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2.4 ECOLOGY

This section describes the terrestrial and aquatic resources found within the planned construction areas, the Turkey Point plant property, and the southeastern region of Florida. It provides the baseline from which to assess potential impacts of construction activities and facility operations associated with Units 6 & 7.

Regional Landscape

The approximately 11,000-acre Turkey Point plant property is located in Miami-Dade County, Florida, approximately 25 miles south of Miami on the coast adjacent to Biscayne Bay and Card Sound (Figure 2.4-1). The plant property is located within the subtropical coastal ecosystem of southeastern Florida. Much of the original coastal zone in the region has been converted to agriculture or residential/developed land. However, the Turkey Point plant property lies in a largely rural area dominated by swamp/marsh areas, even though the property is relatively close (25 miles) to the metropolis of Miami. The predominant land uses within 6 miles of the center point of Units 6 & 7 are wetlands (61 percent), forests (23 percent), agriculture (9 percent), urban/built-up land (5 percent), and other land uses (2 percent) (see Table 2.2-1). This area is typified by low elevation, generally less than elevation 10 feet (NAVD 88) (up to 10 miles west of Biscayne Bay), with open marsh and mangrove swamp habitats interspersed with tidal creek drainages flowing east and south toward Biscayne Bay and Card Sound. Many of the wetlands have become degraded by invasive exotic species such as Brazilian pepper (*Schinus terebinthifolius*), Australian pine (*Casuarina equisetifolia*), melaleuca (*Melaleuca quinquinervia*), and old world climbing fern (*Lygodium* species).

The hydrology of southern Florida is influenced by an extensive system of canals and levees created to buffer climatic extremes (flooding and drought). These water management structures were built in the 1950s and 1960s by the federal government and are managed by the South Florida Water Management District (SFWMD), a state agency. Approximately 1800 miles of canals and levees currently exist in southern Florida including Miami-Dade County, the location of the Turkey Point plant property. The corridors containing the proposed transmission lines and reclaimed water pipelines cross several of these canals.

General Site Description

The Turkey Point plant property contains two natural gas/oil steam electric generating units (Units 1 & 2), two pressurized water reactor nuclear units (Units 3 & 4), and one natural gas combined-cycle steam electric generating unit (Unit 5). Approximately 340 acres of the Turkey Point plant property consist of generating facilities, buildings, and parking areas, switchyard, and transmission line corridors associated with Units 1 through 5. (Subsection 2.2.1.1). In addition to the existing generating facilities and supporting infrastructure, a major landscape feature of the site is the approximately 5900-acre (2 miles by 5 miles) industrial wastewater facility. Current

land use at the Turkey Point property is described in Section 2.2 and shown in Figure 2.2-3. The existing Turkey Point facilities were established on mangrove-covered tidal flats, on land elevated by fill material. Although numerous drainage ditches and the industrial wastewater facility are located throughout the plant property, it contains no lakes or perennial streams. The Turkey Point plant property lies immediately adjacent to Biscayne Bay and Card Sound. The interface between the plant property and the bay/sound is primarily red mangrove (*Rhizophora mangle*) swamp. Seagrass beds containing shoal grass (*Halodule wrightii*), turtle grass (*Thalassia testudinum*), and manatee grass (*Syringodium filiforme*) are found throughout Biscayne Bay (NPS 1999).

Units 1-4 use the cooling canals of the industrial wastewater facility for condenser and auxiliary system cooling. The industrial wastewater facility also receives cooling tower blowdown from Unit 5. It is a closed-loop system that includes the canals adjacent to the Units 6 & 7 plant area (Figure 2.4-1). The industrial wastewater facility consists of 32 canals that carry warm water south away from the units and 7 canals that return cooled water to the units. Approximately 4400 acres of the industrial wastewater facility are open water. The canals are 200 feet wide and 1 to 3 feet deep. The berms are approximately 90 feet wide. Activities within the industrial wastewater facility include aquatic plant removal (3-year cycle), terrestrial vegetation removal from the berms (10-year cycle), and monitoring of the American crocodile (*Crocodylus acutus*) (see Subsection 2.4.1.2). The shallow canals are hypersaline (typically 40–50 parts per thousand [ppt] salinity), with water temperatures as high as 100.4^{o}F (38°C). Because of these environmental conditions, the resident fish assemblage is dominated by species adapted to living in harsh conditions (e.g., sheepshead minnow and several *Fundulus* species). The approximately 167 miles of the industrial wastewater facility are not waters of the United States or the state.

Units 6 & 7 Plant Area

The power blocks, makeup water reservoir, switchyard, and other infrastructure would be located on the Units 6 & 7 plant area, immediately south of Units 3 & 4 within the industrial wastewater facility. The plant area is approximately 218 acres that is a sparsely vegetated hypersaline mudflat, partially buffered from tidal influence by the industrial wastewater facility (see Figure 2.4-2). Two remnant canals cross the plant area. An ecological assessment of the Units 6 & 7 plant area and the adjacent laydown area was conducted in 2008, including habitat characterization and surveys for federal and state listed species. Wetlands were the primary habitat types occurring on this site, with non-wetland habitats making up the remainder.

Wetland habitats within the Units 6 & 7 plant area and the adjacent laydown area include mudflats (187.5 acres), remnant and active canals (25 acres), dwarf mangrove (17 acres), open water (16 acres), mangrove heads (12 acres), and wetland spoil areas (10 acres). Encircled by canals, the sparsely vegetated mudflats are inundated by water 3 to 4 months out of the year and a few hardy plant species that can tolerate these conditions persist, including saltwort (*Batis maritima*), sea oxeye daisies (*Borrichia* spp.), woody glasswort (*Salicornia virginica*), and dwarf

glasswort (*Salicornia bigelovii*). Dwarf mangrove habitats contain red mangrove as well as a few white mangrove (*Laguncularia racemosa*) and black mangrove (*Avicennia germinans*) stunted by high salinities and fluctuating water levels. The mangroves are located within the open water area on the western edge of the laydown area. The open water area joins the upper end of the industrial wastewater facility. Harsh conditions in the open water area limit submerged aquatic vegetation to scattered patches of widgeon grass (*Ruppia maritima*) and shoal grass. Mangrove heads, remnants of the original tidal creeks, contain primarily red mangrove, but white mangrove and black mangrove are also present. The connection between these creeks and Biscayne Bay were severed during construction of the industrial wastewater facility. Wetland spoil areas adjacent to remnant canals are typically occupied by Australian pine, buttonwood (*Conocarpus erectus*), and mangrove.

Non-wetland areas within the Units 6 & 7 plant area and adjacent laydown area include approximately 20 acres of fill area/roadway habitat and approximately 8 acres of upland spoil piles (Figure 2.4-2). The former are limerock aggregate uplands filled for construction of access roads, parking areas, and the land utilization facility. These areas are dominated by maintained grasses with wetland edges containing Brazilian pepper, buttonwood, and assorted herbaceous plants. Upland spoil piles were formed with spoil from the canal dredging operation. The vegetation in these areas is dominated by exotics such as Brazilian pepper and Australian pine, as well as poisonwood (*Metopium toxiferum*), buttonwood, wild sage (*Lantana involucrata*), ground orchid (*Bletia* spp.), and sea grape (*Cocoloba uvifera*).

The surface grade of the plant area varies from approximately elevation –2.4 to 0.8 feet (NAVD 88). The eastern margins of the plant area slope gently to the east perimeter canal, which is separated from Biscayne Bay by a 15 foot-high berm. There is no berm between the Units 6 & 7 plant area and the canal; however, when water levels rise in the canal, there is sheet flow to the west and the mudflats are inundated. The remnant canals would be eliminated during filling of the Units 6 & 7 plant area.

Laydown Areas

Two laydown areas would be created. The largest is 46 acres in size and would be located immediately west of the Units 6 & 7 plant area. Habitats present in this area include open water (industrial wastewater facility), dwarf mangroves, and existing facilities/roads. A smaller (6 acre) laydown area would occur on the site of a dead-end canal immediately northwest of the Units 6 & 7 plant area. This area is primarily an open water segment of the industrial wastewater facility, with adjoining upland spoils.

Nuclear Administration and Training Buildings and Parking Area

Nuclear administration and training buildings and a parking area would be located on two adjacent parcels (32 total acres) immediately north of the Units 6 & 7 plant area. These parcels are largely wetland habitats: mangrove swamps (24 acres), willows (2 acres), and fill areas/roads (6 acres).

Reclaimed Water Pipelines and FPL Reclaimed Water Treatment Facility

Underground pipelines would bring reclaimed water from the Miami-Dade Water and Sewer Department (MDWASD) South District Wastewater Treatment Plant (SDWWTP) to the FPL reclaimed water treatment facility for eventual use as makeup water. The pipelines would extend approximately 9 miles between the SDWWTP and the FPL reclaimed water treatment facility. For about 6.5 miles of their length, the pipelines would be collocated with the existing Clear Sky-to-Davis transmission line right-of-way and adjacent road and canal rights-of-way. Primary land covers would be wetlands (56 percent) and forested uplands (38 percent). The FPL reclaimed water treatment facility would be established on 44 acres of wetland habitat positioned between SW 344th Street/Palm Drive and the test canals. This habitat is primarily dwarf mangroves with some areas of sawgrass. The portion of the reclaimed water pipelines on the Turkey Point plant property (from the MDWASD South District Wastewater Treatment Plant to the FPL reclaimed water treatment facility, and from the FPL reclaimed water treatment facility to the makeup water reservoir) would potentially impact approximately 2 acres including dwarf mangrove habitat and a laydown area.

Potable Water Pipelines

Potable water pipelines, approximately 10 miles in length, would bring potable water from the Miami-Dade County Water and Sewer Department to the Units 6 & 7 plant area. The pipelines would generally follow existing roadways/corridors. Much of the pipelines would be adjacent to or within the corridors containing the access road improvements and construction along SW 328th Street/N. Canal Drive to SW 117th Avenue to SW 359th Street to the plant area. The habitats/ land covers associated with this corridor include existing roadways, urban/disturbed, agriculture, and various canals and wetlands.

Radial Collector Wells and Pipelines

Radial collector wells would provide a backup source of makeup water for Units 6 & 7. Four radial collector wells would be located on a 3-acre area on the northeastern tip of Turkey Point. Each radial collector well would consist of a central reinforced concrete caisson extending below the ground level with laterals projecting from the caisson. The well laterals would be advanced horizontally a distance of up to 900 feet beneath Biscayne Bay and installed at a depth of approximately 40 feet. The well location area is primarily industrial habitat, with a thin strip of

mangroves on the Biscayne Bay shore. Water supply pipelines from the radial collector wells to the cooling towers on the plant area, would occupy approximately 15 acres, and would be trenched under an existing perimeter access road, potentially impacting about 4.5 acres of previously-disturbed adjacent wetland habitats.

An additional 3-acre laydown area for the radial collector well construction would be built along the northwest-facing shore of barge turning basin, on previously disturbed industrial habitat.

Spoil Areas

Spoils from the Units 6 & 7 plant area, FPL reclaimed water treatment facility, and other construction locations would be deposited on three areas (total approximately 199 acres) within the industrial wastewater facility. Two of these areas would be located on wide berms on either side of Grand Canal, the primary north-south canal in the center of the facility. The third would be along a strip of land below the southern end of the industrial wastewater facility. All three areas have been used historically for spoil deposition and contain scattered patches of early succession vegetation (grasses, low shrubs, etc.).

Equipment Barge Unloading Area and Heavy Haul Road

The existing barge turning basin would be expanded, with a 0.15- acre equipment barge unloading area to be excavated on previously disturbed industrial lands on a shore of the barge turning area. A heavy haul road would be built over existing roads between the equipment barge unloading area and the Units 6 & 7 plant area.

Transmission Laydown Areas

In support of transmission expansion, a 3-acre laydown area would be established on previously disturbed lands (concrete pads currently functioning as parking areas) on the north side of SW 360th Street.

Previously Disturbed Areas on the Turkey Point Plant Property

Several previously disturbed areas on the Turkey Point plant property would be impacted including: security buildings and associated pull-off and parking areas, transmission infrastructure improvements (e.g., towers and bridges), sanitary waste pipeline from the existing units to the Units 6 & 7 plant area. These areas are typically previously filled areas or existing concrete pads.

Access Roads

A total of 10.8 miles of roadway expansions and improvements would be needed for construction-related travel (workers, fill material deliveries, equipment, etc.) for Units 6 & 7.

These improvements would be located adjacent to and along existing roads, transmission rights-of-ways, and canals. The access roads would traverse existing roadways, maintained grasses, agricultural lands, various wetland habitats, and upland forests.

FPL-Owned Fill Source

Offsite borrow material would be supplied from an approximately 300 acre site about 4.8 miles northwest of Units 6 & 7, other regional sources, or reused material. Most of the 300-acre site (244 acres) exists as agricultural lands, with the remainder as upland melaleuca and wetland habitats bordered by state canals.

Transmission Corridors

Transmission lines would extend, primarily along existing transmission corridors, from the Turkey Point plant property to the Levee, Pennsuco, Davis, and Miami substations (Figure 2.2-5). Existing transmission lines generally pass through typical habitats associated with the coastal region of southeast Florida. For the Clear Sky to Levee lines, these include agricultural fields, wetlands, forests, rangeland, and urban/built-up lands (Table 2.2-2). Some remnant pine rockland habitat is found along this line. This line would extend approximately 43 miles. The initial segment of this corridor would be new construction, crossing the northern end of the industrial wastewater facility and requiring new towers/poles and several bridges across the canals to access the tower sites on the berms. The line continues west for approximately 12 miles and turns north toward Levee. The northern section of this line crosses the eastern portion of the ENP (Figure 2.2-5). A likely alternative to impacting the ENP (West Option) follows the same corridor from Turkey Point, but shifts east to border the ENP (East Option) rather than cross it (Figure 2.2-5). A land exchange has been proposed to relocate the approximately 8-mile-long segment of this corridor within the ENP to the periphery of the park.

The route of the Clear Sky to Pennsuco line would use the Clear Sky to Levee corridor, then bypass the Levee substation and follow an existing 230 kV transmission easement for approximately 8 miles to connect to the existing Pennsuco substation. Land types traversed would include industrial lands, and smaller segments of rangeland, forest and wet prairie.

The Clear Sky to Davis corridor would extend approximately 19 miles north from the Turkey Point plant property through the following habitats: industrial, agricultural, forested, wetlands, and barren land (Table 2.2-2), using existing transmission rights-of-way.

The Davis to Miami corridor extends east for approximately 4 miles from the substation through agricultural and urban habitats, although it borders two protected pine rockland areas. This segment of the corridor is typically mowed to a low level. The corridor would then extend to the north for approximately 13 miles along a Miami Metro bus and rail corridor adjacent to U.S. Highway 1 through industrial/urban habitats.

2.4.1 TERRESTRIAL ECOLOGY

2.4.1.1 Terrestrial Wildlife

Wildlife species found in and around the Turkey Point plant property are typical of those in southeastern Florida coastal areas. Approximately 90 species of birds have been observed on or near the Turkey Point plant property and associated transmission corridors during surveys from 1972 and more recent surveys (2005–2009) (Table 2.4-1). These observed species reflect the predominance of aquatic habitats within and adjacent to the property. They include 19 shorebird species, 11 wading bird species, 6 seabird species, and 5 other waterbird species (pelicans, cormorants, mergansers). Several of these avian species are listed as endangered or designated as species of concern and are described in Subsection 2.4.1.1. A late winter survey for birds around the construction areas resulted in 36 avian species observed (see Table 2.4-1). Nine avian species (25%) were considered wintering birds, including most of the shorebirds. Most wading birds were relatively common, and the double-crested cormorant (*Phalacrocorax minor*) and white ibis (*Eudocimous albus*) were considered abundant. The predominance of observed water birds (wading birds, shorebirds, pelicans, etc.) was indicative of the primary habitats available: the industrial wastewater facility and the adjacent mangrove wetlands. A late summer survey (late June 2009) will occur to document wet/breeding season avian species and will be reported separately.

The diversity of mammalian fauna observed in surveys from the 1970s to the present is limited, also due to the predominance of aquatic habitats. Mammals observed on the property include white-tailed deer (*Odocoileus virginianus*), raccoon (*Procyon lotor*), opossum (*Didelphis virginiana*), eastern cottontail (*Silvilagus floridanus*), and various species of small rodents (Table 2.4-2). A small mammal trapping effort in April 2009 indicated that cotton rats (*Sigmodon hispidus*) and black rats (*Rattus rattus*) were the dominant small mammals in the construction activity areas (Figure 2.4-3). They were the only mammal species captured during 345 trap-nights (Sherman live traps). Cotton rats were found essentially site-wide and were relatively abundant whereas black rats were primarily found within the Units 6 & 7 plant area and adjacent mangrove areas. Based on pedestrian surveys, raccoons were also wide-spread and relatively abundant. Marsh rabbits (*Silvilagus palustris*) and/or their sign were relatively common within the vegetated portions of the spoil deposition areas. White-tailed deer and Virginia opossum sign were seen in the mangrove areas west of the industrial wastewater facility and along SW 344th Street/Palm Drive, respectively. No bats were observed during one hour of surveys between the existing facilities and a mangrove area.

