proportion of breeding and non-breeding birds
- 2) locating and counting breeding colonies on remote and difficult to access sites
- 3) evaluating the proportion of birds that have left the nest to obtain food, and
- 4) defining the effects of harsh weather on numbers of birds at the colony (Bibby et al. 1995).

With large flocks, problems might include:

- 1) limitations of binoculars and telescopes
- 2) variability in the ability of observers to identify species of birds in flocks
- 3) difficulty in estimating numbers of birds within a flock, especially when several species of different sizes are intermingled.

COUNTING METHODS FOR VARIOUS GROUPS OF WATERBIRDS

HERONS:

The **Apparently Occupied Nest** counts are most easily acquired for Great Blue Herons and Great Egrets, which tend to nest higher in woody vegetation and are, therefore, typically easily visible. When visiting colonies, great care must be taken not to disturb the birds, causing them to abandon their nest. The counting unit is the **Apparently Occupied Nest**. It is best to count the birds during the late incubation or early nestling period (late April). You can ascertain nest occupancy by using the following criteria: 1) eggs in nest, 2) eggshells beneath nest, 3) young seen or heard, 4) adults sitting, 5) fresh nesting material found, 6) droppings on or below the nest. It is sometimes difficult to distinguish between individual nests. When this occurs, you will need to estimate the number of Apparently Occupied Nests. These methods have been shown to record about 70% of the pairs using a site, according to detailed counts in a sample of heronries. It may therefore be possible to produce correction factors for heronry counts (Bibby *et al.* 1995).

In large study areas, all heronries, or a random sample of them, may be counted to produce an accurate picture of changes in the breeding population. Colonies naturally increase and shrink, with new colonies being established. For this reason, in long-term studies of a regional heron population the new colonies must be located; otherwise counts will be biased toward showing population declines.

Bare-ground nesting species: For small bare-ground nesting species like the least tern, the counting unit is the territorial bird, which is best counted when it is incubating eggs. The recommended counting technique for this species is to scan 50 to 100 meters ahead and count all visible birds, then walk on rapidly and repeat the process. Because the birds are often inconspicuous, careful scanning is essential. It is not, however, necessary to prove breeding by finding nests or broods. This not only causes disturbance it is also very time-consuming. There are also problems with keeping track of all the birds during the count (Bibby *et al.* 1995). Great care must be taken not to crush eggs or step on chicks and both are cryptic and very difficult to see (Lee Elliott, pers. comm.).

Colonial Species: Various methods are available to count the colonial and non-colonial members of the group. The counting unit for colonial species is the **Apparently Occupied Nest**. The best time to carry out these counts is in spring during the prime time, before things have started to wind down. You can assess apparent occupancy from criteria such as 1) birds bringing nesting material, 2) birds sitting on the nest, 3) birds landing on the nest (Bibby *et al.* 1995). In areas of thick vegetation and with species that nest in this type of habitat (i.e. tricolored herons, snowy egrets, white-faced ibis, occasionally reddish egrets, and others), an estimate based on the distribution of individuals within the habitat may be possible. This method is especial useful in situations where actual observation of nests is not possible (Lee Elliott, pers. comm.).

Look-see population surveys involve studies of areas of habitat thought to be suitable for the study bird, usually during the breeding season. It is essential to be familiar with the study area and the ecology and behavior of the birds concerned. Similar levels of effort should be expended in counting each potential site to avoid counts reflecting effort rather more than number of birds (Bibby *et al.* 1995).

GULLS: There are several methods available for counting Laughing Gulls:

1. **Full-nest counts.** For this method the counting units are **Apparently Occupied Nest-sites**. These are defined as the summed number of occupied and unoccupied nests that appear to have been used during the present breeding season. This caveat is applied because gulls have semi-precocial young and some nests may have fledged young when others may still contain young or have not as yet had eggs laid in them. If a good vantage point is available and the colony contains fewer than 200 pairs, then all Apparently Occupied Nest-sites can be counted directly during the mid-incubation period, late April to May. Remember that mid-incubation period can be variable from year to year depending on climatic conditions. The count conditions should be applied to all counts. Also, extremely hot conditions should be avoided. Every attempt should be made to accomplish counts prior to 11 a.m.
2. **Full nest-counts** should be made between 8 and 11 a.m., as colony attendance is most stable during this period of the day. Counts should not be done during periods of heavy rain or high winds, as these are believed to affect the accuracy of the count.
3. Nest-estimate using **transects**. In less easily viewed, or larger, colonies the number of Apparently Occupied Nest-sites, as defined on the criteria presented above, may better be estimated using transects through the colony. The first step is to map the extent of the colony, either from a ground survey, or more rapidly from aerial photographs, and mark the boundaries on a base-map. When doing transects or using quadrats it is essential to minimize the time spent in the colony. Thirty minutes is the maximum period observers should remain in the colony, at which time they will need to withdraw until the birds settle down again. Prolonged disturbance invariably leads to egg loss (e.g. predation), or chick loss (e.g. chick's wandering from their nest and being either attacked or killed.)
4. **Flushing counts.** In this method the counting unit is the flying bird. All the gulls are flushed from their nests and rapidly counted, and the number divided by two to give an estimate of the number of pairs. The method is primarily useful in isolated locations and especially on small islands. It is also useful in colonies with large numbers of breeding pairs. The technique involves the observer(s) startling the birds by raising and lowering their arms while standing on the highest point in the area, or by making a loud noise. This causes the gulls to leave their nests and fly around where they can then be counted. If flushing of gulls is likely, it is helpful to have an observer off-shore in a boat estimating numbers. Frequently, the large numbers that may be present make estimation from within the flushed colony difficult.

TERNs:

Terns may move their colonies between years; hence it is extremely important to search the study area thoroughly to determine the distribution of colonies before the counting commences. Three methods have been developed to count the numbers of breeding birds at colonies of Caspian, royal, Forster's, Sandwich, and least terns, as well as black skimmers.

1. **Direct counts.** This method is often possible due to the open nature of the nesting habitat of tern colonies. The counting unit is the **Apparently Occupied Nest-site**, defined as those birds sitting tight and apparently incubating eggs or brooding chicks. Ideally, these Apparently Occupied Nest-sites are counted from a position where the whole colony can be viewed. However, problems occur when the entire colony can't be viewed, or where both members of the pair sit slightly apart and both are counted as incubating birds. Nonetheless, this method produces accurate results if done carefully and is most useful in smaller colonies.
2. **Flushing counts.** For this method the counting unit is the flying bird. The procedure is to flush all present at a colony into the air using a loud noise, like a boat horn, and then count the birds several times while they are in the air. By averaging the counts the mean number of birds at the colony can be calculated. Timing of the counts is critical if accurate results are to be obtained. Counts made throughout the incubation and post-incubation period, starting in late March (first egg laying) and continuing until mid-May (first chicks fledging) show a peak in the number of birds in mid-April (mid incubation to early nestling). According to Winnie Burkett (pers. comm.), Royal and Sandwich terns were just starting to nest on the Upper Texas Coast in mid-April, so attention needs to be given both to latitude and special weather conditions. This is probably the best counting period for tern species in Texas. Colony attendance is usually the most stable between 8 and 11 a.m. This should be validated, however, for the various count areas to assess diurnal and seasonal variation in colony attendance. Flushing counts have been related to the true number of nesting pairs by calculating a nest-attendance index. This is done by counting terns using both direct counts of Apparently Occupied Nest-sites and Flushing Counts at a small number of 'calibration colonies' twice over the breeding season at two-hourly intervals between 08:00 and 11:00 a.m. CST. It has been found that three flying birds are equivalent to two breeding pairs. By using this calibration figure, an estimate of the total breeding population can be made for the whole study area. There is also a close correspondence between Flushing Counts and Direct Nest Counts for colonies of Forster's terns. Because terns are so susceptible to disturbance (much more so than herons and egrets), the calibration needs to be well-designed. The recommended level of every five days over the breeding season at two-hour intervals is overly disruptive in the Texas climate.
3. **Transect counts.** For this method the counting unit is the Apparently Occupied Nest-site as defined above. Firstly, the total extent of the colony is assessed on the ground or from aerial photographs. Then transects passing through the colony are used to sample, and hence assess, the breeding population. This method may cause particular disturbance and hence can be used only in the less dense colonies. Lee Elliott (pers. comm.) recommends, in fact, using transect methods for calibration of direct or flush counts, especially if the colony is less dense.

Whatever method you use to count terns, the observer should never remain in the colony for longer than 20 minutes, as terns are highly sensitive to disturbance and may desert the site, have their eggs taken by predators, or be trampled by inexperienced observers. Indeed, on many occasions,

the terns will become so agitated in the first few minutes that the observer will have to retreat and allow the birds to calm down.

MONITORING BREEDING COLONIAL WATERBIRD POPULATIONS

As an adjunct to complete counts of the breeding birds in a study area, it is also important to be able to monitor colonial waterbird reproductive success annually to assess whether populations over large areas are changing. Monitoring plots must be well-defined areas, usually a colony or a group of birds within a colony, where annual counts of the breeding birds take place. As a general rule, and depending on the species being studied, monitoring sections should include 50 to 100 pairs of island-nesting birds. The position of the monitoring site within the colony is important. The plots should aim to provide a representative sample of the colony. Ideally, plots should be randomly located throughout the colony, but in practice, randomly located plots may be impossible to count. For this reason, most monitoring plots have been selected for their ease of counting and believed representativeness, i.e., plots encompass most of the variation in the colony, including some edge, but avoiding areas where the birds are particularly densely packed and thus extremely difficult to count. Select several study plots. This can be done by dividing a colony into 4 or 5 approximately equally sized sections and picking one or two plots within each section, trying not to bias plots toward the center or edge of the colony (Bibby et al. 1995).

The first step is to take photos of the monitoring plots from a good vantage point when the birds are incubating or brooding small young. Large-scale photographs (20 x 20 cm) are essential for the first year. In subsequent years, however, the outline of the colony, important features, and location of study plots can be traced from the original photo. Tape overlays onto the original photo so it can be annotated in the field. View the area from where the photos were taken, at approximately the same time of the year. Plot the positions of (1) birds with an egg, (2) birds with a chick, (3) birds apparently incubating, (4) pairs regularly attending a site that appears capable of supporting an egg (bearing in mind that some eggs are laid on unsuitable sites).

Make several visits until satisfied that most of the occupied sites have been located. Record any chicks without an adult in attendance. Number the active sites. To assess breeding success the contents of active sites should be noted every 6 days. Any young leaving when aged 15 days or more and/or are well feathered can be considered as having been raised successfully. If assessing breeding success, present the results as x young fledged from y active (i.e. 1-3 above) and z inactive (i.e. 4 above) sites as found on the dates of the first checks. Follow the same areas in the same order each year (Bibby et al. 1995).

SCHEDULING AND TIMING OF MONITORING EFFORTS

Timing both in terms of season, time of day (early a.m. vs. late afternoon), is an exceedingly important consideration in surveying and monitoring birds. Colonial waterbirds may be crepuscular, diurnal, or both. Scheduling should properly reflect the phenology and natural history of the particular species (established nesting periods, arrivals on the breeding grounds, etc.). Many birds are most easily monitored at certain times of day, early morning or late afternoon, when they forage or vocalize most conspicuously, or when they are all gathered at one loafing spot. For each species, a detailed preliminary study of their feeding, reproductive, territorial, roosting and flocking behavior should be made to determine the best time to monitor them. In Texas, low precipitation years need to be factored in. Monitoring may have to be moved up to ensure that the

birds are breeding under drought conditions. Once established for normal years, censusing and monitoring schedules should be respected, for sake of consistency.

SUMMARY

- 1) Colonies must be located, described and the birds counted using appropriate methods.
- 2) Methods vary according to species but should be well standardized.
- 3) Gulls and terns are counted as Apparently Occupied Nest-sites directly, along transects, within quadrats, or after flushing.
- 4) Counts of individuals can be used to produce estimates of pairs of nesting colonial waterbirds.
- 5) For monitoring purposes, groups of birds in colonies should be counted in sections, or within well-defined study plots.

SKILLS DEVELOPMENT AND EQUIPMENT NEEDS

Audubon volunteers and other seasonal staff assigned to the colonial waterbird censusing effort must be able not only to recognize the various species of colonial waterbirds being surveyed, but also all the other bird species in the area. He or she must know how to identify the bird by sight. Where possible, it is also extremely useful to become acquainted with the distinctive calls the various species make and distinctive flight patterns and profiles, where they apply. With colonial waterbirds, such as gulls and terns, it is especially important to be fully acquainted with the various plumages associated with different ages of the birds. Many of them change drastically from juvenile to adult, and this may affect not only plumage but also facial skin, bill, legs and length of tail. Recognizing nests, eggs, nestling and fledgling plumages is also critical to successful surveying skills. To prepare for this project, all volunteers should have access to or own good bird field guides, slides or photographs, relevant audiocassettes and a good pair of binoculars. Videocassettes can also be helpful in this regard. Knowing in advance what birds you will be seeing helps you to perform the survey quickly and easily without having to constantly fumble through your field guide at awkward moments. Understandably, nestlings, fledglings, juveniles and immature birds are difficult to identify and take lots of practice. Each participant should spend lots of time practicing, both in the field, listening to tapes, watching videos and pouring over their field guides, for it is essential during the survey not to guess. It's much better to write down a question mark than to write in a wrong guess. There should optimally be a two- or three-week training period during which all participants pair up with experienced observers in the field to practice estimating numbers, distances, and begin recognizing calls of the colonial waterbirds of the area they will cover. Learning how to fill out the survey form is also important, and knowing what each box asks for should be clear in your mind.

Proper dress

Proper dress is important when monitoring or censusing birds. Volunteers should be urged to wear only earth-tone colors, such as greens, browns, tans and khakis. Avoid colors such as red, yellow or white, even in hats or shoes. If more than one observer is present, it is important to be very quiet and to keep conversation to a minimum, especially when doing ground counts on foot. Avoid making any sudden movements, gestures or noises. Stealth is a valuable adjunct to successful censusing of birds. Of course, surveying from a boat offshore allows for a bit more freedom in conservation (as long as it is not distracting from the subject at hand).

