

**Biological Assessment  
For Threatened and Endangered Species  
Potentially Affected by the  
Renewal of the Operating Licenses for  
the Turkey Point Units 3 and 4,  
Miami-Dade County, Florida**

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## **1.0 Background**

This biological assessment (BA) has been prepared by the U. S. Nuclear Regulatory Commission (NRC) to support the Supplemental Environmental Impact Statement (SEIS) for the renewal of the operating licenses for the two nuclear power reactors at the Turkey Point site, located on the shore of Biscayne Bay in southern Miami-Dade County, Florida. Commercial operation of these reactors has been licensed by the NRC since 1972, and the current licenses are set to expire in 2012 (Unit 3) and 2013 (Unit 4). The proposed license renewal for which this BA has been prepared would extend the operating licenses to 2032 and 2033 for Units 3 and 4, respectively.

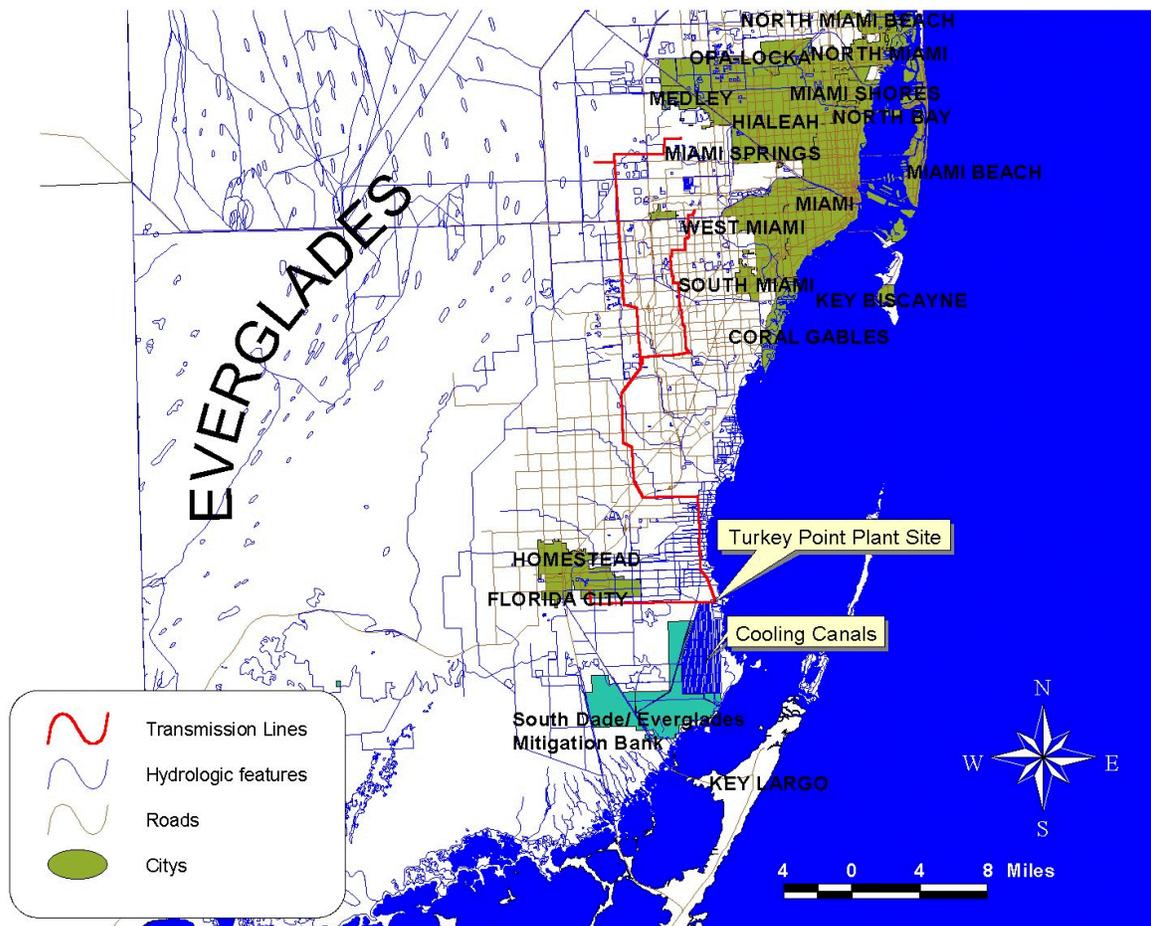
A SEIS was issued on June 12, 2001, to support the relicensing decision; it supplements a Generic EIS (GEIS) for license renewal of commercial nuclear power plants (NRC 1996). The SEIS covers specific issues such as endangered and threatened species that are of concern at the Turkey Point Units 3 and 4 that could not be considered on a generic basis in the GEIS.

An EIS was prepared to support the initial licensing actions in 1972 (AEC 1972). That EIS included brief discussions of rare species in the vicinity of the plant. However, the primary law that now governs the protection of rare species in the U.S., the Endangered Species Act of 1973, had not been passed when the original environmental documentation was prepared. Subsequent to the initial licensing evaluation, potential impacts to endangered or threatened species from aspects of plant operation have been evaluated. A biological assessment (BA) (NRC 1980) (FWS reference number 4-1-80-A-219) was prepared by the NRC staff and submitted to the U.S. Fish and Wildlife service. The BA covered the American crocodile, American alligator, the green, leatherback, hawksbill, and Kemp's Ridley sea turtles, eastern indigo snake, west Indian manatee, brown pelican, and bald eagle as part of the environmental documentation for a license amendment concerning the replacement of steam generators at the Turkey Point plant. The BA concluded (and USFWS concurred) that the operation of the Turkey Point plant would either have no effect or was not likely to adversely affect any of the species considered.

## **1.1 Proposed Action**

The current proposed action considered in the SEIS is the renewal of the operating licenses for Turkey Point Units 3 and 4 for an additional 20-year term beyond the period of the existing licenses. Therefore, the proposed action is essentially administrative in nature; no new construction or refurbishment is proposed. If the operating license renewals are granted, the nuclear units, the cooling canal system, and the transmission lines and corridors will be operated and maintained as they are now until 2032 and 2033.

It should be noted that the overall effect on endangered and threatened species in the vicinity of the site will not be drastically changed whether the operating licenses for Units 3 and 4 are renewed. This is because the two nuclear units share the site with two fossil fuel units that are not under the jurisdiction of the NRC. All four units share the same cooling canal system, and



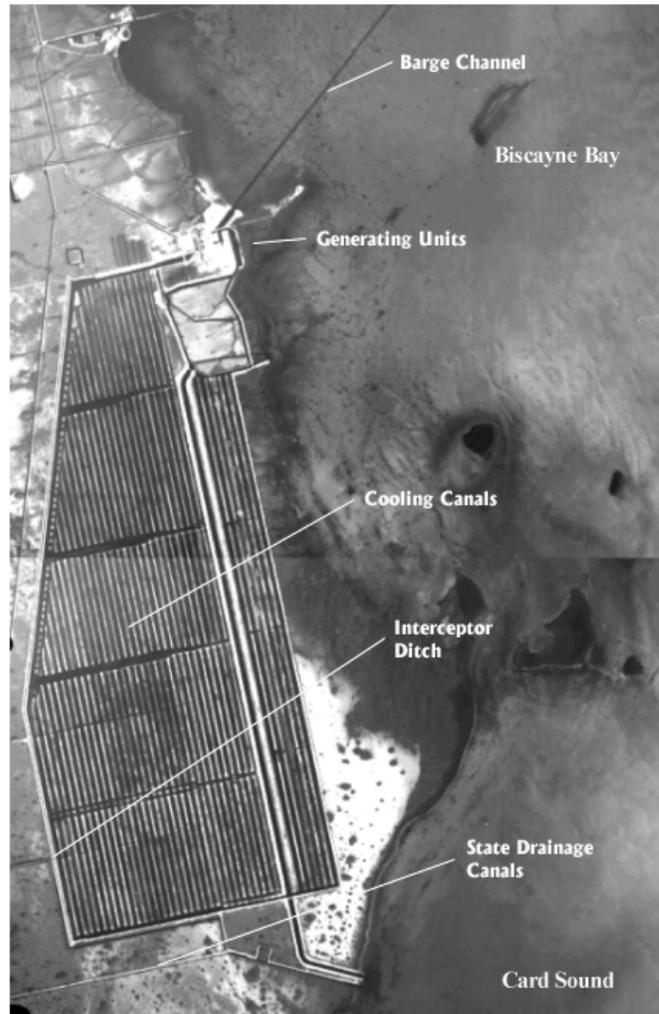
**Figure 1. Location of Turkey Point Units 3 and 4 and Cooling Canals in Southern Miami-Dade County, Florida.**

the electricity generated at all four units is transferred to the regional electrical grid using the same transmission corridors. Therefore, even if the license renewals were denied, the cooling system would continue to be used by the fossil units and the transmission lines and corridors would continue to be used and maintained as they are at present.