Other fauna observed on the Turkey Point plant property since the 1970s include reptiles and amphibians (Table 2.4-2). The American crocodile is the most conspicuous reptile on site, breeding in the industrial wastewater facility and using all canals as travel corridors (see details in Subsection 2.4.1.1). Surveys for reptiles, excluding American crocodiles, and amphibians

occurred from April 13–16, 2009 and employed coverboards, minnow traps, dip nets, and pedestrian searches. Twenty coverboards were installed in late March of 2009 (Figure 2.4-2) within several areas that would be disturbed during Units 6 & 7 plant construction and checked daily during the week of April 13–16. Four minnow traps were set in the ditch along Palm Drive (reclaimed water treatment facility site) and 7 were set in the standing water within the administrative building/parking area site (two mangrove areas immediately north of the Units 6 & 7 plant area). The minnow traps were checked each day for two days. Dip nets were dragged through aquatic vegetation within the two mangrove areas. Planned construction areas were searched during approximately 1,000 minutes of pedestrian surveys (all areas combined). The April 2009 survey efforts documented four species of snakes, three species of lizards, three species of amphibians, and one species of turtle (Table 2.4-2). Based on these surveying efforts, only the Cuban brown anole (*Anolis sangrei*) was considered relatively abundant. Four of the 12 herpetological species observed were exotic species: Cuban brown anole, green iguana (*Iguana iguana*), Mediterranean gecko (*Hemidactylus turcicus*), and greenhouse frog (*Eleutherodactylus planirostris*).

Several of the animal species observed within the Turkey Point plant property are considered an invasive or exotic species and several exotic plant species (see the preceding section) exist on the property. Many other exotic animal species exist within the region, some as close as the adjacent Everglades Mitigation Bank (EMB) (see Subsection 2.4.1.3) (FPL 2008a), and, therefore, could exist on the Turkey Point plant property. These exotic species include marine toad (*Bufo marinus*), Cuban tree frog (*Osteopilus septentrionalis*), rock dove (*Columba livia*), scarlet ibis (*Eudocimus rubber*), spectacled caiman (*Caiman crocodylus*), and Indo-pacific gecko (*Hemidactylus garnoti*).

Wildlife species found within the Turkey Point plant property are common to the region and would be expected to be found in off-site project areas associated with Units 6 & 7: access roads, reclaimed water pipelines, transmission corridors and FPL owned fill source.

Although the Turkey Point plant property hosts such potential disease vectors as ticks and mosquitoes, no vector-borne diseases resulting from them are known.

2.4.1.2 Threatened and Endangered Species

The U.S. Fish and Wildlife Service (USFWS) is responsible for designating areas as “critical habitat” for federally listed endangered and threatened species. Such areas are protected to aid the recovery of the species and may require special management activities. Critical habitats associated with two species found in the Turkey Point plant property are addressed below within the descriptions of the individual species.

Endangered and threatened species listed for Miami-Dade County, the location of the Turkey Point plant property and the existing and proposed transmission corridors, are identified in Table 2.4-3 although only a few species exist on Turkey Point plant property. The list is based on classifications of the USFWS (USFWS Feb 2008a) and Florida Natural Areas Inventory (FNAI 2008). Four federally-listed species have been observed within the Turkey Point plant property: American crocodile, Eastern indigo snake, Florida manatee, and wood stork. As described below, several state-listed species have also been observed. Approximately 170 animal and plant species are either federal- or state-listed as endangered, threatened, or candidates, or designated (not listed) species of concern for Miami-Dade County, with the vast majority being plant species (Table 2.4-3). It should be noted that records of federally-listed species on the state and federal Web sites occasionally differ, with the state including all counties within the historical range of these species and the federal listing including only counties with sightings. As a conservative approach, species in counties from both sources have been included. Also, it is acknowledged that these listings reflect only recorded or historical occurrences and the possibility exists that other (unrecorded) rare species might exist in this county. Contacts have been initiated with the appropriate federal and state agencies regarding the existence of endangered and threatened species.

American crocodiles inhabit coastal estuarine marshes, tidal swamps, and creeks/canals of southern Florida, the Caribbean, and Central America. They were down-listed from federally endangered to threatened in 2007 because populations were expanding (USFWS Mar 2007a). Their recovery was linked to the conservation efforts at Turkey Point. Construction of the industrial wastewater facility eliminated several thousand acres of relatively natural potential habitat (tidal mangrove) for this species in the 1970s. However, crocodiles discovered and colonized the industrial wastewater facility, which now hosts approximately one-third to one-half of the breeding population of crocodiles in the United States. From 2005 to 2008, FPL biologists have reported 21 to 26 crocodile nests in the industrial wastewater facility, making it the second largest breeding aggregation in the state of Florida. A crocodile management plan prescribes maintenance procedures for the industrial wastewater facility (timing and method of vegetation clearing in canals and on berms) least likely to disturb nests, hatchlings, and adults. Additional management activities have included excavating small ponds on and around the berms as sanctuaries and/or freshwater catchments, clearing berms of exotic vegetation and providing shade by planting native tree species. FPL has also established a crocodile monitoring program to document breeding success and survival within the industrial wastewater facility. This monitoring includes hatchling studies involving weighing, measuring, and permanently marking (clipping scutes and embedding microchips with unique identification numbers) individual hatchlings. Much of the Turkey Point plant property and adjacent lands to the east, south, and west, including the Units 6 & 7 plant area, have been designated critical habitat for the American crocodile (Figure 2.4-4; USFWS Sep 1977). Most crocodile nesting occurs in the southwestern corner of the industrial wastewater facility; however, a limited number of nests have been

observed on berms within the northern portion of the return canals (Figure 2.4-5). Nesting crocodiles have never been documented within the Units 6 & 7 plant area. The plant area consists primarily of low areas that are not typically used by crocodiles because of lack of vegetation (for thermoregulating) and presumed lack of prey items in the remnant canals and flats. A limited number of crocodiles have been observed basking on the perimeter shore of the plant area.

Crocodiles could also be found within aquatic habitats associated with the access roads, reclaimed water pipelines, FPL-owned fill source, and transmission corridors.

Wood storks (*Mycteria americana*) are large wading birds that nest in trees and shrubs over water and forage on fish in shallow wetlands in the southeastern United States. They are federal- and state-listed as endangered. They feed by touch, literally bumping into their prey, and thus require shallow wetlands relatively clear of vegetation in order to forage efficiently. They are seen in low numbers in the shallow portions of the industrial wastewater facility during the winter months. Three wood storks were observed foraging/roosting in shallow wetlands in the laydown area immediately west of the Units 6 & 7 plant area. They do not nest on or near the Turkey Point plant property but have historically nested in two colonies south of Tamiami Trail (U.S. Route 41) near (within 5 miles) the proposed Turkey Point-to-Levee transmission corridors Portions of both corridors fall within the core foraging areas of both colonies (radius of 18.4 miles around each colony). Wood storks could also be found within aquatic habitats associated with the access roads, reclaimed water pipelines, and FPL-owned fill source. Critical habitat has not been defined for this species.

The Eastern indigo snake (*Drymarchon corais couperi*) is a federally threatened species that inhabits a variety of habitats in the southeastern United States from scrub and sandhill to wet prairies and mangrove swamps. Their existence is frequently linked to gopher tortoise populations and use of their subterranean burrows. Indigo snakes have been observed south of the industrial wastewater facility in the Everglades Mitigation Bank (in 2004) and within an area south of SW 344th Street/Palm Drive, adjacent to the FPL child daycare facility (in 1981). Eastern indigo snakes could also be found within appropriate habitats found near the access roads, reclaimed water pipelines, FPL-owned fill source, and transmission corridors. Critical habitat has not been defined for the indigo snake.

Manatees (*Trichechus manatus*) are large marine mammals that frequent warm water estuarine habitats including rivers, marshes, bays, and sounds in Florida and other southeastern coastal states. They use warm water refuges in the cooler months, including freshwater springs and heated effluent from power plants. Manatees are federal- and state-listed as endangered, and their critical habitat includes Biscayne Bay and Card Sound adjacent to the Turkey Point plant property and the streams, rivers, and canals entering these water bodies (Figure 2.4-3; USFWS Sep 1977). Manatees have been observed in the barge turning basin and nearby state canals.

Four endangered and one threatened species of sea turtle inhabit Biscayne Bay and Card Sound at varying times of the year. These include the endangered green sea turtle (*Chelonia mydas*), leatherback sea turtle (*Dermochelys coriacea*), hawksbill sea turtles (*Erytmochelys imbricata*), Kemp's ridley sea turtle (*Lepidochelys kempii*), and threatened loggerhead sea turtle (*Caretta caretta*). Of these, the loggerhead turtle is the most common in the vicinity of the Turkey Point plant property. These turtles typically forage within the bay and sound, but beach habitats that they need for their nesting do not exist on the mainland shoreline near Turkey Point. It should be noted that the Kemp's ridley sea turtle is not listed for Miami-Dade County, but is listed for the adjacent Monroe County.

The Florida panther (*Felis concolor coryi*) is a large, federally endangered cat that inhabits the Everglades region. Their population size within the region is estimated at fewer than 60 animals. They use a combination of upland hammocks and dense saw palmetto thickets and prey on deer and feral hogs. While there have been no confirmed sightings on the Turkey Point plant property, there have been more than 60 sightings of panthers over the last 20 years in the Everglades National Park (ENP) area crossed by the two alternative routes for the Clear Sky-to-Levee transmission corridor.

The Everglades snail kite (*Rostrhamus sociabilis plumbeus*) is a federally endangered species that inhabits tropical, open freshwater marshes and shallow lakes in southern Florida. They depend on apple snails (*Pomacea paludosa*) as prey, caught at the surface of freshwater marshes. Critical habitat exists west and north of the proposed Clear Sky to Levee transmission corridors (Figure 2.4-4; USFWS Sep 1977), but a single Everglades snail kite was observed in the area of the proposed transmission corridors bordering the ENP during recent reconnaissance. The species has been documented using the wetlands of the EMB adjacent to the Turkey Point plant property as recently as 2003.

The Cape Sable seaside sparrow (*Ammodramus maritimus mirabilis*) is a federally endangered species that inhabits seasonally inundated freshwater interior marshes. There may be scattered populations of these sparrows in Miami-Dade County, primarily in prairies to the east of Shark Slough in the ENP. These prairies do not occur on the Turkey Point plant property and the species has not been observed on the property. Critical habitat exists within the ENP; smaller critical habitat areas occur northwest of nearby Florida City (Figure 2.4-4; USFWS Nov 2007b).

The bald eagle (*Haliaeetus leucocephalus*) was de-listed in 2007, but remains protected under the Bald and Golden Eagle Protection Act. Eagles do not nest on or near the Turkey Point plant property, but some have been observed flying near the existing units and along the transmission corridors and a single adult eagle was observed perched near the northwest corner of the industrial wastewater facility.

Several state-listed species have been observed on or adjacent to the Units 6 & 7 plant area. These include two threatened species: the least tern (*Sterna antillarum*) and the white-crowned pigeon (*Columba leuccephala*). Six wading birds designated as "species of concern" have been observed on or adjacent to the 6 & 7 plant area: little blue heron (*Egretta caerulea*), roseate spoonbill (*Ajaia ajaja*), snowy egret (*Egretta thula*), tricolored heron (*Egretta tricolor*), reddish egret (*Egretta rufescens*), and white ibis (*Eudocimus albus*). Many of these wading bird species were observed during 2008–2009 reconnaissance along the transmission corridors and all wading bird species could possibly use appropriate wetland habitats associated with the access roads, reclaimed water pipelines, FPL-owned fill source, and transmission corridors.

No federal- or state-listed plants (see Table 2.4-3) have been observed on the Units 6 & 7 plant area. Multiple surveys of the transmission corridors for federal and state-listed plants in 2008 and 2009 documented 36 listed species (Table 2.4-4). Three were federally-listed candidate species: Florida brickell-bush (*Brickellia mosieri*), pineland deltoid spurge (*Chamaesyce deltoidea ssp. pinetorum*), and sand flax (*Linum arenicola*). All three, as well as several state-listed species, are endemic pine rockland habitats. A 9-acre pine rockland area (maintained by fire, not mowing) contained 23 listed plant species. Pine rocklands are savanna-like forests on limestone outcrops. They have a single canopy species, South Florida slash pine (*Pinus elliottii var. densa*), and a dense understory of shrubs and herbs. Pine rocklands are typically fire-maintained communities, fire serving to eliminate many invading hardwoods and exotic plant species and reduce duff layers (USFWS 1999).

Several listed plant species were found on disturbed habitats (e.g., spoil piles). Spoil piles/ disturbed areas adjacent to the existing corridor within the Turkey Point plant property (exiting west from the facility) contained three species of state listed species: locustberry (*Byrsonima lucida*), Mullein nightshade (*Solanum donianum*), and West Indian trema (*Trema lamarckianum*). These same plant species could possibly occur in similar habitat along the access road and reclaimed water pipeline corridor.

2.4.1.3 Other Important Species and Habitats

"Important species" are defined in the *Standard Review Plans for Environmental Reviews for Nuclear Power Plants* (NUREG-1555) as those that are federally or state-listed as threatened or endangered, proposed for listing as threatened or endangered, commercially or recreationally valuable, essential to the maintenance or survival of species that are rare or commercially or recreationally valuable, critical to the structure and function of the local terrestrial ecosystem, or serve as biological indicators. Game species fall within the "commercially or recreationally valuable" species category. The primary game species on the Turkey Point plant property are white tailed deer, rabbits, and mourning doves. Hunting and/or trapping of game animals is not allowed on Turkey Point property. No "travel corridors" for terrestrial game species cross the property; however, waterfowl likely use the industrial wastewater facility and other wetlands on

the property during migration. American crocodiles use the canals as travel corridors to move throughout the plant property and possibly into the nearby mangrove swamps and marshes.

Important habitats, as defined under NUREG-1555, include wildlife refuges, sanctuaries, or preserves, habitats identified by federal or state agencies as rare or to be protected, wetlands, floodplains, other resources specifically protected by federal or state regulation, or land areas identified as critical habitat for threatened or endangered species. Much of the Turkey Point plant property, particularly the industrial wastewater facility, is classified as critical habitat for the crocodile (Figure 2.4-4) and segments of the access roads and transmission corridors could also have this classification. Locations of other critical habitats were discussed within their species descriptions in Subsection 2.4.1.2.

The mangrove forests of South Florida are a vital component of the estuarine and marine environment in this region and thus mangrove areas, especially red mangrove (*Rhizophora mangle*), should be considered important as an indicator habitat of the south Florida region. Mangroves are plants that are highly adaptive to the extreme conditions associated with shorelines habitats, including soft sediments (prop roots), high salinities (adaptive root membranes), and oxygen-poor soils (prop roots). These forests provide a detrital base for organic food webs and significant habitat for arboreal, intertidal and subtidal organisms, including shellfish, crustaceans, fish, and birds. Some of the species that are highly dependent on mangrove systems are mangrove rivulus (*Rivulus marmoratus*), reddish egrets, mangrove cuckoos (*Coccoyzus minor*) and white-crowned pigeons. The majority of mangroves within the project construction areas are on lands disturbed and previously impacted by the construction and operation of the Turkey Point complex and isolated from Biscayne Bay; however, they likely still provide structural habitat for mangrove community wildlife.

The Everglades Mitigation Bank (EMB) contains approximately 13,000 acres of relatively undisturbed freshwater and estuarine wetlands west and south of the industrial wastewater facility (Figure 2.4-1). This land is also owned and managed by FPL and it operates as a commercial mitigation bank with wetland habitat credits that can be purchased to offset regional wetland impacts. The EMB contains the following vegetative habitats: sawgrass marsh, wet prairie, hypersaline mangrove, tidal mangrove, coastal band mangrove, and coastal ridge mangrove. Many of these habitats contain distinctive “tree island” habitats embedded within them. The EMB is home to 14 species of amphibians, 39 species of reptiles, 14 species of terrestrial mammals, and approximately 150 species of birds (FPL 2008a).

The 181,500-acre Biscayne National Park lies east and north of the Turkey Point plant property. The park preserves mangrove wetlands, extensive open water habitats (Biscayne Bay), the northernmost of the Florida Keys, and coral reef habitat (NPS 2006).