Necessary Equipment and Gear

In addition to bringing the necessary field guides, training manuals, recording forms and waterproof or protected data sheets and waterproof pens, other important gear should be included. It is good to prepare an equipment list ahead of time so that the various items can be checked off before taking off for the censusing site. Remember, once having traveled a long way on a boat it will be impossible to return for items left behind. Marine charts, binoculars, a wide-brim hat (that won't blow off), rain gear, back-pack, comfortable shoes -- good for walking and proper for the boat -- sun screen, mechanical hand counter, etc., are some of the many items required. In fact rain gear should always be on hand as long boat rides in choppy conditions can produce quantities of splashing water even in sunny weather. Shoes should be of a type that can get wet (old tennis shoes are good) and they should provide reasonably good protection against thorns and sand burs. Sandals are definitely not recommended. Long pants are preferred over shorts since walking through tall vegetation may be required and Texas plants are often well armed with thorns, prickles and spines. Snake guards should also be considered, as rattlesnakes are fairly common on most of the islands. Monitoring colonial waterbirds located on small islands will require all sorts of extra gear, including special boats, outboard motors, adequate gas and spare gas can, oars, anchors, life preservers, tool kits, water-proof plastic and vinyl bags, lots of drinking water securely contained, food, rucksacks, rope, etc. Always bring a flashlight, just in case. If transects or permanent observation points are to be set up, flagging and marking stakes will be needed.

Safety Considerations

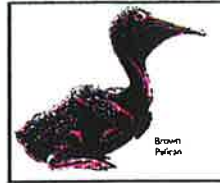
Field biologists and their volunteers rarely take time to consider that some monitoring and censusing tasks can be extremely hazardous. Any time censusing efforts require the use of boats, an extra dimension of potential danger is added to the task. Attention must be paid to weather reports, storm warnings, small craft advisories, as well as the proper operation, launching, and landing of boats, etc. When monitoring birds on or near loose gravel or soft sand or where there may be poisonous snakes hidden in tall grass or reeds, special care should be taken. Finally, volunteers must remember that the habitats they are censusing are critical to the birds that depend on them for nesting. Care should be taken not to disturb either the birds or the substrate in any way. Pack out all garbage. Never throw plastic bags or soda cans or other garbage away, as unwary wildlife often mistakes these things for food. Finally, for the safety of the birds, if fishing line or other entangling materials is found, they should be removed from the colony and discarded appropriately.



AMERICAN WHITE PELICAN
PELECANUS ERYTHRORHYNCUS



BROWN PELICAN
PELECANUS OCCIDENTALIS



DOUBLE-CRESTED CORMORANT
PHALACROCORAX AURITUS



NEOTROPIC CORMORANT
PHALACROCORAX BRASILIANUS



ANHINGA
ANHINA ANHINGA



GREAT BLUE HERON
ARDEA HERODIAS



COLONIAL WATERBIRDS OF TEXAS

American White Pelican

Pelecanus erythrorhincus

Photo courtesy of John L. Tveten

At home in both fresh and salt water, American white pelicans breed on islands and are strong swimmers and fliers. White with large yellow bills and black and white wings, white pelicans are highly social birds that enjoy each other's company whether foraging, nesting, or just plain loafing on the beach. They are enormous, weighing from 11 to 15 pounds, and have a nine-foot wing span. In spite of their bulk, they are amazingly graceful in the air. Young differ from adults only in having gray areas on their wings and a brownish-gray cap on the head (Pough 1951).

Breeding Range: White pelicans breed in the western half of North America, ranging as far north as central Canada. They winter on the southern California, northern Gulf of Mexico, and Florida coasts south to Nicaragua. Birds breed on inland lake islands in western Canada and the northwestern U.S. east to Minnesota and south to northern California and Colorado. Breeding occurs on the Texas Coast on an island in the Upper Laguna Madre. According to Lee Elliott (pers. comm.), this is the only known breeding colony in Texas. Other white pelicans seen during the summer in Texas are most likely non-breeding birds or wandering young birds that do not migrate northward. American white pelicans do breed in the Laguna de Tamulipas along the coast of Mexico.

Habitat: For nesting, birds require islands in permanent water, usually freshwater. In Texas, birds nest in saltwater habitats, e.g., in the Laguna Madre in South Texas. Shallow coastal bays and islets remote from human disturbance provide excellent breeding sites for these birds. Terrain must be flat or slightly sloping with little obstructing vegetation.

Nest: Birds nest in dense colonies, usually on islands free from mammalian predators. Nests are placed directly on bare ground or, more rarely, on matted-down vegetation. Earth and debris are drawn up to form a rim around the eggs, the nest occasionally forming a low mound with a depression in the center. Breeding season starts in Texas in late April.

Eggs and Young: Clutch ranges from 1 to 2 chalky white eggs. Two eggs form the normal clutch, but seldom is more than one chick raised successfully. Both male and female incubate the nest-stained eggs from 29 to 36 days. Semi-altricial young are brooded from 15 to 18 days after hatching, and leave the nest at 21-28 days (Ehrlich et al. 1988). Both parents feed the young. Renesting is typical if the eggs are lost within 10 days of laying; otherwise one brood is the norm. Young first fly between 7 and 10 weeks thereafter. Fledglings gather in groups called "creches," for feeding.

Ageing and Identifying Young. Nestlings are born completely featherless; their naked skin is bright flesh pink, bill and pouch are grayish white, while feet are pale yellow. The iris is white. Within 10 days nestlings are covered by pure white, fluffy natal down. First winter plumage is acquired by a complete post-juvinal molt. Birds can stand at 3 weeks of age (Baicich 1997). At this time, primaries are slate-colored and all but the inner secondaries are a dull black, while

lesser wing coverts are drab to light brown with white tips and edgings. The rest of the plumage is white (Oberholser 1974).

Notes: The American white pelican does not dive for its food; instead, while floating, it paddles its webbed feet and scoops up fish with its enormous bill and pouch. White pelicans often feed in flocks, herding schools of fish ahead of them and all dipping into the school in synchronized motion. A white pelican consumes about three pounds of fish a day, most of it nongame fish. Large and small fish, mostly of no commercial value, and other aquatic animals like salamanders and tadpoles are the chief food items. Between early morning and late afternoon feedings, birds rest together along beaches and sandbars; during the breeding season, much food gathering is done at night. Breeding behavior is closely synchronized within a given colony, and most pairs begin mating within a few days of each other. Birds require isolated islands, reasonably close to the type of shallow water that is suited to their highly specialized fishing method. Linear areas without vegetation are also required for takeoffs and landings. Adult birds may fly as much as 150 miles from the nesting colony in search of food for young. Changes in habitat, e.g., S. Bird Island, may have caused birds to desert this as a nesting site. Others have theorized that ectoparasites may have become so bad that pelicans had to desert this island (Robyn Cobb, pers. comm.).

Brown Pelican

Pelecanus occidentalis

Photo courtesy of John L. Tveten

A striking bird in any plumage, the adult brown pelican has a gray-brown body and blackish belly. The head and neck are white, often with a yellowish wash. In breeding plumage the forehead is yellow and most of the neck is chocolate brown that fades to grayish-brown as the breeding season progresses. With its 4-foot length and 7-foot wingspan, it is the smallest of all the pelican species. Brown pelicans are noisy when young, uttering notes that vary from low grunts and barks to shrill squeals. Adults rarely emit more than a few low clucks (Pough 1951).

Breeding Range: U.S. range of the eastern subspecies includes the Atlantic and Gulf Coasts from N. Carolina to Texas. In Texas they are uncommon to locally common residents along the coast, with principal breeding areas from Nueces to Galveston counties (TOS, 1995). Texas' Pelican Island has one of the largest populations of the once endangered brown pelican in the world.

Habitat: Strictly a coastal species, brown pelicans prefer islands, mainly in shallow coastal waters, lagoons, tidal rivers, and small inlets. Birds rarely stray far seaward, or far inland, from their preferred saltwater shores. Preferred breeding habitat consists of sparsely vegetated islands.

Nest: Brown pelicans start to breed in February on the lower coast. On the upper coast they start in April. Birds nest strictly in colonies, often on flat-topped, open islands in the company of herons, egrets, and cormorants. Nests are placed on the ground or in trees only a few feet apart. Ground nests are made of sticks, reeds, leaves, grass, and other available materials. Tree nests are bulky platforms constructed of the same material but are more substantial. Males gather the nesting material while females build the nest. Birds will steal material from unguarded nests of neighbors. In Texas, platform nests are found from 3 to 8 feet off the ground. The nesting season

lasts till July on the lower coast (Oberholser 1974). Dependent young are still on the ground well into the month of August in the coastal bend area (Lee Elliott, pers. comm.). In fact, on the Upper Texas Coast nesting season can last into the month of September (Winnie Burkett, pers. comm).

Eggs and young: Birds lay from 1 to 5 eggs, usually 2 to 3, starting late in March. Shells are oval to long-oval, dull chalky white, with a granular surface. Eggs are often nest-stained and soiled. Eggs are laid at intervals of 2 or more days. Both parents incubate the eggs for 28 to 30 days and tend the semi-altricial young for 60 days or more, as it takes time for them to learn to forage successfully by plunge-diving on their own. Usually only one chick survives, but if more than one makes it, the young huddle together if on the ground, or clamber around the branches of their tree nests. Birds fly at around 9 weeks, but parents continue to feed them for long afterward.

Ageing and Identifying Young. Nestlings are born completely featherless; naked skin is a dull red at first, then turns black. Eyes are open at 2 days. A coat of white natal down soon covers the nestlings in 10 to 12 days. Pouch and bill are pale gray. Irides are brownish-yellow or dark brown, with a bare bluish space around the eye. Immatures are entirely brown with lighter bellies, and do not acquire adult plumage until their third year. The gular sack is dull grayish blue to blackish (Oberholser 1974).

Notes: Brown pelican populations were decimated by the widespread use of the chemical pesticide, DDT and its breakdown products (DDE). In Texas, a small number of fishermen broke eggs and killed young for fear of competition for sport fish. Brown pelicans are rebounding since the pesticide ban and increased awareness on the part of fishermen; last year, they were downgraded from the endangered species list. Brown pelicans feed by diving, sometimes from heights of from 50 to 60 feet. They net the fish in their expanded pouches and surface again to drain the water. Their method of feeding requires clear water, and for this reason they tend to avoid river mouths and other turbid areas. Gulls, frigatebirds, and terns constantly harass them in an attempt to steal part of their catch. Favorite foods in the Gulf of Mexico consist mostly of menhaden, pinfish, mullet, and thread herring, species too oily and bony for human consumption (Oberholser 1974). This fact has not put an end to the malicious killing of pelicans by those who mistakenly believe they compete with fishermen for game fish.

Double-crested Cormorant

Phalacrocorax auritus

Photo courtesy of John L. Tveten

The double-crested cormorant is the larger of Texas' two cormorant species and is the one most commonly found here in winter. Adult birds in breeding plumage are black, attractively glossed with bronze and green. The throat pouch is orange and clearly visible. Two small tufts of feathers curve backward from behind the bluish-green eyes, giving this species its common name. Birds fly in long strings or goose-like formations with outstretched necks held above the horizontal, often with their mouth open. On the water, swimming birds have a distinctive upward tilt of the bill. Most characteristic of this species is the way birds pose bolt upright or spread-eagle on a rock, buoy, or pylon when drying their feathers after bouts of foraging underwater.

Breeding Range: Birds breed locally from Maine to Florida and the Gulf of Mexico, inland along the Mississippi River in suitable habitat and all through the Great Lakes. Double-crested cormorants are rare nesters in Texas, mostly inland, where they are uncommon summer residents in the southeast on many inland reservoirs. As the bird's range is expanding, coastal nesting in the future should not be ruled out, but is still clearly a rare event. The A.O.U. lists the Florida subspecies as nesting in southeastern Texas on the Matagorda peninsula (TOS 1995).

Habitat: Double-crested cormorants nest extensively in inland freshwater habitats. Birds prefer undisturbed areas with a nearby reliable food supply, on coastal islands, reefs, large rocks, cliff sides, and remote swamps. Birds establish breeding sites close to waters that provide a rich supply of fish, remote from human disturbance. Rookeries are easily disrupted and frequently abandoned when entered.

Nest: Birds nest in colonies on islands at the beginning of May. Birds often nest in the company of gulls, pelicans, great blue herons or great egrets (Oberholser 1974). Nests are generally closely grouped on the ground with communal space between groups. Inland nesters, birds construct nests in live or dead trees near the water, often with 30 or more nests per tree. Nests usually consist of a foundation of seaweed, with sticks and rubbish added; finer material is used for lining. The male brings nesting material while the female builds the nest in about 4 days.

Eggs and young: Clutch ranges from 2 to 6, usually from 3 to 4 long-oval to cylindrical pale bluish eggs. Shells have an uneven white chalky surface, which soon becomes stained in the nest. Incubation is performed by both sexes for 25 to 29 days, beginning with the third egg (Baicich 1997). Eggs hatch asynchronously over 2 to 7 days. Both parents brood and tend the altricial young. Their first flight is usually to water at around 35 to 42 days. At 3 to 4 weeks young birds wander from the nest but continue to be fed by their parents. They reach full independence at around 10 weeks (Baicich 1997).

Ageing and Identifying Young: Nestlings are born completely featherless. The naked skin is brownish turning blackish-purple. After 6 days a thick, short black woolly down begins to appear and is complete after 14 days. Eyes open at 4 to 5 days, with young active by the 7th to 10th day. Feathering starts at day 16 and is complete by the end of 7 weeks. Immature birds have brownish upper-parts and paler underparts, particularly on the upper breast and neck.

Notes: There has not been any recent nesting on the coast but there has been some nesting of this species on inland lakes and reservoirs. Birds seem to be universally disliked by fishermen who fear competition for game fish despite numerous studies that show prey fish taken consists of species of little economic importance, including gunnel, sculpin, capelin, and herring (Oberholser 1974).

Neotropic Cormorant

Phalacrocorax brasilianus

Photo courtesy of John L. Tveten

The Neotropic Cormorant is the smaller of the two cormorants living on the Gulf Coast. In fact, it is the only truly neotropical member of its family occurring in the U.S., where it is found only in southeastern Texas and occasionally in Louisiana. Its lanky appearance is this bird's best

field mark. All black in color, it has a purplish rather than a greenish-bronze sheen, and during the breeding season it sports a distinctive white line where the throat and gular sac meet. Young birds are brownish with pale to whitish underparts (Pough 1951). Fairly vocal for this group, it frequently utters a guttural, pig-like grunt, especially when frightened (Ehrlich 1987).

Breeding Range: Neotropic cormorants breed from south Louisiana and Texas to Nicaragua, Cuba, the Bahamas, south to the Amazon, and west to High Andean lakes. In Texas, it is uncommon to locally common resident along the Texas coast and coastal plain, with a few present year-round at some inland lakes and reservoirs in central Texas (TOS 1995).

Habitat: Nesting habitat is found mainly in warm, southern waters on coastal islands and in coastal marshes and swamps, and very occasionally on inland lakes.