The transmission lines associated with the Turkey Point site represent a small portion of the electrical power transmission system in south Florida. The only lines considered in the SEIS and this BA are those originally installed to connect Turkey Point Units 3 and 4 to the regional grid, and which were included in the original site EIS (AEC 1972).

## 2.0 Description of Area

The Turkey Point site is located on the shore of Biscayne Bay approximately 40 km (25 mi) south-southwest of downtown Miami, Florida in Miami-Dade County at latitude 25° 26' 04"



**Figure 2. Composite Satellite Image of Turkey Point Units 3 and 4 and the Cooling Canal System. (Source: National Oceanic and Atmospheric Administration Images 5WGS3233 and 5WGS3235)**

north and longitude 80° 19' 52" west. (Figure 1). The nearest towns are Florida City, located 13 km (8 mi) west and Homestead, located 14 km (9 mi) northwest. The plant site abuts the western boundary of Biscayne National Park and the South Florida or Everglades Mitigation Bank to the

south and southwest. The Turkey Point plant owner, Florida Power and Light (FPL), is also the owner of the mitigation bank land. The two nuclear units at the Turkey Point site share the general location and the cooling system with two fossil fuel plants that are not covered under the NRC licensing actions.

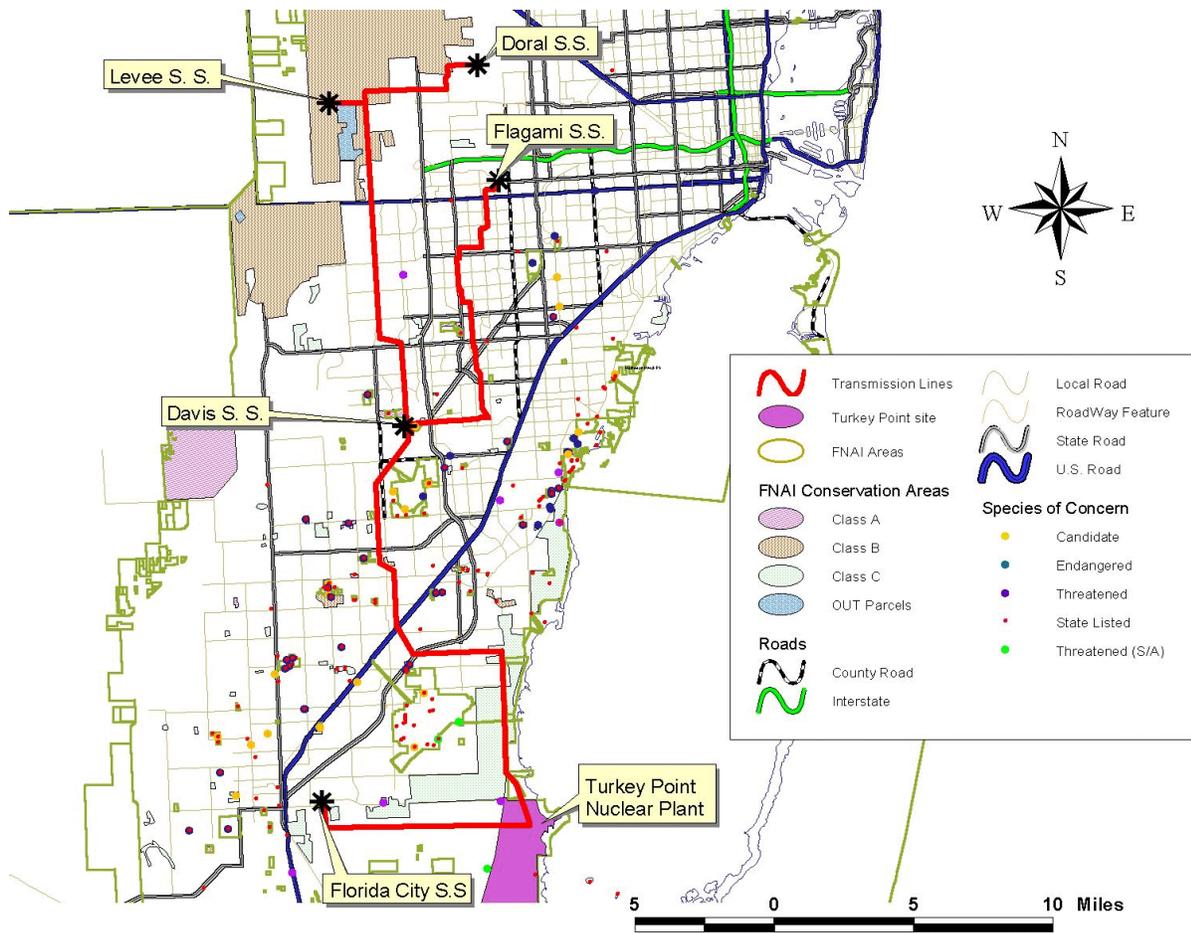
The 29 km<sup>2</sup> (7166 ac) Turkey Point site includes approximately 2 km<sup>2</sup> (494 ac) used for the power plants, support facilities, parking lots, etc. and approximately 27 km<sup>2</sup> (6700 ac) devoted to the cooling canal system (Figure 2). The cooling canal system consists of 32 channels that carry 82 m<sup>3</sup>/s (1.3 million gpm) of warm water south from the plant and 8 channels that return water north to the plant. The 270 km (168 mi) of channels are about 61 m (200 ft) wide and 0.3 to 1 m (1 to 3 ft) deep. Water temperatures range from 17<sup>o</sup> C to 42<sup>o</sup> C (63<sup>o</sup> F to 108<sup>o</sup> F). The average salinity is 36 ppt and the maximum is 46 ppt. The canal system does not withdraw or discharge waters to or from other water bodies; evaporative loss is made up from precipitation or by flow through the porous dike. An interceptor ditch protects freshwater habitats to the east and south of the system from intrusion of the hypersaline waters of the canals during dry periods. Groundwater flow in the area is from west to east toward Biscayne Bay. The flora of the cooling canals is dominated by rooted marine plants which are removed on about a three-year cycle to maintain water flow.

The reproducing fauna of the canals include crabs and killifish (Cyprinodontidae) and live-bearer fish (Poeciliidae). Several estuarine gamefish species, such as snook, barracuda, and tarpon are found in low abundance and are believed to have entered the system prior to closure. Typical spawning habitat for these species does not occur in the cooling canal system.

The canals are separated by berms of spoil material dredged when the canals were constructed. These berms are 1 to 5 m (3 to 15 ft) in height and up to 61 m (200 ft) wide. In different areas the berms may be barren, covered with salt tolerant herbs and grasses, or densely covered with Australian pine (*Casuarina equisetifolia*), Brazilian pepper (*Schinus terebinthifolius*), red mangrove (*Rhizophora mangle*), and buttonwood (*Conocarpus erectus*). Woody terrestrial vegetation is removed from the berms by mechanical means on a ten-year cycle to maintain the cooling efficiency of the canals.

Aquatic and marine habitats surrounding the cooling canal system include Biscayne Bay and Card Sound to the east, state drainage canals to the south and west, and the Everglades farther to the west beyond Florida City, Florida, and Homestead, Florida. Several threatened, endangered, and candidate species occur in these surrounding habitats; their distributions are described in the species accounts later in this report.

Prior to site construction, the eastern portion of the site was primarily dominated by red mangrove and the western portion of the site, where the canals are now located, was dominated by sawgrass (*Cladium jamaicensis*), cattails (*Typha* sp.), and dwarf red mangrove, with scattered islands of black mangrove (*Avicennia germinans*), white mangrove (*Laguncularia racemosa*), and buttonwood (AEC 1972). The areas immediately west of the cooling canals are presently



**S. S. = substation**

**Figure 3. Transmission Lines Associated with Turkey Point Units 3 and 4, with Reported Locations of Endangered, Threatened, and Candidate Species and the Distribution of Some Conservation Areas. (Data from Florida Geographic Data Library, February 2001)**

characterized as sawgrass marsh or wet prairie with islands of mangrove and hardwood hammocks (FPL 1995).