The Crocodile Lake National Wildlife Refuge is a 6600-acre facility located 10 miles south of the Turkey Point plant property on Key Largo in Monroe County. Its primary function is to create refuges for crocodiles and other wildlife associated with mangrove/keys habitats (USFWS 2008b).

The ENP occupies over 1.5 million acres in Miami-Dade and Monroe Counties and its eastern boundary is located approximately 10 miles southwest of the Turkey Point plant property. The park includes most of Florida Bay and is undergoing extensive restoration efforts to repair historical impacts to the system's hydrology.

2.4.2 AQUATIC ECOLOGY

The primary aquatic habitat found on the Turkey Point plant property is the 5900-acre industrial wastewater facility. The industrial wastewater facility encompasses the Units 6 & 7 plant area. There is also an interceptor ditch along the northwest and west sides of the industrial wastewater facility. To restrict the inland movement of groundwater, water from the interceptor ditch is pumped back into the industrial wastewater facility.

Other aquatic habitats adjacent to the Turkey Point plant property include Lower Biscayne Bay, Card Sound, and the ENP. The proposed transmission lines, reclaimed water pipelines, and road upgrades may affect aquatic species in wetlands, drainage canals, and other man-made channels. Subsection 2.4.2.1 describes the aquatic communities of each of these aquatic habitats.

2.4.2.1 Aquatic Communities

The following subsections include descriptions of important aquatic resources at the Units 6 & 7 plant area, the Turkey Point plant property, and surrounding areas. These descriptions include information related to the abundance of important species found and the value of the habitats present.

2.4.2.1.1 Turkey Point Plant Property

The surface water habitats on the Units 6 & 7 plant area include hypersaline mudflats, remnant canals, channels, dwarf mangrove wetlands, and open water. The Units 6 & 7 plant area and the adjacent laydown area are largely wetland habitats (approximately 272 acres) (Figure 2.4-2). All of these habitats support only a limited number of aquatic species because of the harsh conditions of water level fluctuations, high water temperatures, and high salinities.

Wetlands within the Units 6 & 7 plant area are reduced in functional value because of their use as part of the industrial wastewater facility. The altered hydrology, soils, salinity, and temperature reduce the functional value of mangrove systems when compared to undisturbed tidal

mangroves of Biscayne Bay. Wetland functional value is influenced by the surrounding landscape characteristics, specifically the existing units, the extensive cooling canals, and the lack of natural tidal inundation.

The industrial wastewater facility supports a variety of aquatic species typical of a shallow, subtropical, hypersaline environment, including phytoplankton, zooplankton, marine algae, rooted plants, crabs, and estuarine fish (Table 2.4-5) The most abundant fish in the industrial wastewater facility are killifish (*Family Cyprinodontidae*) and live-bearers. FPL employees have also reported seeing game species, such as the common snook (*Centropomus undecimalis*) and tarpon (*Megalops atlanticus*), in the industrial wastewater facility. Sampling of large fish in the cooling canals is not feasible because sampling gear could easily trap young crocodiles. The larger game fish species, such as tarpon, can be long-lived (up to 78 years); individuals in the cooling canals are likely older individuals that occurred there in 1973 when the canals were isolated from Biscayne Bay. They may persist in the cooling canals until the end of their natural life spans without reproducing. It is plausible, though undocumented, that small numbers of other gamefish species occasionally enter the cooling canals of the industrial wastewater facility as larvae carried by hurricane storm surge. For example, Hurricane Andrew carried a storm surge between 8 and 9 feet at Turkey Point. (Andrews et al. 2001). Although recreationally important in other areas, none of the fish or other marine life in the industrial wastewater facility is available for recreational or commercial fishing. However, fish and crabs life in the industrial wastewater facility support a variety of wading birds and a resident population of the American crocodile.

Within southern Biscayne Bay and Card Sound, there are 11 aquatic species that are protected under the Endangered Species Act or are candidates for listing. Of these, 10 are found in Biscayne Bay and Card Sound, but are not known or expected to be in the industrial wastewater facility. These are Johnson's seagrass *(Halophila johnsonii),* the mangrove rivulus *(Rivulus marmoratus)*, the small-toothed sawfish *(Pristis pectinata),* five species of sea turtle, described in Subsection 2.4.1.1, the American alligator *(Alligator mississippiensis),* and the Florida manatee (Table 2.4-6). Johnson's seagrass occurs along the Florida coast from Sebastian Inlet to central Biscayne Bay at Virginia Key, Key Biscayne. This seagrass is not known to occur as far south as the Turkey Point plant property. The mangrove rivulus is a fish that inhabits crab burrows in mangrove areas, and it could be present in mangrove areas fringing the plant site, but is unlikely to be present in the industrial wastewater facility due to lack of habitat. The small-toothed sawfish inhabits inshore bars, seagrass beds, and mangrove areas, and is unlikely to exist in the industrial wastewater facility due to lack of habitat. The sea turtles are found in marine habitats that open to the sea, such as Biscayne Bay and Card Sound, but the industrial wastewater facility is not a suitable habitat, and the shoreline adjacent to the plant property lacks the beach habitats preferred by sea turtles for nesting. The industrial wastewater facility is not connected to Biscayne Bay.

The approximately 47-acre wetland area for the FPL reclaimed water treatment facility is dominated by dwarf mangrove. This area is assumed to contain aquatic species typical of disturbed dwarf mangrove habitat. Historical tidal connection to this area has been interrupted by construction and operation of the existing units and the industrial wastewater facility. Aquatic organisms existing in the area in November 2007 are presented in Table 2.4-5.

Radial collector wells would be constructed on approximately 3 acres of land that has been previously disturbed. As described in Section 2.2, the radial collector wells would include laterals extending underground offsite from an onsite caisson at a depth of approximately 40 feet under Biscayne Bay. Wildlife species existing near the radial collector wells and associated pipeline corridor would be similar to those observed on the Turkey Point plant property.

The roadway improvements would involve widening of existing paved roads and paving existing unpaved roads. In addition, intersection improvements at six locations would be made to accommodate peak construction traffic. The roadway improvements are about 10.75 miles in length, of which about 5.5 miles would be on FPL property. Aquatic habitats potentially affected by roadway improvements include canals and mangroves. The new 4-lane roadway planned for SW 359th Street would run along the northern edge of the industrial wastewater facility. Construction of this road would be separated from the cooling canals of the industrial wastewater facility by the existing berms as well as construction buffers. Canals occur adjacent to the roadway rights-of-way associated with SW 344th Street/Palm Drive and SW 328th Street/N. Canal Drive. In-stream vegetation is minimal within the man-made canals adjacent to existing roadways, due to the steep slopes and minimal littoral zone. These canals provide habitat for common freshwater forage fishes native to south Florida, as well as for nonindigenous fishes commonly inhabiting canals of Miami-Dade County. Areas of mangroves occur adjacent to SW 359th Street near the L-31 Canal. During times of high water, fishes from the canals may enter the mangrove areas. Most would move back into channels as waters recede.

Fish sampling will be performed during Summer 2009 in several areas that would be potentially impacted by construction of Units 6 & 7. These sample areas include the two remnant canals on the plant area, the dead-end canal (laydown area), pools within the mangrove areas (nuclear administration building, training building, and parking area), a ditch along SW 344th Street/Palm Drive (in the area of the FPL reclaimed water treatment facility), and two locations along the cooling canals of the industrial wastewater facility (see Figure 2.4-3). Details on the sampling are presented in Section 6.5.

2.4.2.1.2 Offsite Areas

The Turkey Point plant property is adjacent to mangroves that are tidally inundated with waters from Biscayne Bay, a shallow, subtropical bay supporting seagrasses, sponges, coral reefs, and

a variety of marine life. Outside of the plant property, dominant aquatic surface water bodies include Biscayne Bay, Card Sound, and the approximately 13,000-acre EMB.

Much of the land surrounding the Turkey Point plant property is managed for environmental conservation purposes by government agencies. Biscayne National Park and the Biscayne Bay Aquatic Preserve are located northeast, east, and southeast of the plant property. The ENP is located approximately 10 miles southwest of the Turkey Point plant property. The FPL-owned EMB is situated to the southwest of the Turkey Point plant property adjacent to the ENP to the west and Biscayne Bay and Card Sound to the east.

2.4.2.1.2.1 Offsite Mangrove Tidal Flats

Mangrove tidal flats are generally described as a coastal community composed of red mangrove and/or black mangrove, which are present in pure or predominant stands. Most of the area within the undeveloped areas and surrounding the existing units is classified as dwarf red mangrove flats, established within the shallow, tidally flushed area adjacent to Biscayne Bay and Card Sound. The dwarf mangrove tidal flat community contains mangroves less than 24 inches high, stunted in response to decreased nutrient availability and increased salinity. Most of the mangrove community north of the existing units experiences sheet flow-type flushing of tidal waters, and exhibits more saline conditions with decreased nitrogen and phosphorus available for plant uptake. Where tidal creeks cut through the dwarf mangrove flat, the adjacent mangroves are up to 20 feet high as a result of exposure to the nutrient-rich tidal creek water with lower salinities.

The mangrove tidal flats are inundated with approximately 1 to 6 inches of hypersaline water in the form of sheet flow. The Southeast Fisheries Science Center of the National Marine Fisheries Service (NMFS) in Miami is conducting baseline surveys in the area to provide a context in which to study the effects of the Comprehensive Everglades Restoration Plan. The study area includes the western margins of central and southern Biscayne Bay, Card Sound, and Barnes Sound, which form a semi-continuous, 30-mile stretch of mangrove-lined shoreline that is interspersed with natural creeks, artificial channels, and freshwater canal mouths. Mangroves immediately adjacent to the site were included in a study of the abundance and size distribution of three species of fish: gray snapper (*Lutjanus griseus*), great barracuda (*Sphyraena barracuda*), and goldspotted killifish (*Floridichthys carpio*) (Serafy et al. 2007).

Serafy et al. (2007) showed that fish occurrence in this 30-mile stretch of red mangrove varies according to the latitude, season, species, and abundance metric being evaluated. The shoreline serves to varying degrees as habitat for mature and immature gray snapper, and mostly immature great barracuda. Conversely, the goldspotted killifish observed in the coastal mangrove habitat were almost exclusively adults (Serafy et al. 2007).

2.4.2.1.2.2 Biscayne Bay/Card Sound

Biscayne Bay is a shallow subtropical saline lagoon located on the southeast coast of Florida. The eastern boundary of Biscayne Bay is composed of barrier islands that eventually become part of the Florida Keys. The western shore is the Florida mainland. Biscayne Bay is connected to the Atlantic Ocean by several channels and cuts, some natural and some man-made. Major tributaries are (north to south) Arch Creek, Biscayne Canal, Little River, Miami River, Coral Gables Waterway, Snapper Creek Canal, Black Creek, Goulds Canal, North Canal, Florida City Canal, and Model Land Canal.

Biscayne Bay was formed during the Holocene Period (approximately 12,000 years ago) as rising sea level filled a limestone depression. It is not a drowned river valley like most estuaries. Unlike most other estuaries, Biscayne Bay does not receive a sediment load from tributary rivers. Biscayne Bay can be divided into three areas: North Bay, Central Bay, and South Bay. The Atlantic Intracoastal Waterway traverses the western portion of Biscayne Bay and Card Sound, and a barge trench is maintained from the Intracoastal Waterway to the existing units.

The Turkey Point plant property is located on South Bay (also identified as Lower Biscayne Bay), which is generally undeveloped and fringed by mangrove wetlands. The main canals draining into this portion of Biscayne Bay are Black Creek, Princeton Canal,Military Canal, Mowery Canal, and Model Land Canal. Ocean exchange is restricted to the tidal creeks between the islands of the northern portion of the Florida Keys.

South Bay is approximately 100 square miles (64,000 acres) in area. The average depth is on the order of 5 feet at mean low water, with a maximum depth of 13 feet. The volume at mean low water is on the order of 1.5E10 cubic feet. Mean tide is 1.65 feet on the mainland shore and 1.55 feet on Elliott Key (eastern side). Salinities vary widely, ranging from 24 to 44 ppt, depending on the amount of rainfall and surface drainage reaching the coastal zone. The vertical salinity gradient in Biscayne Bay is relatively low, and the water can be considered vertically homogeneous. Natural water temperatures range from 59°F to 92°F at the surface, with little or no stratification.

Biscayne National Park was first established in 1968 as a national monument and was expanded in 1980 to approximately 173,000 acres of water, coastal lands, and 42 islands. Boating is the most popular activity in the park, and recreational and commercial fishing are allowed. Other recreational activities include snorkeling, diving, camping, picnicking, and hiking.

A portion of Biscayne Bay Aquatic Preserve is located approximately one-half mile to the east of the Units 6 & 7 plant area (Figure 2.4-1). The preserve is a shallow, subtropical lagoon consisting of three separate areas of Biscayne Bay. The northern part of the preserve is just south of Cape Florida on the east, and south of Chicken Key on the west. The southern portion of the preserve

is in Card Sound. These areas of the preserve are separated by Biscayne National Park. The preserve is approximately 69,000 acres of submerged state land that has been designated as an Outstanding Florida Water, defined as waters worthy of special protection because of their natural attributes. The Florida Department of Environmental Protection, Office of Coastal and Aquatic Managed Areas, manages the preserve. The preserve offers recreational and commercial in-water activities, including power boating, sailboating, canoeing, sculling, waterskiing, jet skiing, hang gliding, swimming, windsurfing, snorkeling, diving, and fishing.

Aquatic Communities of Biscayne Bay/Card Sound

Important communities in Biscayne Bay and Card Sound include the mangrove forest on its eastern edge, and seagrasses, which are found primarily in Central and South Bays. The mangrove forest is one of the longest continuous stretches of mangroves remaining on the east coast of Florida. The lush seagrass beds provide food and refuge for approximately 70 percent of the area's recreationally and commercially important marine species. Seagrass beds are also a food resource for sea turtles and the Florida manatee. Important seagrass species are shoal grass, turtle grass, and manatee grass. Biscayne Bay and Card Sound are nursery areas for the spiny lobster *(Panulirus argus),* and the area from Cape Florida south through Card Sound is designated a Lobster Sanctuary by the State of Florida. Highly desired game fish in Biscayne Bay and Card Sound include tarpon *(Megalops atlanticus),* snook, red drum *(Sciaenops ocellatus),* permit *(Trachinotus falcatus),* and sea trout *(Cynoscion* spp.)

Studies were conducted in Biscayne Bay and Card Sound adjacent to area for Units 3 & 4 in the early 1970s (AEC 1972). Fish and invertebrate sampling conducted in the red mangrove community along the shoreline of Biscayne Bay resulted in over 50 species of fish, dominated by gray snapper, mullet (*Mugil* spp.), and yellowfin mojarra (*Gerres cinereus*). Five species of invertebrates were collected, with 90 percent represented by the blue crab (*Callinectes sapidus*).

Baseline Aquatic Biological Characterization Study

In March 2008, a one-year Baseline Aquatic Biological Characterization Study in Card Sound Canal was initiated adjacent to the Units 6 & 7 plant area and in nearshore waters of Card Sound. The sampling program includes bi-weekly trawling for juvenile and adult fish and shellfish and netting for fish and shellfish eggs and larvae at five stations (two within Card Sound Canal and three in the nearshore area of Card Sound near the mouth of the canal). Results are summarized below for the first three quarters of sampling.

<u>Trawl Samples</u>

In Spring 2008, species richness was twice as high at Card Sound stations as at the two Card Sound Canal stations. Mojarra (*Eustinostomus* spp.) and pink shrimp (*Farfantepenaeus duorarum*) comprised over 90% of the total catch at canal stations. A greater variety of fish and

invertebrates were caught at Card Sound stations. Common fish included mojarra, grunts (*Haemulon* spp.), and pinfish (*Lagodon rhomboides*). Numerically abundant invertebrates in Card Sound trawls included penaeid shrimp (*Farfantepenaeus* and *Litopenaeus* spp.), green sea urchin (*Lytechnius variegates*), and mud crabs (*Xanthoidea*).

In Summer 2008 trawl samples, species richness was more than twice as high at the Card Sound stations than at the two Card Sound Canal stations. Three taxa (mojarra, pink shrimp, and bivalves) comprised 80% of the total catch at the Card Sound Canal stations, whereas 15 taxa accounted for 77% of the catch in Card Sound. Common fish included mojarra, pinfish, bluestriped grunts (*Haemulon sciurus*), and fringed pipefish (*Anarchopterus criniger*). Numerically abundant invertebrates in Card Sound trawls included sea urchins, pink shrimp, bivalves, mud crabs, gastropods, hermit crabs (*Paguroidea*), brittle stars (*Ophiuroidea*), and caridean shrimp.