Nest: Birds usually nest in colonies, in trees, bushes or on the ground. Sometimes birds will nest on rocks, usually over or near the water. They build rude but sturdy platform nests of sticks, twigs, weeds, and coarse grasses on coastal islands with low vegetation. Nests are from 15 to 20 inches across and 4-6 inches deep. Neotropics normally build substantial nests in either live or dead trees from 3 to 15 feet off the water where the young are safe from predators. The breeding season begins in late January with courtship starting as early as late December and can run as late as early October (Oberholser 1974).

Eggs and Young: Females lay from 2 to 5, usually 4, chalky white, greenish, or bluish eggs that are about the size of chicken eggs, but more elongated. The unmarked eggs are overlaid by an uneven chalky deposit and soon get stained in the nest. Eggs are incubated for 25 days apparently by both parents, but this is not known for sure. Young hatch over several days, so nests usually contain young in all stages of growth. Young birds don't reach independence for a long time, perhaps only after 12 weeks. Both parents tend the young while they learn how to forage for themselves.

Ageing and Identifying Young: Nestlings are born completely featherless; naked skin is blackish-gray. Chicks are soon covered with a blackish down.

Notes: The original name for this species was Mexican cormorant, but it has also been called the olivaceous, Bigua, and Brazilian cormorant. Although there is no formal migration, with a few birds wintering along the Texas and Louisiana coasts, most move much further south where the weather is warmer. Neotropics are generally tolerant of varying temperatures and thus has few habitat requirements beyond water with some form of animal life for food. Birds feed on small fish mostly the abundant small fish of shallow protected waters. Typical prey items are from 2 to 5 inches long. Often seen in spread-wing posture, air-drying its plumage after foraging dives. Their eyes are specially adapted for aerial as well and underwater vision. Neotropic cormorants are often seen perching on branches and wires (Ehrlich 1987). During the winter, double-crested cormorants perched beside them clearly highlight the size difference between the two species.

Anhinga

Anhinga anhinga

Photo of bird courtesy of John L. Tveten

Photo of eggs courtesy of Hal H. Harrison

Otherwise known as the “snake-bird” or “water turkey”, the anhinga has a long fanlike tail, a long snaky neck, and small head that is held out straight in flight. Anhingas have strangely structured neck vertebrae resulting in a pronounced crook in the long neck, similar to that of herons. This gives these birds the ability to thrust forward quickly and powerfully, driving their sharp bill into their prey. Anhingas resemble cormorants to some extent, but are trimmer and have a straight, pointed, dagger-like bill. During courtship, soaring birds often emit a short series of hawk-like squeals and whistles. Otherwise they are generally silent, with only the occasional harsh guttural grunts (Pough 1951).

Breeding Range: Anhingas range all along the Coastal Plain, from N. Carolina south to Florida and the Gulf States. In Texas, they are uncommon summer residents along the Gulf coastal plain and locally in east and central Texas. Birds are usually absent in winter except along the coast and the Lower Rio Grande Valley where they are rare winter residents (TOS 1995).

Habitat: Sheltered quiet waters of ponds in cypress swamps, freshwater sloughs, marshy lakes, canals, and tidal streams are favorite haunts. The anhinga is principally a freshwater species unlike other members of the pelicaniform order. In Texas, anhingas prefer small bodies of quiet or sluggishly flowing fresh water common near channels and open ponds associated with extensive marshlands. Here they find suitable clumps of trees and small shrubs for nesting and roosting that are close to their food supply (Pough 1963).

Nest: Anhingas are mostly colonial breeders, with up to several hundred pairs separated into clusters of 8 to 12 pairs, but usually less, nesting in close proximity. Birds often nest with herons, ibises, and cormorants, but tend to form small groups by themselves at the outskirts of a big rookery. Nests are placed from 5 to 20 feet above water or ground in cypress, willows or buttonbush. The bulky nest has a base of twigs, coarse sticks, and dead leaves, lined with leaves or finer twigs with foliage. The male establishes the nest site and gathers nesting material while the female builds the nest. Pairs may use the same nest each year. Anhingas start breeding in late March with the first eggs laid by mid-April (Oberholser 1974).

Eggs and young: Clutch varies from 2 to 5, usually 4, oval to long-oval eggs. Eggs are pale bluish-white with a chalky coating, which becomes glossy and nest-stained during incubation. Both sexes share incubation duties, which lasts from 25 to 28 days. Incubation starts only when the clutch is complete. Both parents tend the young. Young begin to fly at around 6 weeks and are independent at 8 weeks.

Ageing and Identifying Young. Nestlings are altricial and born completely featherless. The naked skin is yellowish buff at birth. Chicks grow rapidly and are soon covered with a thick, short, gray to buffy brown down. Irides are dark. Legs and feet are yellowish-buff, while the bill is dark (Baicich 1997).

Notes: Anhingas are at least 2 years old before they breed for the first time. Excellent swimmers and divers, anhingas often perch with out-stretched wings in the manner of cormorants. Feathers are not waterproof like those of ducks and geese, so after diving and swimming birds must take time out and dry their wings. Often when the bird is in the water only the head and neck are visible, hence the name snake-bird. Young regurgitate food when alarmed, an effective predator

defense (Baicich 1997). After only 2 weeks, young will leave the nest if disturbed and will try to return later. Anhingas migrate south in large flocks of 100+, often in the company of hawks.

Great Blue Heron

Ardea herodias

Photo of bird courtesy of John L. Tveten

Photo of eggs courtesy of Hal H. Harrison

Standing four feet tall with a wingspan of six feet, the great blue heron ranks as the largest of the North American herons. The large size and overall blue-gray color set this bird apart from any other bird in the United States. People sometimes refer to it as the blue crane, but it is in no way related to this group of birds. In flight, the great blue folds its neck back and rests its head on its shoulders in the manner of herons. Upon taking flight it will often emit a harsh, drawn-out goose-like honk or when startled, a hoarse, guttural squawk. Versatile and adaptable, the great blue has the largest range of any other heron in North America (Pough 1951).

Breeding Range: Great blues breed from the Alaskan peninsula, across southern Canada to Nova Scotia, south through the United States, Mexico, West Indies, the Galapagos Islands, south to South America. While migratory in the northern part of its range, it is a permanent resident in the southern regions of the U.S. In Texas, birds are uncommon to common residents in nearly all parts of the state. They are common winter residents along the coast, less common inland (TOS 1995).

Habitat: In Texas, great blues are most commonly found along the coast, but can also be seen beside streams, ponds, and lakes throughout the state. Wet meadows and pastures are also common feeding grounds. Shallow saltwater or freshwater areas are favorite haunts, as well. Nesting birds prefer remote inaccessible situations far from human disturbance.

Nest: Generally great blues nest in colonies on islands and in wooded swamps, in the company of other herons, ibises, cormorants, pelicans -- usually nesting earlier than other species. In congested communities, great blues will nest several in one tree. The nest is securely lodged in a crotch or on a limb of tree up to 30 feet off the ground. Sometimes nests are found in bushes, low mangroves where they occur, and rarely on the ground. Along the coast, nests are also found on gas wells, duck blinds in the shallow bays, and channel markers and buoys in deeper bays. Males gather the nesting material while females build the nest. Nests range from flimsy to compact platforms of large sticks, lined with fine twigs and green leaves. They are thin and small when newly built, but old nests are added to seasonally, becoming very bulky (Baicich 1997). Birds are generally single-brooded. Birds begin to breed in late January in Texas, with first eggs laid toward the end of February, and wind down in mid- to late August (Oberholser 1974).

Eggs and young: Clutch ranges from 3 to 6, usually 4, oval to long-oval pale bluish green eggs. Eggshells are smooth or slightly rough and unmarked. Incubation is performed by both sexes and lasts from 23 to 28 days. Young fly at 60 days and leave the nest after 64 to 91 days after gaining independence (Ehrlich 1988).

Ageing and Identifying Young: Nestlings are semi-altricial and are born downy. The down on upperparts and flanks is long and has long bristle-like tips that stand up on the crown to produce

a rather comical-looking bristling wig (Baicich 1997). Upperparts are dark grayish-brown with pale-gray sides and white undersides. Feathering is sparser on the sides of back and mid belly, and totally absent around the eyes, lores, chin, throat, and back of neck. The bill is relatively short and blunt at first, before assuming its more characteristic longer length (Baicich 1997). Moreover, the bill is entirely dark brown in first year birds.

Notes: Birds forage for fish either by waiting patiently for prey to come within range or by walking slowly through shallow water (Pough 1963). Birds take little or no game fish, preying instead of nongame fish species. As much as 2/3rds of a great blue's diet is fish. The rest may be made up of frogs, lizards, snakes, crayfish, crabs, other birds and rodents (mice, rats and young nutria). Unfortunately, it still remains a tempting target for the thoughtless and unenlightened, who find it easy to shoot down.

Great Egret

Ardea alba

Photo of bird courtesy of John L. Tveten

Photo of eggs courtesy of Hal H. Harrison

Symbol of the National Audubon Society, the great egret is the largest of the white herons in Texas. It is distinguished by its large size, yellow bill and blackish legs and feet. The 40 to 50 long nuptial plumes that develop during breeding season made them an important target for the plume hunters, reducing the bird to a rarity in much of the U.S. (Pough 1951). Fortunately, it has recovered substantially since receiving legal protection. Not especially pleasing to the ear, its voice consists of a deep, hoarse, rattle-like croak.

Breeding Range: The United States breeding range extends from Oregon to California, along the Gulf Coast from Texas to Florida, through the Midwest to the Great Lakes, and along the Atlantic Coast as far north as Maine. Great egrets are common permanent residents along the coast in Texas and are locally common summer residents in the eastern and central portions of the state (TOS 1995).

Habitat: In Texas, great egrets are found primarily along the coast, where they feed in both saline and freshwater marshes, mud flats, rice fields, ponds, and streams. Birds breed near fresh or salt water in thickets and woodlands and coastal marshes.

Nest: Great egrets sometimes nest on their own or in small to large colonies on islands or in wooded swamps with other species of herons, cormorants, anhingas, and pelicans. Nests are placed in trees or shrubs, usually 3-30 feet above the ground. Great egrets sometimes nest up to 60 feet off the ground. Nests are generally built of sticks and twigs; they may or may not be lined with leaves, moss, and fine materials. Great egret nests are larger and more substantial than those of small herons, but are not so bulky as the nest of the great blue heron. The male selects the nest site and helps the female build the nest. Birds start to breed in early March in Texas depending on weather and water levels. First eggs are laid toward the end of March (Oberholser 1974). The nesting season ends in early August.

Eggs and young: The normal clutch is from 3 to 4 smooth blue or blue-greenish unmarked eggs, rarely more. Long-oval to elliptical in shape they have little or no gloss. Incubation is performed by both sexes for approximately 23 to 24 days, and both parents feed the chicks. Young fledge



GREAT EGRET
ARDEA ALBA



Great Egret

Photo courtesy of John L. Tveten



SNOWY EGRET
EGRETTA THULA



LITTLE BLUE HERON
EGRETTA CAERULEA



Photo courtesy of John L. Tveten



TRICOLORED HERON
EGRETTA TRICOLOR



Tricolored Heron



EDDISH EGRET
EGRETTA RUFESCENS



CATTLE EGRET
BUBULCUS IBIS



42 days thereafter. Young remain in and around the nest from the end of May to late August. Birds start to fly short distances by 5 weeks of age and start flying with adults at 6 to 8 weeks until they reach independence (Baicich 1997).

Ageing and Identifying Young: Nestlings are born semi-altricial and downy. The down is long and white with fine silky tips. Stiffer crown feathers produce a distinctive crest. Down is sparse on the neck and underparts and totally absent around the eyes, lores, chin, throat, and back of neck. The bill is pink at hatching, but soon turns yellow. Legs and feet are gray-green, turning gray. Irides are off-white (Baicich 1997). Young get true feathers after one week and are completely covered in 4 to 5 weeks.

Notes: This species was almost totally extirpated by plume hunters in the early 20th century. Breeding status is currently stable, thanks to legal protection. After feeding all day singly or in small groups, birds fly at sunset to large communal roosts, which they share with other herons and egrets. Preferred food items include all types of aquatic animal life, and rice farmers consider them valuable allies because of their heavy consumption of crayfish. Frogs, snakes, and small fish are also favorite prey items (Pough 1951).

Snowy Egret

Egretta thula

Photo of bird courtesy of John L. Tveten

Photo of eggs courtesy of Hal H. Harrison

Delicate and ethereal in full breeding plumage, the snowy is perhaps our most elegant white egret. A slender black bill and black legs with bright yellow feet separate this slim, dainty bird from the other white herons. Bearer of the exquisite "cross aigrettes," lovely, recurved back plumes, so sought after by the milliner's trade, it probably came closer to extinction than any other member of the group (Pough 1951). Fortunately, it has recovered much the ground it lost. Generally silent, it can utter a harsh, grating scold or hiss. During the early part of the breeding season, however, snowy egrets can be very vocal, making a curious noise like a human gargling (Pough 1951).

Breeding Range: Snowy egrets have a wide nesting range in the U.S., from central California in the west to the Atlantic coast as far north as New England, south through the Gulf coastal states to Florida. Their range also extends throughout the West Indies, Mexico, Central and South America. In Texas, snowies are uncommon to common summer residents from the Sabine River west to the Rolling Plains, especially along the coast (TOS 1995).

Habitat: In Texas, birds breed primarily along the coast and in scattered marshes and swamps to the north and east. Salt bays and saltwater marshes are highly attractive feeding and nesting areas. Freshwater marshes, willow and buttonwood ponds as well as rice plantations are favored haunts inland. Yucca, prickly pear, huisache, and tamarisk-covered islands in coastal lagunas and salt bays are preferred nesting substrates along the lower end of the Gulf coast (Oberholser 1974).

Nest: Birds nest in colonies, by the thousands in some heronries. Nests are placed in trees or shrubs, averaging 5 to 10 feet from ground, sometimes as high as 30 feet. Flat, elliptical, loosely woven structures of slender twigs on foundation of heavy sticks, nests tend to be frail structures.

Finer material, such as reeds, rushes, dead cane, etc., is added as lining, as available. Building is done by both sexes, requiring 5 to 7 days. Male selects the territory and both sexes defend it vigorously. Positive identification of nest and eggs is not possible without seeing the bird in the nest. Birds start to breed in late March in Texas with first eggs laid in mid-April, first young in the nest by the end of April till mid-July. The nesting season ends in mid-August (Oberholser 1974).

