Bowlees Creek Island Bird Sanctuary

Management Plan

Prepared for
Department of Environmental Protection
Division of State Lands
Bureau of Public Land Administration
3900 Commonwealth Boulevard, Mail Station No. 125
Tallahassee, FL 32399

and

U. S. Fish and Wildlife Service
Jacksonville, FL

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U.S. FISH & WILDLIFE SERVICE DEPARTMENT OF THE INTERIOR

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EXECUTIVE SUMMARY

This document has been written by Audubon of Florida's Florida Coastal Islands Sanctuaries Program, based in Tampa, to provide an Annual Report and Management Plan for the Bowlees Creek Island Bird Sanctuary in regard to the lease between the Florida Audubon Society, Inc. and the Board of Trustees of the Internal Improvement Trust Fund of the State of Florida, Lease No. 410013853. The report is funded in part by a grant from the U.S. Fish and Wildlife Service Coastal Program, St. Petersburg, FL.

Bowlees Creek Island is located on the east side of Sarasota Bay at the mouth of Bowlees Creek in Manatee County. It is a small spoil island approximately 3.5 acres in size. The island is owned by the State of Florida as a sovereign submerged land and is leased for management as a wildlife sanctuary by the Florida Audubon Society dba Audubon of Florida. This report outlines habitats and wildlife use of the island and presents a Management Plan, in accordance with lease requirements.

Bowlees Creek Island is included in the Sarasota Bay Estuary Programs' Five-Year Habitat Restoration Plan (2003) and ranked among the top ten sites for potential restoration activities.

Management recommendations for Bowlees Creek Island Bird Sanctuary include:

1. Protect water quality and seagrass beds.
    - ❖ Mark the channel and seagrass bed areas to prevent prop-scarring.
    - ❖ Impose a boater speed zone in shallow water around the island.
    - ❖ Educate the public using seagrass map distribution.
    - ❖ Enlist public participation in appropriate fertilizer and pet waste management, trash and fishing line removal projects.
2. Protect and enhance habitats and wildlife.
    - ❖ Post the island for day-use and prohibit over-night camping.
    - ❖ Remove non-native, invasive plant infestations and replace with native plant communities.
    - ❖ Remove derelict vessels and trash, especially targeting fishing line and entangling debris.
3. Increase public participation in Bowlees Creek Bird Island and other wildlife habitats management in Sarasota Bay.
    - ❖ Develop cooperative projects with local Audubon chapters, Sarasota Bay National Estuary Program, Sarasota Bay Watch, Sarasota Bay Parrotheads, and other groups to manage regional wildlife resources.

INTRODUCTION

General Description

Bowlees Creek Island is located west of the mouth of Bowlees Creek, a small tidal creek on the eastern side of Sarasota Bay in Manatee County, about 30 yards offshore of the Whitfield Estates subdivision near Bayshore Gardens and Indian Beach (24.3°N 82.33°W, Section 26, Township 25 South, Range 17 East). The island is approximately 3 acres, surrounded by shallow seagrass flats with wide oysterbars on the north side of the Bowlees Creek channel and along the island's southern shorelines. A secondary navigation channel connects the docks of the homes on the shore with the Bowlees Creek navigation channel running east into Bowlees Creek on the north side of the island. This channel was dredged in the late 1960s and the dredged spoil material was placed on Bowlees Creek Island (Figure 1).

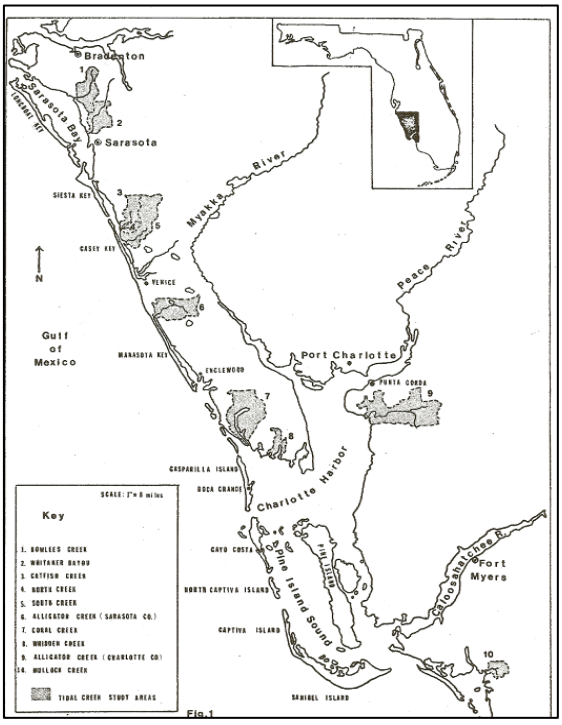


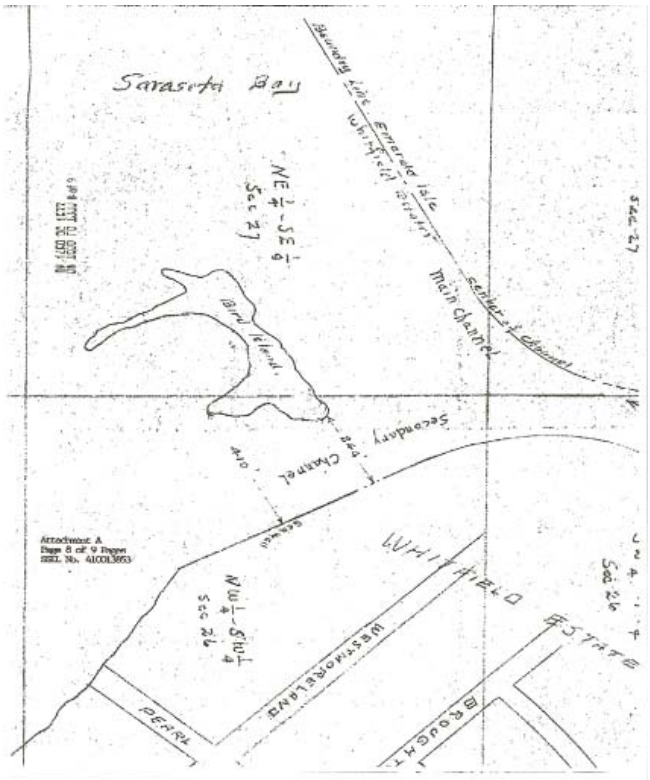
Fig.1

Figure 1. Location of Sarasota Bay on the Florida peninsular west coast (Smolker et al. 1977).

EXISTING CONDITIONS

Legal Background and Description

The Florida Audubon Society (FAS) (now National Audubon Society, Inc. dba Audubon of Florida, following a strategic merger with the National Audubon Society, Inc.) has held a lease on Bowlees Creek Island since the early 1960s, as documented by a letter from the Division of State Lands, dated March 7, 2000, which refers to "Previous Lease No. 1385", and the "1960 lease that was issued to the Florida Audubon Society." The State of Florida's Internal Improvement Trust Fund renewed the lease on the island to Audubon of Florida on November 7, 2000, and renewed it again for five years on August 9, 2003 as Sovereignty Submerged Lands Lease no. 410013853, with the intent that the island be managed as a wildlife refuge.



The legal description of the island is (wording quoted from the lease): "In Manatee County Florida, Section 26, Township 25 South, Range 17 East: A mangrove sovereign island in Sarasota Bay in the East ½ of Northeast ¼ of Southeast ¼ of Section 27 and the West ½ of the West ½ of the Northwest ¼ of Southwest ¼ of Section 26, Township 35 South, Range 17 East, Manatee County Florida. The above described tract contains 3 acres, more or less."

Figure 2. Legal map showing the location of Bowlees Creek Island (from: Department of Environmental Protection Division of State Lands lease with the Florida Audubon Society, Inc.).

Geology and Topography

Bowlees Creek contributes to the Sarasota Bay estuary in Manatee County. The upper reaches of the creek originate near Samoset and Oneco, approximately five miles east of Sarasota Bay, and it flows southwest through residential and agricultural land, crossing under the Seminole Gulf Railway south of Oneco Road (53rd Avenue) near the Meadow Lake subdivision and then under County Road 683 south of Saunder's Road.

The creek flows west through the Villa Del Sol Mobile Home Park, to the Sara Bay Country Club, where a weir prevents upstream tidal movement of salt water from Sarasota Bay. From this point, the creek flows westward under U. S. Highway 41 and empties into Sarasota Bay near the residential communities of Bayshore Gardens, Ballentine Manor, and Indian Beach at the Whitfield Estates subdivision (Figures 3, 4, and 5).

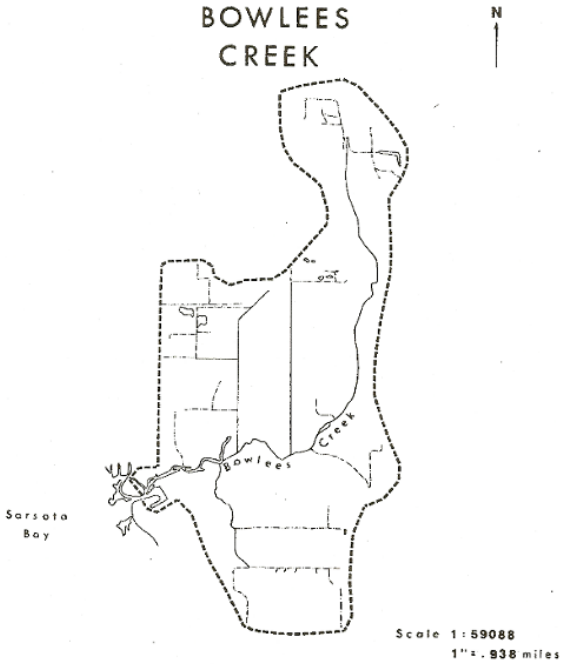


Fig. 9: Drainage basin map for Bowlees Creek

Figure 3. Boundaries of the Bowlees Creek watershed (Smolker et al. 1977).

Figure 4. Watersheds of major river basins, west central Florida, Southwest Florida Water Management District .

Figure 5. Location of Bowlees Creek and Bowlees Creek Island (south of the creek mouth) on the shoreline of East Sarasota Bay.

Soil Types

The single soil type mapped on Bowlees Creek Island by the USDA NRCS Soil Survey for Manatee County is Canaveral sand, fill, described as nearly level, moderately well drained to somewhat poorly drained soil consisting of sand and shells dredged from nearby water areas (Hyde and Huckle 1983).

Meteorology

The region falls within two climatic divisions and is essentially in a zone of climatic transition between a temperate continental climate and a subtropical Caribbean climate (Wooten 1985). The mild subtropical conditions prevailing over much of the bay area are a result of its low latitude, proximity to the Gulf of Mexico and Atlantic Ocean, and low elevations. Warm humid summers are followed by relatively dry, mild winters. Rainfall and seasonal conditions are affected in summer by the presence of the Bermuda high-pressure system and in winter by continental frontal systems.

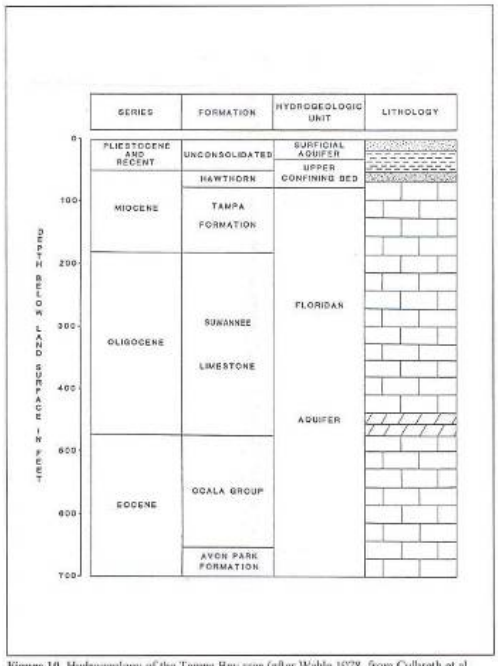
Rainfall is influenced by temperature differences of the land and water and by seasonal climatic conditions. Summer rains are usually the result of differential air pressures produced by the daily warming of air masses over the land. Convectional summer showers result from cumulonimbus clouds formed over the land, frequently in the form of thundershowers. Winter showers are primarily carried along ahead of cold fronts as colder, drier air comes in contact with warmer, moister air along the frontal boundary. These showers depend on the temporal movement of the front and are usually not heavy or particularly long, unless the front becomes stationary.