In Fall 2008, trawl samples, species richness was more than twenty times higher at the Card Sound stations than at the two Card Sound Canal stations. Bivalves comprised 98% of the total catch at the Canal Stations, whereas 13 taxa accounted for 76% of the catch in Card Sound. Common fishes included pinfish, fringed pipefish, bluestriped grunt, white grunt (*Haemulon plumierii*), and silver jenny (*Eucinostomus gula*). Numerically abundant invertebrates included mud crabs, pink shrimp, hermit crabs, sea urchins, gastropods, bivalves, brittle stars, and caridean shrimp.

Plankton Samples

Plankton samples were sorted and specimens assigned to one of four categories: fish eggs, fish larvae (ichthyoplankton), commercially important (CI) meroplankton, and non-commercially important (NCI) meroplankton). The CI meroplankton are represented primarily by decapod crustaceans with commercial value, such as edible shrimps (penaeid species), lobster, blue crabs, and stone crabs, but also include some mollusks (e.g., clams, oysters, squid, etc.) and several other organisms used as bait or in medical research (e.g., mole crabs, horseshoe crabs, and mantis shrimps). The NCI taxa represent a variety of other decapod crustaceans, such as grass shrimp, hermit crabs, and mud crabs (*Xanthidae*).

In Spring 2008, eggs were 3.5 times more abundant in Card Sound Canal samples than in Card Sound samples. Both areas were dominated by unidentified eggs and clupeid (herrings and sardines) eggs. Unidentified eggs were those that contained no embryo, were damaged, or could not be assigned to an egg complex based on observed characteristics. Nearly six times as many fish larvae were collected at the Card Sound Canal stations as at the Card Sound stations (per unit volume of water filtered). Both the Card Sound Canal and Card Sound samples were dominated by a few groups of ichthyoplankton (gobies, sleepers, herring, shad, sardines, and menhaden). In addition, Card Sound stations contained labrisomid blennies and flag and tube

blennies. CI meroplankton were not abundant in spring samples (on average, fewer 3,000 individuals per million gallons of water filtered for all stations and photoperiods combined). Samples from Canal Stations contained almost exclusively stone crab and blue crab larvae (98% combined). Card Sound stations were dominated by blue crabs and mantis shrimp, with several other taxa also contributing substantially to the catch. NCI meroplankton were more abundant than CI meroplankton at all stations; overall abundances were four times greater in Card Sound Canal than in Card Sound. Brachyuran crabs and caridean shrimp dominated the NCI catch at all stations.

In Summer 2008, egg samples were again predominately unidentified or clupeid eggs. Fish larvae were 3.7 times more abundant in Card Sound Canal samples than in Card Sound samples. Card Sound Canal stations were dominated by larvae of herring, shad, sardines, menhaden, gobies, and sleepers, while Card Sound Stations were dominated by gobies, silverside (*Atherinomorus stipes*), labrisomid blennies, herring, shad, sardines, and menhaden. CI meroplankton were not abundant in general. Samples from Card Sound Canal Stations contained almost exclusively stone crab and blue crab larvae (99% combined). Card Sound stations were dominated by blue crabs, stone crabs, and mantis shrimp, with several other taxa also contributing substantially to the catch. The abundance of CI meroplankton for all taxa combined was almost three times higher at the Card Sound Canal stations than the Card Sound stations. As in the Spring 2008 samples, NCI meroplankton were more abundant than CI meroplankton at all stations; overall abundances were nine times greater in Card Sound Canal than in Card Sound. Brachyuran crabs and caridean shrimp dominated the NCI catch at all stations.

In Fall 2008, samples of eggs and ichthyoplankton showed a reversal of abundances compared to previous seasons. Eggs were 40% more abundant in Card Sound than in the Card Sound Canal. As in previous seasons, however, unidentified eggs dominated all samples. Fish larvae were 1.2 times more abundant in Card Sound samples than in Card Sound Canal samples. Card Sound stations were dominated by larvae of chaenopsid blennies, gobies, labrisomid blennies, and dragonets (*Diplogrammus pauciradiatus*). Card Sound Canal stations were dominated by larvae of anchovies, gobies, sleepers, and porgies (*Sparidae*). Relatively few CI meroplankton were collected in Fall 2008. The abundance of CI meroplankton for all taxa combined was about 40% higher at the Card Sound Canal stations than the Card Sound stations. Stone crab and blue crab larvae made up 95% of the CI catch in the Card Sound Canal. Card Sound stations were dominated by stone crabs, blue crabs, mantis shrimp, and brown shrimp. As in the Spring and Summer 2008, samples, NCI meroplankton were more abundant than CI meroplankton at all stations; overall abundances were twice as high in Card Sound Canal than in Card Sound. Brachyuran crabs and caridean shrimp dominated the NCI catch at all stations.

2.4.2.1.2.3 Everglades Mitigation Bank

The EMB contains 13,000 acres of relatively undisturbed freshwater and estuarine wetlands, including sawgrass marsh, wet prairie, herbaceous flats, dwarf mangrove, scrub mangrove, coastal band mangroves, coastal ridge mangroves, and disturbed areas that support the exotic species Australian pine and Brazilian pepper. FPL manages the EMB to maintain functioning wetland habitat that may be purchased as mitigation credits to offset wetland impacts within the bank's service area.

2.4.2.2 Important Species of Biscayne Bay and Card Sound

NOAA's (National Oceanographic and Atmospheric Administration) Estuarine Living Marine Resources program was developed to provide a consistent database of the distribution, abundance, and life history characteristics of important fishes and invertebrates in U.S. estuaries. Four criteria were used to select the 44 species included in the database: (1) commercial value, (2) recreational value, (3) indicator of environmental stress, and (4) ecological value (Nelson et al. Oct 1991). These criteria are similar to those used to identify important species in NUREG-1555.

Because the Estuarine Living Marine Resources program covered 20 estuaries throughout the southeastern United States, the selected species list may not adequately represent the south Florida estuarine fauna, which includes species from the tropical Caribbean biogeographic province (Nelson et al. Oct 1991). However, of the 30 fish species and 10 invertebrate species that were evaluated by NOAA, 12 fish and 6 invertebrates were common, abundant, or highly abundant in Biscayne Bay, as shown in Table 2.4-7.

2.4.2.3 Other Important Species

Rare species include species listed by the USFWS or the NMFS as threatened or endangered species proposed for listing by these agencies, species that are candidates for listing by these agencies, and species that are listed as threatened or endangered by the state in which the proposed facilities are located. Although diadromous (migratory) fish are not one of the groups designated by the NRC as "important," they are considered in the impacts assessment to the extent warranted by their presence in the vicinity (See Subsection 2.4.2.3.1.1).

2.4.2.3.1 Rare/Sensitive Species

Construction and operation of Units 6 & 7 could potentially impact populations of important aquatic species in habitats adjacent to the Turkey Point plant property, including lower Biscayne Bay/Card Sound. Plant and animal species designated by the USFWS, the Florida Fish and Wildlife Conservation Commission or the Florida Department of Agriculture and Consumer Services as endangered, threatened, species of special concern, commercially exploited, or

under review, are included in this category. Construction and operation of Units 6 & 7 would result in no impacts to rare or sensitive aquatic species.

Other than the American crocodile, described in Subsection 2.4.1, no listed aquatic or semi-aquatic species occur within the plant property. A number of federal- and state-listed plants and animals are associated or potentially associated with the area surrounding the developed portions of the Turkey Point plant property, including two fish: the mangrove rivulus and the smalltooth sawfish (NMFS 2008d) (Table 2.4-6).

Mangrove Rivulus

The mangrove rivulus is a state and federal species of special concern. It was not reported to occur on the Turkey Point plant property, but is known to occur in the vicinity where suitable habitat exists. Its range closely parallels that of the range of the red mangrove, the preferred habitat of the mangrove rivulus. The rivulus is found in the Caribbean and Central America, and ranges as far north as Florida, where it is locally rare (FMNH 2008a). The mangrove rivulus is primarily a saltwater or brackish water species, with limited occurrence in freshwater. It can tolerate salinities from 0–68 ppt. Within the Everglades and along Florida's west coast, this fish occurs in stagnant, seasonal ponds and sloughs as well as in mosquito ditches within mangrove habitats. Along the east coast of Florida, it occurs in elevated marsh habitats above the intertidal zone, often within the burrows of the great land crab (*Cardisoma guanhumi*). This preferred microhabitat may provide shelter from cool winter temperatures, allowing for a more northerly distribution than would otherwise be possible. Great land crab burrows also provide areas of refuge during the dry season, when seasonal pools of water dry up. The mangrove rivulus is able to survive in moist detritus without water for up to 60 days. This fish has been observed slithering and flipping across land during the rainy season to reach pools of water or crab burrows containing water (FMNH 2008a).

This carnivorous fish feeds heavily on terrestrial and aquatic invertebrates when its habitat becomes flooded. The mangrove rivulus eats ants and flying insects as well as aquatic invertebrates such as polychaete worms, gastropods, mollusks, and mosquito larvae. The mangrove rivulus has been observed jumping out of the water to capture termites, returning to the water to swallow its prey. It may also be cannibalistic, feeding on other mangrove rivulus, while living in crab burrows containing very limited food resources (FMNH 2008a).

Predators include other fish and wood storks, as well as possibly the Atlantic saltmarsh snake which is often found in crab burrows containing mangrove rivulus (FMNH 2008a).

The mangrove rivulus was designated a species of concern in Florida by NOAA in 1997. The species is extremely vulnerable to habitat modification and fragmentation, environmental alteration, and human development/encroachment (NMFS Nov 2007).

Smalltooth Sawfish

The federally endangered smalltooth sawfish has been observed in Biscayne Bay and the Biscayne Bay Aquatic Preserve (NMFS 2006). Although habitat destruction and overfishing have succeeded in eradicating the smalltooth sawfish from most of its former range, it survives in small pockets, notably in south Florida (FMNH 2008b). Loss of the mangrove habitat that juveniles rely on is cited as one of the primary reasons for listing the species as endangered (NMFS 2006). The U.S. distinct population segment of the smalltooth sawfish was listed as endangered by the NMFS in 2003 (FR Apr 2003), and is currently undergoing a 5-year review by the NMFS to ensure that the listing classification is accurate (FR May 2008).

This sawfish primarily occurs in estuarine and coastal habitats such as bays, lagoons, and rivers. It does at times occur in deeper waters, however, and may make crossings to offshore islands. It can tolerate freshwater. When foraging, the smalltooth sawfish swings its saw from side to side, impaling prey fishes on the rostral teeth. The sawfish then scrapes the captured prey off against the substrate and consumes it. The saw is also used to disturb muddy bottoms in search of small prey items, including benthic invertebrates such as crustaceans. Sawfishes are ovoviviparous, producing embryos that mature internally and are nourished by a yolk sac. Gestation is believed to last a year, with 15–20 pups born per litter (FMNH 2008b).

2.4.2.3.1.1 Diadromous Species

No anadromous fish exist in surface water on the Turkey Point plant property, and no major rivers flow into Biscayne Bay or Card Sound. True anadromous species in the south Atlantic Ocean (e.g., blueback herring, American shad, and striped bass) tend to spawn in major rivers flowing into the Atlantic Ocean further north; none of these rivers occurs much south of the St. Johns River in northern Florida (Nelson et al. Oct 1991). One migratory diadromous fish species, the American eel, is reported to occur in Biscayne Bay (Nelson et al. Oct 1991). Adults, juveniles and larvae are common in both low and high salinity portions of the bay (see Table 2.4-7). Because Biscayne Bay is not fed by any river, the eel does not use the bay to access inland waters, as is its habit in other estuaries.

The American eel occurs in rivers and streams along the east coast of the U.S. from Maine to Florida. It occurs throughout most of Florida in both fresh and brackish waters and in Atlantic and Gulf of Mexico drainages. The American eel is primarily riverine but does occur in ponds and lakes, especially oriented to structure and flow. Recent reports have raised concerns over the status of the American eel stock and have urged increased protection (FWC 2008a). In 1999, the South Atlantic Fisheries Management Council (SAFMC) developed a Fishery Management Plan for the American eel, which is an interstate cooperative effort to protect and enhance the Atlantic stock of American eel in the United States while providing for a sustainable harvest of the

species. The Florida Fish and Wildlife Conservation Commission monitored young-of-year and adult yellow eels in northeast Florida waterways.

In response to a petition received in November 2004, the USFWS, on July 6, 2005, announced in a 90-day finding that it was initiating a status review to determine if listing the American eel was warranted (FR Jul 2005). The description of population status indicated that population declines have been most dramatic in Canada and New England and populations may be stable in the southeastern United States. On February 2, 2007, USFWS published its findings on a Petition to List the American Eel (FR Feb 2007). After a thorough review of all available scientific information, the USFWS found that listing the American eel as either threatened or endangered was not warranted.

2.4.2.3.2 Nuisance Species

Literature was surveyed for information on the presence of nuisance species on the Turkey Point plant property or in the vicinity of the property that could create biofouling problems in cooling water systems or cause “other significant problems.”

South Florida is host to a large variety of nonindigenous freshwater aquatic species, more than any other drainage in the state; fish, amphibians, reptiles, crustaceans, mollusks, and plants have been introduced, although not all have established reproducing populations (USGS 2008). The effects of many of the nonindigenous species have not been well documented (Courtenay 1997). However, some nonindigenous species are clearly known to cause economic or ecological harm. Among the known nuisance species in the vicinity of the Turkey Point plant property is the Asiatic clam (*Corbicula fluminea*) (USGS 2008).

The Asiatic clam is a problematic invasive mollusk from southeastern Asia. It is a small bivalve that is typically found at high densities and has a relatively high growth rate. Because of its tolerance of a wide variety of aquatic conditions and its high reproductive rate, it has developed into a pest that clogs ditches and interferes with pipes and heat exchangers of power plants. The Asiatic clam is primarily a freshwater species that tolerates, but does not thrive in, brackish water (Warren 1997). The Asiatic clam is well established in south Florida (USGS 2008). The Asiatic clam has not been recognized as a nuisance for the existing units.

2.4.2.4 Habitat Importance

Many marine fish and estuarine fishes that are federally managed by the SAFMC and NMFS rely on coastal bays during part of their lives. The Sustainable Fisheries Act of 1996, identifying the contribution of habitat loss and degradation on fishery declines, amended the Magnuson-Stevens Act to create a program to protect essential fish habitat. The statute defined essential fish habitat as “those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity” (Connolly 2002). A description of essential fish habitat is in 50 CFR 600.10 of the

regulations implementing the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act; P.L. 104–297). The SAFMC and NMFS are responsible for designating essential fish habitat for each life stage of federally managed marine fish species.

In addition, the NMFS developed regulations (50 CFR Part 600 Subpart J; 62 FR 665531) to guide Fisheries Management Councils in the implementation of the essential fish habitat provisions. The essential fish habitat regulations encourage councils to identify habitat areas of particular concern within areas designated as essential fish habitat to focus conservation priorities on specific habitat areas that play a particularly important role in the life cycles of federally managed fish species. The intent of the NMFS in encouraging the designation of habitat areas of particular concern is to help focus conservation efforts on localized areas that are vulnerable to degradation or especially important ecologically. Habitat areas of particular concern should be subsets of the total area necessary to support healthy stocks of fish throughout all of their life stages. Healthy populations of fish require not only the relatively small habitats identified as habitat areas of particular concern, but also other suitable areas that provide habitat functions that support larger numbers of fish needed to support sustainable fisheries and a healthy ecosystem (NMFS 2001).

The SAFMC has designated portions of Biscayne Bay and Card Sound essential fish habitat for several groups of managed species, including snapper-grouper, coastal migratory pelagics, highly migratory species, penaeid shrimp, red drum, and spiny lobster. Each of these is addressed below.

2.4.2.4.1 Snapper-Grouper Fishery Management Plan

Ten families of fishes containing 73 species are managed under the snapper grouper plan (NMFS 2008a). As coastal inlets, all of Biscayne Bay and Card Sound meet the criteria for essential fish habitat and habitat areas of particular concern. Areas within the coastal inlets that are designated habitat areas of particular concern for species in the snapper-grouper management unit include near shore hard bottom areas, mangrove habitat, oyster/shell habitat, and seagrass habitat along the western edges of these water bodies (NMFS 2008b). During a 2-year study of recreational fishing in Biscayne Bay in the early 1980s, the gray or mangrove snapper was the most important finfish species, by weight, harvested recreationally (Berkeley 1983).

As part of designating habitat areas of particular concern for the snapper-grouper management unit, NMFS provided a generalized profile of the gray snapper, which is presented below (NMFS 2008c). One of the most commonly caught marine fishes in Florida, the gray snapper exists in marine and estuarine waters from North Carolina and Bermuda through Brazil. Spawning activity occurs offshore and peaks during the summer and early fall. Eggs and larvae are planktonic and occur offshore. Flexion of the caudal fin occurs at 4.2 millimeters. Planktonic larval duration is

estimated to range from at least 25 to 40 days, with a mean of 33 days post-fertilization based on otolith microstructure. Settlement sizes range from approximately 10 to 20 millimeters. Larvae appear competent to settle at ages from approximately 3 to 5 weeks. Maturity is reached at approximately 200 millimeters total length, probably during the third year. Gray snappers reach a maximum length of 720 millimeters and a maximum age of 10 years (NMFS 2008c).