Eggs and young: Normal clutch ranges from 3 to 4 eggs, sometimes up to 6. Eggs are laid about every other day. Oval in shape, they are pale greenish blue and unmarked. The shell is smooth, with little or no gloss. They are generally indistinguishable from the eggs of little blue or tricolored herons. Incubation is performed by both sexes for 18 days, possibly longer. Both parents tend the young, dropping food on the nest for the first few days. Later young grasp the adult's bill to get food. Young leave the nest for nearby branches from 20 to 25 days after hatching (Baicich 1997).

Ageing and Identifying Young. Nestlings are semi-altricial and hatch covered in down. The white down is long and fine on the head. Bill and feet are pale yellow, while facial skin is a light green (Baicich 1997).

Notes: The snowy egret is a very active feeder and rivals the Reddish egret in its frenetic activity level. Rather than stalking slowly for its prey, it moves briskly through the shallow water, shuffling its golden "slippers" to stir up the bottom and stabbing repeatedly for the aquatic life that darts from cover. It may also feed in pastures and fields to supplement a varied diet that includes small fish, shrimp, crayfish, frogs, worms, snails, insects and the occasional rodent.

Little Blue Heron

Egretta caerulea

Photo of bird courtesy of John L. Tveten

Photo of eggs courtesy of Hal H. Harrison

The adult little blue heron is entirely dark slate blue, with a reddish purple head and neck in breeding plumage. The bill is blue with a darker tip, and the legs are bluish green. The juvenile little blue heron causes the most confusion in identification because it is entirely white. In size and color, it resembles a snowy egret, but it has a thicker, two-toned grayish bill and greenish legs and feet. Not until the spring after its hatching year does it begin to acquire the dark plumage of the adult. When alarmed, little blues utter a hoarse croak. During territorial disputes, they emit harsh parrot-like screams (Pough 1951).

Breeding Range: Found along the coast and inland in southeastern U.S., along the Atlantic Coast to New Jersey and, occasionally, to New England, their range is gradually extending northward. While a permanent resident in Florida and along the Gulf coasts, little blues that nest further north spend the winter along the Gulf Coast. In Texas, little blues are common summer residents in central and eastern part of the state, as well as along the coast (TOS 1995). Birds tend to wander in late summer to other parts of the state during the post fledging dispersal period.

Habitat: Preferred nesting habitats in Texas include inland freshwater marshes, saltwater marshes, swamps, and bayous, as well as marine and coastal bay islands. Fresh, brackish, or saltwater habitats in open habitats are preferred (Oberholser 1975).

Nest: Little blue herons tend to be colonial nesters, but when the colony contains other species, little blues prefer to keep to themselves on the fringes. They nest on a number of coastal islands, but the majority nest in wooded mainland swamps. Depending on the habitat, little blue herons nest in bushes two to four feet off the ground, in trees and shrubs around the water's edge, or in tall trees well away from the water. The nest is usually placed 8 to 15 feet above water in buttonbush, deciduous holly, swamp privet, or other low shrubs. Nests are loosely woven, almost flimsy, platforms of twigs and sticks and are variable in shape. The egg cavity may or may not be lined with leaves, reeds, grass and finer twigs. Unfortunately, positive identification of nest and eggs is not possible without seeing the bird. Birds start to breed in early to mid-March in Texas, with first eggs laid in mid-April. Breeding season comes to an end in mid-August (Oberholser 1974).

Eggs and young: Clutches range from 2 to 6, usually 3-5, pale blue-green eggs. Shells are smooth and non-glossy, very similar to those of snowy egret and tricolored heron. Eggs are laid on alternate days, and both parents incubate them for 22 to 24 days. Hatching takes 3 to 5 days. Young can make short flights 30 days after hatching. By day 17, they spend much time on branches near the nest, but return to the nest for food. Young gain independence 35 to 39 days later (Baicich 1997)

Ageing and Identifying Young. Nestlings are semi-altricial and hatch covered with down. Sparse on the underside, down is longer on top of the head. Upon hatching it is a very pale gray with tawny tips on the head, gradually turning white. Irides are white to pale gray. The bill is pinkish-gray, becoming yellow later on, while mouth parts are orange. Legs and feet start out gray, but soon turn greenish-yellow (Baicich, 1997). Feathering begins after one week and young are fully feathered in 12 days, at which time they can leave the nest. (Baicich 1997).

Notes: Little blue herons are more common in fresh than saltwater. Slow, deliberate hunters along ponds, lakes and marshes, they feed on an array of small fish and other aquatic life. They are particularly fond of crayfish and are seen stalking along the dikes of rice fields, giving them the alternate common name of "levee walker" in East Texas and Louisiana. It's also dubbed the "calico" bird, which well describes the blue and white pied appearance of young birds in the process of acquiring adult plumage.

Tricolored Heron

Egretta tricolor

Photo of bird courtesy of John L. Tveten

Photo of eggs courtesy of Hal H. Harrison

With their overall slate-blue color with white foreneck and belly, tricolored herons are exceedingly beautiful birds, especially in breeding plumage when adults are decked out in elegant beige buff mantle feathers. In silhouette, it has a long, almost snakelike neck and a long bill. The black-tipped bill varies according to the season from purplish-blue to yellowish, with

legs changing from slate to yellowish-green. Not especially loud, calls consist of a variety of hoarse, guttural notes (Pough 1951).

Breeding Range: Tricolored herons breed throughout the coastal regions from Texas to Florida, north to New Jersey; occasionally as far north as Massachusetts. In Texas they are common nesters along the coast, breeding inland to Colorado, Henderson, Polk, and Jasper counties (TOS 1995).

Habitat: Preferred habitats include islands, ponds, sloughs, lakes, and bayous, in fresh or saltwater environments. For nesting, birds particularly favor various saltwater habitats including coastal islands. On Texas islands, nesting sites include dry thickets, large canebrakes, and shrubby vegetation dominated by sea ox-eye daisy and prickly-pear (Oberholser 1974). On bare coastal islands in salt bays, birds nest in grasses and other seaside vegetation (Baicich 1997).

Nest: Highly sociable, tricoloreds typically nest in large colonies, but on occasion are solitary at the periphery of their range. Nests are often placed in the same shrubs and trees with other species, otherwise they may be located in homogeneous groups within larger colonies. Nests are placed in trees from 2 to 12 feet off the ground or water. Nests are low, flat, round or elliptical structures made of sticks and twigs and sparingly lined with green leaves, grasses, and weeds. The breeding season begins in late March in Texas, with first eggs laid in early April through June 23. Young have been found in the nests into late August (Oberholser 1974).

Eggs and young: Clutch averages from 3-7 eggs, usually 3-4. Oval to long-oval pale greenish-blue, unmarked eggs have smooth shells, with no gloss. Tricolored's eggs are indistinguishable from those of little blue heron or snowy egret. Incubation duties are performed by both sexes, lasting about 21 days. Young can scramble onto branches from the nest at 11 to 17 days, but return to the nest to be fed. Young leave the nest at 22 days and completely fledge at about 59 days. They tend to form social groups away from the nest with young of their own species (Baicich 1977).

Ageing and Identifying Young: Nestlings are semi-altricial and downy when they hatch. Down is dark gray on head, neck, back and wings, with longer tawny down on the head. Foreneck, undersides, and thighs are white. Down on the head soon turns brownish-red, while neck and back down turn brownish-gray. The bill is dark gray, while legs and feet are pinkish-gray, becoming gray green. Irides are generally off-white (Baicich, 1997). Feathering begins at 4 to 5 days and is complete after about 4 weeks (Oberholser 1974).

Notes: Probably the most abundant heron in the South, some tricolored colonies number in the thousands. Until recently, this bird was called the Louisiana heron. When feeding it usually keeps on the move, momentarily crouching or freezing before darting out with its long bill to stab prey with unerring precision. Minnows, killifish, and other small shallow-water fish are favored prey items, with shrimp, crayfish, and large insects an added supplement.

Reddish Egret

Egretta rufescens

Photo courtesy of Greg Demuth

The reddish egret has caused much confusion and controversy due to its dichromatism (occurring in two color morphs). There is a white phase, red phase, and a much rarer “pied” form, which shows both white and reddish-gray feathers. Both the white and dark morph birds show the distinctive pink, black-tipped bill and cobalt blue legs. In the breeding season, the plumes on the neck and head give the reddish egret a decidedly shaggy look. Consisting of a guttural squawk, the reddish egret’s voice is somewhat less harsh than that of its congeners.

Breeding Range: In the U.S., reddish egrets breed locally on the Texas and Louisiana coasts, from Tampa, Florida, south to the Keys. It also breeds on both coasts of Mexico and the Bahamas, West Indies, and Central American. A few individuals remain on the Gulf Coast during the winter months, but most move south along the coast of Mexico to El Salvador. The reddish egret has the most limited geographical and ecological range of any of the other U.S. herons, and being strictly coastal, it seldom ranges inland to freshwater feeding grounds. In Texas, reddish egrets are locally common residents along the coast but are considerably more numerous toward the southern end (TOS 1995). Birds are somewhat migratory here.

Habitat: Reddish egrets prefer coastal areas. Because birds feed only in shallow water, they are most common in Laguna Madre and shallow Mexican bays. Rarely seen inland, the bird is found almost exclusively on saltwater beaches and bays. Islands vegetated in baccharis, tamarisk, and huisache accommodate many nesting reddish egrets. Along the lower coast brushy prickly pear thickets on dry islands are favorite haunts (Oberholser 1974).

Nest: Reddish egrets may be solitary, but they usually nest in colonies, often with other species in crowded heronries. Birds begin to gather on the islands in February. Territory is selected by the male, but is vigorously defended by both adults. The reddish egret prefers to nest in low trees and bushes where they build a flat stick platform nest with no lining of any sort. They will also nest on the ground, fashioning deep-cup nests from the surrounding grasses. Building is done by both sexes and material is added continuously throughout the egg-laying period. Birds start to breed in early March in Texas with first eggs laid in mid-March. Nesting season lasts until early August (Oberholser 1974).

Eggs and young: Clutch averages from 3 to 4, occasionally 5, oval to long-oval, pale bluish-green, unmarked eggs, rarely more. Shells are smooth and lack gloss. Incubation is performed by both sexes and lasts 26 to 27 days. Young can make short flights at around 28 days, and can fly well at 46 days of age. Both parents continue to feed young for another 2 to 3 weeks, until they reach independence (Baicich 1997).

Ageing and Identifying Young: Nestlings are semi-altricial and downy at hatching. While sparse under the body, down is long on top of the head. Grayish-cinnamon on head and neck, the down is smoky gray on the body. Bill, legs and feet are dark olive (Baicich 1997). Both white and dark phases can occur in the same nest (Oberholser 1974). Dark phase young are almost wholly gray, showing only a touch of reddish color on the throat and forewing (Pough 1951).

Notes: The reddish egret forages by rushing rapidly about in shallow water with its wings raised, chasing down fish, frogs, and crustaceans. It also brings its wings forward in front of its body, creating a “canopy” of shade from which it spots its prey more easily. Amid wildly excited lurches, flapping wings and drunken staggers, birds seize prey with a swift, thrusting jab of the bill (Oberholser 1974). Reddish egrets are extroverts in the bird colony, flaring their plumage to

all passers-by. A major threat to the bird is that during the nesting period, they are rather confiding and easily approached.

Cattle Egret

Bubulcus ibis

Photo of bird courtesy of John L. Tveten

Photo of eggs courtesy of Hal H. Harrison

Historically natives of Africa, cattle egrets colonized the Americas on their own, arriving first in South America and gradually making their way north. The first reported nesting of the cattle egret in Texas was in 1958. The adult cattle egret is a small, white, stocky bird with a short yellow bill. In breeding plumage, the bird sports a buff-colored crown, back, and foreneck, while the bill turns dull red at the base and legs turn a dusky magenta.

Breeding Range: Cattle egrets breed throughout Florida and locally along the entire Gulf Coast to Texas, north along the Atlantic Coast to New England. A native of Africa, the species arrived in the United States by way of South America and has been expanding its range since that time. In Texas, cattle egrets are common to abundant breeders along the coast, and inland through the eastern half of the state (TOS 1995).

Habitat: Cattle egrets breed in a variety of sites, usually, but not necessarily, near water. Fresh and saltwater marshes, willow-buttonwood ponds and vegetated islands in coastal bays are favored sites.

Nest: Highly social birds, cattle egrets join other herons and egrets in the large colonial gatherings on coastal islands. Inland, they nest around lakes or ponds or in groves of trees well away from water. Males carry the material while the female builds the nest, usually taking from 3 to 6 days. Roles are occasionally reversed. The nest is usually placed in a tree or shrub and consists of a platform of sticks, twigs, and vines or other handy vegetation. Pilfering material from other nests is not uncommon. Birds adapt readily to their surroundings and build their nest as high as 30 feet off the ground, sometimes only inches apart from one another. One bird remains on the nest at all times. Building continues throughout the incubation period. Nests are usually found lower down than those of little blue herons with whom they often share nesting trees (Baicich 1997). Birds breed from late March to early April through September in Texas (Oberholser 1974), though the breeding season can be variable. Nesting is usually synchronized throughout the colony (Baicich 1997).

Eggs and young: Clutch ranges from 3 to 6, usually 4 to 5, unmarked, oval eggs, probably laid every other day. Shells are a very pale blue to bluish-white, lack gloss, and are paler than eggs of other herons. Incubation starts as soon as the first egg is laid and is performed by both sexes, lasting from 21 to 24 days. Occasional polygamous matings occur, but only one brood is attempted. Hatching intervals produce a striking variation in the size of young in the nest (Baicich 1997). Young fly short distances at 40 days, but don't gain independence before 3 months.

Ageing and Identifying Young. Nestlings are semi-altricial and downy when they hatch. Down is generally white with fine tips, but upright and stiff on the crown. Bill and facial skin is



BLACK-CROWNED NIGHT-HERON



YELLOW-CROWNED NIGHT-HERON



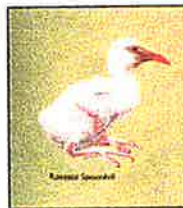
WHITE IBIS



WHITE-FACED IBIS



ROSEATE SPOONBILL



LAUGHING GULL



greenish-yellow while legs and feet are a reddish buff. The iris is yellowish-white, giving the bird a pale-eyed appearance (Baicich, 1997).

Notes: These birds often feed with herds of cattle, hence their name, catching insects chased up by the grazing animals, and may even defend their territories around an individual steer. Huge flocks may follow farm tractors to grab exposed insects and earthworms (Oberholser 1974).