Infrequent hurricanes and associated storm surges can result in dramatic effects on the hydrology and sediments of the region. Lewis and Estevez (1988) distinguished three periods of seasonal climatic change: a warm, dry period lasting from April to mid-June, a warm wet period lasting from mid-June to November, and a cool dry period lasting from November to April. A detailed description of rainfall and wind patterns, temperature, relative humidity, solar radiation, evapotranspiration, and hurricanes is given in Wolfe and Drew (1990).

Hydrology

Groundwater

Groundwater in this region is present in two distinct aquifers—the Floridan Aquifer, confined to the area below the Hawthorn Geologic Formation, and a surficial aquifer in the unconsolidated sediments above (Figure 10). The Floridan Aquifer consists of 300–400 m of water-bearing geologic formations. Recharge occurs primarily northeast of Tampa Bay where the aquifer is exposed. To the southwest, the confining layer runs under Tampa Bay and Sarasota Bay, allowing mixing of fresh and salt waters in the surficial aquifer. The surficial aquifer occupies sand and mixed sediments from 6 m to 30 m thick above the confining layer. It discharges laterally into Tampa Bay, Sarasota Bay, and their contributing rivers and creeks (Figure 6; Culbreth et al. 1982).



There is some exchange of water between the Florida and surficial aquifers where sinkholes or manmade features (i.e., canals, dredged channels, and uncased boreholes) allow. Downward leakage occurs farther inland and is important for recharge of the Florida Aquifer while upward leakage occurs where the potentiometric surface is above the surficial aquifer surface. Overall, lateral flow of groundwater follows general drainage patterns towards Tampa Bay and Sarasota Bay.

Figure 6. Hydrogeology (Culbreth et al. 1982).

Surface Water

Surface water inputs affect the biological inhabitants of Bowlees Creek Island Sanctuary by impacting water quality and quantity. Water quality is impacted by the activities of residents, businesses, and other human activity in the Bowlees Creek watershed. Impacts such as over-fertilization of residential and business gardens and lawns, disposal of liquid wastes, runoff from streets and parking lots, agricultural waste and runoff from farm fields, pesticides and other chemicals that enter the water of ponds, ditches, and streams, and leakage from sewer lines and septic tanks result in cumulative non-point source pollution of rainwater draining toward Bowlees Creek and into Sarasota Bay. Nutrients and other chemical pollution washing into Sarasota Bay from Bowlees Creek affect the seagrasses, oysterbars, and mangrove shorelines of the Bowlees Creek Island Sanctuary. Increased nutrients stimulate algal growth in the water column, shading seagrasses which require sunlight for photosynthesis. In addition, increased nutrients promote the growth of algae directly on the seagrass blades themselves, similarly negatively affecting seagrass photosynthesis. Oysters filter feed small plants and animals living in the water column, and can be negatively affected by oils, gasoline residues, pesticides, and other chemicals that may enter the waters of Bowlees Creek and the east side of Sarasota Bay. Mangroves growing on the shorelines of Bowlees Creek Island can be impacted by release of chemicals into bay waters (Sarasota Bay National Estuary Program 1995).

Irrigation of agricultural fields and landscaping, leading to additional freshwater inputs, can affect water quantity in the Bowlees Creek watershed. Water quantity can also be affected by withdrawals from the aquifer supporting Bowlees Creek from wells, and withdrawals from the creek itself for irrigation (Southwest Florida Water Management District March 1995). Rainfall and storm events with their associated stormwater flushes are important inputs to Bowlees Creek and the east Sarasota Bay estuary. Fundamental estuarine biological productivity is based on natural variations in freshwater input. Creek and river freshwater sources creating dilution of estuarine water salinities provide variation in salinity values within sectors of the bay system. This variation presents opportunities for sea and estuarine fish and invertebrates at various stages in their life histories to find the salinity and other habitat values critical to their survival. Thus, it is important that the amount of water entering Sarasota Bay, through Bowlees Creek and other watersheds, be provided at naturally occurring input amounts and according to normal seasonal input regimes (Livingston 1990).

Vegetative Community

Much of the vegetation on Bowlees Creek Island is composed of mangrove trees, adding to the island's ecological significance (Figure 7). Approximately half of the island is vegetated with black, red, and white mangroves and buttonwood trees (*Avicennia germinans*, *Rhizophora mangle*, *Laguncularia racemosa* and *Conocarpus erecta*, respectively). The mangroves are located on the shorelines of the island, and in two small, shallow interior channels largely dominated by black mangroves. These small interior channels are connected to Sarasota Bay by shallow inlets. Currently, the inlets are choked with trash, wooden debris, and other flotsam, affecting tidal water flow.

Mangroves are woody halophytic plants that have morphological and physiological adaptations for survival under conditions of periodic or continual inundation by salty or brackish water. Mangroves trees thrive in sheltered estuarine bays or backwaters, estuarine fringes and along tidal rivers. A valuable function of mangrove-dominated communities is providing a detrital food base for a wide variety of marine invertebrates and economically important fishes.

Figure 7. Red mangroves and oysterbars, with foraging American Oystercatchers, White Ibis, and Black-bellied Plovers (photo credit: Ann Paul, Florida Coastal Islands Sanctuaries).

Birds such as Ospreys and herons, egrets, ibis, spoonbills, and Brown Pelicans often use mangrove trees for roosting and nesting. Neotropical migrants forage on insects and other small invertebrates in mangrove trees. Prairie Warblers, Black-whiskered Vireos, and Mangrove Cuckoos nest in mangrove forests in Florida. Mangrove crabs, adapted to life in the estuarine forest, occur commonly. Mangrove trees and their roots provide protection of shorelines from erosion by waves and storms. The roots of mangroves provide a substrate for oyster and barnacle attachment; these animals filter water improving water quality and also are important elements of the food web (Odum and McIvor 1990).

About half of the island is dominated by non-native, invasive tree species, especially carrotwood (*Cupaniopsis anacardiodes*). Other non-native invasive plant species present include Australian pine (*Casuarina equisetifolia)* and Brazilian pepper (*Schinus terebinthifolius).* Some of the Australian pines and Brazilian pepper trees appear to have been previously girdled and/or killed with herbicide treatment. Australian pines provide elevated perches for Brown-headed Cowbirds, which are parasitic on nesting passerines (primarily the obligate mangrove nesters). The island's mangrove community, oysterbars, and grassflats have good ecological integrity, and provide very high quality habitat for birds, fish, and other wildlife. Carrotwood and other non-native invasive trees present are not desirable, even though they provide berries for frugivorous birds, because they suppress the native coastal hammock plant species.

Bowlees Creek Island is surrounded by a shallow-water flat that supports a seagrass meadow. Seagrasses on the shallow flat surrounding Bowlees Creek Island include shoal grass (*Halodule wrightii*), turtle grass (*Thalassia testudinum*), and manatee grass (*Syringodium filiforme*). Oyster beds adjacent to the island and on the north side of the Bowlees Creek channel actively filter water entering Sarasota Bay from Bowlees Creek, improve water quality, and provide a hard substrate for benthic invertebrates. They are also important low tide roost sites and foraging areas for birds, notably American Oystercatchers, Black-bellied Plovers, Willets, Ruddy Turnstones, and sandpipers, and other migratory and wintering shorebirds. Detailed descriptions of the habitat types on Bowlees Creek Island, using the Florida Land Use Cover Codes (FLUCCS), are included in Appendix 1 (Florida Natural Areas Inventory and Department of Natural Resources 1990).

Figure 8. Adult Tricolored Heron foraging in the shallow water surrounding the mangrove island (right) (photo credit: FCISP files).

Figure 9. Whimbrel on oyster-rich shoreline, one of the migrant wintering shorebird species that use oysterbars near Bowlees Creek Island (left) (photo credit FCISP files).

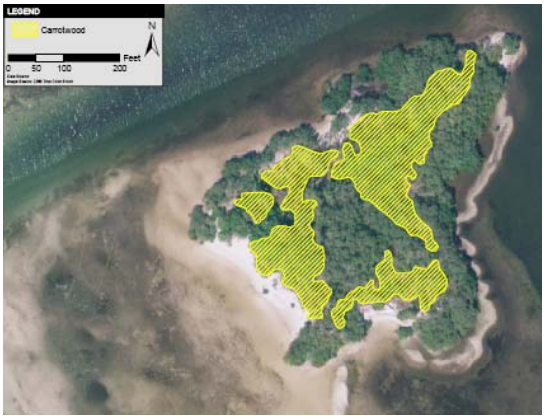
Fauna

Benthic invertebrates are often studied because of their usefulness as indicator species. The populations and species richness present provide important data with regard to the relative ecological integrity of a particular site. Tampa and Sarasota Bays are nurseries for about 220 species of the larvae and juveniles of both resident and migratory fish species. Seventy-nine species use the bay as a nursery (Lewis and Estevez 1988). During and following spawning periods, larval and juvenile fish typically migrate into shallow, protected, low-salinity nursery areas of the bay, river, and creeks to feed and mature (Comp 1985, Lewis et al. 1985). Unfortunately, during the 1950s and 1960s, seagrass meadows in the bay were significantly reduced by dredging, which has affected approximately 15% of the bay bottom (5,054 acres) (Sarasota Bay National Estuary Program 1995). About 26 reptiles and amphibians, 16 mammals, and 143 birds occur regionally (Appendix 1).

MANAGEMENT CONCERNS

1. Camping on Bowlees Creek Bird Island creates concerns about human waste disposal, trash and litter, risks from campfires, loss of native trees cut for firewood, and other human management concerns.

2. Non-native invasive plant species, including Brazilian pepper, carrotwood, Australian pine, and other species, are prevalent on Bowlees Creek Bird Island, out-competing native vegetation that would provide better habitat for birds and wildlife.



3. Debris, including trash washed into the mangroves at high tides, trash left by campers and other visitors to the island, fishing line and other entangling debris that poses a threat to wildlife, and abandoned derelict vessels should be removed from Bowlees Creek Bird Island Sanctuary.

4. Seagrass beds, mangrove shorelines, sand and mud flats, and oysterbars surrounding Bowlees Creek Island Bird Sanctuary provide important habitat features that increase the value of this sanctuary for wildlife. Protection of these features should be a priority. Water quality and quantity are factors that affect the health of these estuarine resources.

MANAGEMENT RECOMMENDATIONS

1. Post the Bowlees Creek Island Bird Sanctuary with signs reading "Bird Sanctuary, No Hunting, No Dogs, Day Use Only, Please help us protect birds, wildlife and vegetation". This posting language will allow fishermen, nature photographers, bird-watchers, and boaters to access the island, but will prohibit overnight camping, fires, trash disposal, collection of plants and animals, and other disallowed activities.

2. Remove the non-native invasive plant species, replant with native plants to establish coastal shoreline marsh, release the mangrove forest, and restore the small upland coastal hammock. Cut down Australian pines to remove possible Brown-headed Cowbird (or other passerine predators) perches. The Sarasota Bay Estuary Program and Florida Coastal Islands Sanctuaries have developed a proposed habitat restoration plan for Bowlees Creek Island (Appendix 3). The location of non-native species and shallow mangrove-lined channels are described and mapped.

3. Improve the existing tidal channels flowing into the small, shallow interior channels by removing vegetation and debris using hand tools.

4. Mark shallow water areas surrounding Bowlees Creek Island with "Shallow Water Warning" signs to help boaters navigate via the marked channel, and to protect the sand flats, seagrass beds, and oysterbars from propeller scarring.

5. Enlist the assistance of community leaders, neighbors, and volunteers in the restoration and management of Bowlees Creek Island Bird Sanctuary, to promote understanding of the ecological requirements of the regional estuarine habitat, long-term participation in the management of the island and its surrounding grassflats, and develop a conservation ethic within the community. Local public involvement will lead to improved concern about runoff from residential yards and streets, improved stormwater quality, and other community activities to protect Sarasota Bay. It is anticipated that community leaders, neighbors, and volunteers will help with the management of Bowlees Creek Island Bird Sanctuary through the following activities:

- Regularly remove trash from Bowlees Creek Island Bird Sanctuary on scheduled clean-up days.
- Participate in the fall Monofilament CleanUP! (normally scheduled annually in October), to specifically target fishing line and other entangling materials and remove them from Bowlees Creek Island and other foraging and nesting bird islands in Sarasota Bay.
- Report over-night camping activities, campfires, or other inappropriate human use of the island, and inappropriate behavior affecting wildlife and bird protection and conservation.
- Undertake community and individual landowner activities to reduce fertilizer, pesticide, and other chemicals in stormwater runoff from residential yards and streets by following Sarasota County's landscape and fertilizer ordinances.