The transmission corridors associated with the Turkey Point site occupy approximately 9.3 km<sup>2</sup> (2295 ac) over a combined distance of approximately 92 km (57 miles) (Figure 3). The transmission lines are in two sets of corridors, the first runs west from the Turkey Point site for approximately 8 km (5 mi) then turns north a short distance to the Florida City substation along Palm Drive approximately 3.2 km (2 mi) east of Florida City. The vegetation along this corridor is primarily sawgrass marsh and wet prairie that has been heavily invaded by Australian pine and Brazilian pepper (FPL 2000). The other transmission corridor runs north from the Turkey Point

site, the first 10 km (6.2 mi) through a tidal mangrove community, then primarily through agricultural and otherwise developed lands. Portions of the northern corridors pass through or near remnant patches of pine rockland, which was the dominant community type along the Miami ridge prior to European settlement and subsequent development. Pine rockland habitat is now extremely rare and harbors several federally listed threatened or endangered plant species (FWS 1999a).

Typical maintenance within the transmission corridors includes tree trimming at mid-span or when exotic species such as Australian pine invade the tower pads or corridor. Herbicides are primarily applied to individual trees or shrubs to prevent re-sprouting, although broadcast applications are used as general weed control in some of the urban or suburban areas. Regular mowing also is used for maintenance of corridors in suburban areas.

### **3.0 Description of Potential Actions and Effects**

This BA has been prepared to evaluate the potential effects of the continued operation and maintenance of Turkey Point Units 3 and 4, the cooling canal system, and the associated electrical power transmission system during the license renewal term of 2012 through 2033. Actions that may affect endangered or threatened species include mowing, trimming, and weed control within the transmission corridors, vegetation management within the cooling canals and on the berms between canals, temperature and effluent effects on the aquatic conditions within the cooling canals, impingement on the intake structure, or entrainment of organisms through the reactor cooling systems.

Minor sources of potential adverse impacts to threatened and endangered species include collision and/or electrocution hazards for the larger birds associated with the transmission lines, effluents from the plant, and power plant effects on the cooling pond temperature regime. Activities that are most likely to result in adverse impacts to endangered or threatened species as a result of continued operation of Turkey Point Units 3 and 4 are vegetation maintenance activities in the cooling pond system and along the transmission line corridors.

The continued effectiveness of the cooling canal system in heat dissipation requires the maintenance of water flow in the canals and air flow above the canals. Several types of rooted marine plants, including widgeon grass (*Ruppia maritima*), shoal grass (*Halodule wrightii*), turtle grass (*Thalassia testudinum*), manatee grass (*Syringodium filiforme*), and stargrass (*Halophila engelmannii*), can grow from the bottom to the top of the water column, impeding water flow. FPL removes rooted marine plants on about a three-year cycle with a barge-mounted machine that moves slowly along the canal system. The barge is mounted on tracks, so that it can also move across the berms. Plants are uprooted by hydraulic means, collected on a rake, ground in a macerator, and discharged back to the canal. Woody vegetation growing on the berms, including exotic species, are pulled up by the roots with a "berm mower," a wide-track bulldozer that pulls a chopping device. Grasses and other herbaceous vegetation then colonize the disturbed areas. Crocodile nesting areas are designated as sanctuaries and are not revegetated.

FPL does not use chemicals for vegetation maintenance in the cooling canal system, nor are chemicals or wastes from plant operations or domestic sources discharged to the cooling canal system. The operation of the Turkey Point Units 3 and 4 primarily affects water flow and temperature within the cooling canal system. Water circulation in the cooling canal system is about 82 m<sup>3</sup>/s (1.3 million gpm), and current speed is less than 0.46 m/s (1.5 ft/s). Impingement and entrainment of organisms and other material in the intakes of the plants is controlled by trash racks and traveling screens. Large items are collected for disposal, while small items are returned to the discharge side of the canals. Flow and temperature in the canals is maintained by the operation of both the Turkey Point nuclear and fossil fuel units. This, plus the recirculating nature of the system, reduces the chance of cold shock effects should the cooling system of one or more units be inoperable or the nuclear units be closed and decommissioned.

FPL generally follows a low-impact approach to transmission line corridor maintenance. Woody vegetation is left in place unless it gets tall enough to compromise the conductors or impair access along the maintenance roads. At most locations there is an active program to remove weedy trees such as Australian pine, Brazilian pepper, and melaleuca (*Melaleuca quinquenervia*). Removal of taller trees is usually by hand, and often the stumps are treated with herbicides to discourage resprouting. Much of the land in the transmission corridors is currently used for agricultural production, including row, tree, and nursery crops. In the urban and suburban portions of the transmission lines, the corridors may be regularly mowed, and in some areas herbicides are used to control weedy vegetation. FPL utilizes a computer database to prepare management prescriptions for each section of transmission line corridor that incorporate known management concerns and environmental sensitivities.

Some of the larger bird species, such as bald eagles and wood storks, could be adversely affected by collisions and / or electrocution on transmission lines. However, there have been no reported occurrences of eagle or wood stork collisions or electrocutions along the transmission corridors associated with the Turkey Point Units 3 and 4 (FPL personal communication).

#### **4.0 List of Species Potentially Present at or Near the Project Site**

There are approximately 23 federally listed endangered or threatened species (Table 1), and an additional 8 species that are currently candidates for federal listing (Table 2) at or near the Turkey Point site and associated transmission lines. The species listed in Tables 1 and 2 were obtained from the U.S. Fish and Wildlife Service (FWS) / Vero Beach web site in January 2001 (FWS 2001a), from the National Marine Fisheries Service (NMFS) website in July 2001 (NMFS 2001a), from the Florida Natural Areas Inventory (FNAI) in February 2001 (FNAI 2001), from the South Florida Multi-Species Recovery Plan (FWS 1999a), from data provided by FPL as part of their license renewal application, and from the data within the Florida Geographic Data Library as of February 2001 (FGDL 2001). Included in Table 1 are all of the Federally listed endangered or threatened species reported to occur within Miami-Dade County, Florida.

**Table 1. List of Federal Endangered or Threatened Species Potentially Occurring at or Near the Turkey Point Site or Associated Transmission Lines**

Species	Common Name	Federal Status <sup>1</sup>
<i>Crocodylus acutus</i>	American crocodile	E
<i>Alligator mississippiensis</i>	American alligator	T(S/A)
<i>Chelonia mydas</i>	green turtle	E
<i>Dermochelys coriacea</i>	leatherback sea turtle	E
<i>Eretmochelys imbricata</i>	hawksbill sea turtle	E
<i>Caretta caretta</i>	loggerhead sea turtle	T
<i>Drymarchon corais couperi</i>	eastern indigo snake	T
<i>Ammodramus maritimus mirabilis</i>	Cape Sable seaside sparrow	E
<i>Charadrius melodus</i>	piping plover	T
<i>Haliaeetus leucocephalus</i>	bald eagle	T
<i>Mycteria americana</i>	wood stork	E
<i>Rostrhamus sociabilis plumbeus</i>	Everglades snail kite	E
<i>Sterna dougallii dougallii</i>	roseate tern	T
<i>Felis concolor coryi</i>	Florida panther	E
<i>Trichechus manatus</i>	West Indian manatee	E
<i>Heraclides aristodemus ponceanus</i>	Schaus swallowtail butterfly	E
<i>Amorpha herbacea</i> var <i>crenulata</i>	crenulate leadplant	E
<i>Chamaesyce deltoidea adhaerens</i> and <i>C. deltoidea deltoidea</i>	deltoid spurge	E
<i>Chamaesyce garberi</i>	Garber's spurge	T
<i>Galactia smallii</i>	Small's milk pea	E
<i>Halophila johnsonii</i>	Johnson's seagrass	T
<i>Jacquemontia reclinata</i>	beach jacquemontia	E
<i>Polygala smallii</i>	tiny polygala	E

<sup>1</sup> Status codes: E = endangered, T = threatened, T(S/A)= Threatened due to similarity of appearance.

**Table 2. List of Federal Candidate Species Potentially Occurring at or Near the Turkey Point Site or Associated Transmission Lines**

Species	Common Name	Federal Status <sup>1</sup>
<i>Rivulus marmoratus</i>	mangrove rivulus	C
<i>Pristis pectinata</i>	small-toothed sawfish	C
<i>Argythamnia blodgettii</i>	Blodgett's wild-mercury	C
<i>Brickellia eupatorioides</i> var <i>floridana</i> (= <i>B. mosieri</i> )	Florida thoroughwort brickell-bush	C
<i>Chamaesyce deltoidea pinetorum</i>	pinelands spurge	C
<i>Digitaria pauciflora</i>	few-flowered crabgrass	C
<i>Linum carteri</i> var <i>carteri</i>	Carter's small-flowered flax	C
<i>Linum arenicola</i>	sand flax	C

<sup>1</sup> Status codes: C = federal candidate species.