In contrast to most snapper species, there is substantial literature on habitat use in juvenile stages of gray snapper, mostly from south or central Florida. Settlement stages and early juveniles primarily use grass beds before migrating to hard structures in deeper waters with growth.

Based on reviews of 40 years of surveys, and new sampling in the Biscayne Bay area, newly settled stages of gray snapper commonly existed in grass beds, were consistently absent from mangrove and hard bottom habitats, and were uncommon or rare from all habitats exceeding 5 meters deep. Early juvenile stages (2.5 to 7.0 centimeters) were more widely distributed, particularly on the habitat scale, existing among a variety of hard structures as well as mangroves and grass beds. The absence of newly settled life stages of gray snapper from hard bottom and mangrove habitats may result from the older resident fauna and more concentrated predation pressures in these habitats (NMFS 2008c).

In summary, early stages of gray snapper exist in estuaries and shallow marine areas. Bottom types of high value include seagrass flats (*Thalassia, Syringodium,* and *Halodule*); soft marl bottoms, fine marl mud with shell and rock outcrops; mangrove roots; hard bottom structures; and shallow basins with seagrasses adjacent to mud banks (NMFS 2008c).

2.4.2.4.2 Coastal Migratory Pelagic Fishery Management Plan

Areas designated as essential fish habitat for coastal migratory pelagic fishes in the vicinity of the Turkey Point plant property include nearshore hard bottom south of Cape Canaveral and Atlantic coast estuaries with high numbers of Spanish mackerel and cobia based on the Estuarine Living Marine Resources program abundance data (NMFS 2008d). According to the Fish and Wildlife Research Institute and SAFMC internet map service for displaying essential fish habitat, only a small area of Biscayne Bay is considered essential fish habitat. No habitat areas of particular concern have been designated for this management group. The Estuarine Living Marine Resources data show that Spanish mackerel do exist in Biscayne Bay, but are not considered abundant (Table 2.4-7). During a 2-year study of fishing in Biscayne Bay in the early 1980s, low catches of Spanish mackerel were reported in Biscayne Bay (Berkeley 1983). Biscayne Bay is not included on the list of estuaries considered as essential fish habitat. A limited amount of habitat exists, but due to the pelagic nature of these species, their presence near Turkey Point is unlikely.

2.4.2.4.3 Penaeid Shrimp Fishery Management Plan

For penaeid (brown, white, and pink) shrimp, essential fish habitat in the vicinity of the Turkey Point plant property includes inshore estuarine nursery areas such as tidal freshwater, estuarine, and marine emergent wetlands; tidal palustrine forested areas; mangroves; tidal freshwater, estuarine, and marine submerged aquatic vegetation (e.g., seagrass); and subtidal and intertidal nonvegetated flats. This applies from North Carolina through the Florida Keys (NMFS 2008e). All of Biscayne Bay and Card Sound meet the criteria for essential fish habitat and habitat areas of particular concern for penaeid shrimp. The western vegetated edges of Lower Biscayne Bay and Card Sound are of particular importance.

Of the three species, only the pink shrimp is highly abundant in Biscayne Bay. The other two species are considered rare (Nelson et al. Oct 1991). In a 2-year survey of recreational fishing in Biscayne Bay conducted in the early 1980s, pink shrimp was the single most important species harvested (by weight) accounting for 29 percent of the total recreational harvest from Biscayne Bay (Berkeley 1983). Shrimp were most abundant at seagrass stations along the western side of the bay. In South Bay, they were most abundant during fall and winter, but in North Bay they were most abundant in summer (Berkeley 1983).

Offshore water also serves as habitat for larval and postlarval shrimp. These shrimp are planktonic and feed on zooplankton in the water column. Shrimp enter the inshore habitat as postlarvae and maintain a benthic existence (NMFS 2008e).

2.4.2.4.4 Red Drum Fishery Management Plan

For red drum, essential fish habitat includes all the following habitats to a depth of 50 meters offshore (FWC 2008b):

- Tidal freshwater
- Estuarine emergent vegetated wetlands (flooded salt marshes, brackish marsh, and tidal creeks)
- Estuarine scrub/shrub (mangrove fringe)
- Submerged rooted vascular plants (sea grasses)
- Oyster reefs and shell banks
- Unconsolidated bottom (soft sediments)
- Ocean high salinity surf zones

- Artificial reefs

The area covered includes Virginia through the Florida Keys.

The red drum is distributed along the Atlantic coast, in the ocean and estuarine areas in relation to their stage of maturity. Juvenile red drum use the shallow backwaters of estuaries as nursery areas and remain there until they move to deeper water portions of the estuary associated with river mouths, oyster bars, and front beaches. Estuarine wetlands are especially important to larval red drum. The types of estuarine systems vary along the Atlantic and subsequently, the preferred juvenile habitat also varies with distribution. Young red drum are found in quiet, shallow, protected waters with grassy or slightly muddy bottoms. Shallow bay bottoms or oyster reef substrates are preferred by subadult and adult red drum. Adult red drum use the oceanic system, which is the area of the Atlantic ocean from the beachfront seaward. Large red drum are thought to migrate along the Atlantic coast and are subjected to man's alterations of the natural system. Nearshore artificial reefs along the Atlantic are also known to attract red drum as they make their spring and fall migrations. In the fall and spring, red drum concentrate around inlets, shoals, capes, and from the surf zone to several miles offshore (FWC 2008b).

Areas that meet the criteria for essential fish habitat-habitat areas of particular concern for red drum include all coastal inlets, all state-designated nursery habitats of particular importance to red drum; documented sites of spawning aggregations described in the habitat plan; other spawning areas identified in the future; and habitats identified for submerged aquatic vegetation (FWC 2008b).

2.4.2.4.5 Spiny Lobster Fishery Management Plan

Essential fish habitat for spiny lobster includes (SAFMC 1998):

- Nearshore shelf/oceanic waters
- Shallow subtidal bottom
- Seagrass habitat
- Unconsolidated bottom (soft sediments)
- Coral and live/hard bottom habitat
- Sponges
- Algal communities (*Laurencia*)
- Mangrove habitat (prop roots)

Essential fish habitat-habitat areas of particular concern for spiny lobster include Florida Bay, Biscayne Bay, and Card Sound (SAFMC 1998).

Spiny lobster begin their existence in the Florida Keys as larvae that arrive on oceanic currents. As planktonic larvae, they pass through 11 life stages in more than 6 months. They then metamorphose into a transitional swimming stage that is found along Florida's southeast coast year-round. They travel through channels between the Keys and enter nursery areas in Florida Bay and the Gulf, where they preferentially settle into clumps of red alga. In 7 to 9 days, they metamorphose into juveniles and take a solitary residence in the algal clumps for 2 to 3 months. When juvenile spiny lobster reach a carapace length of 15 to 16 millimeters, they leave the algal clumps and reside individually within rocky holes, crevices, coral, and sponges. They remain solitary until carapace length reaches approximately 25 to 35 millimeters, when they begin congregating in rocky dens. They remain in these nurseries for 15 months to 3 years (NMFS 2008f).

Adult lobsters move to deeper waters in the coral reef environment, where they occupy dens or holes during daylight hours. They are nocturnal feeders and predominantly prey on mollusks and crustacea, including hermit crabs and conch. Adults move to the offshore reef to spawn, and larvae are swept up the east coast by the Florida current (NMFS 2008f).

In addition to providing essential fish habitat and habitat areas of particular concern for the federally managed species listed above, Biscayne Bay and Card Sound provide nursery and rearing habitat for other important estuarine species (listed in Table 2.4-7), as well as for non-harvested forage species that support the harvested species.

2.4.2.4.6 Highly Migratory Species (Sharks and Skates) Fishery Management Plan

In addition, NMFS is in the process of reviewing and updating essential fish habitat for highly migratory species, including sharks (NMFS 2008g). Essential fish habitat regulations call for a comprehensive review of all essential fish habitat information, and this amendment constitutes the comprehensive review and proposed update of essential fish habitat for all highly migratory species (HMS). New information on the biology, distribution, habitat requirements, life history characteristics, migratory patterns, spawning, pupping, and nursery areas of Atlantic HMS were taken into consideration when updating essential fish habitat in this amendment. The proposed updated Fishery Management Plan designates coastal areas of Biscayne Bay and Card Sound as essential fish habitat for various life stages of sharks, including several large coastal sharks (three species of hammerhead shark (*Sphyrna zygaena, S. lewini, and S. mokarran*), nurse shark (*Ginglymostoma cirratum*), bull shark (*Carcharhinus leucas*), Caribbean reef shark (*C. perezi*), dusky shark (*C. obscurus*), lemon shark (*Negaprion brevirostris*), sandbar shark (*C. plumbeus*), silky shark (*C. falciformis*), spinner shark (*C. brevipinna*), and tiger shark (*Galeocerdo cuvier*) and one small coastal shark, the bonnethead (*Sphyrna tiburo*).

2.4.2.5 Preexisting Environmental Stresses

Much of the preexisting stress to habitats on the Turkey Point plant property and in the area immediately surrounding the property is the result of past development activity. The natural topography, soils, and hydrology of areas adjacent to the property have been altered as a result of the construction of existing units, the support facilities, and the industrial wastewater facility. Units 3 & 4 were constructed on mangrove-covered tidal flats. Natural surface water drainage features have been modified through road building and the industrial wastewater facility.

Mangrove heads along historical tidal creek channels within the surrounding mudflats have also been stressed by development as well as by natural causes. The historical tidal connections to Biscayne Bay were severed during construction of the industrial wastewater facility, which has resulted in hypersaline conditions, altered hydrology, and elevated temperatures. Whereas undisturbed tidal creeks of Biscayne Bay typically contain dense mangrove growth along the entire creek channel, the channels within the Units 6 & 7 plant area contain sparse pockets of mangroves, likely a result of stress caused by the hypersaline conditions and drastic fluctuations in water levels. Mangroves in the vicinity have not fully recovered in health or extent from a severe freeze in 1989 and Hurricane Andrew in 1992.

The industrial wastewater facility is not considered a natural habitat, and, therefore, some environmental stress is to be expected. The cooling canals of the industrial wastewater facility contain hypersaline water (approximately 40 to 50 ppt), shallow depths (approximately 3 feet), and maximum temperatures between 95°F to 100°F. The biotic community is restricted to those species that can survive under the limiting conditions of salinity, temperature, and depth. The predominant aquatic vegetation is widgeon grass and the dominant fish are forage fish. Predatory fish, including snook and tarpon, have been observed in the industrial wastewater facility, although the environmental conditions are not conducive to successful reproduction for these fish.

Within Biscayne Bay and Card Sound, preexisting stresses are more difficult to evaluate. Nearly all the nearshore habitat in these coastal waters is protected; however, anthropogenic effects are still evident. Basins in southern Biscayne Bay, including Card Sound, have been the focus of much attention in recent times because of the persistent algal bloom that developed in this region during autumn 2005. An increase in green macro-algae in this region during the late 1990s and early part of this decade is notable, because it could indicate chronic nutrient enrichment that could have played some role in the current phytoplankton bloom (SFWMD & FDEP Mar 2008).

2.4.2.6 Reclaimed Water Pipelines Aquatic Resources

The reclaimed water pipeline corridor would extend approximately 9 miles between the SDWWTP and the FPL reclaimed water treatment facility. For about 6.5 miles of their length, the

pipelines would be collocated with the existing Clear Sky-to-Davis transmission line right-of-way and adjacent road and canal rights-of-way. Land use includes over 30 acres of wetland and canal habitat (see Section 2.2). The pipelines would be generally underground. Aquatic invertebrates and fishes typical of the area exist in canals and wetlands crossed by this pipeline corridor; however, no areas designated by the USFWS as critical habitat for endangered or threatened aquatic invertebrate or fish species occur in Miami-Dade County.

2.4.2.7 Radial Collector Wells and Pipelines Aquatic Resources

Radial collector wells installed beneath Biscayne Bay would also provide an alternate source of makeup water for the new units. The four wells would be located within three acres of previously filled lands on the northern edge of Turkey Point. Habitats adjacent to the filled lands include coastal mangroves and Biscayne Bay. The radial collector well laterals would be installed horizontally at a depth of approximately 40 feet below the bottom of Biscayne Bay. Water would flow into the laterals and flow by head force to the collection caisson located onshore where the water would be pumped via one or more pipelines to Units 6 & 7. Pipelines would occupy approximately 8 acres and would cross approximately 4.5 acres of wetlands. Construction laydown areas, access roads, and spoil/muck deposits would potentially impact another approximately 6 acres of primarily industrial habitat.

Construction of the radial collector wells would not affect aquatic resources in the vicinity. The only important aquatic species is the mangrove rivulus, a state and federal species of concern (described in Subsection 2.4.2.3.1) that is associated with red mangrove communities. Red mangroves exist in the general vicinity of the construction area. Because this species is closely tied to the distribution of red mangrove, any activity that removes red mangrove could have a potential impact on this fish. However, construction of the radial collector wells and associated pipelines would not impact red mangroves because the four wells would be located within three acres of previously filled lands on the northern edge of Turkey Point. No presently undisturbed mangrove habitat would be affected by well construction. Environmental best management practices would reduce the amount of erosion and sedimentation associated with construction, and would limit impacts to aquatic communities in down-gradient water bodies. Because the well laterals would be drilled beneath Biscayne Bay, and surface water and sediment would not be disturbed, no increases in turbidity or sedimentation would result.

2.4.2.8 Aquatic Resources Along Transmission Corridors

Existing transmission lines generally pass through typical habitats associated with the coastal plain region of southeast Florida: wetlands, agricultural fields, pasture/rangeland, and residential/developed lands (Table 2.2-2). The proposed transmission lines extend from Clear Sky to Levee, Clear Sky to Pennsuco, Clear Sky to Miami (via Davis substation) through a variety of urban, agricultural, range, and wetlands habitats (see Figure 2.2-5).

Along the proposed 43-mile-long Clear Sky-to-Levee line, wetlands make up 39 percent of the corridor (Table 2.2-2). This line would cross the eastern expansion of the ENP (Figure 2.2-5). An alternative route is relocated eastward to run along the border of the ENP rather than through the park.

The Levee-to-Pennsuco corridor would cross 6 acres of wetlands (2 percent) (Table 2.2-2).

The approximately 19-mile-long Clear Sky-to-Davis line would be built within an existing corridor (Figure 2.2-5), of which 18 percent of the land is wetlands (Table 2.2-2). No towers would be built within water bodies. The lines would span the water bodies.

The approximately 18-mile-long Davis-to-Miami line would largely be built within an existing corridor (Figure 2.2-5), of which less than 2 percent are wetlands (Table 2.2-2).

The only special-status fish species in Miami-Dade County that potentially could occur along the proposed transmission corridors is the mangrove rivulus, although the corridors would not include ideal habitat (mangrove) for the fish. Other special-status species might exist in the aquatic and wetland habitats crossed by the proposed corridors.

2.4.2.9 Roadway Improvements

Wetlands and terrestrial habitats affected by the roadway improvements are described in Subsection 2.4.1. Aquatic habitats potentially affected by roadway improvements include canals (FLUCFCS Code 510) and mangroves (FLUCFCS 612), which are described below.

Canals occur adjacent to the roadway right-of-ways associated with SW 344th Street/Palm Drive and SW 328th Street/N. Canal Drive. In-stream vegetation is minimal within the man-made canals adjacent to existing roadways, due to the steep slopes and minimal littoral zone. These canals provide habitat for common freshwater forage fishes native to south Florida, such as mosquitofish (*Gambusia holbrooki*), sailfin molly (*Poecilia latipinna*), least killifish (*Heterandria formosa*), sunfish (*Lepomis spp.*), and gar (*Lepisosteus spp.*). Nonindigenous fishes commonly inhabiting canals of Miami-Dade County include peacock bass (*Cichla ocellaris*), spotted tilapia (*Tilapia mariae*), blue tilapia (*Oreochromis aureus*), Mayan cichlid (*Cichlasoma urophthalmus*), jaguar guapote (*Cichlasoma managuense*), and oscar (*Astronotus ocellatus*).

Areas of mangroves occur adjacent to SW 359th Street near the L-31 Canal. These areas are dominated by a mixture of red mangrove (*Rhizophora mangle*) and black mangrove (*Avicennia germinans*), along with several other plant species. During times of high water, fishes from the canals may enter the mangrove areas. Most will move back into channels as waters recede.