Black-Crowned Night-Heron

Nycticorax nycticorax

Photo of bird courtesy of John L. Tveten

Photo of eggs courtesy of Hal H. Harrison

The black-crowned night-heron is easily recognized in adult plumage by its black crown, black bill and back, and grayish neck and wings. While most herons are tall and gangly, the night-herons are cast in a somewhat different mold. Bulky, heavy-bodied birds, they have relatively short legs and stouter necks and beaks than most other herons. They have a decidedly hunched up appearance, especially when their neck is contracted (Pough 1951). During the breeding season, a pair of long, slender white head plumes extends down the back. Dull gray-brown, streaked and spotted with lighter markings, immature night-herons look very different from adults. Sometimes called the 'squawk' bird, black-crowns utter a characteristic quock that readily identifies them as they fly overhead. During the breeding season, they deliver a variety of other guttural notes and shrill squawks (Pough 1951).

Breeding Range: Cosmopolitan in range, black-crowned night-herons breed from Florida and the Gulf of Mexico, north to Canada, but are absent from the Appalachian region in North America. It is a permanent resident along the Gulf and East coasts to New England. The black-crown is a fairly common nester on the Texas Gulf Coast, and is rare to locally common summer resident in nearly all inland parts of the state, as far north as the Panhandle (TOS 1995).

Habitat: Birds will nest in extremely varied habitats, including fresh, salt, or brackish water areas. They nest in trees, shrubs, groves, forests, thickets, reeds, cattails, and even city parks, where birds can be found roosting, sometimes in large groups, in marshes or clumps of saltcedar.

Nest: Black-crowns usually nest in small groups of 2 to 6 pairs, as large colonies are quite rare. While they may be attracted to large heronries, they tend to nest by themselves on the outskirts. Birds start to breed from early February to late July in Texas, with first eggs laid in late February to June (Oberholser 1974). There does not seem to be such a thing as a "typical" black-crowned night-heron nest. They may nest on the ground among high marsh vegetation or high in a tree or in a low shrub. Nests are usually thick, bulky structures made of sticks, twigs or reeds with fine lining. Nesting material varies with availability, and nests can be anywhere from very flimsy when first constructed, to substantial when reused. Both sexes defend the nest territory and share in nest construction. Males are more active in gathering the material; however, females perform most of the building activities. Nests take from 3 to 5 days to build (Ehrlich 1988).

Eggs and young: Clutch ranges from 1 to 6 smooth, oval to long-oval eggs, usually 3 to 5. Shells are unmarked blue or greenish-blue in color with no gloss. Eggs are similar to those of the great egret, but are slightly smaller. They are very difficult to distinguish from those of the yellow-

crowned night-heron's. Incubation is performed by both sexes, and lasts from 24 to 26 days. Young are able to leave the nest at 2 to 3 weeks, but return to be fed. Young gain their independence by 6 weeks of age (Oberholser 1974).

Ageing and Identifying Young: Nestlings are semi-altricial and downy at hatching. Body down is sparse with long silky tips, but is stiff and bristly on the crown, producing a somewhat comical crested appearance. Down is absent from around the eyes, chin, throat, lower chin, neck and parts of the belly. Rufous-brown above, the down is darker and more rufous on the head and neck. The bill is gray, while the legs and feet are gray-green. The iris varies from gray to green, finally turning a rich amber (Baicich, 1997). Feathering starts at 12 days and birds are fully feathered by 4 weeks. Differentiating immature black-crowns from immature yellow-crowns can be difficult. Major points to look for include shorter legs, longer, thinner, bicolored bill, and browner upperparts with bolder white spotting in the black-crowned night-heron.

Notes: Night-herons commonly sleep all day in treetop roosts and fly out at sunset to their feeding grounds. Their large, light-sensitive red eyes enable them to forage mainly at night. When tending young or on cloudy days, birds will forage at any time day or night. On Little Pelican Island there are about two hundred breeding pairs; however, they are especially difficult to count because their nests are scattered in dense, brushy areas.

Yellow-Crowned Night-Heron

Nyctanassa violacea

Photo of bird courtesy of John L. Tveten

Photo of eggs courtesy of Hal H. Harrison

The yellow-crowned night-heron is a handsome bird, with its gray-slate body and black head contrasting sharply with white cap and jaunty cheek patch. The yellow tinge to the crown, for which it is named, is not easily seen. Long head plumes trail down their backs during the breeding season. Adult plumage is not achieved until the third year, and immatures look very much like young black-crowned night-herons, although they are slightly grayer with less conspicuous spotting and have stouter beaks and longer legs.

Breeding Range: Birds breed chiefly throughout the southern states, sparingly north to Tennessee, Michigan, Pennsylvania, New Jersey; rarely as far north as Long Island and Massachusetts. In Texas, they spread out across the eastern portions of the state where they are uncommon to locally common breeders in the eastern and central portion of the state from the coast north and west to Bexar, Parker, and Lubbock counties (TOS 1995).

Habitat: Bayous, backwaters in cypress swamps, freshwater ponds, swamps, isolated groves, and islands in coastal bays are favorite haunts of the yellow-crown. Birds breed by salt and fresh water in trees and bushes at varying heights, from ground level to high off the ground.

Nest: Birds usually nest in small to large colonies; however, single nests sometimes occur. Birds may nest with other herons, but isolated colonies are the general rule. The nest is built anywhere from 1 to 50 feet from the ground or water in a variety of trees and shrubs. Nests may be fragile or thick and are built of sticks and lined with fine twigs, rootlets, and leaves. Both sexes build the nest and continue to add material, even after the young hatch. Birds may reuse the nest from the

previous season. While the breeding season is variable, birds start to breed in late February to early March in Texas (Oberholser 1974) The nesting season lasts until the middle of July.

Eggs and young: The clutch averages from 3 to 4, sometimes 5, pale bluish-green unmarked eggs. Eggs are oval, long-oval, to cylindrical in shape, smooth in texture, and lack gloss. Yellow-crowned eggs are difficult to distinguish from those of the black-crowned night-heron. First eggs are laid in late March in Texas and continue to be laid until late June. Incubation is performed by both sexes, and lasts 26 days. Both parents tend the young. Young first leave the nest at 30 days and gain independence after 40 days. Yellow-crowns are single brooded, though a clutch lost early on will usually be replaced.

Ageing and Identifying Young: Nestlings are semi-altricial and covered in down after hatching. The down is fine and grayish, forming a conspicuous long crest on the head. The bill can be brownish or greenish, while legs, feet, and loreal skin is greenish-yellow. Irides are deep yellow (Baicich, 1997). Differentiating immature yellow-crowns from immature black-crowns can be difficult. Major points to look for include long legs that trail farther behind in flight, shorter, stouter, unicolored black bill, and lighter brown upperparts with finer white spotting in the yellow-crowned night-heron.

Notes: Less nocturnal than the black-crowned, yellow-crowns forage during the day as well as at dusk. It is particularly fond of crabs and crayfish, and to that end, has an unusually heavy bill, great for cracking shells. In fact, the larger bill permits them to seize generally larger prey than other similarly sized herons (Ehrlich 1985). Interestingly, island forms have larger bills than mainland birds.

White Ibis

Eudocimus albus

Photo of bird courtesy of John L. Tveten

Photo of eggs courtesy of Hal H. Harrison

The adult white ibis has clear field marks: pure white plumage, long reddish, down-curved bill, outstretched neck, and black wing tips as if dipped in ink.. Young are white only on the underparts, lower back, and upper tail coverts, while upper back and wings are a rich chocolate brown. Soft parts vary from dull flesh in winter to brilliant red during courtship. Another victim of the millinery trade, these birds were saved from extinction thanks to the vigilant protection afforded them by Audubon wardens at their rookeries. Wheeling high in the air in perfect unison, they seem alternately to appear and disappear completely as they bank one way and the other, especially at a distance. Birds often fly in very long V-formations. On the breeding grounds, white ibis utter soft grunting sounds, interspersed with hoarse howling notes. Calling distends the colorful gular pouch. Otherwise, birds are generally silent (Pough 1951).

Breeding Range: The white ibis is a bird of the southeastern coastal marshes, from the Carolinas to Florida and around the Gulf, southward into Central and South America. In Texas, the bird lives primarily along the coast, but thousands nest as far as 100 miles inland where they are a locally common resident.

Habitat: White ibis occur in salt, fresh, or brackish water environments, generally near the coast, often on islands or in swamps. Birds feed inland in rice fields and wet pastures. Birds nest in both fresh- and saltwater marshes and bays, as well as on dry coastal islands. Preferred sites consist of areas of low trees or shrubs standing in water. Large food supplies are essential for successful nesting (Ehrlich 1988).

Nest: Highly social, white ibis nest in dense colonies with herons and other waterbirds. Breeding season is variable depending on a number of factors. Birds generally start to breed in early April in Texas, but it can be earlier, with first eggs laid from mid April to mid-June (Oberholser 1974). Birds nest in cypress, willow, prickly-pear and other shrubs, often under active nests of other herons, cormorants, or pelicans. They have also been known to nest on the ground. Nests are constructed of dead sticks, live twigs, leaves and Spanish moss. They are deeply cupped and often lined with green leaves or grasses. The male establishes the territory and gathers nesting material, while the female selects the nest site and does most of the building. The nesting season winds down in late July to early August, though eggs have still been found in nests as late as mid-August (Oberholser 1974).

Eggs and young: Clutch ranges from 2 to 5, usually 4, smooth to finely granulated oval to long-oval eggs. Pale buff, to bluish or greenish-white in color, the non-glossy eggs vary from almost immaculate to heavily spotted and blotched or splashed with shades of brown. Clutches are larger inland than on coastal bay islands. Incubation is done by both sexes and lasts from 21 to 23 days. Young are tended by both parents and leave the nest 28 days after hatching, but do not fly well until they are about 35 days old (Baicich 1997).

Ageing and Identifying Young: Nestlings are semi-altricial and downy at hatching. Smoky-brown down covers the head, neck, upper breast and wings, the rest of the body is almost bare. The skin is dull pink to gray. Black down covers the head, but is longer and lighter on the rest of the body. There is a narrow white line in front of the eye. Facial skin is grayish with two characteristic pink gular patches. The bill is pink with three broad black bands at the base, middle and tip. Irides are light brown. Bare parts acquire a straggly woolly down with time, upperparts stay smoky gray, but underparts turn white (Baicich 1997). Immature birds have white underparts and wing linings, and pinkish bill. Gradually they molt into adult plumage, looking rather like brown and white calico birds. Birds do not attain white plumage until the second fall.

Notes: White ibis colonies frequently desert one location to nest at another from one year to the next, forming very large colonies that shift among sites from year to year. Birds use their long down-curved bill to probe the mud and are particularly adept at removing crawfish and fiddler crabs from burrows. In mixed foraging flocks, they are often robbed of prey by other species. For some reason, males appear to forage for longer periods of time than females. Interestingly, white ibis chicks must be fed on freshwater invertebrates, as saltwater invertebrates retard the chicks' growth. Adults sometimes must fly very long distances to find suitable food for their young. Crows and great-tailed grackles are serious predators of both eggs and young, and exact a heavy toll during early phases of the nesting season. Food shortages due to drought can also be devastating and will cause birds to desert the nesting grounds.

White-faced ibis

Plegadis chihi

Photo courtesy of John L. Tveten

Notes: On small islands, young spoonbills leave their nests at about six weeks and gather along the shoreline, where they learn to fly and feed themselves. On large islands, where the nests are in taller trees or in dense brush, the chicks must remain in their nest until fledging time. When spoonbill populations increased in Texas, many people did not know what they were, and called them “Pink Flamingos.” During the scourge of plume hunters, roseate spoonbill populations were decimated for the wing feathers used in ladies’ fans. Since 1940, numbers have recovered, but drainage of wetlands for mosquito control and real estate development continue to threaten the species (Ehrlich 1988).

Laughing Gull

Larus atricilla

Photo of bird courtesy of John L. Tveten

Photo of eggs courtesy of Hal H. Harrison

The laughing gull, the only breeding gull of the South Atlantic Gulf-Caribbean area, is essentially a warm-water bird. In breeding plumage, it sports a black hood with a contrasting broken white eye-ring, red bill and legs. The underparts are immaculately white and the mantle (the back and upper wings) is a dark slate-gray, blending into black wingtips without intervening white bars. In winter, the black head becomes largely white, with only a grayish wash across the nape and on the face. The birds’ plumage, however, does not always match the season, and a variety of in between plumages are often seen. Additionally, immature birds have distinctive plumages for the first 2 years before they acquire full adult plumage. Call is a harsh, often abrupt, crow-like, single kwup, frequently prolonged into kwur-ir-ip, and oft-repeated, hence its name.

Breeding Range: Laughing gulls range along both the Atlantic and Gulf coasts to the Caribbean. In Texas, birds are very abundant residents along the entire length of the coast. Winter reports have been increasing in nearly all parts of the state, although they are more expected in central and eastern Texas (TOS 1995).

Habitat: The laughing gull is primarily a coastal bird, seldom ranging very far inland. Birds nest primarily on islands along the seacoast in wet marshy areas, on dry sand dunes, or in meadows, on wet or dry ground. They will frequently visit inland bodies of freshwater to sit, bathe and preen.

Nest: Birds nest in compact breeding colonies, sometimes containing thousands of nests. Birds may often join colonies of terns and black skimmers. They also nest close to small heron and egret colonies. Other than being ground nesters, this small gull exhibits very little consistency in its nesting habits. Some birds build large stick mounds; others build just a minimal stick and grass nest; while still others dig a small depression in the sand or shells. Platform nests in the marsh grass are also possible. On slightly higher ground in open shortgrass areas, they build neatly cupped grass nest. Both parents build the nest on islands with other species. Birds begin to breed in Texas in early April with the first eggs laid in early April (Oberholser 1974). Nesting season ends towards the end of July to early August (Oberholser 1974).

Eggs and young: Clutch ranges from 2 to 5, usually 3, generally oval weakly glossy eggs with a slightly rough texture (Oberholser 1974). Olive-buff or olive-brown in color, they are evenly spotted, blotched, and scrawled with shades of brown. Incubation is performed by both sexes and lasts about 20 days. Birds are single-brooded. Young are tended by both parents and are continuously brooded or shaded at first (Baicich 1997). Young fledge from 35 to 40 days later (Ehrlich 1988).

Ageing and Identifying Young: Semi-precocial, chicks hatch with their eyes open, covered with pale drab brown down, slightly lighter on the underparts. Down is long and soft with head, neck and back heavily mottled with bold dark brown spots (Baicich 1997).

Notes: In warmer weather, when food is plentiful, laughing gulls catch small fish, shrimp, and crabs, or follow the shrimp and fishing boats, picking up leftovers. Birds breed for the first time in their third year. Soon after the young learn to fly, they go to the western coast of Central and South America where most spend their first year. When colonial waterbird colonies are disturbed, laughing gulls will come in and take eggs and small chicks. This is why it is very important not to disturb colonies too often, especially when laughing gulls are present. Laughing gulls are also cannibalistic, preying on young of their own kind when unguarded or wandering away from their nest. According to Chester Smith (pers. comm.), laughing gulls are probably the most serious predator of colonial waterbirds nesting on the Texas coast.