- Participate in regular "vegetation" patrols and work-days to remove non-native vegetation on Bowlees Creek Island Bird Sanctuary, to prevent re-infestations of invasive plants, and ensure that the restoration project will have long-term value to the native plant communities of Sarasota Bay.
- Raccoons are a common mammalian predator that interrupt colonial waterbird nesting, and raccoon tracks have been noted on Bowlees Creek Island Bird Sanctuary every time Audubon biologists have surveyed the island. The presence of raccoons or other mammalian predators on Bowlees Creek Island eliminates the potential that the island will be used by colonial waterbirds as a bird nesting colony site. Because the island is close to the mainland, it will be difficult to keep it free from mammalian predators that swim well and can easily access the island, and it is not reasonable to expect that regular trapping and removal of raccoons would be successful enough to allow the island to become useful to colonial waterbirds as a nesting colony.
- Bowlees Creek Island Bird Sanctuary provides important foraging and roosting opportunities for many bird species, and some bird nesting should be expected. It is possible that a few pairs of Great Blue Herons, night-herons, or Green Herons will nest on the island (Figures 10, 11). Ospreys nest on the island.

Figure 10. Green Heron nest in mangroves (FCISP photo files).

Figure 11. Green Heron fledglings in mangroves (FCISP photo files).

Management Recommendations Summary

Following is a summary of key management issues that specific groups and agencies may be responsible for, and approaches to implementing these recommendations.

Water Quality and Seagrass Protection:

Issue: Loss of Seagrass/Seagrass Propeller Scarring and Dredging

1. Implement a channel-marking program and signage at strategic locations to protect seagrass beds;
2. Mark existing seagrass areas;
3. Impose boating speed limitations in water less than three feet deep around the Bowlees Creek Island;
4. Enforce speed zone areas;
5. Prepare a map outlining seagrass boundaries, channels, oysterbeds, and other features. Post the map at local boat ramps and provide it to boaters and saltwater fishing license applicants.

Issue: Runoff from Residential Areas

1. Sponsor seminars or distribute educational materials to homeowners about environmentally beneficial landscape design and lawn maintenance procedures, especially to reduce excess fertilizer use or pet waste contamination of waterways draining into Bowlees Creek or Sarasota Bay;
2. Increase citizen stewardship of natural areas through participation in the habitat management and planting projects at Bowlees Creek Island, trash cleanups, and other environmental habitat management projects;
3. Involve students from area schools in land stewardship activities;
4. Promote community and volunteer participation in trash and monofilament clean-up activities.

Habitat/Wildlife Management Issues:

Issue: Trespass and Camping on Bowlees Creek Island

1. Post Bowlees Creek Island for day-use only;
2. Enlist the community and law enforcement officers to support this use;
3. Enlist the community, neighbors, and others in reporting over-night camping, and other inappropriate activities.

Issue: Invasion of Native Habitats by Non-native Plants

1. Initiate a large-scale cooperative effort among agencies, community groups, and private landowners to remove non-native plants;
2. Replant treated areas with native plants and shrubs appropriate for estuarine shoreline and coastal hammock communities;
3. Continue regular "vegetation" patrol/non-native vegetation removal on Bowlees Creek Island, to ensure that non-native species do not re-infest it.

Issue: Trash, Derelict Vessel, and Fishing Line Debris

1. Organize citizen volunteer cleanups to remove trash and fishing line from Bowlees Creek Island;
2. Work with the U.S. Coast Guard to remove derelict vessels from Bowlees Creek Island;
3. Educate community leaders and members of the public concerning proper trash and fishing line disposal.

Figure 12. Fishing line is considered by FFWCC biologists to be the main cause of Brown Pelican mortality in Florida (photo: Libbie Carnahan, Pinellas Aquatic Preserves, Florida Dept. Environmental Protection).

Issue: Management Entity

1. Reevaluate the State Lease to the Florida Audubon Society.
2. Identify appropriate alternate lessees for Bowlees Creek Island.
3. Continue cooperative efforts among Audubon of Florida, Sarasota Bay Estuary Program, State of Florida and others to post, protect, and monitor the bird habitat islands in Sarasota Bay;
4. Develop a community education program about the importance of the major bird nesting and habitat islands in Sarasota Bay.

Issue: Threats to Manatees

1. Implement channel marking using double gated channel markers and boating speed restrictions recommended for seagrass protection (see above); these will also protect manatees and their foraging areas.

Issue: Develop Community Support for Bowlees Island Bird Sanctuary Management and Protection

1.Work with various community leaders and agencies to involve the public in management activities, including Sarasota Bay National Estuary Program, Sarasota Bay Watch, Sarasota and Manatee County Audubon Society chapters, Sarasota Parrotheads, the Bay Buddies, and others.

2. Organize planned work events that build community support and understanding of conservation needs for bay habitats.

3. Enlist media coverage of community activities.

ACKNOWLEDGMENTS

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ACRONYMS

FDEP	Florida Department of Environmental Protection
FDOT	Florida Department of Transportation
FFWCC	Florida Fish and Wildlife Conservation Commission
FCISP	Florida Coastal Islands Sanctuaries Program
MHW	Mean High Water
MLW	Mean Low Water
MLLW	Mean Lowest Low Water
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resource Conservation Service
SCS	Soil Conservation Service
SWFWMD	Southwest Florida Water Management District
SWIM	Surface Water Improvement and Management (Program)
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Service

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APPENDICES

Appendix 1 -Florida Land Use Cover Code (FLUCCS) descriptions of plant communities on Bowlees Creek Island

Upland Hardwood

Brazilian Pepper (4220): The non-native Brazilian pepper is typical of disturbed sites. In moist to wet conditions, this aggressive species invades natural communities such as hydric and tropical hammocks, mixed hardwoods, and coastal scrub. Other non-natives that occur with Brazilian pepper are Australian pine, lead tree (*Leucaena leucocephala*), air potato (*Dioscorea bulbifera, D. floridana*), and chinaberry (*Melia azedarach*).

Coastal Uplands include beach/dune communities, with neutral to alkaline soil composed of coarse sand and shell freagments, with little organic matter, low fertility, and some salt content. Plants are adapted to hot, dry, sunny, and windy conditions. Beach/dune plants are salt-tolerant. Typical shrubs include cocoplum (*Chrysobalanus icaco*), croton, (*C. punctatus*), varnishleaf, (*Dodonea viscosa*), coralbean (*Erythrina herbacea*), Florida privet (*Forestiera segregata*), Simpson stopper (*Myrcianthes fragrans*), necklace pod (*Sophora tomentosa*), and Spanish bayonet (*Yucca aloifolia*). Ground cover plants include chaff-flower (*Alternanthera* spp.), dune spurge (*Chamaesyce* spp.), saltgrass (*Distichlis spicata*), railroad vine (*Ipomoea pes-caprae*), beach morning glory (*I. stolonifera*), beach elder (*Iva imbricata*), muhly grass (*Muhlenbergia capillaris*), and prickly-pear cactus (*Opuntia* spp.). Gound covers/vines include bitter panicum (*P. anarum*), knotgrass (*Paspalum vaginatum*), glasswort (*Salicornia* spp.) sea purslane (*Sesuvium portulacastrum*) marsh grass (*Spartina patens*), seashore dropseed (*Sporobolus virginicus*), sea oats (*Uniola paniculata*), bay bean (*Canavalia maritima*), corky-stem passion vine (*Passiflora suberosa*), wild allamanda (*Urechites lutea*), sea-oxeye daisy (*Borrichia* spp.), partridge pea (*Cassia* spp.), seaside gentian (*Estoma exaltatum*), blanket flower (*Gaillardia pulchella*), beach sunflower (*Helianthus debilis),* horsemint, (*Monarda puncata),* seaside evening primrose (*Oenothera humifusa*), tropical sage (*Salvia coccinea*), and beach verbena (*Verbena maritima*). (Jameson and Moyroud 1991).

Australian Pine (4370): Australian pines are a non-native tree species that occurs along roadside ditches, fields, drainage areas, disposal sites, and areas where the soil is disturbed or denuded. They completely displace native vegetation, resulting in eventual displacement of native wildlife as well. The trees are salt tolerant and quick growing. Monospecific stands of Australian pines are rapidly established as the dense needle-like leaves accumulate on the ground and prevent germination of other species' seedlings. This species, carrotwood, and Brazilian pepper are common biological invaders in upland areas.

Wetlands

Mangrove Swamps (6120): Mangrove shorelines are a prevalent habitat type on Bowlees Creek Island Sanctuary with red, black and white mangroves (*Rhizophora mangle*, *Avicennia germinans*, *Laguncularia racemosa*) occurring throughout. Mangroves stabilize fine sediments, provide food and shelter to fish, invertebrates, birds and other wildlife, and provide a buffer against storm events (Dawes 1981). Lugo and Snedaker (1974) have described three major mangrove community types: 1) riverine forests that occur along tidal creeks and rivers; 2) fringing forests that form thin bands along waterways; and 3) basin forests that occur inland from fringing and riverine forests. The Bowlees Island shorelines and two small interior channels are vegetated with mangrove swamps.

Salt Marsh (6420)

Cordgrass (6421): Smooth cordgrass (*Spartina alterniflora*) and salt meadow cordgrass (*S. patens*) occur in small patches on Bowlees Creek Island Sanctuary. Cordgrass marshes function to stabilize sediments, filter stormwater runoff, and serve as nursery grounds for fish and invertebrates.

Tidal Flats (6510)

Subtidal (6511). Although this habitat type is unvegetated, it is very productive. An abundant assemblage of microorganisms (bacteria, protists, meiofauna, and meioflora) and invertebrates exist in these fine, organically rich sediments. The diversity of this community provides food for numerous wildlife species including estuarine-dependent Reddish Egrets and migratory and wintering shorebirds. These shorebirds use subtidal flats and adjacent islands to rest and forage to accumulate body fat for long distance migrations and over-wintering.

Figure 13. Tidal mudflat with a foraging Great Blue Heron and a Black-bellied Plover, and roosting pelicans, showing red algae (photo credit: Florida Coastal Islands Sanctuaries).

Figure 14. Marbled Godwits and White Ibis, roosting and foraging on bay mudflats (photo credit: Carol Cassels, Florida Coastal Islands Sanctuaries).

Supratidal (6512): Upper intertidal zone, inundated typically only by high tides creating hypersaline conditions with seasonal expansion of typically low-growing, salt tolerant, succulent vegetation.

A small section of the upper beach on Bowlees Creek Island of this supratidal habitat supports characteristic salt tolerant, succulent vegetation, including *Sococornia* and similar halophytic plant species.

Figure 15. Horseshoe crab, halophytic *Portulacastrum maritima*, and black mangrove pneumatophores on the beach (photo credit: Florida Coastal Islands Sanctuaries).

Oysterbars (654).

Cemented oystershells attached to bay estuarine rocky shoals or other hard structures in shallow water near creek and river outflows. Oysterbars create a hard substrate habitat feature where algae and sessile animals attach. They are used by small fish, crabs, and other marine invertebrates as refuge and forage site, and these in turn provide forage for wading birds, seabirds, and shorebirds, as well as roost areas when they are exposed at low tides.

Seagrasses

Seagrasses are submerged flowering plants that require light penetration through the water column for photosynthesis. Seagrass beds constitute one of the world's most ecologically significant environments (McRoy and McMillan 1977). Highly productive, seagrasses provide food, shelter and nursery grounds for many fish and invertebrates (Dawes 1981). Seagrasses also improve water quality by trapping and stabilizing fine sediments (Dawes 1981).

Dense Seagrass (9112): Shoal grass (*Halodule wrightii*) and wigeongrass (*Ruppia maritima*) occur in the seagrass flats near Bowlees Creek Island. Wigeongrass can tolerate fluctuating salinities, and occurs in both high and low salinity environments. Wigeongrass can be ephemeral; with the thread-like leaves present in the spring and

persisting until mid-summer, when the plants then subsist through storage of nutrients in the below-ground biomass (fleshy roots and rhizomes) until the following spring.