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Table 2.4-1 (Sheet 1 of 4)
Avifauna Observed on/near the Turkey Point Plant Property and Along Existing/Proposed Transmission Corridors

Common Name	Scientific Name	General Habitat[a]	FES[b]	DERM[b]	Surv1[b]	Surv2[b]	Winter'09[c]
Sharp-shinned hawk	*Accipiter striatus*	C	Y	—	—	—	—
Common myna	*Acridotheres tristis*	F	—	—	—	Y	—
Spotted sandpiper	*Actitis macularia*	C	Y	Y	Y	Y	—
Red-winged blackbird	*Agelaius phoenicius*	M, C	Y	—	Y	Y	C
Roseate spoonbill	*Ajaia ajaja*	M, C, T	—	—	Y	Y	—
Anhinga	*Anhinga anhinga*	C, T	—	—	—	Y	U
Great egret	*Ardea albus*	M, T	Y	Y	Y	Y	C
Great blue heron	*Ardea herodias*	M, C, T	Y	—	Y	Y	C
Great horned owl	*Bubo virginianus*	M	—	Y	Y	—	—
Cattle egret	*Bubulcus ibis*	M, F, C	Y	—	—	—	—
Red shouldered hawk	*Buteo lineatus*	C, T	Y	—	Y	—	—
Broad-winged hawk	*Buteo platypterus*	T	—	—	—	Y	—
Green heron	*Butorides virescens*	M, T	Y	Y	Y	Y	U
Sanderling	*Calidris alba*	C	—	Y	Y	—	—
Red knot	*Calidris canutus*	C	—	—	—	—	U
Western sandpiper	*Calidris maurii*	C	—	Y	Y	—	U
Least sandpiper	*Calidris minutilla*	C	—	Y	Y	—	U
Chuck-will's-widow	*Caprimulgus carolineusis*	C	—	—	—	Y	—
Northern cardinal	*Cardinalis cardinalis*	C, T	Y	—	—	Y	U
Willet	*Catoptrophorus semipalmatus*	C	—	—	Y	—	C
Turkey vulture	*Cathartes aura*	C, T	Y	—	—	Y	C
Belted kingfisher	*Ceryle alcyon*	C, T	Y	Y	Y	Y	U
Semipalmated Plover	*Charadrius semipalmatus*	C	—	Y	Y	—	U
Killdeer	*Charadrius vociferous*	F, C	Y	Y	Y	Y	C
Wilson's plover	*Charadrius wilsonia*	C	—	Y	Y	—	—

Table 2.4-1 (Sheet 2 of 4)
Avifauna Observed on/near the Turkey Point Plant Property and Along Existing/Proposed Transmission Corridors

Common Name	Scientific Name	General Habitat[a]	FES[b]	DERM[b]	Surv1[b]	Surv2[b]	Winter'09[c]
Common nighthawk	*Chordeiles minor*	M, C	—	Y	Y	Y	—
Northern harrier	*Circus cyaneus*	C	—	—	—	—	U
Yellow-billed cuckoo	*Coccyzus americanus*	C	—	—	Y	—	—
Mangrove cuckoo	*Coccyzus minor*	C, M	—	—	—	Y	—
Northern flicker	*Colaptes auratus*	C	Y	—	—	—	U
White-crowned pigeon	*Columba leucocephala*	C, T	—	Y	Y	—	—
Rock dove	*Columba livia*	F	—	—	—	Y	—
Common ground-dove	*Columbina passerine*	C	—	—	—	Y	C
Black vulture	*Coragyps atratus*	M, F, C	Y	—	Y	—	—
Fish crow	*Corvus ossifragus*	C	Y	—	—	—	—
Blue jay	*Cyanocitta cristata*	M	—	—	—	—	—
Prairie warbler	*Dendroica discolor*	C	—	Y	Y	—	U
Palm warbler	*Dendroica palmarum*	M,C	—	—	—	Y	C
Pileated woodpecker	*Dryocopus pileatus*	C	Y	—	—	—	—
Gray catbird	*Dumetella carolinensis*	C, M	Y	—	—	Y	—
Little blue heron	*Egretta caerulea*	M, C, T	Y	—	Y	Y	C
Reddish egret	*Egretta rufescens*	C, M	—	Y	Y	Y	U
Snowy egret	*Egretta thula*	M, C, T	Y	—	Y	Y	C
Tricolor heron	*Egretta tricolor*	M, C, T	—	Y	Y	Y	C
Swallow-tailed kite	*Elanoides forficatus*	T	—	—	—	Y	—
White ibis	*Eudocimus albus*	M, C, T	Y	—	Y	Y	A
Rusty blackbird	*Euphagus carolinus*	C	Y	—	—	—	—
Kestrel	*Falco sparverius*	C, T	Y	—	—	—	U
Magnificent frigatebird	*Fregata magnificens*	M	Y	—	—	—	—
Wilson's snipe	*Gallinago delicata*	C	Y	—	—	—	—
Bald eagle	*Haliaeetus leucocephalus*	M, T	Y	—	—	Y	—

Table 2.4-1 (Sheet 3 of 4)
Avifauna Observed on/near the Turkey Point Plant Property and Along Existing/Proposed Transmission Corridors

Common Name	Scientific Name	General Habitat[a]	FES[b]	DERM[b]	Surv1[b]	Surv2[b]	Winter'09[c]
Black-necked stilt	*Himantopus mexicanus*	C	—	Y	Y	—	—
Barn swallow	*Hirundo rustica*	C	—	Y	Y	—	—
Loggerhead shrike	*Lanius ludovicianus*	C, T	—	—	—	Y	C
Herring gull	*Larus argentatus*	C, M	Y	—	—	—	—
Laughing gull	*Larus atricilla*	C, M	Y	—	—	—	—
Short-billed dowitcher	*Limnodromus griseus*	C	—	Y	Y	—	—
Red-bellied woodpecker	*Melanerpes carolinus*	M	—	—	—	—	—
Red-breasted merganser	*Mergus serrator*	C	Y	—	—	—	—
Mockingbird	*Mimus polyglottis*	C, F, M, T	Y	—	Y	Y	C
Wood stork	*Mycteria americana*	M, C, T	Y	—	Y	—	—
Great crested flycatcher	*Myiarchus crinitus*	M	Y	—	—	—	—
Long-billed curlew	*Numanius americanus*	C	—	Y	Y	—	—
Whimbrel	*Numanius phaeopus*	C	—	Y	Y	—	—
Osprey	*Pandion haliaetus*	C	—	—	—	—	U
Savannah sparrow	*Passerculus sandwichensis*	C	—	—	—	—	C
White pelican	*Pelecanus erythrorhynchos*	M, C	—	—	Y	Y	C
Brown pelican	*Pelecanus occidentalis*	T	—	—	—	Y	—
Double-crested cormorant	*Phalacrocorax auritus*	C, M	—	Y	Y	Y	A
Greater flamingo	*Phoenicopterus rubber*	C	—	Y	—	—	—
Black-bellied plover	*Pluvialis squatarola*	C	—	Y	Y	—	—
Blue-gray gnatcatcher	*Polioptila caerulea*	C	—	Y	Y	—	—
Cliff swallow	*Pterocheilidan pyrrhonota*	C	—	Y	Y	—	—
Boat-tailed grackle	*Quiscalus major*	M, C	Y	—	—	—	U
Common grackle	*Quiscalus quiscala*	C	—	—	—	—	U
American avocet	*Recurvirostra americana*	C	—	Y	Y	—	—
Bank swallow	*Riparia riparia*	C	—	—	Y	—	—

Table 2.4-1 (Sheet 4 of 4)
Avifauna Observed on/near the Turkey Point Plant Property and Along Existing/Proposed Transmission Corridors

Common Name	Scientific Name	General Habitat[a]	FES[b]	DERM[b]	Surv1[b]	Surv2[b]	Winter'09[c]
Everglades snail kite	*Rostrhamus sociabilis p.*	T	—	—	—	Y	—
American redstart	*Setophaga ruticilla*	M	—	—	—	Y	—
Yellow-bellied sapsucker	*Sphyrapicus varius*	C	Y	—	—	—	—
Least tern	*Sterna antillarum*	C, T	—	Y	Y	Y	—
Common tern	*Sterna hirundo*	C, M	Y	—	—	—	—
Royal tern	*Sterna maxima*	C	—	—	Y	—	—
European starling	*Sturnus vulgaris*	F	—	—	—	Y	C
Lesser yellowlegs	*Tringa flavipes*	C	—	Y	Y	—	—
Greater yellowlegs	*Tringa melanoleuca*	C	—	Y	Y	Y	C
Solitary sandpiper	*Tringa solitaria*	C	—	Y	Y	—	—
American robin	*Turdus migratorius*	M	Y	—	—	—	—
Mourning dove	*Zenaida macroura*	C, F, M, T	—	—	—	Y	U

(a) Habitat categories include: C — cooling canal area, F — facilities area, M — mangrove area[8], T — transmission corridor.
(b) Avian surveys within the Turkey Point plant property prior to the seasonal surveys:
FES: surveys of the canal area, mangrove areas (E of canals) in 1972–1973.
DERM: surveys of the plant area on August 29, 2007, by Miami–Dade County Dept. Environmental Resources Mgmt.
Surv1: surveys of the Units 6&7 and construction staging areas in November, 2007, and June, 2008.
Surv2: reconnaissance of the general facility, cooling canals, and transmission corridors in May 2008, and during other wildlife surveys in April 2009 (does not including the seasonal avian surveys).
(c) During the late winter 2009 avian surveys, species were classified by their relative abundance: A = abundant (> 50 individuals observed), C = common (10 — 50 observed), U = uncommon (< 10 observed).

Table 2.4-2
Wildlife Observed on/near the Turkey Point Plant Property and Along the Existing/ Proposed Transmission Corridors

Common Name	Scientific Name	General Habitat[(a)]	Early Surveys[(b)]	April 2009 Surveys
Mammals				
Virginia opossum	*Didelphus virginiana*	M, T	—	Y
White-tailed deer	*Odocoileus virginiana*	M, T	—	Y
Rice rat	*Oryzomys palustris*	C, M	Y	—
Cotton mouse	*Peromyscus gossypinus*	M	Y	—
Raccoon	*Procyon lotor*	C, F, M, T	—	Y
Black rat	*Rattus rattus*	C, M	—	Y
Cotton rat	*Sigmodon hispidus*	C	—	Y
Marsh rabbit	*Silvilagus palustris*	C, T	Y	Y
Eastern cottontail	*Silvilagus floridanus*	C, M	Y	—
Reptiles				
Carolina anole	*Anolis carolinensis*	C, M, T	Y	—
Key West anole	*Anolis sagrei stejnegeri*	C, M	Y	—
Cuban brown anole	*Anolis sagrei*	C, F, M	—	Y
Florida softshell turtle	*Apalone ferox*	M	—	Y
Southern black racer	*Coluber constrictor priapus*	C, M	Y	Y
American crocodile	*Crocodylus acutus*	C, M	Y	Y
Eastern diamondback rattlesnake	*Crotalus adamanteus*	C, M, T	Y	—
Mediterranean gecko	*Hemidactylus turcicus*	M	—	Y
Green iguana	*Iguana iguana*	C	—	Y
Mangrove salt marsh snake	*Nerodia clarkii compressicauda*	M	Y	Y
Florida water snake	*Nerodia fasciata pictiventris*	M	—	Y
Rough green snake	*Opheodrys aestivus*	C	—	Y
Amphibians				
Florida cricket frog	*Acris gryllus dorsalis*	C, M	Y	—
Southern toad	*Bufo terrestris*	C, T	—	Y
Greenhouse frog	*Eleutherodactylus planirostris*	M	—	Y
Green tree frog	*Hyla cinerea*	C, M, T	Y	—
Little grass frog	*Hlya ocularis*	C, M, T	Y	—
Squirrel tree frog	*Hyla squirella*	C, M, T	Y	—
Florida chorus frog	*Pseudacris nigrita verrucosa*	C, M	Y	—
Bullfrog	*Rana catesbeiana*	C, M, T	Y	—
Southern leopard frog	*Rana utricularia*	M, T	—	Y

(a) General habitat categories: C = industrial wastewater facility (including proposed construction site); F = existing facilities (Units 1–5); M = mangrove swamp; and T = transmission corridors.
(b) Observation recorded in AEC 1972, and reconnaissance in 2003 and 2008.

Table 2.4-3 (Sheet 1 of 6)
Protected Species In Miami-Dade County

Common Name	Scientific Name	Federal Status[a]	State Status[a]
Amphibians			
Gopher frog	*Rana capito*	—	S
Birds			
Roseate spoonbill	*Ajaia ajaja*	—	S
Cape Sable seaside sparrow	*Ammodramus maritimus mirabilis*	E	E
Limpkin	*Aramus guarauna*	—	S
Florida burrowing owl	*Athene cunicularia floridana*	—	S
Piping plover	*Charadrius melodus*	T	T
Little blue heron	*Egretta caerulea*	—	S
Reddish egret	*Egretta rufescens*	—	S
Snowy egret	*Egretta thula*	—	S
Tricolored heron	*Egretta tricolor*	—	S
White ibis	*Eudocimus albus*	—	S
Peregrine falcon	*Falco peregrinus anatum*	DL	E
American kestrel	*Falco sparverius paulus*	—	T
Florida sandhill crane	*Grus canadensis pratensis*	—	T
American oystercatcher	*Haematopus palliates*	—	S
Bald eagle	*Haliaeetus leucocephalus*	DL	T
Wood stork	*Mycteria Americana*	E	E
White-crowned pigeon	*Patagioenas leucocephala*	—	S
Brown pelican	*Pelecanus occidentalis*	—	S
Snail kite	*Rostrhamus sociabilis plumbeus*	E	E
Black skimmer	*Rynchops niger*	—	S
Least tern	*Sterna antillarum*	—	T
Fish			
Mangrove rivulus	*Rivulus marmoratus*	S	S
Invertebrates			
Florida leafwing (butterfly)	*Anaea troglodyta floridalis*	C	—
Miami blue (butterfly)	*Cyclargus thomasi bethunebakeri*	C	E
Stock Island tree snail	*Orthalicus reses reses*	T	E
Schaus' swallowtail (butterfly)	*Papilio aristodemus ponceanus*	E	E
Bartram's scrub-hairstreak (butterfly)	*Strymon acis bartami*	C	—
Mammals			

Table 2.4-3 (Sheet 2 of 6)
Protected Species In Miami-Dade County

Common Name	Scientific Name	Federal Status[(a)]	State Status[(a)]
Florida bonneted bat	*Eumops floridanus*	—	E
Southern mink	*Neovison vison*	—	T
Florida mouse	*Podomys floridanus*	—	S
Florida panther	*Puma concolor coryi*	E	E
Florida manatee	*Trichechus latirostris*	E	E
Florida black bear	*Ursus americanus floridanus*	—	T
Plants			
Golden leather fern	*Acrostichum aureum*	—	T
Fragrant maidenhair fern	*Adiantum melanoleucum*	—	E
Brittle maidenhair fern	*Adiantum tenerum*	—	E
Meadow jointvetch	*Aeschynomene pratensis*	—	E
Bracted colic-root	*Aletris bracteata*	—	E
Everglades leaf lace	*Alvaradoa amorphoides*	—	E
Crenulate lead-plant	*Amorpha herbacea var. crenulata*	E	E
Wright's anemia	*Anemia wrightii*	—	E
Sea lavender	*Argusia gnaphalodes*	—	E
Blodgett's wild-mercury	*Argythamnia blodgettii*	C	E
Dutchman's pipe	*Aristolochia pentandra*	—	E
American toothed spleenwort	*Asplenium dentatum*	—	E
American bird's nest fern	*Asplenium serratum*	—	E
Modest spleenwort	*Asplenium verecundum*	—	E
Rockland orchid	*Basiphyllaea corallicola*	—	E
Costa Rican ladies'-tresses	*Beloglottis costaricensis*	—	E
Smooth strongbark	*Bourreria cassinifolia*	—	E
Spider orchid	*Brassia caudate*	—	E
Florida brickell-bush	*Brickellia mosieri*	C	E
Locustberry	*Byrsonima lucida*	—	T
Myrtle-of-the-river	*Calyptranthes zuzygium*	—	E
Narrow-leaved strap fern	*Campyloneurum angustifolium*	—	E
Powdery catopsis	*Catopsis berteroniana*	—	E
Many-flowered catopsis	*Catopsis floribunda*	—	E
Hairy deltoid spurge	*Chamaesyce deltoidea ssp. adhaerens*	E	E
Deltoid spurge	*Chamaesyce deltoidea ssp.deltoidea*	E	E
Pinelands spurge	*Chamaesyce deltoidea ssp.pinetorum*	C	E