Gull-billed Tern

Sterna nilotica

Photo of bird courtesy of John L. Tveten


Photo of eggs courtesy of Hal H. Harrison

The common name of the gull-billed tern comes from its short, thick black bill, which looks more like a gull's bill than that of a tern. The gull-billed is the whitest of all the North American terns, being light gray above and white below, with a black crown that extends over its head and down the back of its neck. Its legs and feet are black as well, which is a good field mark during the breeding season. Common calls consist of a dry, rasping, almost insect-like kay-did and a short, single note repeated over and over in rapid succession (Pough 1951).


Breeding Range: Gull-billed terns breed on the Salton Sea in California, along the Gulf Coast from Texas to Florida; and on the Atlantic coast of South America to northern Argentina. In Texas, gull-bills are common permanent residents along the coast, though they are less numerous during winter (TOS 1995).

Habitat: Gull-bills live chiefly in and over salt marshes and wet coastal prairies and fields where they feed on aerial insects like grasshoppers, locusts and dragonflies. Most gull-billed terns nest in saltwater habitats and on shell and sandbanks of small islands, preferring sandy, grassy or shell-strewn flats.


Nest: Birds typically nest in segregated groups among or near nests of other species (terns most frequently). Nests are placed on high, dry sand flats behind outer beaches above the high-tide line, often among large quantities of washed up shells. The nest consists of a slight hollow in the sand where eggs are well camouflaged by surrounding shells and sometimes elaborate piles of



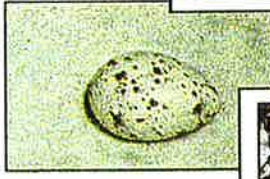

GULL-BILLED TERN





CASPIAN TERN



ROYAL TERN

SANDWICH TERN



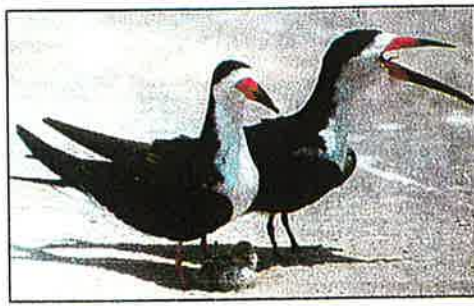

FORSTER'S TERN




LEAST TERN




SOOTY TERN

BLACK SKIMMER



dead sedges gathered from nearby marshes. Nests are much like that of a Skimmer, but with a few twigs deposited around the perimeter. Gull-bills maintain long-term pair bonds, but have weak site tenacity (Ehrlich 1988). Birds start to breed in Texas in early April, with first eggs laid in mid April through mid-July (Oberholser 1974). Breeding season generally ends at the end of July to early August. Birds are generally no younger than 5 years of age before first breeding.

Eggs and Young: Clutch ranges from 2 to 3, occasionally 4, buffy oval to short-oval eggs that are well-rounded at the small end. Rounder and lighter colored than eggs of any other medium-sized tern, they have a smooth, non-glossy shell that is spotted, blotched, and overlaid irregularly with shades of brown. Incubation is carried out by both sexes and lasts from 22 to 23 days. Hatching is asynchronous. Young fledge from 28 to 35 days later. Fledglings are fed by both parents for at least 2 to 3 months thereafter (Ehrlich 1988).

Ageing and Identifying Young: Nestlings are semi-precocial and downy at hatching. The down is long and soft with fine, hair-like tips. Upperparts are usually buffy-gray with a blackish-brown pattern. Three narrow, irregular crown stripes, spots, or streaks are on the nape and behind the eye, while the forehead is unmarked. A pair of dark streaks runs along the mid-back with spotting at the sides, along flanks, and upper wings. (Baicich 1997). Young birds have white heads, generally with fine blackish streaking behind, and in winter adults, with a brown band on the end of the tail. Juveniles also have buffy edges to the feathers of the upperparts, some dark brown mottling, especially on the scapulars, with an orange-brown bill and reddish-brown legs (Pough 1951).

Notes: Formerly a typical marsh breeder until populations were greatly reduced by eggers and millinery trade gunners, gull-bills have shifted their range and widened their habitat preferences. Gull-billed terns eat mostly insects, catching them in the air or picking them off the surface of the water. They also eat crustaceans, frogs, toads, lizards, and small mammals. Occasionally they will dive for small fish in the manner of other terns. Gull-bills nest mostly with black skimmers, which share similar nesting substrate preferences, and may also derive a certain amount of nest and egg protection in the bargain (Chester Smith, pers. comm.)

Caspian Tern

Sterna caspia

Photo courtesy of John L. Tveten

A large, gull-like tern, the Caspian is the largest of all the terns, and has an almost worldwide distribution. The most obvious markings that separate the adult Caspian from the similar looking Royal tern are the heavy red bill and solid black (breeding) or streaked (winter) cap that never shows the white forehead. They are the largest, strongest, fiercest and least gregarious of all the terns (Ehrlich 1988. The tern's flight is powerful and tends to be gull-like. Voice is highly distinctive, consisting of a hoarse, deep, almost croaking ca-arrrr ka-ka-ka-kaow, also a short kow or kowk. Their call is perhaps the easiest way to distinguish them from royals.

Breeding Range: Caspian terns are locally common and widely scattered along the Great Lakes, Atlantic Coast of Virginia to northern Florida and along the Gulf Coast. In Texas, they are common residents along the entire coast and rare migrants and winter visitors in the eastern half of the state (TOS 1995).

Habitat: Caspians feed in the same marine habitats that royal terns do, but unlike royals, they also frequent fresh water areas. Birds winter primarily in coastal bays, estuaries, lakes, marshes and rivers. Birds nest on flat sand or gravel beaches, shell banks, or occasionally in saltmarshes.

Nest: The least gregarious of the terns, Caspians prefer to nest apart from other colonial birds on very small islands or isolated shell banks they can have all to themselves, although this is not normally the case on the central coast. Birds prefer to nest on low, flat, marine and lake islands; also mainland beaches. When they do nest on larger islands, they will gather in their close-knit colonies and avoid mingling with other birds. Nests vary greatly in different localities. Some are shallow indentation in the sand, sparingly lined, with very little material added. Others are large deep hollows lined with sticks, straw, rubbish, shells, and with the rim generally built up more like a gull's nest than the usual tern's nest. Birds start to breed in Texas in mid March with first eggs laid at the end of March through mid June (Oberholser 1974). Early nests tend to be more successful than later ones due to increased rate of predation. Mate retention between years is related to nest site stability, not to previous nesting success. Breeding season lasts until from mid to the end of August (Oberholser 1974).

Eggs and young: Clutch ranges from 1 to 4, normally 2 oval or long-oval pinkish to greenish buff eggs, somewhat rough and lusterless in texture. Sparingly marked and overlaid with small to medium brown spots, irregular blotches, and occasional scrawls, Caspian eggs look more like gull's eggs than typical tern eggs (Oberholser 1974). Birds are single-brooded, but will replace clutch lost early on. Both parents incubate eggs from 20 to 22 days. Young fledge 28-35 days thereafter. Caspians exhibit the longest parental care known for terns, with parents feeding juveniles from 5 to 7 months after fledging (Ehrlich 1988).

Ageing and Identifying Young. Nestlings are semi-precocial and downy and look much like gull-bill nestlings, but are larger and paler, with a distinctively larger bill. Down is long and soft with fine hair-like tips, but varies in color. There are fewer small blackish-brown markings on the dull buff upperparts than on the gull-bill chicks. Bill is reddish-orange with dark near the tip, but leg color varies from orange-pink to gray (Baicich 1997).

Notes: The downy young hatch in three weeks and quickly learn to recognize the calls of their parents as they return with meals of small fish. Adults are strict disciplinarians, punishing their young with sharp pecks and blows of the wings for wandering too far off. The Caspian's favorite and almost exclusive food is small fish, which it catches by diving bill-first into the water. Caspian terns tend to be feisty defenders of eggs and young along the Texas coast, and will dive boldly at any intruder entering the nesting colony. Historically, human intrusion at nest sites has been responsible for lower nesting success.

Royal Tern

Sterna maxima

Photo of bird courtesy of John L. Tveten

Photo of eggs courtesy of Hal H. Harrison

The smaller orange-red bill and white forehead (except for a very brief period during the breeding season) are the primary features that distinguish the royal from the similar looking Caspian tern. A large, streamlined, pearl-mantled white tern, it has a deeply forked tail and a

much less chunky appearance than the Caspian. Vocally, it is highly distinctive, and this can be one of the best clues to proper identification. Calls are clear, shrill, and generally short, sounding like kree or tsirr. Birds also deliver a longer, melodious, rolling, almost plover-like whistle (Pough 1953).

Breeding Range: The breeding range of the royal tern extends south from Maryland to central Florida on the Atlantic coast; and from northern Florida to Texas on the Gulf coast. It also breeds on the coasts of the Yucatan peninsula, the West Indies, and western Africa. Royal terns winter in southern California, the northern Gulf of Mexico, south to Argentina. In Texas, they are common residents along the entire coast. They are rarely reported inland to Bexar, Travis and Zapata counties; when they are sighted inland, it is mostly after tropical storms (TOS 1995).

Habitat: Royal terns reside on coastal islands and mainland beaches and is a strictly saltwater species. Birds prefer sandy islands or sandbars along seacoasts for nesting.

Nest: Birds nest in very dense colonies, often in the company of laughing gulls and other tern species. Birds make hollow scrapes in the sand or shell on upper beaches or sandbars. Royals add no lining to their nest. Birds start to breed in Texas in late March with first eggs laid in early April (Oberholser 1974). Nesting season ends in mid-August

Eggs and young: Clutch ranges from 1 to 3, normally 2, smooth, lusterless, oval to cylindrical, whitish-buff eggs marked with scattered brown dots, spots, or blotches. Incubation is probably performed by both sexes and lasts approximately 20 days (Oberholser 1974). Eggs are laid just far enough from each other that incubating birds cannot touch bills. Hence, it is almost impossible to walk through a colony without stepping on eggs. Young royal terns gather together in large groups called crèches, within a few days of hatching. While a few adults remain to watch the chicks and herd them protectively back and forth, the others are free to go fishing. Adults and young recognize each other's voices and chicks are fed only by their own returning parents. Young normally fledge from 28 to 35 days thereafter. Young may still be found in the nest as late as July 22 (Oberholser 1974).

Ageing and Identifying Young: Nestlings are precocial and downy at hatching. As with the Caspian, down color varies. It is short and stiff on the head and long with fine tips on the body. Ground color varies from pale pinkish-cinnamon to pinkish buff, paler underneath to more dusky overtones. Markings include heavy spotting over the back, wings, flanks, head and throat on the pale forms. In the more dusky forms, the markings are hardly visible (Baicich 1997).

Notes: A common sight along the Texas coast, royals fish offshore or about inlets and bays, feeding almost wholly on small fish. Birds seize the fish by diving into the water, from considerable heights. Colonies are sometimes destroyed by storms or high tides, but birds commonly re-nest or reestablish the colony, en masse elsewhere (Ehrlich 1988). Interestingly, laughing gulls associate with royals all year and prey substantially on their eggs, but are ignored by the terns and are not viewed as enemies (Ehrlich 1988).

Sandwich Tern

Sterna sandvicensis

Photo of bird courtesy of John L. Tveten

Photo of eggs courtesy of Hal H. Harrison

A fast, powerful bird on the wing, the Sandwich tern is best recognized by its long, slender black bill with a bright yellow tip, as if it had been dipped in mustard. Slightly larger than the Forster's tern that is so abundant on the Texas coast, it looks more like a miniature royal tern, with its trim lines and short black crest. Immature birds are similar to winter adults, but earlier in the juvenile plumage, the mantle is spotted with black. Call consists of a very loud kirr-ritt and a more abrupt gwit, gwit, which are less grating on the ear than those of other terns (Pough 1951).

Breeding Range: The Sandwich tern is mainly a coastal nester, breeding locally from Virginia to northern Florida, west to Texas. In Texas it is a common summer resident and uncommon winter resident along the coast. It is rarely recorded inland except after tropical storms (TOS 1995).

Habitat: Coastal islands and mainland beaches are the Sandwich tern's preferred haunts. Birds are often observed near Gulf jetties, either coursing over the breakers or loafing on the beach. It is often in the company of royal terns and, like them, prefers foraging farther from shore than do most other coastal terns. Nesting habitat consists of sandy, low and rather flat salt bay or coastal islands (Oberholser 1974).

Nest: Sandwich terns are very sociable birds, gathering in dense flocks at nesting time, often with the larger royal terns. The Sandwich tern nests on isolated sand and shell banks and islands in saltwater bays and along shores. The porous flats and shell banks of Little Pelican Island, in Galveston Bay, provide prime nesting sites for Sandwich terns. Here they make a shallow depression in the sand or on the shell bank, or sometimes just laying their eggs directly on the substrate, often with no lining. Birds start to breed in Texas in mid-April, with first eggs laid by the end of the month (Oberholser 1974). Breeding season lasts until the end of July to early August (Oberholser 1974).

Eggs and young: Clutch ranges from 1 to 3, usually 2, oval to long-oval smooth, lusterless pale pinkish buff to olive-buff eggs. Shells come in a wide variety of markings; some are uniformly covered with small dark brown dots or spots, densely or sparingly; others are boldly marked with heavy blotches or irregular scrawls (Oberholser 1974). Mated birds form long-term pair bonds and share incubation duties with the female doing the lion's share of the work. Eggs hatch in about 24 to 25 days at intervals of 2 to 3 days apart, and the chicks are tended by both parents. Young fledge 30 to 35 days thereafter. Sandwich tern young join a large crèche, sometimes consisting of thousands of birds, which assembles near the water (Baicich 1997). A few adults remain behind to watch the chicks while the others go out into the Gulf fishing. Adults and young recognize one another's voices, as chicks are fed only by their parents.

Ageing and Identifying Young: Nestlings are semi-precocial and downy. The buffy down is long and soft with fine, hair-like tips, and is patterned with blackish-brown spots on the head. Upperparts and forehead are mostly a uniform buff, paler underneath. Larger dark blotchings on the back and wings are broken along the flanks tending to form paired dark streaks on the back (Baicich 1997). Individual downy chicks display a good deal of color variation, however. Some are white; others are yellowish. All are lightly flecked with darker spots, blending well into the surrounding substrate (Oberholser 1974).