Seagrass, Patchy (9113): Major anthropogenic impacts in Sarasota Bay have reduced historical seagrass coverage significantly. Dredge and fill operations have increased turbidity, decreased light penetration, and removed suitable habitat for seagrasses (Lewis 1977) by increasing depths beyond the light penetration zone and by filling in areas where seagrasses would occur naturally. Nutrient inputs from pollution points inland have resulted in algal epiphytes attaching to seagrass blades, increased phytoplankton and extensive macroalgae blooms in the water column, greatly reducing available light for seagrasses growing on the bay floor. In addition, impacts to seagrass flats from boat propellers have created slots and trenches, disrupting flat drainage and impacting seagrass cover of flats near Bowlees Creek Island.

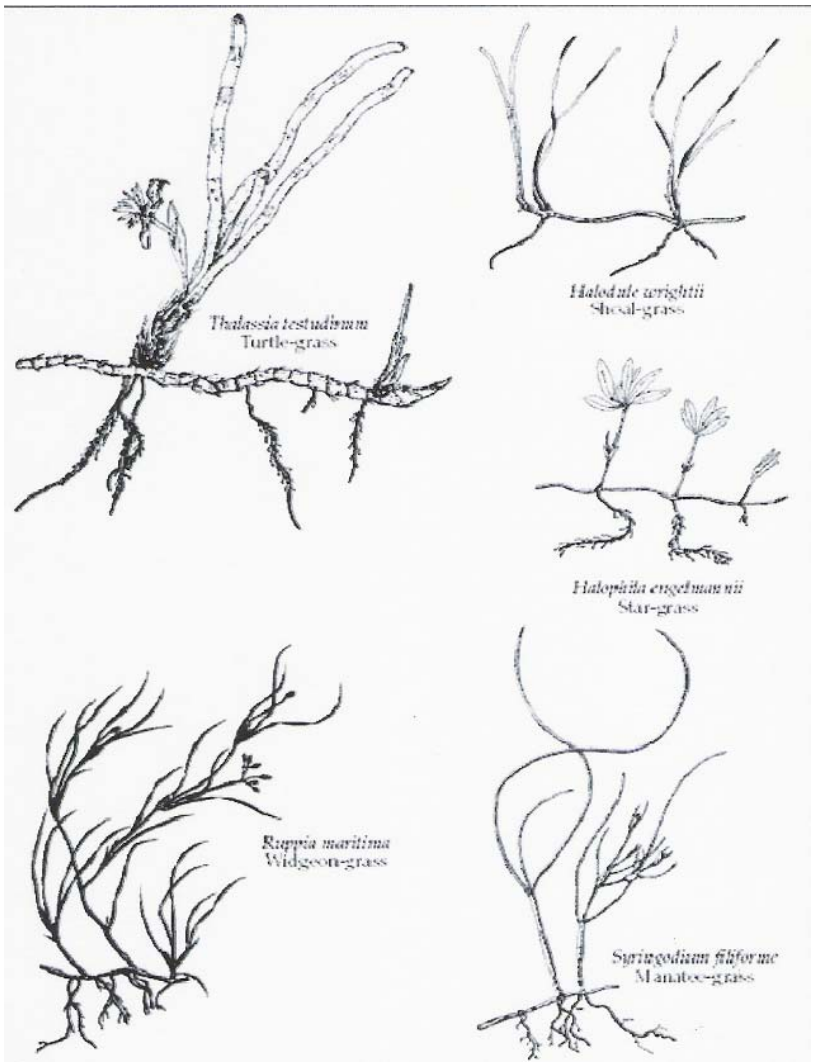


Figure 16. Sketches of seagrass species occurring in Sarasota Bay (Environmental Protection Commission of Hillsborough County September 2007).

Appendix 2 -Fauna of Bowlees Creek Island.

Estuarine Benthic Invertebrates

Recent studies in nearby Tampa Bay recorded 79 benthic invertebrate species (Table 1). This total reflects studies conducted over a 7-year period and is probably a realistic indication of the regional benthic faunal richness. This list of benthic invertebrates is very probably similar to species that occur in Sarasota Bay near Bowlees Creek Island. Multiple crab traps located in Bowlees Creek and nearby on Sarasota Bay also attest to a productive local blue crab (*Callinectes sapidus*) fishery.

Table 1. Taxa collected in benthic sampling in Tampa Bay, July 1988 through June 1995.

TAXON	SCIENTIFIC NAME
NEMERTEANS	*Stylochus* sp.
	Nemertea sp.
	unid. rhyncocoel
ANNELIDS	*Eteone heteropoda*
	Eumida sanguinea
	Genityllis castanea
	Neanthes succinea
	Parahesione luteola
	Laeonereis culveri
	Glycera americana
	Glycinde solitaria
	Diopatra cuprea
	Kinbergonuphis simoni
	Leitoscoloplos sp.
	Leitoscoloplos foliosus
	Scoloplos rubra
	Scolelepis taxana
	Aricidea philbinae
	Aricidea taylori
	Polydora cornuta
	Polydora websteri
	Prionospio heterobranchia
	Prionospio steenstrupi
	Paraprionospio pinnata
	Streblospio benedicti
	Carazziella hobsonae
	Magelona corona
	Magelona pettiboneae
	Capitella capitata
	Heteromastus filiformis
	Mediomastus ambiseta
	Axiothella mucosa
	Cistenides gouldii
	Melinna maculata
	Fabriciola trilobata
	Limnodriloides cf. *rubicundus*
	Tharyx annulosus
	Syllid *spp*.
BRYOZOANS	*Phoronis architecta*
ECHINODERMS	*Ophiophragmus filograneus*

TAXON	SCIENTIFIC NAME
MOLLUSKS	unid. gastropod
	Acteocina canaliculata
	Assiminea succinea
	Haminoea succinea
	Teinostoma lerema
	unid. bivalve
	Amygdalum papyrium
	Astarte subequilatera
	Ensis minor
	Lyonsia hyalina
	Macoma constricta
	Mysella planulata
	Parastarte triquetra
	Pseudomiltha floridana
	Tagelus plebeius
	Tellina sp.
CRUSTACEANS	*Bowmaniella* sp.
	Taphromysis bowmani
	Oxyurostylis smithi
	Almyracuma sp. A
	Cyathura polita
	Xenanthura brevitelson
	Edotea sp. A
	Erichsonella filiformis
	Ampelisca sp.
	Ampelisca abdita
	Ampelisca vadorum
	Ampelisca holmesi
	Acuminodeutopus sp.
	Corophium sp.
	Elasmopus laevis
	Grandidierella bonnieroides
	Gammarus mucronatus
	Monoculodes edwardsi
	Orchestia sp.
	Leptalpheus forceps
	Neopanope texana
	Panopeus herbstii
	Pinnixa pearsi

Sharks and Rays

Mote Marine Laboratory has conducted studies in Sarasota Bay. These studies show that Sarasota Bay is an important area for sharks; including bull sharks (*Carcharhinus leucas*), hammerheads (*Sphyrna* sp.), juvenile black-tipped (*C. limbatus*), and bonnethead (*S. tiburo*) sharks. Rays and skates include cow-nosed rays (*Rhinoptera bonasus*), southern and Atlantic stingrays (*Dasyatis americana*, *D. sabina*, respectively), butter rays (*Gymnura* sp.),, and spotted eagle rays (*Aetobatis narinari*) (R. Hueter, Mote Marine Laboratory, pers. comm.). Water quality declines and subsequent decline in food availability have had important impacts on shark numbers (C. Manire, Mote Marine Laboratory, pers. comm.). Overfishing, a major problem for fish stocks and shark populations all over the world, has had dramatic effects regionally (R. Hueter, pers. comm.).

Fish

Comp (1985) prepared a list of 202 fish species collected within Tampa Bay (also in Wolfe and Drew 1990; Table 2, 3). They thought that only 125 of these could be considered common inhabitants and, although the list indicates a diverse fish assemblage, ten or fewer species usually made up the majority of the fish caught in sampling programs. The ten most common fish in Tampa Bay in terms of numerical abundance in collections made with standard gear (which is somewhat biased toward capturing smaller, less mobile species) likely occur in upper Sarasota Bay near Bowlees Creek Island (Table 2).

Adults of larger, more predatory species of fish typically depend upon these "top ten" as their main food source. Many of these species are of important to recreational and commercial fisheries, especially tarpon, snook, cobia (*Rachycentron canadum*), spotted seatrout, sand seatrout (*Cynoscion arenarius*), and various species of sharks. Other important fish species appear to depend on invertebrates as their main source of food. These include the red drum (*Sciaenops ocellatus*), black drum (*Pogonias cromis*), gag grouper (*Mycteroperca microlepis*), and catfish. Snook and spotted seatrout larvae seek out seagrass meadows for nursery areas.

Figure 17. Osprey carrying sunfish prey (photo credit: FCISP file).

Table 2. The ten dominant fish species in Tampa Bay, listed in approximate order of abundance, noted by bay area (modified from Springer and Woodburn 1960, Finucane 1966, Comp 1985).

		COASTAL BEACHES	LOWER TAMPA BAY	MIDDLE TAMPA BAY	HILLSBOROUGH & MCKAY BAYS
SPECIES	SCIENTIFIC NAME	low salinity	medium to high salinity	medium salinity	low salinity
Tidewater silverside	*Menidia peninsulae*	X	X	X	X
Bay anchovy	*Anchoa mitchilli*	—	X	X	X
Scaled sardine	*Harengula jaguana*	X	—	X	X
Striped mullet	*Mugil cephalus*	—	X	X	X
Pinfish	*Lagodon rhomboides*		X	X	X
Longnose killifish	*Fundulus similis*	—	X	X	X
Spot	*Leiostomus xanthurus*	—	X	X	X
Silver perch	*Bairdiella chrysoura*	—	X	X	—
Silver jenny	*Eucinostomus gula*	—	X	X	—
Code goby	*Gobiosoma robustum*	—	X	X	—

Table 3. Fish species of Tampa and Sarasota Bays (adapted from Wolfe and Drew 1990).

	COMMON NAME	SCIENTIFIC NAME	HABITAT TYPE	ABUNDANCE
Chondrichthyes				
	nurse shark	*Ginglymostoma cirratum*	M	
	whale shark	*Rhincodon typus*	M	X
	sand tiger	*Odontaspis taurus*	M	X
	white shark	*Carcharodon carcharias*	M	X
	blacknose shark	*Carcharhinus acronotus*	M	
	bull shark	*C. leucas*	M	
	blacktip shark	*C. limbatus*	M,E	
	dusky shark	*C. obscurus*	M	
	sandbar shark	*C. plumbeus*	M	X
	lemon shark	*Negaprion brevirostris*	M	X
	great hammerhead	*Sphyrna mokarran*	M	X
	bonnethead	*S. tiburo*	M,E	
	smalltooth sawfish	*Pristis pectinata*	M,E	X
	Atlantic guitarfish	*Rhinobatos lentiginosus*	M	
	southern stingray	*Dasyatis americana*	M,E	
	Atlantic stingray	*D. sabina*	M,E	X
	bluntnose stingray	*D. sayi*	M,E	
	smooth butterfly ray	*Gymnura micrura*	M,E	
	spotted eagle ray	*Aetobatus narinari*	M	
	cownose ray	*Rhinoptera bonasus*	M,E	
	Atlantic manta	*Manta birostris*	M	
Osteichthyes				
	Atlantic sturgeon	*Acipenser oxyrhynchus*	E	X
	longnose gar	*Lepisosteus osseus*	F	X
	Florida gar	*L. platyrhincus*	F	X
	ladyfish	*Elops saurus*	M,E	
	tarpon	*Megalops atlanticus*	M,E	
	bonefish	*Albula vulpes*	M	
	American eel	*Anguilla rostrata*	M,E	X
	ocellated moray	*Gymnothorax saxicola*	M	X
	sooty eel	*Bascanichthys bascanium*	M	X
	spotted spoon-nose eel	*Echiophis intertinctus*	M	X
	stippled spoon-nose eel	*E. punctifer*	M	X
	speckled worm eel	*Myrophis punctatus*	M,E	
	shrimp eel	*Ophichthus gomesi*	M,E	
	Palespotted eel	*O. ocellatus*	M	X
	gulf menhaden	*Brevoortia patronus*	M,E	
	yellowfin menhaden	*B. smithi*	M	
	gizzard shad	*Dorosoma cepedianum*	F	X
	threadfin shad	*Dorosoma petenense*	F	X
	scaled sardine	*Harengula jaguana*	M,E	
	Atlantic thread herring	*Opisthonema oglinum*	M,E	
	Spanish sardine	*Sardinella aurita*	M	
	Cuban anchovy	*Anchoa cubana*	M	
	striped anchovy	*A. hepsetus*	M,E	
	bay anchovy	*A. mitchilli*	M,E	
	inshore lizardfish	*Synodus foetens*	M,E	
	hardhead catfish	*Arius felis*	M,E	
	gafftopsail catfish	*Bagre marinus*	M,E	
	brown bullhead	*Ictalurus nebulosus*	F	X
	gulf toadfish	*Opsanus beta*	M,E	
	leopard toadfish	*O. pardus*	M	
	Atlantic midshipman	*Porichthys plectrodon*	M,E	
	skilletfish	*Gobiesox strumosus*	M,E	
	pancake batfish	*Halieutichthys aculeatus*	M	X
	polka-dot batfish	*Ogcocephalus radiatus*	M,E	
	southern hake	*Urophycis floridana*	M,E	
	longnose cusk-eel	*Ophidion beani*	M	X
	blotched cusk-eel	*O. grayi*	M	