Several of the species listed in Table 1 have had Critical Habitat designated by the FWS or NMFS near the Turkey Point site or within Miami-Dade County. These species include:

- American crocodile critical habitat includes all land and water south of a line from Turkey Point to Christmas Point on Elliot Key (FWS 1999a).
- Everglades snail kite has critical habitat designated north and west of the Turkey Point site and associated lines (FWS 1999a).
- Cape Sable seaside sparrow critical habitat is west of the Turkey Point Site, primarily within the Everglades National Park just west of Homestead, FL (FWS 1999a).
- Piping plover critical winter areas are not located within Miami-Dade County, but have been designated within Monroe County, the Florida Keys, and in Palm Beach County north of the project areas (FWS 2000).
- West Indian manatee critical habitat includes Biscayne Bay, Card Sound and connecting waters south from the northern tip of Key Largo and adjacent Miami-Dade County on the mainland (FWS 2001b). This area includes the state drainage canals immediately south of the cooling canal system.
- Johnson's seagrass critical habitat includes the northern-most portions of Biscayne Bay (NMFS 2001b).

## **5.0 Inventories and Surveys**

FPL commissioned a survey of the transmission corridors associated with Turkey Point Units 3 and 4 during the Spring of 2001 (Cotleur and Hearing 2001). The biologists mapped the vegetation types throughout the corridors, and surveyed all portions of the corridors to a degree commensurate with the likelihood of habitation by species of concern. For instance, areas currently used as orchards were given cursory surveys focusing on wildlife species, whereas areas with natural vegetation were surveyed using pedestrian transects spaced at 1.5 m (5 ft) to 4.5 m (15 ft) intervals.

The only federally listed species observed during these field surveys was a single wood stork that was observed standing in an access road near Biscayne Bay National Park. No federally listed plant species were observed during the surveys, but several plant species listed as endangered, threatened, or commercially exploited by the Florida Fish and Wildlife Conservation Commission / Florida Department of Agriculture (FFWCC 1997) were observed.

## **6.0 Individual Species Descriptions and Assessments**

In the following sections, the potential effect of continued operations of Turkey Point Units 3 and 4 and associated transmission lines is evaluated for each of the species listed in Table 1. Each section provides a brief description of the species, its life history, present distribution and status, and threats to continued existence. Turkey Point Units 3 and 4 are then evaluated in regard to these data to derive effects conclusions for each species. Most of the life history, distribution, status, and trend information is based on information provided in the South Florida Multi-Species Recovery Plan (FWS 1999a), and unless otherwise specifically stated, it can be assumed that the recovery plan is the implied reference for the information presented.

### **6.1 American Crocodile (*Crocodilus americanus*)**

The American crocodile is one of two crocodylians native to the United States, the other being the American alligator (see Section 6.2 for a discussion of that species). Its range includes coastal areas of the Americas from northern South America to south Florida. In Florida, its historic range was from Key West north to Lake Worth on the east coast and Tampa Bay on the west coast. Currently, the population is limited to Miami-Dade, Monroe, Collier, and Lee Counties. The American crocodile is a coastal species, preferring mangrove habitats, bays, creeks, and swamps. Crocodiles move seasonally between preferred nesting, non-nesting, and wintering habitats. Nesting occurs on sandy shorelines or marl creek banks, including the berms of the Turkey Point cooling canal system. Although primarily an estuarine species, crocodiles require access to freshwater, whether these are low salinity ponds, creek effluents, rainwater pools, or rainwater lenses. Holes, undercut banks, and the roots of mangroves and other trees provide protection for both adults and juveniles, and deep water areas adjacent to nesting and resting habitats are important for adults. Individuals of the species are mobile, moving seasonally between preferred habitats. In the non-nesting season and winter, crocodiles may

move inland. Crocodiles eat a wide variety of food items, including crabs, fish, birds, small mammals, and other crocodilians.

Historically, human threats to the American crocodile have included hunting, land development and urbanization, and human activity. Habitats have been reduced and fragmented, and water quality and water flows have been altered. Crocodiles are killed by vehicles as animals cross roadways. Human recreational activities in coastal and estuarine areas can disturb crocodile behavior, including nesting. In Florida, nest defense by females is variable, but parental assistance is necessary for successful hatching. Females do not care for the young after hatching. Important factors in nest failure are desiccation, predation, and flooding. Sources of natural mortality include severe weather, such as tropical storms and hurricanes, lack of freshwater, predation, and low temperatures. Young crocodiles are eaten by birds, crabs, fish, and other crocodiles. From perhaps 1000 to 2000 individuals in the early 20<sup>th</sup> century, populations declined to about 100 to 400 non-hatchlings by the 1960s and 1970s. In the last 25 years, populations have increased to about 500 to 1000 individuals. The number of observed nests has also increased in recent years to about 50 (FWS 1999a, ESandE, Inc 2000).

The American crocodile was first observed in the Turkey Point cooling canal system in 1978, four years after completion of the canals. Preferred habitats are adjacent to the interceptor ditch in the south and southwestern portion of the system, where nests, juveniles, and adults are found. Crocodiles move freely into and out of the Turkey Point cooling canal system. During 1999 and 2000, 15 and 17 nests, respectively, were recorded. These nests produced about 300 young (FPL, personal communication). The resident adult population is on the order of 30 to 40 individuals. Likely food sources for crocodiles in the canal system are small fish, crabs, wading birds, and other crocodiles. The crocodile population in the cooling canal system is relatively undisturbed, since the area is closed to the public and activities are limited to canal maintenance and crocodile research.

Several features of the cooling canal system provide good crocodile habitat. These include warm temperatures during the winter, relative isolation from human activity, and preferred nesting habitat (raised banks above the high water line near deeper water). Although the water of the canal system is hypersaline, fresh water collects in small depressions on the berms between the canals. The freshwater pools on the berms are important juvenile rearing habitats (FPL, personal communication).

FPL has prepared an ecological risk assessment for the crocodile in the cooling canal system (ESandE, Inc. 2000). That study concluded that the Turkey Point population is growing and reproducing successfully. Hypersalinity does not adversely affect the growth of hatchlings. Potential chemicals of concern are not elevated above concentrations in reference populations in other areas. Operation of the Turkey Point plant is contributing to the increase in the American crocodile in Florida. A substantial portion of crocodile nesting occurs in the Turkey Point cooling canal system, where about 15 nests are recorded annually. Numbers of nests increase at a rate of about 1 per year. These nests produce about 300 hatchlings, or more than 50% of known

hatchling production in the region (ESandS, Inc. 2000). Crocodiles from the Turkey Point canal system emigrate to other areas; tagged juveniles from the Turkey Point canal system have been recaptured on Key Largo.

FPL has obtained state permits for research and carcass salvage. Since 1983, FPL has managed the site to protect crocodiles, including

- constraints on vehicular traffic at night and during critical periods of the nesting season
- constraints on road maintenance and construction at night and during critical periods of the nesting season
- coordination of canal dredging and maintenance with the Environmental Department
- marking and avoidance of disturbance of nest site sanctuaries
- training requirements for personnel handling hatchlings
- population monitoring programs.

Actions of continued operation that could affect the American crocodile population in the cooling canal system include:

- continued closure of the canals to access by the public (beneficial effect),
- research and monitoring activities (small adverse effect resulting in beneficial management practices)
- continued vegetation control, including exotic control (beneficial effect),
- continued maintenance of perched freshwater ponds on the berms (beneficial effect)
- hypersalinity of the canal water (offset by maintenance of freshwater pond - no effect).

Crocodiles are protected from impingement in the intakes of the nuclear units by two factors: the slow speed of water movement in the canals (less than 0.5 m/s [1.5 ft/s]) and the location of preferred crocodile habitat at the opposite end of the canal system from the nuclear and fossil units. Occasionally (four instances in 1998-2000), crocodile carcasses have been removed from the returning cooling water by the trash racks at the intake screens. The conditions of the carcasses indicate that the animals were dead prior to arrival at the intakes (FPL, personal communication).

Continued operation of the Turkey Point Units 3 and 4 for an additional 20 years beyond the current operating license period would continue to provide the habitat conditions in the cooling canal system that support a reproducing population of American crocodiles. Based on the information provided above, it is concluded that continued operation of Turkey Point Units 3 and 4 IS LIKELY TO HAVE A BENEFICIAL EFFECT on the American crocodiles during the license renewal term.

## **6.2 American Alligator (*Alligator mississippiensis*)**

The American alligator is one of two native crocodylians in the United States, the other being the American crocodile (see Section 6.1 for a species account). Alligators inhabit rivers, swamps, estuaries, lakes, and marshes; they may co-occur with the American crocodile in estuarine areas. The distribution of the American alligator extends from North Carolina to Texas. Alligators declined from over hunting and habitat destruction to the point that they were listed as endangered in 1967. Subsequent protection of the species has resulted in recovery of the population to the extent that it was delisted in 1987. However, the American alligator is considered threatened due to similarity of appearance to the American crocodile, which is listed as endangered.