Notes: Royal and Sandwich terns associate with one another throughout the year and return to traditional breeding areas together. Birds often feed well offshore, diving from considerable heights. Fish, shrimp, marine worms, and squid are among their favorite food items (Pough 1951).

Forster's Tern

Sterna forsteri

Photo of bird courtesy of John L. Tveten

Photo of eggs courtesy of Hal H. Harrison

The deeply forked tail, mostly orange-red bill, snow-white underparts, and light gray back characterize the graceful Forster's tern. Birds closely resemble common terns. This is seldom a problem in Texas as commons are anything but common here. In flight, Forster's moves its wings with a quick, sharp snap instead of the slower, deeper strokes of other similar looking terns. In fall, both adults and young are unmistakable because of the black ear patches on an otherwise white head. Juveniles are quite heavily marked with buff and brown, both above and below, but this is mostly gone by winter (Pough 1951). Calls have a distinctive nasal quality and are very different from those of other terns. Adults utter a soft, even-pitched, buzzy snee-e-e-e that suggests a nighthawk's call. It also delivers a series of shrill kit, kit, kit notes, which sound like a person clucking to make a horse go (Pough 1951).

Breeding Range: Strictly a North American species, the Forster's tern breeds along the Atlantic and Gulf coasts from Maryland to Texas. Birds are also found along the Great Lakes, from northeastern Illinois, Wisconsin, to Michigan. In Texas, birds are common residents along the length of the coast. They are uncommon to common migrants throughout the state and are locally common winter residents on inland lakes and reservoirs (TOS 1995).

Habitat: Preferred habitats include extensive inland marshes and marshy borders of lakes and large ponds. Birds also frequent coastal saltmarshes behind open sandy beaches. Like the gull-billed tern, the Forster's truly deserves the name "marsh tern" for their habit of feeding and nesting in fresh and saltwater marshes. In Texas, birds prefer to nest on more or less grassy islands in salt bays (Oberholser 1974).

Nest: Highly social birds, Forster's terns nest in fairly closely-packed colonies. They nest in a variety of places including shell banks and mudflats. Inland nests are often placed on muskrat or nutria houses, feeding platforms, or floating material. Birds will sometimes even use old pied-billed grebe nests. Coastal nests tend to be larger and more elaborate, consisting of well-built piles of dead grasses, sedges, all lined with fine grasses and reeds. Built by both sexes, nests are cup-shaped and well constructed. Normally found very close to the water, nests are often lost to storms and high tides, but are safer from predators than many other tern nests. Site tenacity appears to be very weak in this species. Birds start to breed in Texas in early April with eggs first laid in mid-April to mid-June. Breeding season ends at the end of July to early August (Oberholser 1974).

Eggs and young: Clutch ranges from 2 to 5, usually 3 or 4, smooth, lusterless, oval to long-oval eggs. Olive or grayish or pinkish buff in color, they are marked and overlaid with small brownish spots, often wreathed near the large end (Oberholser 1974). Sometimes they can be boldly

marked with large brownish blotched or irregular scrawls. Larger clutches may be due to more than one female's laying in one nest. Incubation is performed by both sexes and lasts from 23 to 24 days. Hatching is asynchronous. Forster's tern eggs are indistinguishable from those of the common tern, but this is not a problem in Texas. Interestingly, young remain in the nest for only a few days, after which they run and swim actively. Both parents feed them until they are able to fly (Baicich 1997).

Ageing and Identifying Young: Nestlings are semi-precocial and downy at hatching. Down varies from pale stone to cinnamon- or pinkish buff, darkening to brown on the throat. Undersides are similar but paler. Upperparts are spotted or streaked in blackish-brown, aggregated to form irregular longitudinal bands on the back (Baicich 1997).

Notes: Forster's terns are definitely insect eaters as well as excellent fishermen. While they feed their young on small fish and shrimp, they may also feed them dragonflies, caddisflies, floating insects, and grasshoppers. The bird can often be seen hawking large aerial insects over saltmarshes but can also swoop gracefully to the water to pluck one from the surface without wetting a feather (Pough 1951). Parents are vigorous defenders of nest, eggs, and young and are fairly hostile to other birds, especially gulls or anyone else who enters the colony (Ehrlich 1988).

Least Tern

Sterna antillarum

Photo of bird courtesy of John L. Tveten

Photo of eggs courtesy of Hal H. Harrison

At nine inches in length and a 20-inch wingspan, the least tern ranks as the smallest of all the American terns. In breeding plumage, the tiny birds are typically silvery-gray above and white below. A distinctive white patch on the forehead interrupts the black cap, and the yellow bill is tipped in black. The short, well-forked tail and bright yellow legs are all excellent field marks. Birds hover above the water for longer periods of time than do other terns. Young birds are similar, with some sandy-buff above, and rather dark wing coverts and primaries. The voice is very sharp and shrill, consisting of a protest call, a series of kip, kip notes. It also has a harsh, rasping, highly distinctive cher-ee-eeep call (Pough 1951).

Breeding Range: Birds occur along the coasts, from Maine to Texas. Inland, they occur on the Mississippi River system, east to Ohio. In Texas, least terns are common summer residents along the coast, but are rare and widely scattered on inland locations (TOS 1995). Least terns nest in Texas along the coast and in a few locations on the Red River system on the northern border and on the Rio Grande.

Habitat: Preferred nesting sites include broad, flat, open spaces and/or gravel beaches on the mainland or islands. River sandbars and land recently cleared (housing developments and spoil banks) are also used. Coastal species do not seem to require an isolated area like most other terns, and consequently nest on mainland beaches where they are vulnerable to beach-goers, their pets, and vehicular traffic.

Nest: Solitary or nesting in small colonies, birds are sometimes segregated from, or sometimes found among or near nests of black skimmers and snowy plovers. A hollow is scraped in the

sand, shell, or gravel; some nests are sparingly lined with plant material and small pebbles. Birds start to breed in Texas in early April with first eggs laid in early April (Oberholser 1974). Breeding season ends in early August.

Eggs and young: Least terns lay 1 to 3, usually 2, smooth, lusterless, oval to short-oval eggs. Pale olive-buff to whitish in color, they are unevenly sprinkled with small or large brown spots or blotches. Protectively colored, they match their surroundings exceedingly well. Incubation is performed by both male and female and lasts from 20 to 22 days. Tended by both parents, young can leave the nest after 1 day, but generally remain close by while learning to forage. Young fledge from 19 to 20 thereafter (Ehrlich 1988).

Ageing and Identifying Young: Nestlings are semi-precocial and downy when they hatch. Down has fine hair-like tips and is shorter than that of other terns. Sandy-buff on the head and upperparts, with darker brown mottling on the back, the least tern usually sports three parallel streaks on the crown and paired dark streaks on the back (Baicich 1997). Sometimes the pattern is irregular and the striping is not so apparent. Underparts are white or sandy-buff. The bill is flesh-gray with a dark brown tip. Legs and feet are a dull flesh color (Baicich 1997).

Notes: On hot days, it is typical for incubating birds to leave the nest, plunge into the water, and return to the nest and shake water drops onto the eggs to cool them (Ehrlich 1988). Flocks are vociferous and active in protecting nests and young, diving and defecating on intruders' heads. With continued residential and beach development, dogs and cats have become major predators. Coastal colonies are also predated by coyotes, skunks, raccoons, laughing gulls, and great-tailed grackles. Ghost crabs also take least tern eggs and chicks. Birds occasionally use nocturnal roosts away from the breeding area so as to reduce the amount of time the colony is subject to nocturnal predators (Ehrlich 1988). Interior least terns are endangered in many parts of the United States, including Texas. Coastal least terns fare somewhat better, but still face risks from disturbance to their nesting colonies. Least tern nest on beaches in washover passes, but these habitats have become increasingly taken over as recreation areas (Lee Elliott, pers. comm.).

Sooty Tern

Sterna fuscata

Photo courtesy of Karel Beylevelt

Photo of eggs courtesy of Hal H. Harrison

A medium-sized tern, adult sooties are mostly black above, pure white on the forehead and underparts, with a deeply-forked black tail. The sharp black line from the slender black bill running through the eye to the cap and the largely blackish flight feathers contrasting with the white wing-linings are excellent field marks (Oberholser 1974). Immatures are dark brown with white spots on the mantle, a whitish belly and crissum. Calls consist of a harsh, squeaky, quack-like quanck, and a high-pitched 3-syllabled utterance, described as ker-wacky-wack. Bird also delivers many other barking, snarling and squawking notes (Pough 1951)

Breeding Range: Sooty terns breed on many of the islands of the Caribbean and the Gulf of Mexico. A few nest regularly on the coasts of Texas and Louisiana. Occasionally birds nest on islands in Texas bays, where they are considered rare; they are local summer residents along the central and lower coast as far north as the Galveston Coast (TOS 1995). Their winter range is still poorly known.

Habitat: Preferring warm tropical seas, birds nest on remote oceanic islands with scattered cover of shrubby sub-tropical plants.

Nest: Birds nest in immense colonies with ground nests placed so close together that each nesting pair occupies a space only 14 to 24 inches in diameter. Territory is acquired and held by dint of constant fighting with intruding neighbors. The nest consists of a slight depression scratched in the sand, occasionally rimmed with soft leaves or grasses. In Texas, sooty terns annually nest on 2 to 7 islands with 1 to 20 pairs found on each island. Birds start to breed in Texas in early late April to early July with the first eggs laid from May 1 to June 15 (Oberholser 1974).

Eggs and young: Sooties lay only 1, rarely 2, smooth, slightly lustrous, ovate eggs. Shells are whitish-buff to cream-colored with red-brown spots and small blotches scattered rather evenly over the surface. Incubation is performed by both sexes and lasts for 26 days after eggs are laid. Both parents tend the young, which are brooded during the first week. Young fledge 57 days after hatching and apparently leave with the adult male and remain with him at sea for about 3 weeks perfecting their foraging skills (Baicich 1997). Birds fly from South Florida and the Texas Coast to the West Coast of Africa, where they spend the first 2 to 6 years of their life.

Ageing and Identifying Young: Nestlings are semi-precocial and downy when they hatch. Down is short with filaments grouped in sheaths. Upperparts, head, throat, and neck are speckled with grayish-white and grayish-black, while underparts are white (Baicich 1997). Birds are completely feathered by about 30 days of age.

Notes: An extraordinarily interesting and mysterious bird, about which not much is known, sooty terns are almost totally pelagic, coming to shore only to nest. Known as “wide-awakes”, they are active 24 hours a day around their nesting colonies. Because their feathers are not waterproof, birds cannot land on the water, so they are often in the air for years at a time. When foraging, birds snatch food from the surface of the water. Food consists mostly of squid and fish, mostly flying fish where available. Most sooty terns do not breed until they are 6 to 8 years old and they may live to be a ripe old age of 28 to 32 years. Disastrous storms and hurricanes occasionally deplete the population. Nesting birds are usually tame, probably because historically they have had little to no contact with humans. For this and other reasons, colonies are highly vulnerable to disturbance.

Black Skimmer

Rhynchops niger

Photo of bird courtesy of John L. Tveten

Photo of eggs courtesy of Hal H. Harrison

With its long, thin wings, white face, white underparts, black upperparts, and long red bill, the black skimmer is seldom confused with any other bird. Also known as cut-water, knife-bill, and scissor-bill, it is the only bird with a lower mandible longer than the upper. Though not usually visible in the field, it is also the only bird able to close its eye in a vertical slit (Ehrlich 1988). The birds are spectacular in flight, especially the way they maneuver in compact flocks with the agility and synchronization normally seen only in shorebirds. Calls are unique; one is a resonant, throaty, barklike kaup, and the other an angry aaar (Pough 1951).

Breeding Range: Coastal nesters, black skimmers breed from Massachusetts to Texas. They are permanent residents in the southern portion of their range. In Texas, skimmers are locally common residents along the coast. They are rare vagrants inland to Central Texas, mostly following tropical storms (TOS 1995).

Habitat: Marine beaches, bays, islands, pebbly sand flats, spoil banks are favorite haunts. Skimmers are birds of sand and seashell beaches and nest on small islands or flats in estuaries, bays, and lagunas in Texas. Skimmers appear to prefer more open, unobstructed sites than many other species.

Nest: Skimmers tend to nest in loose colonies frequently close to other nesting birds, such as laughing gulls, royal and Sandwich terns. Nests average 3 feet apart. Skimmers typically sit on their nests facing into the wind. Nests are unlined, well-defined depressions in the sand or shell on open beaches, above the high-tide line. They are an inch or so deep and 4 to 6 inches wide. Skimmers start to breed in Texas in mid March with the first eggs laid at the end of March to the end of August. Breeding season ends from late August to early September (Oberholser 1974).

Eggs and young: Clutch ranges from 3 to 6, normally from 4 to 5, oval to long-oval smooth, lusterless eggs. Bluish-white, creamy white, pale buff or pinkish buff in color, they are heavily marked, overlaid with brown spots, blotches, and scrawls. Incubation is performed by both sexes after the first egg is laid and lasts 21 to 23 days. Males incubate and brood more than females do, but females are more aggressive in defending the nest from predators. They also feed more extensively than males do. Following predation, the colony site is more likely to be abandoned than if it has been flooded out (Ehrlich 1988). Young hide by scratching themselves out a hollow and kicking up sand to cover themselves.

Ageing and Identifying Young. Nestlings are semi-precocial and downy when they hatch. Down is soft and thick and pale buff in color. Upperparts are mottled with dusky brown on the back and a faint mottling on the head, while underparts are white. The bill looks more gull-like than skimmer-like at first and is reddish in color while legs are a dull dark red. Normal bill length is not acquired until after fledging (Baicich 1997).

Notes: In the late 19th century, eggs were harvested commercially, and adults were killed for their feathers, resulting in a major decrease in population numbers. Since gaining legal protection, they have recovered significantly. Predators include dogs, cats, raccoons, feral hogs, coyotes, laughing gulls, and fire ants that swarm and eat the chicks alive. Birds defend the colony by flying and “barking” at intruders. Skimmers feed in open water or in marshes along streams. They feed mostly in the early evening or at night when the water is generally calm, and small fish and crustaceans are near the surface of the water (Ehrlich 1988).

COMMUNITY OUTREACH

National, state and local organizations can often provide assistance and information on environmental problems in your area. These organizations can be excellent sources of advice and support.