COMMON NAME	SCIENTIFIC NAME	HABITAT TYPE	ABUNDANCE
crested cusk-eel	*O. welshi*	M	
ballyhoo	*Hemiramphus brasiliensis*	M	X
halfbeak	*Hyporhamphus unifasciatus*	M,E	
Atlantic needlefish	*Strongylura marina*	M	X
redfin needlefish	*S. notata*	M,E	
timucu	*S. timucu*	M,E	
houndfish	*Tylosurus crocodilus*	M	X
diamond killifish	*Adinia xenica*	E	
sheepshead minnow	*Cyprinodon variegatus*	E	
goldspotted killifish	*Floridichthys carpio*	E	
marsh killifish	*Fundulus confluentus*	E	
gulf killifish	*F. grandis*	E	
Seminole killifish	*F. seminolis*	F	X
longnose killifish	*F. similis*	E	
rainwater killifish	*Lucania parva*	E	
mosquitofish	*Gambusia affinis*	F,E	
sailfin molly	*Poecilia latipinna*	E	
rough silverside	*Membras martinica*	E	
tidewater silverside	*Menidia peninsulae*	E	
oarfish	*Regalecus glesne*	M	X
lined seahorse	*Hippocampus erectus*	E	
dwarf seahorse	*Hippocampus zosterae*	E	
fringed pipefish	*Micrognathus criniger*	E	
dusky pipefish	*Syngnathus floridae*	E	
chain pipefish	*S. louisianae*	E	
gulf pipefish	*S. scovelli*	E	
bluegill	*Lepomis macrochirus*	F	X
largemouth bass	*Micropterus salmoides*	F	X
snook	*Centropomus undecimalis*	M,E	
black sea bass	*Centropristis striata*	M	X
blackchin tilapia	*Tilapia melanotheron*	E	
sand perch	*Diplectrum formosum*	M	
Jewfish	*Epinephelus itajara*	M,E	
red grouper	*E. morio*	M	X
gag	*Mycteroperca microlepis*	M	
belted sandfish	*Serranus subligarius*	M	X
greater soapfish	*Rypticus saponaceus*	M	X
bronze cardinalfish	*Astrapogon alutus*	M	X
bluefish	*Pomatomus saltatrix*	M,E	
cobia	*Rachycentron canadum*	M,E	
sharksucker	*Echeneis naucrates*	M,E	
remora	*Remora remora*	M,E	
blue runner	*Caranx crysos*	M	
crevalle jack	*C. hippos*	M,E	
horse-eye jack	*C. latus*	E	X
Atlantic bumper	*Chloroscombrus chrysurus*	M,E	
bluntnose jack	*Hemicaranx amblyrhyncus*	M	X
leatherjacket	*Oligoplites saurus*	M,E	
Atlantic moonfish	*Selene setapinnis*	M	X
lookdown	*Selene vomer*	M	
Florida pompano	*Trachinotus carolinus*	M,E	
permit	*T. falcatus*	M,E	
Palometa	*T. goodei*	M	
schoolmaster	*Lutjanus apodus*	M	X
gray snapper	*L. griseus*	M,E	
lane snapper	*L. synagris*	M,E	
tripletail	*Lobotes surinamensis*	M,E	
Irish pompano	*Diaterus auratus*	M	X
striped majarra	*D. plumieri*	E	
spotfin mojarra	*Eucinostomus argenteus*	M,E	

COMMON NAME	SCIENTIFIC NAME	HABITAT TYPE	ABUNDANCE
silver jenny	*E. gula*	M,E	
yellowfin mojarra	*Gerres cinereus*	E	X
tomtate	*Haemulon aurolineatum*	M	X
white grunt	*H. plumieri*	M	
pigfish	*Orthopristis chrysoptera*	M,E	
sheepshead	*Archosargus probatocephalus*	M,E	
grass porgy	*Calamus arctifrons*	M	X
spottail pinfish	*Diplodus holbrooki*	M	
pinfish	*Lagodon rhomboides*	M,E	
silver perch	*Bairdiella chrysoura*	M,E	
sand seatrout	*Cynoscion arenarius*	M,E	
spotted seatrout	*C. nebulosus*	M,E	
high-hat	*Equetus acuminatus*	M	X
cubbyu	*E. umbrosus*	M	X
spot	*Leiostomus xanthurus*	M,E	
southern kingfish	*Menticirrhus americanus*	M,E	
gulf kingfish	*M. littoralis*	M	
northern kingfish	*M. saxatilis*	M,E	
Atlantic croaker	*Micropogonias undulatus*	E	
black drum	*Pogonias cromis*	M,E	
red drum	*Sciaenops ocellatus*	M,E	
spotted goatfish	*Pseudupeneus maculatus*	M	X
Bermuda chub	*Kyphosus sectatrix*	M	X
Atlantic spadefish	*Chaetodipterus faber*	M,E	
slippery dick	*Halichoeres bivittatus*	M	X
hogfish	*Lachnolaimus maximus*	M	X
emerald parrotfish	*Nicholsina usta*	M	
striped mullet	*Mugil cephalus*	M,E	
white mullet	*M. curema*	M,E	
fantail mullet	*M. trichodon*	M,E	
great barracuda	*Sphyraena barracuda*	M,E	
northern sennet	*S. borealis*	M	X
guaguanche	*S. guachancho*	M	X
Atlantic threadfin	*Polydactylus octonemus*	M	X
moustache jawfish	*Opistognathus lonchurus*	M	X
sand stargazer	*Dactyloscopus tridigitatus*	M	X
southern stragazer	*Astroscopus y-graecum*	M,E	
banded blenny	*Paraclinus fasciatus*	E	X
marbled blenny	*P. marmoratus*	E	X
striped blenny	*Chasmodes bosquianus*	M	X
Florida blenny	*C. saburrae*	M,E	
crested blenny	*Hypleurochilus geminatus*	M	X
feather blenny	*Hypsoblennius hentzi*	M,E	
highfin blenny	*Lupinoblennius nicholsi*	M	X
seaweed blenny	*Blennius marmoreus*	M	X
fat sleeper	*Dormitator maculatus*	F	X
frillfin goby	*Bathygobius soporator*	E	
darter goby	*Gobionellus boleosoma*	E	
sharptail goby	*G. hastatus*	E	
naked goby	*Gobiosoma bosci*	E	
twoscale goby	*G. longipala*	E	X
tiger goby	*G. macrodon*	M,E	
code goby	*G. robustum*	E	
clown goby	*Microgobius gulosus*	E	
green goby	*M. thalassinus*	E	
Atlantic cutlassfish	*Trichiurus lepturus*	M	
king mackerel	*Scomberomoros cavalla*	M	
Spanish mackerel	*S. maculatus*	M,E	
harvestfish	*Peprilus alepidotus*	M	X
butterfish	*P. triacanthus*	M	X

COMMON NAME	SCIENTIFIC NAME	HABITAT TYPE	ABUNDANCE
barbfish	*Scorpaena brasiliensis*	M	X
horned searobin	*Bellator militaris*	M	X
bluespotted searobin	*Prionotus roseus*	M	X
blackfin searobin	*P. rubio*	M	X
leopard searobin	*P. scitulus*	M,E	
bighead searobin	*P. tribulus*	M,E	
ocellated flounder	*Ancylopsetta quadrocellata*	M	X
spotted whiff	*Citharichthys macrops*	M	X
fringed flounder	*Etropus crossotus*	M	
gulf flounder	*Paralichthys albigutta*	M,E	
dusky flounder	*Syacium papillosum*	M	X
lined sole	*Achirus lineatus*	M,E	
hogchoker	*Trinectes maculatus*	M,E	
blackcheek tonguefish	*Symphurus plagiusa*	M,E	
orange filefish	*Aluterus schoepfi*	M	
fringed filefish	*Monacanthus ciliatus*	M,E	
planehead filefish	*M. hispidus*	M,E	
scrawled cowfish	*Lactophrys quadricornis*	M,E	
trunkfish	*L. trigonus*	M,E	X
smooth truckfish	*L. triqueter*	M	X
smooth puffer	*Lagocephalus laevigatus*	M,E	X
southern puffer	*Sphoeroides nephelus*	M,E	
striped burrfish	*Chilomycterus schoepfi*	M,E	
balloonfish	*Diodon holocanthus*	M	X

Notes: Occurrence code: M—marine; E—estuarine; F—freshwater; X -- uncommon to rare.

Amphibians and Reptiles

Amphibians typically reproduce in small ephemeral, freshwater ponds. Future regional habitat restoration projects should include the restoration and creation of such ponds upstream in the Bowlees Creek watershed.

Reptiles are more common within the study area, with 15 species suspected or confirmed. Diamondback rattlesnakes (*Crotalus adamanteus*) are common residents on islands, and especially any spoil islands, in Sarasota Bay. Rattlesnakes are excellent swimmers. The diamondback terrapin (*Malaclemys terrapin*) is of particular interest. It is a small estuarine turtle that occurs locally in shallow coastal waters along the eastern seaboard and both coasts of Florida. They are now extirpated from Chesapeake Bay and endangered in Cape May, New Jersey (R. C. Wood pers. comm.). Their distribution in Florida is spotty. Recent surveys have not found terrapins in Sarasota Bay (G. Heinrich pers. comm.), although they are resident in Tampa Bay (Boca Ciega Bay near Tarpon Key National Wildlife Refuge, Hillsborough Bay near Audubon's Alafia Bank Bird Sanctuary, the Little Manatee River mouth, and Terra Ceia Bay near Audubon's Nina Griffith Washburn Bird Sanctuary) (A. Hodgson and A. Paul, pers. obs.). Two species of sea turtles, loggerhead (*Caretta caretta*) and Kemp's ridley (*Lepidochelys kempi*), occur in Sarastoa Bay. Discarded plastic bags and monofilament fishing line are a common cause of mortality of these species (A. Meylan, Florida Fish and Wildlife Conservation Commission Florida Wildlife Research Institute, pers. comm.). Green anoles are the native Florida anole. Brown anoles were introduced from the Caribbean in 1960s and their populations have displaced the native green anoles. Several of the small heron species, including Cattle Egrets, Great Egrets, Little Blue Herons, and Snowy Egrets, have been observed preying on brown anoles.

Over 20 species of amphibians and reptiles are known or suspected to occur in the Bowlees Creek watershed, although probably few of these occur on Bowlees Creek Island itself (Table 4). While this list is likely incomplete, enough is known to identify particular management concerns and opportunities.

Table 4. Herpetofauna known or expected to occur within or adjacent to Bowlees Creek.