Alligators are not found in the Turkey Point cooling canal system. Their distribution is limited to freshwater habitats to the west and south of the Turkey Point site, and in freshwater habitats crossed by the transmission line system. No individuals or nests of alligators were observed during a Spring 2001 survey of transmission line corridors. Individuals or nests may occasionally be disturbed by infrequent vegetation control measures in localized areas where transmission lines cross drainage canals.

Based on these considerations, it is concluded that the continued operation of Turkey Point Units 3 and 4 and the associated transmission lines during the license renewal period IS NOT LIKELY TO ADVERSELY AFFECT the American alligator.

## **6.3 Eastern Indigo Snake (*Drymarchon corais couperi*)**

The eastern indigo snake is a large, dark colored, non-venomous snake that is widely distributed throughout Florida and southern Georgia; historically, it also inhabited much of the coastal plain of Alabama and Mississippi. The largest endemic population is centered in the sand hills of northern Florida and southern Georgia. In the northern populations, the distribution is closely linked with that of the gopher tortoise. The gopher tortoise burrows provide thermal refugia and help the snakes prevent desiccation. In southern Florida, the more stable thermal regime reduces the snake's dependence on thermal refugia. In wetter habitats that lack gopher tortoises, indigo snakes may take shelter in hollowed root channels, hollow logs, or the burrows of other animals such as rodents, armadillos, and land crabs.

Indigo snakes appear to use a wide variety of habitat types in southern Florida. They are especially common in pine flatwoods, pine rocklands, and tropical hardwood hammocks, but they can be found in almost any type of undeveloped area. Home range size in south central Florida averages about 74 ha (183 ac) for males and about 19 ha (47 ac) for females. Indigo snakes will consume almost anything that they can overpower, including lizards, frogs, fish, other snakes, turtles, juvenile gopher tortoises, young alligators, birds, and small mammals. Juvenile indigo snakes prey primarily on invertebrates.

When the indigo snake was first listed as threatened by the FWS, the principal threats were considered to be over-collection for the pet industry and gassing of gopher tortoise burrows during the collection of rattlesnakes. Effective enforcement of protection laws has greatly reduced these threats. The development and alteration of vast portions of the available habitat is now the leading threat to the indigo snake. The optimal quantity and distribution of land required to maintain viable populations is not known at this time, although some models suggest that preserves must be at least 4000 ha (9880 ac) to ensure survival of small populations.

Eastern indigo snakes are not common on the Turkey Point site, but they are resident in the area and are infrequently sighted. No indigo snakes or signs of snakes were observed during the surveys of the transmission line corridors, although FPL personnel reported that they are occasionally observed within the corridors. NRC staff and contractors observed a specimen of the Eastern indigo snake on the Turkey Point site during the December 2000 site visit. FPL maintains a handling permit issued by the Florida Fish and Wildlife Conservation Commission (WX01041) that allows them to move individuals out of danger when necessary. In addition, site personnel and contractor personnel (including transmission line and corridor maintenance personnel and sub-contractors) are required to attend training classes prior to starting work. Procedures are in place to ensure that indigo snakes are not harassed or killed during the course of routine activities, and any dead indigo snakes that are found are reported.

Based on these considerations, it is concluded that the continued operation of Turkey Point Units 3 and 4 and the associated transmission lines during the license renewal period IS NOT LIKELY TO ADVERSELY AFFECT the eastern indigo snake.

#### **6.4 Schaus Swallowtail Butterfly (*Heraclides [=Papilio] aristodemus ponceanus*)**

The Schaus swallowtail butterfly is a large, blackish-brown swallowtail with dull yellow contrasting markings. The adult wing span is approximately 8.6 to 9.5 cm (3.4 to 3.7 in).

This species occurs exclusively in subtropical dry forests known as hardwood hammocks. Suitable habitat can include areas that have been previously cleared, but have since regrown. Larger patches of hardwood hammock are now found only in the Upper Keys in Miami-Dade and Monroe Counties. Optimal habitat tends to be of higher elevation (3.0 m (10 ft) to 4.6 m (15 ft) above sea level), away from tidal waters, and has a mature overstory of trees such as gumbo-limbo (*Bursera simaruba*), pigeon plum (*Coccoloba diversifolia*), black ironwood (*Krugiodendron ferrum*), West Indian mahogany (*Swietenia mahogoni*), and wild tamarind (*Lysiloma latisiliquum*). The primary food plants for larvae are the torchwood (*Amyris elemifera*) and wild lime (*Zanthoxylem fagara*). The minimum patch size needed to successfully sustain a population is not known, but viable wild populations have been documented within areas as small as 4 ha (10 ac).

Schaus swallowtail historically was found in hardwood hammocks from south Miami to Lower Matecumbe Key. Presently, it is found in the Florida Keys from Elliot Key in southern Biscayne

Bay, and in the Keys south and west to Lower Matecumbe Key in the Middle Keys. The species is currently known from 13 locations on the mainland and Upper and Middle Keys following reintroduction efforts performed between 1995 and 1997. One of the release sites was on the Charles Deering Estate near south Miami; the rest were scattered in the Keys between northern Key Largo and Point Charles.

The species was originally described based on specimens collected in the south Miami area in the late 1800's, but wild specimens have not been collected on the mainland since 1924. Currently, it is most common on Elliot Key and other Keys within Biscayne National Park, and at a few sites on northern Key Largo. Between 1985 and 1990, the population on Elliot Key fluctuated between approximately 600 and 1000 annually, and 50 to 100 individuals were normally found on each of four other Keys within Biscayne National Park. Hurricane Andrew in 1992 temporarily reduced the number of individuals to approximately 58 in Biscayne National Park, but the population appears to have rebounded to at least 600. After the introduction performed between 1995 and 1997, the total number of individuals in the wild is at least 1200.

Schaus swallowtail was initially listed as threatened in 1976 because of population declines due to destruction of hardwood hammock habitat, mosquito control practices, and over-harvesting by collectors. It was reclassified as endangered in 1984 because of dramatic population and range reductions. The principal threats continue to be loss of habitat due to residential and commercial conversion, and introduction of pesticides, with some loss due to road kills, extreme climatic conditions, predation, parasites, and continued collection pressure.

Other than the Spring 2001 transmission corridor surveys, there have been no known surveys for the Schaus swallowtail butterfly in the vicinity of the Turkey Point site or associated transmission lines. The species was not observed during the 2001 survey, and the species is highly unlikely to occur within the project areas because the lack of tropical hardwood hammock habitat. Therefore, it is concluded that the continued operation of Turkey Point Units 3 and 4 and associated transmission lines during the license renewal term will have NO EFFECT on the Schaus Swallowtail butterfly.

## **6.5 Wood Stork (*Mycteria americana*)**

The wood stork is a large (wingspan approx. 1.6 m (5.3 ft)), long-legged wading bird with a black featherless head. It is the only species within the stork family (Ciconiidae) in North America. Wood storks nest from Northern Argentina, through central America, Mexico, Cuba, and the southeast U.S. Currently, nesting sites in the United States are restricted to Florida, Georgia, and South Carolina. Wood storks nest in many south Florida counties, including Miami-Dade, Broward, and Monroe counties, but the nearest known nesting site to the Turkey Point site or transmission lines is in the Everglades National Park, at least 15 km (9 mi) from the transmission lines. Wood storks often nest communally with other wading birds such as white ibis, tri-colored herons, and snowy egrets. Bald cypress (*Taxodium distichum*) and red mangrove are the preferred trees for breeding colonies.

Wood storks rely on an unusual feeding behavior called tactolocation, in which they hold their mouth open under water. When they feel a fish, they quickly snap shut their bill to catch the fish. They will often stir the water with their feet to startle prey. Because of this feeding behavior, they require foraging areas with relatively high prey density. The natural hydrological regime in south Florida involves seasonal flooding of large flat areas followed by a drying period, which concentrates fish into smaller pools that can be exploited by wood storks.

Wood stork populations have shrunk considerably since the 1930's throughout the species range. Data suggest that the Florida population once included 15,000 to 25,000 breeding pairs and upward of at least 100,000 individuals, whereas more recent data from the early 1990's suggested only about 4000 to 7000 pairs. The data also indicate that the population in southern Florida has substantially declined since the 1960's, whereas the population in northern Florida, Georgia, and South Carolina has increased. The greatest current threat to wood storks in south Florida is the massive changes to the natural hydrological regime that have occurred throughout the everglades. During wet years, current water management practices prevent the formation of shallow pools that concentrate fish, and during dry years, freshwater sloughs are over-drained, and freshwater flows into estuaries are reduced, limiting fish production potential.