LOCAL ORGANIZATIONS

AUDUBON CHAPTERS ON THE COAST

Houston Audubon

440 Wilchester Boulevard
Houston, Texas 77079-7329
(713) 932-1639

Coastal Bend Audubon Society

15645 Cuttysark
Corpus Christi, Texas 78418-6420
Rare Bird Alert: (512) 265-0377

Golden Triangle Audubon Society

P.O. Box 1292
Nederland, Texas 77627-1292
(409) 768-1340

COASTAL CONSERVATION ORGANIZATIONS

Lower Laguna Madre Foundation

Information on Texas coastal issues
P.O. Box 153
Port Mansfield, Texas 78598

Sierra Club

Assistance with pollution problems, natural resource protection, legislation, agency regulations, and public participation
1104 Nueces
Austin, Texas 78701
(512) 4771729

Environmental Defense Fund

Information on toxins, air pollution, recycling, energy and utilities
44 East Avenue, Suite 304
Austin, Texas 78701
(512) 478-5161

Coastal Bend Bays Foundation

P.O. Box 23025
Corpus Christi, Texas 78403-3025

Jennifer Lorenz, Executive Director

Coastal Bend Bays and Estuaries Program

P.O. Box
Corpus Christi, Texas 78401
Ray Allen, Executive Director

Gulf Coast Observatory

9800 Richmond Avenue, Suite 150
Houston, TX 77042
Cecilia Riley, Director

FEDERAL AGENCIES

U.S. Environmental Protection Agency (EPA)

Responsible for federal management of air and water pollution, solid waste, pesticides and pollution from oil and gas production

Regional Office for Texas:

Environmental Protection Agency
1445 Ross Avenue
Dallas, Texas 75202
General Information: (214) 665-6444
Community Right to Know hotline: (800) 535-0202

U.S. Fish and Wildlife Service (USFWS)

Broad-based responsibilities for protection of wildlife habitat, endangered species and wetlands, migratory birds, etc.

Field Offices: Austin (512) 490-0057
Arlington (817) 885-7830
Clear Lake (713) 286-8282
Corpus Christi (512) 994-9005

These regulatory agencies can provide background and site-specific information. They maintain libraries for general information as well as publish reports or studies. Most environmental issues involve scientific or engineering questions, and you may be able to get help from technical experts. Gaining access to agency experts is fairly straightforward. And while they may have their own particular agency points of view, they will always talk with you and provide much information and/or direct you to other sources of information.

TEXAS STATE GOVERNMENT AGENCIES INVOLVED IN COASTAL MANAGEMENT

Texas Natural Resource Conservation Commission (TNRCC)

Responsible for state management of air and water pollution and waste management, except that related to oil and gas production, pesticides and strip mining. Shares responsibility for radioactive waste management with the Texas Department of Health. TNRCC issues water rights and attempts to balance economic and environmental needs by considering the effects of consumptive water use on various in-stream and estuarine habitats and measuring water quality for human consumption. Also, by law, TNRCC maintains the states' Water Quality Management Plan.

TNRCC Information Center: (800) 64-TEXAS
General Information: Exec. Dir.: (512) 239-3900
Assistance; Public Interest Counsel: (512) 239-6363

Texas General Land Office (TGLO)

Stephen F. Austin Building
1700 N. Congress Avenue
Austin, TX 78701
512/463-5001

Oversees state lands, the coast and handles oil spills. Responsible for managing the habitats and waters of the Texas coastal region. In the 1970s the GLO agreed to lease over 34 coastal island sanctuaries to Audubon to ensure the conservation of these islands. In 1987, the GLO and TPWD decided to establish additional coastal preserves.

In 1991, the legislature directed GLO to head up the new Coastal Coordination Council, which has since developed a Texas Coastal Management Plan with other state agencies.

The management plan sets policies, affecting certain activities on private and public property within the coastal zone and major goals for the area. Examples of activities in the coastal zone that shall be consistent with the Plan are construction of electric generating and transmission facilities, construction of waterfront facilities and other structures on submerged lands, and dredging and dredged material disposal and placement. A copy of the plan should be available at your local library.

Texas Natural Resources Information Services (TNRIS)

12100 Park 35 Circle
Austin, TX 78722
512/463-8337

Repository of maps, aerial photographs, census data, and Geographic Information Systems (GIS) data. (512) 463-8337.

Texas Parks and Wildlife Department (TPWD)

4200 Smith School Road
Austin, TX 78744
512/389-4800

Responsible for Texas endangered and threatened species, state parks and other state public lands and its native wildlife.

Information: 1- 800-792-1112

Texas Water Development Board (TWDB)

Responsible for carrying out studies on rivers, lakes, dams, and the uses of water in Texas. (512) 463-7847.

Secretary of States

Has information of Texas corporations and companies: (512) 463-5555

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Maps and illustrations

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Photographs

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Table of Breeding Colonial Waterbird Life History Parameters

Species	Nest Location	Nest Type	Who Builds	Clutch Range Norm	Mating System	Incubation Who-how long	Nestlings	Hatching To Fledging
Am. White Pelican	Ground	Scrape	MF	(1-3) 2	Mono g	MF 29-36 days	Altricial	MF 60+ days
Brown Pelican	Ground	Scrape	MF	(1-3) 2	Mono g	MF 29-36 days	Altricial	MF 84- 97 days
Double-crested Cormorant	Ground or Tree	Bulky Platform	MF	(2-6) 4	Mono g?	MF 25-29 days	Altricial	MF 35- 42 days
Neotropic Cormorant	Ground Dead tree	Sturdy Platform	?	(2-6) 4	Mono g?	MF ? Days	Altricial	MF ? days
Anhinga	Tree 4-20 ft	Bulky Platform	MF	(2-5) 4	Mono g	MF 26-29 days	Altricial	MF 50-60 days
Great Blue Heron	Shrub 30-60 ft	Stick Platform	MF	(1-7) 3-5	Mono g	MF 28 days	Semi- Altricial	MF 56- 60 days
Great Egret	Shrub 5-10 ft	Stick Platform	MF	(1-6) 3	Mono g	MF 20-24 Days	Semi- Altricial	MF 42- 49 days
Snowy Egret	Shrub 5-10 ft	Flat Platform	MF	(3-6) 3-5	Mono g	MF 20-24 Days	Semi- Altricial	MF 30 days
Little Blue Heron	Shrub 1.5-40 ft	Flimsy Platform	MF	(1-6) 2-5	Mono g	MF 20-23 days	Semi- Altricial	MF 42-49 days
Tricolored Heron	Shrub 2-12 ft	Flat Platform	MF	(3-7) 3-4	Mono g	MF 21-25 days	Semi- Altricial	MF 35 days
Reddish Egret	Shrub- grd 0-10 ft	Flat Platform	MF	(2-7) 3-4	Mono g	MF 25-26 days	Semi- Altricial	MF 45 days
Cattle Egret	Shrub 3-30 ft	Stick Nest	F	(2-5) 3-4	Mono g Polyg y	MF 22-26 days	Semi- Altricial	MF 30 days

Black-crowned Night-Heron	Shrub 15-30 ft	Stick Platfor m	MF	(1-7) 3-5	Mono g	MF 24-26 days	Semi- Altricial	MF 42-49 days
Yellow-cr. Night-Heron	Shrub 30-40 ft	Stick Platfor m	MF	(4-8) 4-5	Mono g	MF 21-25 days	Semi- Altricial	MF 25 days
White Ibis	Tree 8-15 ft	Stick Platfor m	MF	(4-5) 2-3	Mono g	MF 21-23 days	Semi- Altricial	MF 28-35 days
White-faced Ibis	Shrub- grd 0-6 ft	Stick Platfor m	MF	(2-7) 3-4	Mono g	MF 21-22 days	Semi- Altricial	MF 28+ days
Roseate Spoonbill	Shrub- grd 10-15 ft.	Stick Platfor m	MF	(1-5) 3	Mono g	MF 22-23 days	Semi- Altricial	MF 35-42 days
Laughing Gull	Ground	Saucer	MF	(2-4) 3	Mono g	MF 20 days	Semi- Precocia 1	MF 35 days
Gull-billed Tern	Ground	Hollo w	MF	(1-4) 2	Mono g	MF 22-23 days	Semi- Precocia 1	MF 28-35 days
Caspian Tern	Ground	Hollo w	MF	(1-4) 2-3	Mono g	MF 20-22 days	Semi- Precocia 1	MF 30-40 days
Royal Tern	Ground	Scrape	MF	1-2	Mono g	MF 30-31 days	Semi- Precocia 1	MF 28-35 days
Sandwich Tern	Ground	Scrape	MF	(1-3) 1-2	Mono g	MF 24-25 days	Semi- Precocia 1	MF 3-35 days
Forster's Tern	Ground	Hollo w	MF	(1-3) 1-2	Mono g	MF 21-26 days	Semi- Precocia 1	MF 27-30 days
Least Tern	Ground	Scrape	F	(1-3) 2	Mono g	MF? 21 days	Semi- Precocia 1	MF? 19-20+ days
Black Skimmer	Ground	Scrape	MF?	(3-5)	Mono g?	MF 21-23 days	Semi- Precocia 1	MF 23-25 days

Survey Form for Counting Texas Breeding Colonial Waterbirds

Data Sheet

Name: _____
 Give address on back of sheet if different from Colony
 Registry Form

Date: _____
 Colony Name: _____

Notes: Use back of sheet

County/Island/Affiliation

Species	Code	Dates	Exact Count	Min. Est.	Max. Est.	Unit	Method	Br. Status
Am. White Pelican								
Brown Pelican								
Double-crested Cormorant								
Neotropic Cormorant								
Anhinga								
Great Blue Heron								
Great Egret								
Snowy Egret								
Little Blue Heron								
Tricolored Heron								
Reddish Egret								
Cattle Egret								
Black-crowned Night-Heron								
Yellow-cr. Night-Heron								
White Ibis								
White-faced Ibis								
Roseate Spoonbill								
Laughing Gull								
Gull-billed Tern								
Caspian Tern								
Royal Tern								
Sandwich Tern								
Forster's Tern								
Least Tern								
Sooty Tern								
Black Skimmer								

UNIT

1 = Individual bird on land

BREEDING STATUS

01 = Bird in habitat 09 Nest building

2 = Apparently occupied nest display

3 = Apparently occupied territory

4 = Other, give details

COUNTING METHOD

1 = From land 4 = From photo

2 = From water 5 = From land and sea young

3 = From air 6 = Other, give details on back of sheet

02 = Singing in habitat

10 = Distraction

03 = Pair in habitat 11 = Used nest

04 = Territory 12 = Fledged young

05 = Display 13 = Occupied nest

06 = Nest site 14 = Food for young

07 = Anxious parent 15 = Nest + eggs

08 = Incubation 16 = Nest +

Survey Form for Counting Breeding Colonial Waterbirds

Data Sheet Page 2

Notes:

Instructions:

Numbers of birds counted and estimated are entered in separate columns, so that the two parts of the census when added together give an approximate total for the colony.

The following codes define the counting units.

Legend:

1 = Individual birds on land, excluding any on non-breeding areas or loafing areas.

2 = Apparently occupied nest-sites

3 = Apparently occupied breeding territories

4 = Other, give details in notes above

The following codes define the counting methods:

1 = From land

2 = From water

3 = From air

4 = From photo

5 = From land and water

6 = Other, give details above

The following codes define the level of certainty that the species breeds in the colony and is not just a visitor:

01 = Bird in suitable nesting habitat during the breeding season

02 = Bird singing in suitable nesting habitat during the breeding season

03 = Pair of birds seen in suitable nesting habitat during the breeding season

04 = Bird seen defending, two records at least 1 week apart

05 = Courtship displays recorded

06 = Nest-site found

- 07 = Agitated/anxious parents seen
- 08 = Bird seen incubating
- 09 = Bird seen building a nest
- 10 = Distraction display recorded
- 11 = Used nest found, e.g. broken eggshells, droppings, food remains, etc.
- 12 = Fledged young present
- 13 = Occupied nests, contents unknown
- 14 = Food seen being brought to young
- 15 = Nest with eggs found
- 16 = Nest with chicks found

(Form modified from Lloyd, *et al.* 1991)

Texas Waterbird Colony Survey Form

In order to record a complete and informed census, it is important to fill out this form as legibly and accurately as possible. The birds covered in the survey are listed on the front of the form. To the right of this list, you will find a list of codes necessary to fill out the form.

The **Reproductive Stage** portion of the **Colonial Waterbirds** section should be filled out only if you are conducting repeated surveys of a sampling of a particular species' nests. This sampling should include about 20 nests and needs to be resurveyed throughout the nesting period (2-4 weeks) to insure accuracy. Many colonial waterbirds do not lay an entire clutch at one time. The average clutch size is listed along with the birds. If the clutch size is normal, check the average box. If the clutch size is above or below normal, indicate the number of eggs in the corresponding box.

The next column, **Survey Type**, indicates how you conducted your survey. The codes for this section are found at the bottom of the code box to the right of the list of birds.

I = indicates counted individual birds
N = indicates counted individual nests.

If the individual nests counted looked occupied, indicate number counted in column, **Active Nests**. If the nest looks old or deserted, do not include on the survey form.

If individual adult birds are observed either in flight or on the ground, include birds in adult plumage only and put them under the **Adults** column. Some fledglings and juveniles will obviously be present at some stages of the survey but should not be included here. Large numbers of fledglings or juveniles should be noted in the Notes section on the back of the form.

In the past, **Est. Breeding Pairs** column is reserved for observed pairs of birds obviously nesting. Birds that are on or building nests can be including under this heading.

The back of this form covers the more descriptive areas of the census.

Colony Site Description should be filled out to the best ability of the surveyor. The **General Habitat** portion indicates the broad and basic surroundings of the survey site. The **Specific Habitat** section focuses on the more minute and specific surroundings and location of the particular surveyed species of waterbird. **Predominant Vegetation and Ground Cover** identifies the basic vegetation, by percentage, around the survey site. Identifiable species of vegetation should be listed below the percentages.

If predators or evidence of predators are noticed, or if there is obvious human traffic and/or interference, check the corresponding box in **Signs of Factors Limiting Productivity** section. Check especially for fire ants, mammalian predators, avian predators, general condition of birds (disease, vigor, etc.).

FIELD EQUIPMENT NEEDS FOR BIRD CENSUS - EXAMPLE

Appropriate field guides (including plant guides)	Hat with wide brim
Colonial waterbird training manual	Sunscreen
GPS Unit	Insect repellent
Census data sheets	Alarm clock
Field notebooks - waterproof	Measuring tape and any other necessary measuring devices
Water-proof pens	Flagging
Clip-boards	Marking stakes
Pencils with erasers	Extra batteries for all battery-operated equipment
Watch with second hand or timer (stopwatch)	Flash light
Mechanical hand counter	Topographical maps
Compass	Binoculars and spotting scope
Gulf marine charts	Camera
Thermometer	Slide film