TAXON	COMMON NAME	SCIENTIFIC NAME
AMPHIBIANS	southern toad	*Bufo terristris*
	Cuban toad	*Bufo marinus*
	green treefrog	*Hyla cinerea*
	squirrel treefrog	*Hyla squirella*
	Cuban treefrog	*Hyla septrionalis*
	southern leopard frog	*Rana sphenocephala*
REPTILES	box turtle	*Terrapene carolina*
	diamondback terrapin	*Malaclemys terrapin*
	gopher tortoise	*Gopherus polyphemus*
	Atlantic loggerhead	*Caretta caretta caretta*
	Kemp's ridley turtle	*Lepidochelys kempi*
	Florida softshell turtle	*Trionyx ferox*
	green anole	*Anolis carolinensis*
	brown anole	*Anolis sagrei*
	ground skink	*Scincella lateralis*
	southeastern five-lined skink	*Eumeces inexpectatus*
	banded water snake	*Natrix fasciata*
	eastern garter snake	*Thamnophis sirtalis*
	eastern indigo snake	*Drymarchon corais couperi*
	Florida kingsnake	*Lampropeltis getulus*
	eastern diamondback rattlesnake	*Crotalus adamanteus*
	mangrove water snake	*Nerodia fasciata*
	ring-neck snake	*Diadophis punctatus*
	black racer	*Coluber constrictor*
	eastern coral snake	*Micrurus fulvius*
	alligator	*Alligator mississippiensis*

Birds

Birds are the most diverse and most highly visible wildlife taxon of the area, with more than 160 species known or likely to occur in Sarasota Bay (Table 5). A relatively high proportion of the species that occur are not generally common; in fact, 12 of the resident species are listed by the federal and state governments as threatened, endangered, or species of special concern. Migrant and wintering species, occurring seasonally, make up another significant segment of the region's avifauna.

Table 5. Birds observed at Bowlees Creek Island Bird Sanctuary by Florida Coastal Islands Sanctuaries staff.

Species	FWC Listing	Date Observed							
		5/8/00	2/17/02	6/6/04	5/17/05	9/7/07	10/16/07	12/3/08	12/16/08
White Pelican									3
Brown Pelican	SSC	16	16			1			1
Double-crested Cormorant		8							
Anhinga						2	3		2
Great Blue Heron			1	1 nest		2	1		
Great Egret		1			4	4	10		3
Snowy Egret	SSC		40				4		
Little Blue Heron	SSC		1	1	Imm		1		1
Tricolored Heron	SSC		1			2			1
Snowy Egret							1		
Reddish Egret	SSC						1 Ad,dm		1 Ad, dm
Cattle Egret									
Green Heron									5
Black-crowned Night-Heron									
Yellow-crowned Night-Heron			1		1	1	1		1
White Ibis	SSC	3	6	1	3	3	2		23
Roseate Spoonbill	T								1
Wood Stork	E						2		
Black Vulture									
Turkey Vulture									
Mallard/Mottled Hybrid			2	1	1				2
Mottled Duck					1	3			1
Red-breasted Merganser									
Osprey		1		2, nest	3	3	3		1, nest
Pied-bill Grebe									2
Black-bellied Plover			1						
American Oystercatcher	SSC	5	1						
Willet				3		1	1		
Spotted Sandpiper		2				1			
Ruddy Turnstone				1					
Dunlin					10				
Laughing Gull			55						
Ring-billed Gull			4						
Belted Kingfisher						2	2		2
Downy Woodpecker							1		
Blue Jay							1		
Fish Crow		3		2	3				
Common Grackle							1		

Notes: Listings – Florida Fish and Wildlife Conservation Commission listings include E = Endangered, T= Threatened, SSC = Species of Special Concern. Abbreviations: Imm = immature; ad = adult; dm = dark morph.

Mud and grass flats, shallows and shores of Sarasota Bay are important foraging areas for species such as Peregrine Falcons (*Falco peregrinus*), an uncommon but regular migrant and winter resident, Bald Eagles (*Haliaeetus leucocephalus*) which forage regularly on and near Sarasota Bay, wintering White Pelicans (*Pelecanus erythrorhynchos*), and shorebirds in general. Although not censused annually, significant shorebird populations use exposed and shallow flats. During the spring and fall, and over the winter, shorebirds rely on the island and

mainland shores, mudflats, and grassflats of the eastern side of Sarasota Bay. Also, neotropical songbirds migrate through the area on spring and fall migrations and use mangroves, hammock trees, and habitats along Sarasota Bay. About 143 species occur in the Sarasota Bay area (Table 6).

Table 6. Bird species known or expected to occur in Sarasota Bay around Bowlees Creek Island.

COMMON NAME	SCIENTIFIC NAME	STATE LISTING	NESTS	SEASONAL STATUS				COMMENTS; HABITAT
				SP	SU	F	W	
Common Loon	*Gavia immer*	-		O		R	O	open water
Pied-billed Grebe	*Podilymbus podiceps*	-					O	
Horned Grebe	*Podiceps auritus*	-		U		U	C	open water
American White Pelican	*Pelecanus erythrorhynchos*	-		C	O	U	C	open water, sandbars, shallows
Brown Pelican	*Pelecanus occidentalis*	SSC	X	C	C	C	C	islands, beaches, open water
Double-crested Cormorant	*Phalacrocorax auritus*	-	X	C	C	C	C	
Anhinga	*Anhinga anhinga*	-	X	C	C	C	C	
Magnificent Frigatebird	*Fregata magnificens rothschildi*	-		O	U	O		forages over open water
Great Blue Heron	*Ardea herodias*	-	X	C	C	C	C	
Great Egret	*Ardea alba*	-	X	C	C	C	C	
Snowy Egret	*Egretta thula*	SSC	X	C	C	C	C	
Little Blue Heron	*Egretta caerulea*	SSC	X	C	C	C	C	
Tricolored Heron	*Egretta tricolor*	SSC	X	C	C	C	C	
Reddish Egret	*Egretta rufescens*	SSC	X	U	U	U	U	forages on shallow flats
Cattle Egret	*Bubulcus ibis*	-	X	C	C	C	C	
Green Heron	*Butorides striatus*	-	X	C	C	C	C	
Black-crowned Night-Heron	*Nycticorax nycticorax*	-	X	U	U	U	U	
Yellow-crowned Night-Heron	*Nyctanassa violacea*	-	X	C	C	C	C	
White Ibis	*Eudocimus albus*	SSC	X	C	C	C	C	feeds in marshes and on flats
Glossy Ibis	*Plegadis falcinellus*	-	X	C	C	U	U	feeds in South Parcel marshes
Roseate Spoonbill	*Ajaia ajaja*	SSC	X	C	C	U	U	
Wood Stork	*Mycteria americana*	E		O	O	O	O	flats, mangroves
Black Vulture	*Coragyps atratus*	-	X	C	C	C	C	
Turkey Vulture	*Cathartes aura*	-		C	C	C	C	
Gadwall	*Anas strepera*	-		O		O	U	
American Wigeon	*Anas americana*	-		U		U	C	
Mallard	*Anas platyrhynchos*	-		R		R	U	
Mottled Duck	*Anas fulvigula*	-	X	C	C	C	C	

COMMON NAME	SCIENTIFIC NAME	STATE LISTING	NESTS	SEASONAL STATUS				COMMENTS; HABITAT
				SP	SU	F	W	
Blue-winged Teal	*Anas discors*	-		U	R	C	C	
Northern Shoveler	*Anas clypeata*	-		U	R	U	C	
Northern Pintail	*Anas acuta*	-		U		U	U	
Green-winged Teal	*Anas crecca*	-		U	R	C	C	
Lesser Scaup	*Aythya affinis*	-		C	O	C	C	large flocks on bay waters in winter
White-winged Scoter	*Melanitta fusca*	-					R	
Oldsquaw	*Clangula hyemalis*	-		R			R	
Red-breasted Merganser	*Mergus serrator*	-		C	U	C	C	
Ruddy Duck	*Oxyura jamaicensis*	-		U	R	U	C	
Osprey	*Pandion haliaetus*	-	X	C	C	C	C	forages throughout area
Bald Eagle	*Haliaeetus leucocephalus*	T		U	U	U	U	approximately 15 nests in Sarasota and Manatee Counties
Northern Harrier	*Circus cyaneus*	-		U		U	U	
Sharp-shinned Hawk	*Accipiter striatus*	-		U		U	U	
Cooper's Hawk	*Accipiter cooperii*	-		R		R	R	
Red-shouldered Hawk	*Buteo lineatus*	-		U	U	U	U	
Red-tailed Hawk	*Buteo jamaicensis*	-		U	U	U	U	
American Kestrel	*Falco sparverius*	-		U		U	U	
Merlin	*Falco columbarius*	-		O		O	O	
Peregrine Falcon	*Falco peregrinus*	T		O		O	O	
Clapper Rail	*Rallus longirostris*	-	X	U	U	U	U	
Black-bellied Plover	*Pluvialis squatarola*	-		C	U	C	C	
Wilson's Plover	*Charadrius wilsonia*	-		U	U	U	C	
Semipalmated Plover	*Charadrius semipalmatus*	-		C	U	C	C	
Killdeer	*Charadrius vociferus*	-		U	U	U	U	
American Oystercatcher	*Haematopus palliatus*	SSC	X	U	U	U	U	
Greater Yellowlegs	*Tringa melanoleuca*	-		C	U	C	U	
Lesser Yellowlegs	*Tringa flavipes*	-		C	U	C	C	
Willet	*Catoptrophorus semipalmatus*	-	X	C	C	C	C	breeds in high marsh, forages on marsh edges and flats
Spotted Sandpiper	*Actitis macularia*	-		C	O	C	C	
Whimbrel	*Numenius phaeopus*	-		O	O	O	O	

COMMON NAME	SCIENTIFIC NAME	STATE LISTING	NESTS	SEASONAL STATUS				COMMENTS; HABITAT
				SP	SU	F	W	
Long-billed Curlew	*Numenius americanus*	-		O		O	O	
Marbled Godwit	*Limosa fedoa*	-		C	O	C	U	
Ruddy Turnstone	*Arenaria interpres*	-		C	U	C	C	
Red Knot	*Calidris canutus*	-		C	O	C	C	
Sanderling	*Calidris alba*	-		U		U	U	
Semipalmated Sandpiper	*Calidris pusilla*	-		C	U	C		
Western Sandpiper	*Calidris mauri*	-		C	U	C	C	
Least Sandpiper	*Calidris minutilla*	-		C	U	C	C	
Dunlin	*Calidris alpina*	-		C	O	C	C	
Short-billed Dowitcher	*Limnodromus griseus*	-		C	U	C	C	
Laughing Gull	*Larus atricilla*	-	X	C	C	C	C	abundant; islands, shores, flats, open water
Ring-billed Gull	*Larus delawarensis*	-		C	O	C	C	
Herring Gull	*Larus argentatus*	-		U	O	U	U	
Caspian Tern	*Sterna caspia*	-	X	U	U	U	U	island shores and sandbars, forages over open water
Royal Tern	*Sterna maxima*	-	X	C	C	C	C	island shores and sandbars, forages over open water
Sandwich Tern	*Sterna sandvicensis*	-	X	U	U	U	U	island shores and sandbars, forages over open water
Common Tern	*Sterna hirundo*	-		R	O	O	R	island shores and sandbars, forages over open water
Forster's Tern	*Sterna forsteri*	-		C	U	C	C	island shores and sandbars, forages over open water
Least Tern	*Sterna antillarum*	T	X	C	C	U		island shores and sandbars, forages over open water
Black Tern	*Chlidonias niger*	-		U	C	U		island shores and sandbars, forages over open water
Black Skimmer	*Rynchops niger*	SSC	X	C	C	U	U	island shores and sandbars, forages over open water and coves, creeks
Rock Dove	*Columba livia*	-	X	C	C	C	C	nests in manmade structures
Mourning Dove	*Zenaida macroura*	-	X	C	C	C	C	
Common Ground-Dove	*Columbina passerina*	-	X	U	U	U	U	
Yellow-billed Cuckoo	*Coccyzus americanus*	-		U	U	U		nests in mangroves in Florida
Mangrove Cuckoo	*Coccyzus minor*	-		R	R			possibly decreasing locally due to Brown-headed Cowbird nest parasitism
Chuck-will's-widow	*Caprimulgus carolinensis*	-	X	U	U	U		
Chimney Swift	*Chaetura pelagica*	-		U	U	U		
Ruby-throated Hummingbird	*Archilochus colubris*	-		U		U		
Belted Kingfisher	*Ceryle alcyon*	-		U	O	C	C	