Table 2.4-3 (Sheet 3 of 6)
Protected Species In Miami-Dade County

Common Name	Scientific Name	Federal Status[(a)]	State Status[(a)]
Garber's spurge	*Chamaesyce garberi*	T	E
Porter's broad-leaved spurge	*Chamaesyce porteriana*	—	E
Silver palm	*Coccothrinax argentata*	—	T
Cuban snake-bark	*Colubrina cubensis var. floridana*	—	E
Christmas berry	*Crossopetalum ilicifolium*	—	T
Rhacoma	*Crossopetalum rhacoma*	—	T
Florida tree fern	*Ctenitis sloanei*	—	E
Tall neottia	*Cyclopogon elatus*	—	E
Cowhorn orchid	*Cyrtopodium punctatum*	—	E
Florida prairie clover	*Dalea carthagenensis var. floridana*	C	E
Few-flowered fingergrass	*Digitaria pauciflora*	C	E
Milkbark	*Drypetes diversifolia*	—	E
Spurred neottia	*Eltroplectris calcarata*	—	E
Dollar orchid	*Encyclia boothiana var. erythronioides*	—	E
Clamshell orchid	*Encyclia cochleata var. triandra*	—	E
Night-scented orchid	*Epidendrum nocturnum*	—	E
Coker's beach creeper	*Ernodea cokeri*	—	E
Tropical ironwood	*Eugenia confusa*	—	E
Red stopper	*Eugenia rhombea*	—	E
Villose fennel	*Eupatorium villosum*	—	E
Rockland painted-leaf	*Euphorbia pinetorum*	—	E
Small's milkpea	*Galactia smallii*	E	E
Two-keeled helmet orchid	*Galeandra bicarinata*	—	E
Coastal vervain	*Glandularia maritime*	—	E
Sheathing govenia	*Govenia floridana*	—	E
Lignum-vitae	*Guaiacum sanctum*	—	E
Fakahatchee guzmania	*Guzmania monostachia*	—	E
Johnson's seagrass	*Halophila johnsonii*	T	—
Simpson's prickly apple	*Harrisia simpsonii*	—	E
Manchineel	*Hippomane mancinella*	—	E
White ironwood	*Hypelate trifoliate*	—	E
Krug's holly	*Ilex krugiana*	—	T
Wild potato morning glory	*Ipomoea microdactyla*	—	E

Table 2.4-3 (Sheet 4 of 6)
Protected Species In Miami-Dade County

Common Name	Scientific Name	Federal Status[(a)]	State Status[(a)]
Rocklands morning glory	*Ipomoea tenussima*	—	E
Pineland jacquemontia	*Jacquemontia curtissii*	—	T
Skyblue clustervine	*Jacquemontia pentanthos*	—	E
Beach jacquemontia	*Jacquemontia reclinata*	E	E
Joewood	*Jacquinia keyensis*	—	T
Small-headed lantana	*Lantana canescens*	—	E
Florida lantana	*Lantana depressa var. depressa*	—	E
Atlantic coast Florida lantana	*Lantana depressa var. floridana*	—	E
Ghost plant	*Leiphaimos parasitica*	—	E
Gulf licaria	*Licaria triandra*	—	E
Sand flax	*Linum arenicola*	C	E
Carter's small-flowered flax	*Linum carteri var. carteri*	C	E
Carter's large-flowered flax	*Linum carteri var. smallii*	—	E
Holly vine fern	*Lomariopsis kunzeana*	—	E
Climbing vine fern	*Microgramma heterophylla*	—	E
Wedgelet fern	*Odontosoria clavata*	—	E
Burrowing four-o'clock	*Okenia hypogaea*	—	E
Florida dancinglady orchid	*Oncidium floridanum*	—	E
Hand fern	*Ophioglossum palmatum*	—	E
Florida semaphore cactus	*Opuntia corallicola*	C	E
White passionflower	*Passiflora multiflora*	—	E
Everglades Key passionflower	*Passiflora sexflora*	—	E
Mangrove mallow	*Pavonia paludicola*	—	E
Blunt-leaved peperomia	*Peperomia obtusifolia*	—	E
Mahogony mistletoe	*Phoradendron rubrum*	—	E
Bitter bush	*Picramnia pentandra*	—	E
Tiny polygala	*Polygala smallii*	E	E
Ghost orchid	*Polyrrhiza lindenii*	—	E
Britton's shadow-witch	*Ponthieva brittoniae*	—	E
Small-flowered prescotia	*Prescotia oligantha*	—	E
West Indian cherry	*Prunus myrtifolia*	—	T
Florida cherry-palm	*Pseudophoenix sargentii*	—	E
Mangrove berry	*Psidium longipes*	—	T
Bahama wild coffee	*Psychotria ligustrifolia*	—	E

Table 2.4-3 (Sheet 5 of 6)
Protected Species In Miami-Dade County

Common Name	Scientific Name	Federal Status[(a)]	State Status[(a)]
Bahama brake	*Pteris bahamensis*	—	T
Giant orchid	*Pteroglossaspis ecristata*	—	T
Florida royal palm	*Roystonea elata*	—	E
Bahama sachsia	*Sachsia polycephala*	—	T
Fahkahatchee ladies'-tresses	*Sacoila lanceolata var. paludicola*	—	T
Ray fern	*Schizaea pennula*	—	E
Havana skullcap	*Scutellaria havanensis*	—	E
Eaton's spikemoss	*Selaginella eatonii*	—	E
Green ladies'-tresses	*Spiranthes polyantha*	—	E
Southern ladies'-tresses	*Spiranthes torta*	—	E
Pineland pencil flower	*Stylosanthes calcicola*	—	E
West Indies mahogany	*Swietenia mahagoni*	—	T
Least halberd fern	*Tectaria fimbriata*	—	E
Devil's shoestring	*Tephrosia angustissima var. angustissima*	—	E
Rockland hoary-pea	*Tephrosia angustissima var. corallicola*	—	E
Coastal hoary-pea	*Tephrosia angustissima var. curtissii*	—	E
Creeping maiden fern	*Thelypteris reptans*	—	E
Stiff-leaved maiden fern	*Thelypteris sclerophylla*	—	E
Toothed maiden fern	*Thelypteris serrata*	—	E
Brittle thatch palm	*Thrinax morrisii*	—	E
Florida thatch palm	*Thrinax radiate*	—	E
Banded wild-pine	*Tillandsia flexuosa*	—	T
Pineland noseburn	*Tragia saxicola*	—	T
Lamarck's trema	*Trema lamarckianum*	—	E
Kraus' bristle fern	*Trichomanes krausii*	—	E
Florida filmy fern	*Trichomanes punctatum ssp. floridanum*	—	E
Florida gama grass	*Tripsacum floridanum*	—	T
Young-palm orchid	*Tropidia polystachya*	—	E
Worm-vine orchid	*Vanilla barbellata*	—	E
Leafy vanilla	*Vanilla phaeantha*	—	E
Biscayne prickly ash	*Zanthoxylum coriaceum*	—	E
Rain lily	*Zephyranthes simsonii*	—	T
Reptiles			
American alligator	*Alligator mississippiensis*	SAT	S

Table 2.4-3 (Sheet 6 of 6)
Protected Species In Miami-Dade County

Common Name	Scientific Name	Federal Status[(a)]	State Status[(a)]
Loggerhead sea turtle	*Caretta caretta*	T	T
Green sea turtle	*Chelonia mydas*	E	E
American crocodile	*Crocodylus acutus*	T	E
Leatherback sea turtle	*Dermochelys coriacea*	E	E
Eastern indigo snake	*Drymarchon corais couperi*	T	T
Hawksbill sea turtle	*Eretmochelys imbricate*	E	E
Gopher tortoise	*Gopherus polyphemus*	—	T
Florida pine snake	*Pituophis melanoleucus mugitus*	—	S
Rim Rock crowned snake	*Tantilla oolitica*	—	T

(a) E = Endangered; T = Threatened; C = Candidate; — = Not listed; DL = Delisted taxon, recovered, monitored for first five years post delisting; SAT = Similarity of appearance – threatened; S = Species of concern.
Sources: FNAI 2008, USFWS 2008a

Table 2.4-4
Listed Plants Observed Within the Transmission Corridors Associated With Units 6 & 7

Common Name	Scientific Name	Federal[(a)]	State[(a)]
Golden leather fern	*Acrostichum aureum*	—	LT
Pineland-allamanda	*Angadenia berteroi*	—	LT
Pinepink	*Bletia purpurea*	—	LT
Mosier's false boneset	*Brickellia mosieri*	C	LE
Locustberry	*Byrsonema lucida*	—	LT
White sunbonnets	*Chaptalia albicans*	—	LT
Pineland deltoid spurge	*Chamaesyce deltoidea ssp. pinetorum*	C	LE
Florida silver palm	*Coccothrinax argentata*	—	LT
Quailberry	*Crossopetalum ilicifolium*	—	LT
Blodgett's swallowwort	*Cynanchum blodgettii*	—	LT
Krug's holly	*Ilex krugiana*	—	LT
Rockland morningglory	*Ipomoeae tenuissima*	—	LE
Pineland clustervine	*Jacquemontia curtissii*	—	LT
Skyblue clustervine	*Jacquemontia pentanthos*	—	LE
Shrub eupatorium	*Koanophyllon villosum*	—	LE
Pineland lantana	*Lantana depressa var. depressa*	—	LE
Ghost plant	*Leiphaimos parasitica*	—	LE
Sand flax	*Linum arenicola*	C	LE
Carter's large-flowered flax	*Linum carteri var. smallii*	—	LE
Pineland blackanthers	*Melanthera parvifolia*	—	LT
Southern fogfruit	*Phyla stoechadifolia*	—	LE
Pineland poinsettia	*Poinsettia pinetorum*	—	LE
Bahama ladder brake	*Pteris bahamensis*	—	LT
Small-leaf snoutbean	*Rhynchosia parvifolia*	—	LT
Bahama sachsia	*Sachsia polycephala*	—	LT
Bahama senna	*Senna mexicana var. chapmanii*	—	LT
Mullein nightshade	*Solanum donianum*	—	LT
Everglade Keys false buttonweed	*Spermacoce terminalis*	—	LT
West Indian lilac	*Tetrazygia bicolor*	—	LT
Abrupt-tip maiden fern	*Thelypteris augescens*	—	LT
Twisted wildpine	*Tillandsia balbisiana*	—	LT
Banded wildpine	*Tillandsia flexuosa*	—	LT
Giant wildpine	*Tillandsia utricularia*	—	LE
Pineland noseburn	*Tragia saxicola*	—	LT
West indian trema	*Trema lamarckianum*	—	LE
Florida gamagrass	*Tripsacum floridanum*	—	LT

(a) Regulatory status: C = Federal candidate, LE = State endangered, LT = State threatened, and — = Not listed
Source: (FNAI 2008).

Table 2.4-5
Aquatic Species Documented On the Turkey Point Plant Property (November 2007)

Common Name	Scientific Name
Submerged Aquatic Vegetation	
Mermaid's wineglass (green algae)	*Acetabularia* sp.
Green algae	*Batophora* sp.
Green algae	*Caulerpa* sp.
Widgeon grass	*Ruppia maritima*
Mollusks	
Lightning whelk	*Busycon contrarium*
Ivory cerith	*Cerithium eburneum*
Lister's tree oyster	*Isognomon radiatus*
Flat tree oyster	*Isognomon alatus*
Giant rams horn	*Marisa cornuarietis*
Eastern Melampus	*Melampus bidentatus*
Florida crown conch	*Melongena corona*
Unidentified species of *Tellin*	*Tellin* sp.
Crustaceans	
Great land crab	*Cardisoma guanhumi*
Fiddler crab	*Uca* sp.
Fish	
Sheepshead minnow	*Cyprinodon variegatus*
Unidentified species of Killifish	*Fundulus* sp.
Mosquitofish	*Gambusia* sp.
Mullet	*Mugil* sp.
Sailfin molly	*Poecilia latipinna*
Needlefish	*Strongylura* sp.
Tarpon	*Megalops atlanticus*

Table 2.4-6
Federally Listed and Florida State-Listed Aquatic Species Potentially Existing in Miami-Dade and Monroe Counties

Common Name	Scientific Name	Federal Status[(a)]	State Status[(a)]
Johnson's seagrass	*Halophila johnsonli*	T	—
mangrove rivulus	*Rivulus marmoratus*	SOC	S
small-toothed sawfish	*Pristis pectinata*	C	—
common snook	*Centropomus undecimalis*	—	S
green sea turtle	*Chelonia mydas*	E	E
hawksbill sea turtle	*Erytmochelys imbricata*	E	E
leatherback sea turtle	*Dermochelys coriacea*	E	E
Kemp's ridley sea turtle	*Lepidochelys kempi*	E	E
loggerhead sea turtle	*Caretta caretta*	T	T
Florida manatee	*Trichechus latirostris*	E	E
American alligator	*Alligator mississippiensis*	T (S/A)	S
American crocodile	*Crocodylus acutus*	T	E

(a) E = Endangered; T = Threatened; T(S/A) = Threatened due to similarity of appearance; C = Candidate for federal listing; S = Florida species of special concern; SOC = NOAA species of concern; — = No listing.

Table 2.4-7 (Sheet 1 of 3)
Relative Abundance of Life Stages of Important Estuarine Organisms in Biscayne Bay

Species	Life Stage	Relative Abundance in Salinity Zones	
		Mixing (0.5 – 25 ppt)	Seawater (>25 ppt)
American Oyster *Crassostrea virginica*	Adult	Common	Common
	Spawning adults	Common	Common
	Juveniles	Common	Common
	Larvae	Common	Common
	Eggs	Common	Common
Bay scallop *Argopecten irradians*	Adult		Common
	Spawning adults		Common
	Juveniles		Common
	Larvae		Common
	Eggs		Common
Hard clam *Mercenaria* sp.	Adult	Common	Common
	Spawning adults	Common	Common
	Juveniles	Common	Common
	Larvae	Common	Common
	Eggs	Common	Common
Pink shrimp *Furfantepenaeus duorarum*	Adult		
	Spawning adults		
	Juveniles	Highly Abundant	Highly Abundant
	Larvae	Highly Abundant	Highly Abundant
	Eggs		
Grass shrimp *Palaemonetes pugio*	Adult	Common	Common
	Spawning adults	Common	Common
	Juveniles	Common	Common
	Larvae	Common	Common
	Eggs	Common	Common
Blue crab *Callinectes sapidus*	Adult	Highly Abundant	Abundant
	Mating adults	Abundant	Common
	Juveniles	Highly Abundant	Abundant
	Larvae	Abundant	Abundant
	Eggs	Abundant	Abundant
Ladyfish *Elops saurus*	Adult	Common	Common
	Spawning adults		
	Juveniles	Common	Common
	Larvae	Common	Common
	Eggs		

Table 2.4-7 (Sheet 2 of 3)
Relative Abundance of Life Stages of Important Estuarine Organisms in Biscayne Bay

Species	Life Stage	Relative Abundance in Salinity Zones	
		Mixing (0.5 – 25 ppt)	Seawater (>25 ppt)
American Eel *Anguilla rostrata*	Adults (silver eel)	Common	Common
	Spawning adults		
	Juveniles (elvers, yellow eels)	Common	Common
	Larvae (glass eel, leptocephali)	Common	Common
	Eggs		
Bay anchovy *Anchoa mitchelli*	Adult	Highly Abundant	Highly Abundant
	Spawning adults	Highly Abundant	Highly Abundant
	Juveniles	Highly Abundant	Highly Abundant
	Larvae	Highly Abundant	Highly Abundant
	Eggs	Highly Abundant	Highly Abundant
Sheepshead minnow *Cyprinodon variegatus*	Adult	Common	Common
	Spawning adults	Common	Common
	Juveniles	Common	Common
	Larvae	Common	Common
	Eggs	Common	Common
Atlantic silversides *Menidia* spp.	Adult	Common	Common
	Spawning adults		
	Juveniles	Common	Common
	Larvae		
	Eggs		
Gray snapper *Lutjanus griseus*	Adult	Highly abundant	Highly abundant
	Spawning adults		
	Juveniles	Highly abundant	Highly abundant
	Larvae	Abundant	Highly abundant
	Eggs		
Pinfish *Lagodon rhomboides*	Adult	Highly abundant	Highly abundant
	Spawning adults		
	Juveniles	Highly abundant	Highly abundant
	Larvae	Highly abundant	Highly abundant
	Eggs		
Spotted seatrout *Cynoscion nebulosus*	Adult	Common	Common
	Spawning adults		Common
	Juveniles	Common	Common
	Larvae	Common	Common
	Eggs		Common

Table 2.4-7 (Sheet 3 of 3)
Relative Abundance of Life Stages of Important Estuarine Organisms in Biscayne Bay