Wood storks are regular winter visitors in the vicinity of the Turkey Point site and portions of the transmission system. Although storks are observed in and around the cooling canal system, there are limited opportunities for wood stork foraging because the forage fish density is relatively low and the water stays at relatively constant levels; therefore, there is no mechanism to concentrate the fish into smaller pools. There are more suitable foraging areas near the transmission corridors north of the Turkey Point site, and numerous sightings between Turkey Point and Chapman Field Park have been reported (USAF 2000). The observations indicate that wood storks tend to forage along the mangrove fringe, in freshwater wetlands, and along roadside ditches. Nearly all wood stork sightings in the vicinity of Turkey Point are during the winter. One wood stork was observed during the Spring 2001 transmission corridor survey.

There have been no reported incidents of wood stork collisions with the transmission lines associated with Turkey Point Units 3 and 4. FPL has reported wood stork collisions with lower voltage distribution lines in Palm Beach County that are not associated with Turkey Point Units 3 and 4. These occurred in areas where the transmission lines were built near roosting areas with an associated higher concentration of storks and high number of stork flights beneath, over, through, or near the conductors and towers. FPL modified those lines to minimize the adverse impacts. FPL has a process in place for identification and reporting of bird collisions, which includes annual staff training (FPL, personal communication).

Based on the available information, it is concluded that the continued operation of Turkey Point Units 3 and 4 and the continued operation and maintenance of the associated transmission corridors during the license renewal term IS NOT LIKELY TO ADVERSELY AFFECT the continued existence of wood storks.

## 6.6 Bald Eagle (*Haliaeetus leucocephalus*)

The bald eagle is a large raptor that occurs throughout North America. Some of the eagles observed in Florida are believed to migrate north during the Spring and summer, but many that breed in southeast Florida and the Everglades apparently reside in the area year round. Bald eagles are usually water dependent, and are typically found near estuaries, large lakes, reservoirs, major rivers, and along sea coasts. In Florida, bald eagles usually nest within 2.5 km (1.5 mi) of open water where they can forage. Pines and bald cypress are the most common tree species used for nests, although in Florida Bay and the Everglades many of the nests are in black and red mangroves. Nesting in south Florida typically occurs between late October and March. Fish and small water fowl are the most common prey.

The population of bald eagles in Florida has shown a steady increase over the last 25 to 30 years, growing from less than 100 successful nests in 1973 and 1974 to over 600 in 1995. This population increase has also been documented in most other parts of the species range, leading the FWS to propose complete delisting of the species (FWS 1999b).

In south Florida, the primary threats to the bald eagle include loss of habitat due to continued development and land use alterations, and other human interactions. Nesting eagles can be highly sensitive to human disturbance, and nest sites are often abandoned if the level of human activity is too high. Environmental contaminants contributed significantly to the rapid decline in the nation-wide eagle population that was observed between the 1940's and 1960's.

Bald eagles are occasionally observed at the Turkey Point site and the surrounding areas (AEC 1972; Connell Metcalf and Eddy, Undated). Nesting was reported in the vicinity of the cooling canal system prior to Hurricane Andrew in 1992 (NRC 1980). It is unlikely that bald eagles can successfully forage in the cooling canals because of low prey density. Nesting presently occurs in the Arsenicker Keys at the south end of Biscayne National Park, and in Barnes Sound south of the Turkey Point site. The Arsenicker Keys nesting site is approximately 3 to 5 km (1.9 to 3.1 mi) east of the Turkey Point cooling canals. Eagles are also regularly reported from the vicinity of Black Point, approximately 12 km (7.5 mi) north of the Turkey Point site and 3 km (1.9 mi) from the transmission lines, but no nesting has been documented in that area (USAF 2000). No bald eagles were observed during the Spring 2001 transmission corridor survey. There has been no reported occurrences of bald eagle collisions or electrocutions along the transmission corridors associated with Turkey Point Units 3 and 4 (FPL, personal communication).

Based on this information it is concluded that the continued operation of Turkey Point Units 3 and 4 and the continued operation and maintenance of the associated transmission lines IS NOT LIKELY TO ADVERSELY AFFECT bald eagles during the licence renewal term.

## 6.7 Cape Sable Seaside Sparrow (*Ammodramus maritimus mirabilis*)

Cape Sable seaside sparrows are medium-size, non-migratory sparrows found only in extreme southern Florida. They are presently found in Miami-Dade and Monroe counties, restricted to areas of marl prairies east and west of Shark River Slough and flanking Taylor Slough. The species feeds primarily on soft-bodied insects, spiders, marine worms, and shrimp, as well as grass and sedge seeds. The species nests from February through early August, primarily during the Spring months when the marl prairies tend to be dry.

The preferred nesting habitat appears to be a mixed marl prairie that often includes muhly grass (*Muhlenbergia filipes*). These areas tend to have short hydroperiods, and contain moderately dense, clumped grasses, with open space that permits ground movement by the sparrows. The Cape Sable seaside sparrow tends to avoid dense sawgrass communities, spike rush marshes, and long-hydroperiod wetlands with tall, dense vegetation, as well as sites supporting woody vegetation. Maintenance of suitable habitat may depend on periodic fires to reduce the amount of woody vegetation and to prevent excessive build-up of dead plant material.

Critical habitat was designated for the Cape Sable seaside sparrow in 1977, and includes areas located approximately 8 km (5 mi) northwest and 8 km (5 mi) west to southwest of the town of Homestead.

The overall population size has diminished in recent years. In 1981, the total population was estimated at 6656 individuals; in 1992, the number was approximately 6576. Since that time, the total number has dropped dramatically, to as low as approximately 2500 in 1996. In 1998, the total population was estimated at 3056 individuals. Much of the decline has occurred in the western population (west of Shark River Slough), which has decreased by over 90% since 1992. The primary cause of the decline appears to be water management practices within the Everglades.

Cape Sable seaside sparrows are not known to occur in the vicinity of the Turkey Point site or near the associated transmission lines (USAF 2000). The species was not observed during the Spring 2001 transmission corridor surveys. Also, the species was not observed during field studies supporting the Homestead Airforce Base Disposal EIS (USAF 2000). There are few areas near the project site that contain suitable marl prairie habitat, with most undeveloped areas being occupied by woody vegetation or denser sawgrass marshes. Cape Sable seaside sparrows may be sighted occasionally in the vicinity of the plant or transmission lines, but this would likely be lone, transient individuals. This species is not known to fly long distances, typically no more than 5 to 7 km (3 to 4 mi) during the non-breeding season. The longer flights normally end at the edge of the short-hydroperiod marl prairie habitats, and it has been suggested that deep water and forested areas are barriers to long-range movements.

Based on the lack of suitable habitat in the project vicinity and the lack of observations of the bird near the project vicinity, it is determined that the continued operation of Turkey Point Units

3 and 4 and the continued operation and maintenance of the associated transmission lines during the license renewal term will have NO EFFECT on the Cape Sable seaside sparrow.

### **6.8 Everglades Snail Kite (*Rostrhamus sociabilis plumbeus*)**

The Everglades snail kite is medium-size hawk with a wing span of about 109 to 116 cm (43 to 46 in). The species feeds almost entirely on apple snails (*Pomacea paludosa*), and the kite has a slender, decurved bill that facilitates the extraction of the snails from their shells. The Florida subspecies (*R. sociabilis plumbeus*) is also found in Cuba and northwestern Honduras. Other subspecies range from Mexico to as far south as Argentina and Peru. The Florida population of snail kites is considered to be a single population with considerable changes in population density over time for a particular location.

The current distribution of the Everglades snail kite in Florida is limited to six large freshwater systems: the upper St. John's drainage, Kissimmee Valley, Lake Okeechobee, Loxahatchee Slough, the Everglades, and Big Cypress basin. Habitat consists of freshwater marshes and the shallow, vegetated edges of lakes. These habitats occur in the humid, tropical portions of the Florida Peninsula and are characterized as palustrine-emergent, long-hydroperiod wetlands. Foraging habitat is normally relatively low profile marsh (vegetation height < 3 m (10 ft) above water level) with a matrix of shallow, clean, clear, open water. The snail kite forages by sight; therefore, it requires clear water, and dense woody overgrowth or dense floating vegetation reduces the ability of snail kites to locate apple snails. Nesting and roosting almost always occurs over water, usually in willow (*Salix* sp.) cypress, or other native trees and shrubs, but can also occur in exotic species such as Melaleuca and Brazilian pepper. Nesting also can occur in herbaceous vegetation such as sawgrass, cattails, bulrush, and reeds.