COMMON NAME	SCIENTIFIC NAME	STATE LISTING	NESTS	SEASONAL STATUS				COMMENTS; HABITAT
				SP	SU	F	W	
Red-bellied Woodpecker	*Melanerpes carolinus*	-	X	C	C	C	C	
Downy Woodpecker	*Picoides pubescens*	-		C	C	C	C	
Northern Flicker	*Colaptes auratus*	-		C	C	C	C	
Eastern Phoebe	*Sayornis phoebe*	-		U		U	C	
Great Crested Flycatcher	*Myiarchus crinitus*	-	X	C	C	C	U	
Gray Kingbird	*Tyrannus dominicensis*	-	X	U	U	U		
Loggerhead Shrike	*Lanius ludovicianus*	-	X	U	U	U	U	
White-eyed Vireo	*Vireo griseus*	-	X	C	C	C	U	
Yellow-throated Vireo	*Vireo flavifrons*	-		R	R	R		
Solitary Vireo	*Vireo solitarius*	-		U	R	U	U	
Red-eyed Vireo	*Vireo olivaceus*	-		C	U	C		
Black-whiskered Vireo	*Vireo altiloquus*	-		R	R	R		nests in mangroves in Florida; possibly extirpated
Blue Jay	*Cyanocitta cristata*	-		C	C	C	C	
Fish Crow	*Corvus ossifragus*	-	X	C	C	C	C	
Purple Martin	*Progne subis*	-		C	C	U		
Tree Swallow	*Tachycineta bicolor*	-		C	U	C	U	
N. Rough-winged Swallow	*Stelgidopteryx serripennis*	-	X	U	U	U		
Ruby-crowned Kinglet	*Regulus calendula*	-		C		C	C	
Blue-gray Gnatcatcher	*Polioptila caerulea*	-		C	U	C	C	
American Robin	*Turdus migratorius*	-		U		U	C	
Gray Catbird	*Dumetella carolinensis*	-	X	C		C	C	
Northern Mockingbird	*Mimus polyglottos*	-	X	C	C	C	C	
European Starling	*Sturnus vulgaris*	-		C	C	C	C	
Cedar Waxwing	*Bombycilla cedrorum*	-		U			U	
Orange-crowned Warbler	*Vermivora celata*	-		R		R	U	
Northern Parula	*Parula americana*	-		C	U	C	R	
Yellow Warbler	*Dendroica petechia*	-				R	R	
Magnolia Warbler	*Dendroica magnolia*	-		O		O		
Cape May Warbler	*Dendroica tigrina*	-		U	R	O		
Black-throated Blue Warbler	*Dendroica caerulescens*	-		U				
Yellow-rumped Warbler	*Dendroica coronata*	-		C		U	C	

COMMON NAME	SCIENTIFIC NAME	STATE LISTING	NESTS	SEASONAL STATUS				COMMENTS; HABITAT
				SP	SU	F	W	
Yellow-throated Warbler	*Dendroica dominica*	-		U	R	U	U	
Prairie Warbler	*Dendroica discolor discolor*	-	X	U	U	U	U	nests in mangroves in Florida
Palm Warbler	*Dendroica palmarum*	-		U		U	C	
Black-and-white Warbler	*Mniotilta varia*	-		C		C	C	
American Redstart	*Setophaga ruticilla ruticilla*	-		U	R	U	R	
Ovenbird	*Seiurus aurocapillus*	-		U		U	U	
Northern Waterthrush	*Seiurus noveboracensis*	-		U		U	R	
Louisiana Waterthrush	*Seiurus motacilla*	-				R	R	
Common Yellowthroat	*Geothlypis trichas*	-		C	U	C	C	
Summer Tanager	*Piranga rubra*	-		U	U	U	R	
Scarlet Tanager	*Piranga olivacea*	-				O		
Northern Cardinal	*Cardinalis cardinalis*	-	X	C	C	C	C	
Rose-breasted Grosbeak	*Pheucticus ludovicianus*	-		U			R	
Indigo Bunting	*Passerina cyanea*	-		U			R	
Painted Bunting	*Passerina ciris*	-		U			R	
Bobolink	*Dolichonyx oryzivorus*	-		U		U		
Red-winged Blackbird	*Agelaius phoeniceus*	-	X	C	C	C	C	
Common Grackle	*Quiscalus quiscula*	-		C	C	C	C	
Boat-tailed Grackle	*Quiscalus major*	-		C	C	C	C	
Brown-headed Cowbird	*Molothrus ater*	-		C	R	C	C	nest parasites on obligate mangrove nesters (Prairie Warblers, Black-whiskered Vireos, Mangrove Cuckoos) and other passerines.
Orchard Oriole	*Icterus spurius*	-		U		U		
Baltimore Oriole	*Icterus galbula*	-		U		U		
American Goldfinch	*Carduelis tristis*	-		U			U	
House Sparrow	*Passer domesticus*	-		U	U	U	U	

Notes: Occurrence code: S—summer resident, T—transient, P—permanent resident, I—irregular or accidental, W—winter resident

Selected Species Accounts

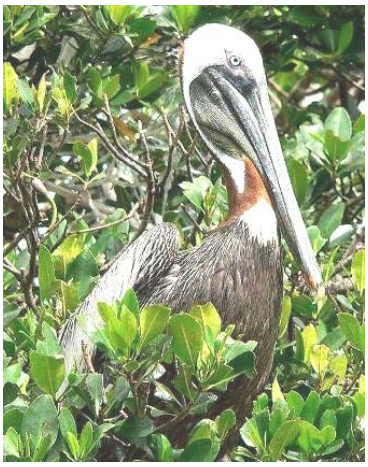
Brief status summaries are provided below for several species that are particularly dependent on the habitats of Bowlees Creek Island Bird Sanctuary to illustrate the significance of this area.

Red-bellied Woodpecker (*Melanerpes carolinus*): Red-bellied Woodpeckers forage for beetle larvae under the bark of decaying trees.

Figure 18. Red-bellied Woodpecker (photo credit: Don Margeson) (left).

Pine Warbler (*Dendroica pinus*): Neotropical migrant songbird species use mangroves and coastal hammocks.

Figure 19. Pine Warbler (photo credit: Don Margeson) (right).



White Pelican (*Pelecanus erythrorhynchos*): White Pelicans over-winter annually (arriving from nesting areas in North Dakota, Minnesota, and Canada in October and wintering until mid-March) in Sarasota Bay, using the oysterbars and sandbars as roost sites. White Pelicans forage widely throughout the area in fresh and salt water, collecting schools of fish startled by their dangling orange feet and scooping them up in their expandable pouches.

Brown Pelican *(Pelecanus occidentalis*): The Brown Pelican is listed by FFWCC as a "species of special concern". Brown Pelicans dive for small fish prey in Sarasota Bay and roost on Bowlees Creek Island. Menhaden is probably the key prey species, but anchovies, silversides, mullet and other small fish are also taken.

Figure 20. Adult Brown Pelican (photo credit: Bruce Ackerman, FCISP files).

Reddish Egret (*Egretta rufescens*): This is the rarest heron in North America with only 2,000 breeding pairs estimated to occur throughout its range, and only about 375 pairs are estimated to be in Florida (Paul 1996). The species was likely extirpated from Florida by plume hunters around 1900, and nesting birds did not return to Tampa Bay until 1974 when two pairs were found at nesting in Hillsborough Bay at the Alafia Bank Bird Sanctuary (Paul et al. 1975). The local population has spread to include three nesting sites in Sarasota Bay (Audubon's Cortez Key Sanctuary, Bishop Bayou, and the Roberts Bay Bird Islands) and has increased to about 80 pairs across the west central coastal Florida region. This species is a habitat specialist, requiring barren, shallow coastal flats for foraging. The shallow mud and sand flats and oysterbars near Bowlees Creek Bird Island and the shallow shorelines of Sarasota Bay provide critical foraging habitat for this species. The Reddish Egret is listed by FFWCC as a "Species of Special Concern".

Figure 21. Adult Reddish Egret foraging on shallow sandflats (Photo credit: J. Wiley).

Black-crowned Night-Heron (*Nycticorax nycticorax*): the Black-crowned Night-Heron is the most widespread heron in the world. It is most active at dusk and at night, feeding in the same areas that other heron species frequent during the day.

Figure 22. Adult Black-crowned Night-Heron in black mangrove (photo credit: Don Margeson).

Yellow-crowned Night-Heron (*Nyctanassa violacea*): It is difficult to conduct population surveys of this species because of its crepuscular and nocturnal behaviors, and use of near-coastal upland slash pine and oak nesting locations. They generally eat crabs, supplemented with small fish and invertebrates.

Figure 23. The broad beak of the Yellow-crowned Night-Heron accommodates capture of its main prey item, small crabs. Note the crab parts in the regurgitated pellets (photo credit: Lauren Deaner).

Other Small Herons: Populations of the Snowy Egret (*Egretta thula*), Little Blue Heron (*Egretta caerulea*), and Tricolored Heron (*Egretta tricolor*) have all declined significantly in Florida in recent decades and all three species are listed by the state as "species of special concern". These species nest in groups called colonies on islands in Tampa and Sarasota Bay that have no mammalian predators.

The main factor affecting the local populations of these small herons is loss of freshwater wetland foraging habitat. Acquisition, protection and management of regional wetland foraging habitats must be pursued aggressively if the future of these species is to be secured. All three small heron species require freshwater wetland prey year-around, with increased requirements during the nesting season. These herons have been observed foraging along Bowlees Creek Island shorelines.

Figure 24. Adult Snowy Egret (photo credit: Don Margeson).

Figure 25. Adult Little Blue Heron (above) and adult Tricolored Heron (below) (photo credit: FCISP photo files).

Green Heron (*Butorides virenscens*): A secretive small heron species that nests in colonies with other colonial waterbirds and

also along shorelines of creeks, lakes, and ponds where spindly vegetation and quiet young provide protection from mammalian predators. Green Herons eat small fish.

Figure 26. Green Heron (photo credit: FCISP files).

Anhinga (*Anhinga anhinga*): Needle-beaked underwater visual predators of swimming fish prey, Anhingas occur generally around freshwater, but also nest on estuary islands in colonies with other colonial waterbirds.

Figure 27. Adult male Anhinga (photo credit: FCISP files).

Great Egrets: (*Ardea alba*). Great Egrets nest on islands in colonies of other waterbirds. Wetland foragers, they eat a wide variety of prey, including fish, frogs, other amphibians, snakes, and other wetland species.

Figure 28. Adult Great Egret in breeding condition. Note the bright green lores (skin around the eyes) that signal courtship readiness (photo credit: Don Margeson).

White Ibis *(Eudocimus albus)*: White Ibis are the most abundant species wading bird species in Florida, although biologists estimate that the population in the state has declined by 80% since the 1940s. For this reason, White Ibis are listed by the FFWCC as a "species of special concern". This decline is due to urban and suburban development, and countywide loss of pasturelands, wet prairie, and freshwater wetland habitats, all of which provide essential foraging resources, since White Ibis require freshwater wetland prey to feed their nestlings (Johnston and Bildstein 1990).

Figure 29. Adult White Ibis (photo credit: Don Margeson).

Roseate Spoonbill (*Ajaia ajaja*): Like the Reddish Egret, the Roseate Spoonbill is another rare coastal species that was

killed for sale of its feathers to the point of near extinction. Spoonbills only recently (*c.* 1975) returned to west central Florida (in Tampa Bay at the Alafia Bank Bird Sanctuary) as a nesting species. In the last few years, nesting has spread to two colonies in Sarasota Bay (Cortez Key Sanctuary and Roberts Bay Bird Islands) but, of the total area population of about 320 pairs, over 80% of the population still nest at the Alafia Bank Bird Sanctuary in Hillsborough Bay. Spoonbills forage extensively on coastal flats, tidal creeks and local wetland habitats. The shallow water and wetland habitats of Sarasota Bay provide crucial foraging habitats for this species.

Figure 30. Roseate Spoonbills (Photo credit: Carlton Ward).

Willet (*Catoptrophorus semipalmatus*): Willets breed in Florida in the coastal marsh grasses, as inconspicuous nesters. They are territorial defenders of nesting territories along shoreline habitats. Chicks hatch as precocially capable young, and forage for themselves as well as being fed by their attentive parents, who also defend them against aerial predators. Chicks will use their effective camouflage to hide from ground predators, crouching motionless against an object on the beach or shoreline that creates a shadow. Willets eat invertebrates and small fish of the beaches and shores, including horseshoe crab eggs. Populations are not well surveyed in Florida due to their territorial and hidden nesting behavior, but are believed to be negatively impacted by human population use of beaches and development of coastal marshes.

Figure 31. Willet (photo credit: Don Margeson).

American Oystercatcher *(Haematopus palliatus)*: This is an extremely rare species in Florida, with recent FFWCC surveys observing less than 400 breeding pairs in the state. Of these, 75 (25%) occur in Hillsborough Bay, (Paul and Below 1991, Hodgson et al. 2008). Nests, consisting of shallow "scrapes" in the sand, are placed just above the high tide line along island shorelines. Oystercatchers forage extensively along the mangrove edges and oysterbars of Sarasota Bay.