Species	Life Stage	Relative Abundance in Salinity Zones	
		Mixing (0.5 – 25 ppt)	Seawater (>25 ppt)
Spot *Leiostomus xanthurus*	Adult	Common	Common
	Spawning adults		
	Juveniles	Common	Common
	Larvae	Common	Common
	Eggs		
Striped mullet *Mugil cephalus*	Adult	Common	Common
	Spawning adults		
	Juveniles	Common	Common
	Larvae	Common	Common
	Eggs		
Spanish mackerel *Scomberomorus maculatus*	Adult	Common	Common
	Spawning adults		
	Juveniles	Common	Common
	Larvae		Common
	Eggs		
Gulf flounder *Paralichthys albigutta*	Adult	Common	Common
	Spawning adults		Common
	Juveniles	Common	Common
	Larvae	Common	Common
	Eggs		

Source: (Nelson et al. 1991)
Notes:
Mixing Zone = Waters with intermediate salinity, from nearly fresh to almost seawater
Seawater Zone = Waters with at least 25 ppt salinity
Common = Frequently encountered but not in large numbers; does not imply a uniform distribution throughout the salinity zone
Highly Abundant = Often encountered in substantial numbers relative to other species
Abundant = Numerically dominant relative to other species
Blank cell = Absent

Figure 2.4-1 Landscape Features Near Turkey Point Facility

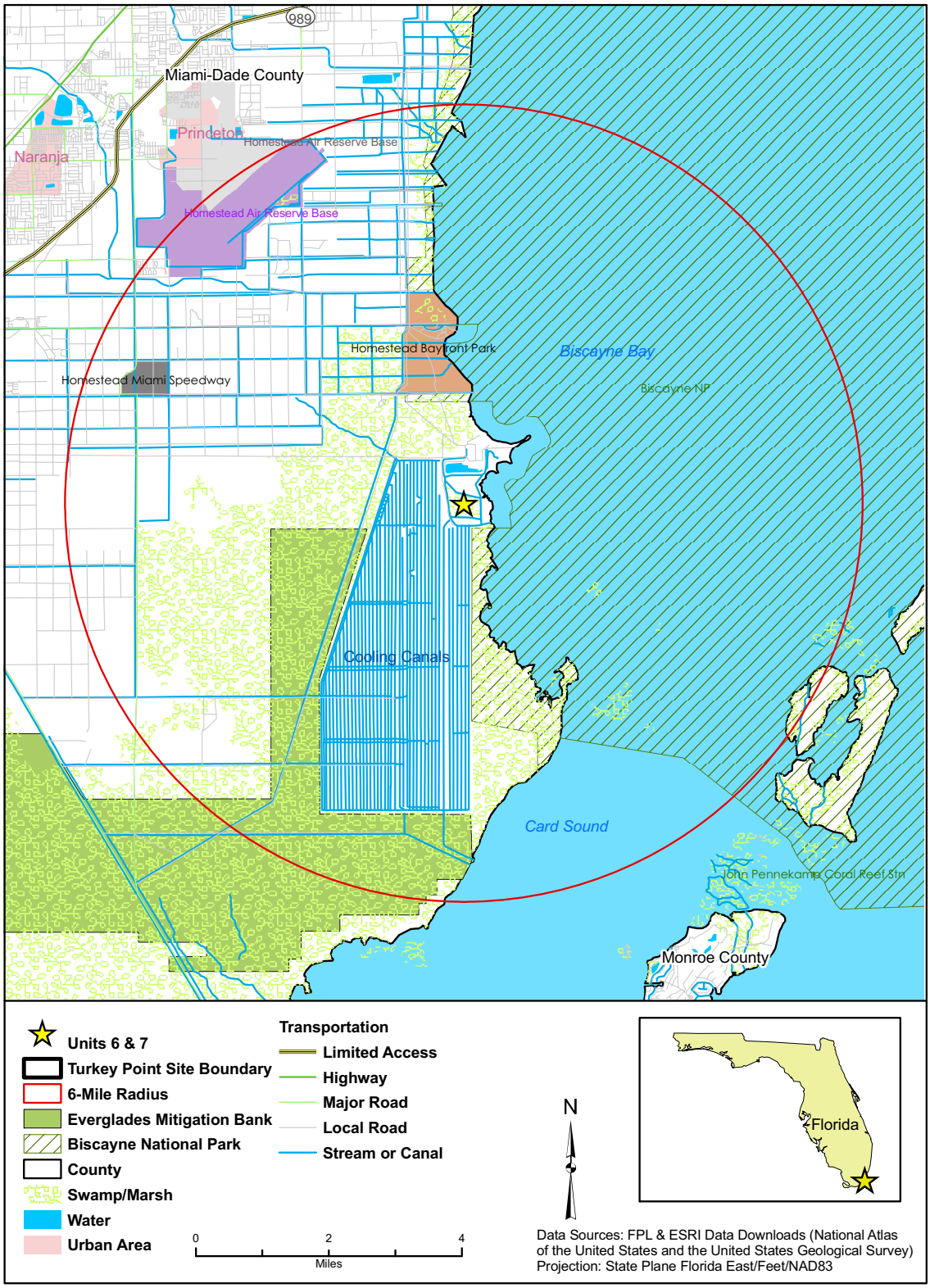

Figure 2.4-2 Habitat Classification at Units 6 and 7

Figure 2.4-3 Locations of Recent Wildlife and Fish Surveys on the Turkey Point Plant Property

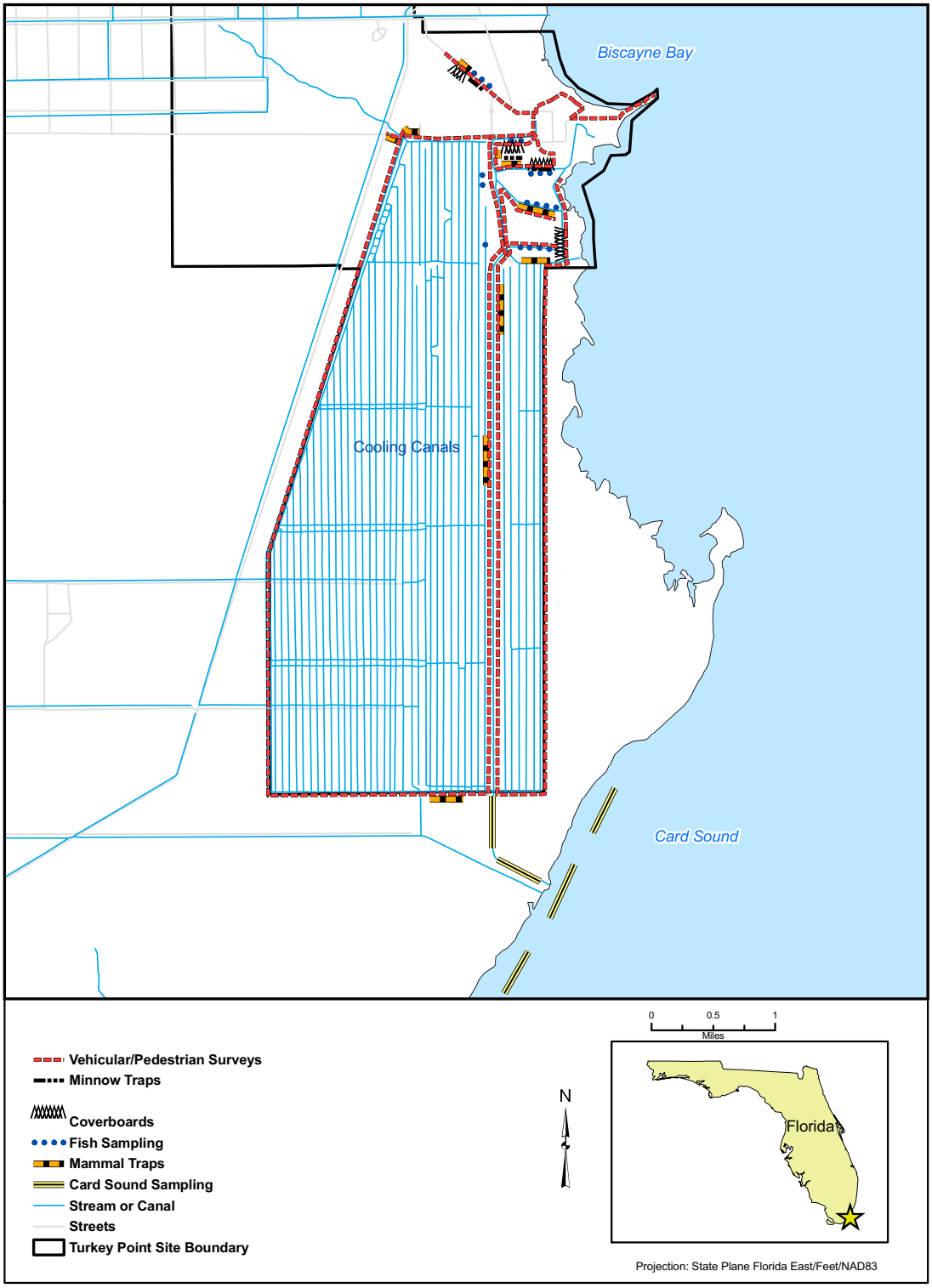

Figure 2.4-4 Designated Critical Habitats Within 50 Miles of the Turkey Point Facility

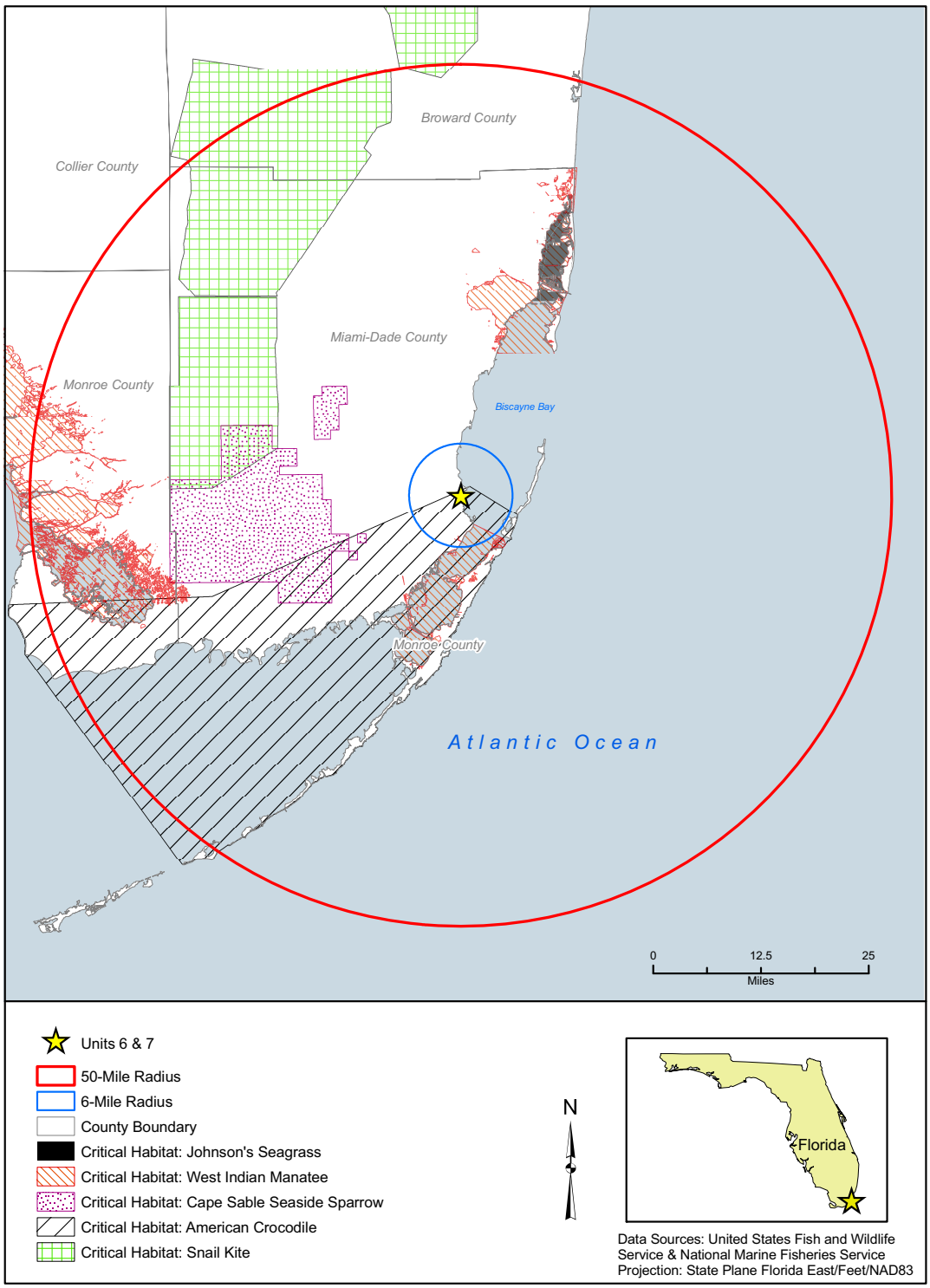
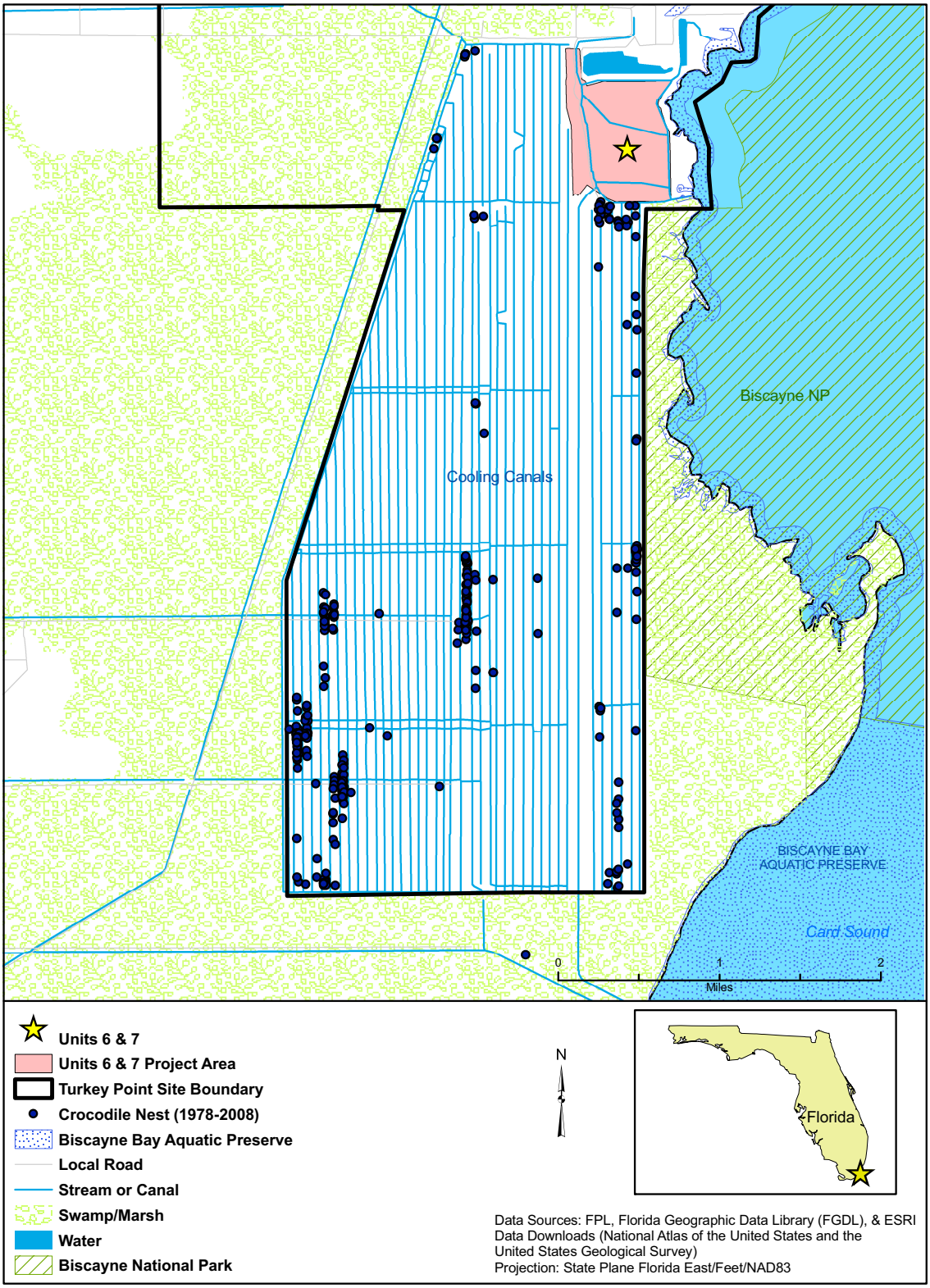
Figure 2.4-5 Crocodile Nest Locations