The snail kite nearly went extinct during the 1960's; only 10 birds were found in 1965. Therefore, it was included in the first group of species protected under the Endangered Species Act in 1967. The total number of birds has increased since the late 1960's with nearly 1000 identified during 1994 surveys. Critical habitat for the Everglades snail kite was designated in 1977. Designated areas include the Western shores of Lake Okeechobee, and much of the area to the west of the highly developed corridor from West Palm Beach to south Miami. In Miami-Dade County, designated critical habitat is restricted to areas west of the L-67 canal system, approximately 32 to 48 km (20 to 30 mi) west of downtown Miami.

The primary threat to the Everglades snail kite is loss of habitat due to increased drainage and land development. Drainage of freshwater marshes reduces the suitable habitat for the apple snails that, in turn, limits the populations of snail kites. Other threats include increased infestation of habitat areas with exotic plant species such as water hyacinth (*Eichornia crassipes*), which reduce the ability of the kites to find prey.

Everglades snail kites have not been observed in the vicinity of the Turkey Point site or associated transmission lines, although the presence of occasional transient individuals is

possible. The species was not observed during the Spring 2001 transmission corridor surveys. The species is not known to regularly inhabit locations east of the Miami Ridge. It was not observed during field investigations supporting the Homestead Air Force Base EIS (USAF 2000), nor has it been observed in Biscayne National Park (BNP 1998). The snail kite is not likely to utilize the Turkey Point cooling ponds because the hypersaline conditions are not conducive to apple snail, which requires freshwater.

Based on the currently available information, it is determined that the continued operation of Turkey Point Units 3 and 4 and the continued operation and maintenance of the associated transmission lines during the license renewal term will have NO EFFECT on the Everglades snail kite.

### **6.9 Piping Plover (*Charadrius melodus*)**

The piping plover is a small, migratory shorebird that winters along the Atlantic and gulf coasts of Florida. There are three main breeding populations of piping plovers in North America -- along the northeast Atlantic coast, the Great Lakes, and riverine systems in the northern Great Plains. All three breeding populations winter in Florida.

Critical wintering habitat for piping plovers in Florida was proposed in July 2000 (FWS 2000). Designated areas in extreme southern Florida include several sites from the vicinity of Fort Myers south to Marco Island on the Gulf coast, a small site near St. Lucie Inlet on the Atlantic coast approximately 193 km (120 mi) north of the Turkey Point site, and a number of sites in the Florida Keys from the Marquesas Keys in Key West National Wildlife Refuge to Lower Matecumbe Key, as well as Sandy Key and Carl Ross Key in Florida Bay.

While wintering, piping plovers appear to prefer land forms that provide tidal flats for foraging and open beaches for roosting in close proximity of each other. They feed primarily on marine, freshwater, and terrestrial invertebrates.

Although the Turkey Point site is located very near to the shore of Biscayne Bay, the plant has very little, if any, effect on the shoreline, tidal flats, or near shore waters. There are no activities related to relicensing that occur on the shoreline or in the waters of Biscayne Bay; therefore, it is unlikely that plant operations will effect any foraging or roosting areas. Piping plovers have not been reported from the Turkey Point vicinity, and have been reported only four times from Biscayne National Park (BNP 1998). Plovers were not observed during the Spring 2001 transmission corridor survey.

Based on these considerations, it is determined that the continued operation of Turkey Point Units 3 and 4 and the operation and maintenance of the transmission lines will have NO EFFECT on the continued survival of piping plovers during the license renewal term.

## **6.10 Roseate Tern (*Sterna dougallii dougallii*)**

The roseate tern is an exclusively coastal, medium-size marine water-bird with a slender body and a forked tail. In North America, the subspecies consists of two distinct breeding populations: one in the northeast U.S. and Nova Scotia, and the other centered in the Caribbean. The species nests colonially on open sandy beaches isolated from human disturbance, although a variety of substrates may be used. In Florida, roseate terns typically nest on isolated islands, rubble islets, dredge-spoil, and the occasional rooftop; they rarely breed on larger islands. Roseate terns normally forage in the near shore surf for small, schooling marine fish.

The Caribbean population of roseate terns breeds from Florida through the West Indies to islands off the coasts of Central and South America, often in mixed colonies with least terns. There have been no thorough compilations of the size of the Caribbean population since the early 1980s. In the early 1990s, there were approximately 350 to 370 breeding pairs in Florida, mostly in the Lower Keys. The primary threats include predation by a number of other birds, feral cats, snakes, and black rats; destruction of nests by storms or tidal flooding; human interference during nesting; and habitat alteration and destruction. In some areas the eggs are gathered as food by humans.

Although the Turkey Point site is located very near to the shore of Biscayne Bay, the plant has very little, if any effect on the shoreline or near shore waters. There are no activities related to relicensing that occur on the shoreline or in the waters of Biscayne Bay; therefore, it is unlikely that plant operations will affect any natural nesting or foraging areas. However, it is possible that individuals will occasionally fly over or near the cooling canal system. Roseate terns were not observed during the Spring 2001 transmission corridor survey.

Based on this information, it is determined that the continued operation of Turkey Point Units 3 and 4 and associated transmission lines will have NO EFFECT on the continued existence of the roseate tern during the license renewal term.

## **6.11 Florida Panther (*Felis concolor coryi*)**

The Florida panther is a large cat, typically reaching a total length of approximately 2.15 m (7 ft) and weighing approximately 50 to 65 kg (110 to 143 lb). Although this species once ranged throughout the southeastern U.S., there are only approximately 30 to 50 adults surviving in the wild. Because of this, the Florida Panther is considered one of the most endangered large mammals in the world. It is one of approximately 27 to 30 subspecies of mountain lion or puma (*Felis concolor*).

Florida panthers utilize a variety of habitat types, but appear to prefer the use of mixed swamp forest, hammock forests, and pine flatwoods over wetlands and disturbed habitats. The primary prey species are white tailed deer (*Odocoileus virginianus*), wild hogs (*Sus scrofa*), and to some extent, raccoons (*Procyon lotor*) and armadillos (*Dasypus novemcinctus*).

The only known, reproducing population is located in the Big Cypress Swamp / Everglades physiographic region of south Florida, with the breeding population centered in Collier, Hendry, and Miami-Dade Counties. Radio-collared panthers have been tracked throughout much of south Florida. Some of the collared individuals have been tracked as recently as the late 1980s or early 1990s in the undeveloped areas immediately west of the Turkey Point site (USAF 2000).

Principal threats to the Florida panther include habitat loss and fragmentation, human-related disturbances and mortality, disease, and genetic degradation due to the extremely small population size. Panthers tend to avoid developed roadways, and usually do not establish home ranges that are bisected by highways. Maternal dens are usually located at least 1 km (0.6 mi) or more from highways. Vehicle collisions are the most often documented cause of mortality for Florida panthers, although the relative significance of highway deaths compared to other sources of mortality is not known.

Florida panthers are extremely rare in the vicinity of the Turkey Point site and transmission lines, primarily because of limited amounts of the preferred forest and flatwood habitats and a preponderance of swamp and wetland habitats. Radio-collared individuals have been detected in the general vicinity (USAF 2000) but not on the Turkey Point site itself. No scat, tracks, or other signs were observed during the Spring 2001 transmission corridor survey. There have been unconfirmed sightings within various FPL transmission corridors by maintenance workers (FPL personal communication), but it is not known if any of these were within transmission corridors associated with Units 3 and 4. There is no indication that usage of the Turkey Point area by Florida panthers would be different if the nuclear facilities were not present, and the local roads probably represent a greater hazard to those panthers that may rarely venture into the area. Therefore, it is determined the continued operation of Turkey Point Units 3 and 4 and the continued operation and maintenance of the associated transmission lines during the license renewal term will have NO EFFECT on the Florida panther.

#### **6.12 West Indian Manatee (*Trichechus manatus*)**

The West Indian manatee is a large aquatic mammal that inhabits both fresh and saltwater environments. Adults average 3 m (10 ft) long and weigh up to 450 kg (1000 lb). They locomote with large, rounded, horizontally-flattened tails and, although appearing sluggish, they are strong swimmers. Manatees are vegetarians, consuming aquatic and marine algae and higher plants. They are social and communicate with sounds audible to human ears. A female may give birth to one offspring about every three years. Approximately 1800 manatees live in Florida. In south Florida, manatees are found in the canals, bays, tidal channels, harbors, shallow bays, and coastal waters. In northern Florida and southern Georgia, they are found in warm water outfalls. Individuals may move north of that range during warm weather. In the winter, some individuals move to Springs seeking warmer water. Manatees are sensitive to the cold, and may be killed by cold weather. Other sources of mortality include injuries from collisions with water craft, adverse weather, loss of habitat, and periodic red tides.