Figure 32. Adult American Oystercatcher (photo credit: Pat Leary).

Black Skimmer (*Rynchops niger*): Although highly coastal, this species is widespread in Florida with about 2,000 breeding pairs at least 20 known colonies statewide (J. Gore, Florida Fish and Wildlife Conservation Commission, pers. comm.). Fully 60% of the state population occurs at eight west central Florida coastal colonies (Hodgson et al. 2006). Skimmers use protected bars for resting and the shallow waters of Sarasota Bay and adjacent inshore areas for foraging.

Figure 33. Adult Black Skimmer (photo credit: FCISP files).

Mammals

At least 14 species of mammals are known to near Bowlees Creek Island (Table 7). Among the terrestrial mammals, one management issue is critical: the impacts of raccoons (*Procyon lotor*) on nesting birds. Raccoons commonly forage along mangrove shorelines and shallow flats. Excellent swimmers, they occasionally reach bird nesting colony islands with the immediate result that nesting birds abandon the site.

Figure 34. Raccoons preclude nesting by most colonial waterbirds (photo credit: FCISP).

Table 7. Mammals occurring in the vicinity of Bowlees Creek Island Bird Sanctuary, Sarasota Bay.

COMMON NAME	SCIENTIFIC NAME	OBSERVATIONS	
		Reported	Expected
Virginia opossum	*Didelphis virginiana*	X	
Bats	unidentified species	X	
Nine-banded armadillo	*Dasypus novemcinctus*	X	
marsh rabbit	*Sylvilagus palustris*	X	
eastern cottontail rabbit	*Sylvilagus floridanus*	X	
eastern gray squirrel	*Sciurus carolinensis*	X	
rice rat	*Oryzomys palustris*	X	
hispid cotton rat	*Sigmodon hispidus*	X	
black rat	*Rattus rattus*	X	
nutria	*Myocastor coypus*	X	
gray fox	*Urocyon cinereoargenteus*		X
raccoon	*Procyon lotor*	X	
river otter	*Lutra canadensis*		X
Coyote	*Canis latrans*		X
bobcat	*Lynx rufus*	X	

Notes: Adapted from Paul (1982), Wolfe and Drew (1990), and unpublished observations of A. Burdett, R. Paul, A. Paul, and J. Youngman.

Two marine mammals, bottlenose dolphins (*Tursiops truncatus*) and Florida manatees (*Trichechus manatus*), are well known residents of waters surrounding Bowlees Creek Island. Manatees are particularly vulnerable to boat collisions, and considerable attention is devoted statewide to their protection. Management recommendations to protect manatees are included in this management plan for Bowlees Creek Island.

Protected Species

About 19 species of plants and animals are protected by the U.S. Fish and Wildlife Service through the Endangered Species Act, or through listing by the FFWCC or the Florida Department of Agriculture and Consumer Services (FDACS) that are known or likely to occur at Bowlees Creek Island or in the Bowlees Creek watershed (Table 8).

Figure 35. Adult Least Tern (Photo credit: FWC).

Table 8. Endangered and threatened species known or likely to occur at Bowlees Creek Island.

TAXON	SCIENTIFIC NAME	COMMON NAME	FFWCC	FDACS	USFWS	CITES
Birds						
	Ajaia ajaja	Roseate Spoonbill	SSC	—	—	—
	Circus cyaneus	Northern Harrier	—	—	—	II
	Egretta caerulea	Little Blue Heron	SSC	—	—	—
	Egretta rufescens	Reddish Egret	SSC	—	C2	—
	Egretta thula	Snowy Egret	SSC	—	—	—
	Egretta tricolor	Tricolored Heron	SSC	—	—	—
	Eudocimus albus	White Ibis	SSC	—	—	—
	Haematopus palliatus	American Oystercatcher	SSC	—	—	—

TAXON	SCIENTIFIC NAME	COMMON NAME	FFWCC	FDACS	USFWS	CITES
	Haliaeetus leucocephalus	Bald Eagle	T	—	T	I
	Lanius ludovicianus	Loggerhead Shrike	—	—	C2	—
	Mycteria americana	Wood Stork	E	—	E	—
	Pandion haliaetus	Osprey	—	—	—	II
	Pelecanus occidentalis	Brown Pelican	SSC	—	—	—
	Rynchops niger	Black Skimmer	SSC	—	—	—
	Sterna antillarum	Least Tern	T	—	—	—
Mammals						
	Lutra canadensis	river otter	—	—	—	II
	Trichechus manatus	West Indian manatee	E	—	E	I
Plants						
	Ilex cassine	dahoon holly	CE	—	—	—
	Opuntia stricta	erect prickly-pear	T	—	—	II

Key:

FFWCC - Florida Fish and Wildlife Conservation Commission (previously Florida Game and Fresh Water Fish Commission) (list published in Section 39-27.003-005, Florida Administrative Code).

FDACS - Florida Department of Agriculture and Consumer Services (list published in Preservation of Native Flora of Florida Act, Section 581.185-187, Florida Statutes).

USFWS - United States Fish and Wildlife Service (list published in List of Endangered and Threatened Wildlife and Plants, 50 CFR 17.11-12).

CITES - Convention on International Trade in Endangered Species of Wild Fauna and Floras.

E - Endangered

T - Threatened

T(S/A) - Threatened due to similarity of appearance

SSC - Species of Special Concern

CE - Commercially exploited

C2 - A candidate for federal listing with some evidence of vulnerability but for which not enough information exists to justify listing; not federally protected under the Endangered Species Act, but the USFWS "...encourages their consideration in environmental planning" (US FR Vol. 55 No. 35, pp. 6184–6229).

I - Appendix I Species

II - Appendix II Species

UR1 - Under review for federal listing, with substantial evidence in existence indicating at least some degree of biological vulnerability and/or threat.

UR2 - Under review for listing, but substantial evidence of biological vulnerability and/or threat is lacking.

UR3 - Still formally under review for listing, but no longer being considered for listing due to existing pervasive evidence of extinction.

UR4 - Still formally under review for listing, but no longer being considered for listing because current taxonomic understanding indicates species in an invalid taxon and thus ineligible for listing.

UR5 - Still formally under review for listing, but no longer considered for listing because recent information indicates species is more widespread or abundant than previously believed.

Appendix 3 - Photographs of Bowlees Creek Island Bird Sanctuary.

All photographs were taken during a site inspection on October 16, 2007, by the Florida Coastal Islands Sanctuaries.

Bowlees Creek Island Bird Sanctuary (west shoreline).

Derelict vessel, tire debris, and refuse on Bowlees Creek Bird Island; Osprey in dead Australian pine on left.

Great Egret roosting in mangroves on the southeast side of Bowlees Creek Bird Island.

Red mangrove islet, white mangroves on shoreline, and black mangrove behind.

Brazilian pepper thicket.

Campsite with trash and debris.

Appendix 4 - Bowlees Creek Island Restoration Plan

Bowlees Creek Island is a 3.0-acre island located at the mouth of Bowlees Creek in Manatee County, Florida. This spoil island was created as a result of historical dredging activities in Sarasota Bay. Bowlees Creek Island is managed by the Audubon of Florida's Coastal Islands Program (Audubon) pursuant to a lease among Audubon and the Florida Internal Improvement Trust Fund. This island was identified as a candidate site for habitat restoration activities by the Sarasota Bay Estuary Program within their Five-Year Habitat Restoration Master Plan. Audubon staff conducted a preliminary habitat evaluation of the island, and have endorsed developing a restoration plan for the island to improve wildlife habitat primarily through exotic vegetation removal and installation of native plants.

Site investigations were performed (November 2007 & January 2008) to gauge the extent of non-native vegetation and identify restoration opportunities for the island. The island is currently vegetated by wetland and upland species. The wetland areas are dominated by red, black, and white mangroves (*Rhizophora mangle*, *Avicennia germinans*, *Laguncularia racemosa*, respectively) and are often fringed by buttonwood (*Conocarpus erectus*). The upland areas are dominated by oaks, strangler figs, and exotic species such as Australian pine (*Casuarina equisetifolia*), Brazilian pepper (*Schinus terebinthifolius*). Carrotwood trees (*Cupaniopsis anacardiodes*) are the primary non-native species onsite. Due to the presence of healthy native vegetation covering approximately 50% of the island, the most effect restoration strategy would be to selectively remove the exotic species and replant with native vegetation. A restoration plan was developed (Figure 1) which identifies areas of exotic plant infestation that will be eradicated and replanted with native species. Fortunately, the majority of the Australian pine has already been treated with herbicide and many are dead. However, the carrotwood trees and some limited Brazilian pepper are still thriving on the island. These will be targeted for removal. In addition, cleaning out the existing flow ways (shown on the plan) would improve flushing and would not require heavy machinery. The trash on the island (that appears to both float onto the island and get dumped by careless campers and transients) needs to be disposed of properly. After project completion, trash cleanups should be scheduled on a regular basis.

The exotic removal on 1.6 acres (Figure 1) will be accomplished through both mechanical and manual removal techniques. Because the project area is an island it would likely be cost prohibitive to take the felled trees offsite. Therefore, mulching on site is recommended. It will be necessary to transport the tree removal equipment via water or air onto the island. A few of the larger Australian pines could be re-treated with herbicide and then left as snags for ospreys (Pandion haliaetus) and other birds to utilize for nesting. The few areas dominated by Brazilian pepper are located along the shoreline.

Native plant installation is necessary since there are limited opportunities for natural re-growth of native species. Appropriate plant palettes have been developed and will be applied to the affected areas with specific plants targeted into areas dependent upon existing ground elevations, anticipated high water elevations, and historic vegetative cover. Subsequent to project completion, regular maintenance activities should be implemented to ensure that the wetland and upland preserves are kept free of exotic and nuisance vegetation as well as trash.

A recommended list of native vegetation for the Bowlees Creek Island Habitat Restoration is attached (Table 1). Ideally, these species should be planted in the height of the regular rainy season (June- August) to facilitate natural hydration of the planted material. Also, mulched material created from the removed exotic plants should be placed around the newly planted material to inhibit weedy growth and retain moisture. Watering (if necessary) will be expensive due to the isolated nature of the site.

Table 1. Exotic vegetation targeted for removal on Bowlees Creek Spoil Island.

Vegetation Type	Amount (acres)
Australian pine	0.07
Brazilian pepper and carrotwood	0.06
Brazilian pepper	0.02
Carrotwood	1.43
Total	1.58

Table 2. List of plants (species and numbers) proposed for Bowlees Creek Island Restoration Project. All plants are to be installed above 3.0 NGVD.

PLANTING SPECIFICATION						
Zone	Elevation (NGVD)	Species		Size	Spacing (feet on center)	Quantity
		Scientific Name	Common Name			
Coastal Hammock						
	Above 3.0 as directed	*Forestiera segregata*	Florida privet	3-gallon	10.0	150
		Juniperus virginiana	Southern red cedar	3-gallon	10.0	50
		Myrsine floridana	Myrsine	3-gallon	10.0	50
			Hercules club			
			hackberry			50
		Sabal palmetto	Cabbage palm	3-gallon	10.0	25
		Quercus virginiana	Live oak	3-gallon	10.0	50
		Pinus elliottii	Slash pine	3-gallon	10.0	10
		Bursera simaruba	Gumbo limbo	3-gallon	10.0	20
		Conocarpus erectus	Buttonwood	3-gallon	10.0	250
Coastal Shrubs						
	As directed	*Shrubs*				
		Cocoloba uvifera	Sea grape	1-gallon	5.0	700
		Ilex vomitoria	Yaupon holly	1-gallon	5.0	200
		Iva frutescens	Marsh elder	1-gallon	5.0	300
		Serenoa repens	Saw palmetto	1-gallon	5.0	300
		Muhlenbergia	Muhly grass	1-gallon	5.0	300
		Groundcover				
		Ipomoea pes-caprae	Railroad vine	2-in.	3.0	500
		Ipomoea stolonifera	Beach morning	2-in.	3.0	500
		Helianthus debilis	Dune sunflower	2-in.	3.0	500
		Gaillardia pulchella	Blanket sunflower	2-in. plugs	3.0	500

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BOWLEES CREEK
Sarasota County, Florida

BOWLEES CREEK ISLAND
CONCEPTUAL RESTORATION PLAN

Figure 1