In the vicinity of the Turkey Point site, manatees are found in Biscayne Bay, in the boat basin adjacent to the fossil units at the Turkey Point site, and in the Florida State drainage canals to the south of the Turkey Point cooling canal system. Manatees are not found in the Turkey Point cooling canal system.

There are no aspects of operation of Turkey Point Units 3 and 4 that would affect manatees. The nuclear units do not receive or deliver goods by barge through Biscayne Bay. Barge traffic to and from the Turkey Point site is associated with operation of the fossil units. Turkey Point Units 3 and 4 do not discharge any effluent or heated water to waters where manatees are found.

Based on these considerations, it is concluded that the continued operation of Turkey Point Units 3 and 4 and the associated transmission lines during the license renewal period will have NO EFFECT on the West Indian manatee.

### **6.13 Sea Turtles**

Five species of sea turtles are found in Florida waters: the green sea turtle (*Chelonia mydas*), hawksbill sea turtle (*Eretmochelys imbricata*), Kemp's ridley sea turtle (*Lepidochelys kempii*), loggerhead sea turtle (*Caretta caretta*), and leatherback sea turtle (*Dermochelys coriacea*).

The green sea turtle is a large sea turtle, reaching 1 m (3 ft) in length and over 135 kg (300 lb) in weight. They can be found on oceanic beaches during nesting, in the convergence zones of pelagic habitats, and in shallow coastal waters with abundant sea grass and algae. In Florida they nest on ocean beaches on the east coast. Although the highest numbers of nests are found north of Miami, nests have been observed in Miami-Dade County and Monroe County.

The hawksbill sea turtle is a small to medium-size sea turtle. It is rare in Florida. Nesting has been reported from Broward, Miami-Dade, Martin, Monroe, Palm Beach and Volusia counties. Nesting has been reported on Soldier Key, a mangrove island in the northern portion of Biscayne Bay National Park. Hawksbill sea turtles forage in pelagic convergence zones and on coral reefs, although they are also known from mangrove habitats. Their main diet in oceanic habitats is sargassum and other floating organic material; in coastal waters their main diet item is sponges.

Kemp's ridley sea turtle is one of the smallest sea turtles. The major population of this turtle is in the Gulf of Mexico. Nearly the entire population nests on one location in Mexico; rarely it nests in Florida in Pinellas, Lee, and Volusia Counties. However, juveniles and adults have been found along the eastern coast. In pelagic areas, the major food item is sargassum; however, in shallow areas they feed on crabs.

The loggerhead sea turtle is the most common sea turtle in south Florida. It is found in temperate and tropical waters worldwide. It is known to nest in all Florida coastal counties, but particularly in the counties north of Miami-Dade. Primary prey items include a variety of invertebrates such as gastropods, pelecypods, decapods, and cephalopods.

The leatherback sea turtle is the largest sea turtle. It is found in the Atlantic, Pacific, and Indian Oceans. The species is the most pelagic of all species and migrates widely. In Florida it nests on the east coast south to Miami-Dade County. The distribution of juveniles is unknown. Leatherback sea turtles feed on pelagic jellyfish and salp and siphonophore colonies.

Sea turtles are threatened by development of beach habitats, by human disturbance, predation on nests and hatchlings by terrestrial animals, predation on juveniles and adults by fish, by entanglement in fishing nets, collisions with water craft, ingesting undigestible trash, and poaching. Lighting, beach nourishment, beach armoring, human presence, and exotic vegetation can all interfere with nesting.

Sea turtles are found in waters of Biscayne Bay and Card Sound, and all five species could be found there. Sea turtles could potentially be found in the boat basin used to deliver oil to the fossil units. This basin is not part of the operations of the nuclear units. Sea turtles are not known to nest on the shoreline of Biscayne Bay adjacent to the Turkey Point site. The canal system is not suitable habitat for nesting. No sea turtles have been observed or captured from the canal system.

Based on these considerations, it is concluded that the continued operation of Turkey Point Units 3 and 4 and the associated transmission lines during the license renewal period will have NO EFFECT on any species of sea turtles.

#### **6.14 Johnson's Seagrass (*Halophila johnsonii*)**

Johnson's seagrass is a small seagrass that grows in shallow estuaries and lagoons. It is known only from the southeastern coast of Florida from Sebastian Inlet to Virginia Key in northern Biscayne Bay. This seagrass has a greater depth range than other seagrasses and has a high tolerance for low light levels and fluctuating salinity. However, storms, erosion, and siltation are threats. Other threats are dredging, prop scouring and anchor mooring, shading, and altered water quality. The limited distribution increases the risk of extinction from chance events.

The Turkey Point site is south of the known distribution for this species. Surveys of the cooling canal system soon after their construction did not identify this species among the seagrasses present.

Based on these considerations, it is concluded that the continued operation of Turkey Point Units 3 and 4 and the associated transmission lines during the license renewal period will have NO EFFECT on Johnson's seagrass.

#### **6.15 Crenulate Leadplant (*Amorpha herbacea* var. *crenulata*)**

The crenulate leadplant is a perennial, deciduous shrub in the pea family. It is rhizomatous and grows to a height of approximately 1.5 m (4.9 ft). The species is endemic to Miami-Dade

County, with a historic distribution covering about 155 km<sup>2</sup> (60 mi<sup>2</sup>). The current range covers less than 52 km<sup>2</sup> (20 mi<sup>2</sup>), and is primarily in the vicinity of Coral Gables and Kendall, Florida.

Crenulate leadplant grows in areas that were historically associated with seasonally hydrated soils and frequent burning, including wet pinelands, transverse glades, and the edges of hammocks. It primarily occurs in poorly-drained Opalocka sands within the Miami pine rocklands, and in wet prairies with Opalocka-rock outcrop complex soils. The species grows in open sun to partial shade.

Crenulate leadplant is currently known from eight locations, including four sites owned by the Miami-Dade County Parks Department. The other sites are in an assortment of settings but do not appear to be well protected or actively managed. All the known populations are located at least 5 km (3 mi) east of the transmission corridor between the Davis and Flagami substations.

As with most of the Miami ridge endemic plant species, the major threat to the crenulate leadplant is the loss of habitat due to urban expansion. At least 98% of the historic pine rockland habitat has been converted to other uses. The small fragments that remain are highly susceptible to weedy species encroachment and are difficult to manage appropriately. The crenulate leadplant, like most of the other pine rockland plant species, relies on a regular burning cycle of from 3 to 15 years to minimize overstory canopy coverage and to control organic litter buildup.

All the known populations of crenulate leadplant and the entire presumed historical distribution are located at least 5 km (3.1 mi) to the east of the northern portions of the transmission lines associated with Turkey Point Units 3 and 4. Therefore, it appears unlikely that the crenulate leadplant will occur at the Turkey Point site or within the transmission corridors. This species was not observed within the corridors during the Spring 2001 surveys. Based on the present and historical distribution, and the lack of observations within or near the transmission corridors, it is determined that the continued operation and maintenance of Turkey Point Units 3 and 4 and associated transmission lines during the license renewal term will have NO EFFECT on the continued existence of the crenulate leadplant.

#### **6.16 Deltoid spurge (*Chamaesyce deltoidea deltoidea* and *C. deltoidea adhaerens*)**

The deltoid spurge is a small, prostrate to decumbent herb that forms mats over exposed limestone. There are three subspecies of deltoid spurge of regulatory interest in the vicinity of the Turkey Point site. The subspecies *C. deltoidea deltoidea* and *C. deltoidea adhaerens* were included within the original 1985 federal listing. The *C. deltoidea pinetorum* subspecies is currently a candidate for federal listing.

Deltoid spurge normally occurs in areas with little or no organic litter accumulation, over exposed limestone, and with an open shrub canopy. It can be found at the edges of sand pockets, growing on both the oolite limestone and in the sand, sometimes in association with the endangered tiny polygala. The *C. deltoidea adhaerens* occurs in fine, reddish sandy loam over

limestone. Dense colonies of deltoid spurge can also be found in pinelands that have undergone mechanical disturbance such as scraping. The plants can develop in areas with little or no topsoil and where productivity is low. These disturbed areas often have very little shrub canopy, allowing for high light levels and low organic litter accumulation.

*Chamaesyce deltoidea deltoidea* is known from at least 19 sites, all generally north of the Goulds area south of Miami. Historically, it was known from as far north as the center of the city of Miami. *C. deltoidea adhaerens* is known from approximately 12 sites in the Redland form of pine rocklands southwest of Goulds. The *Chamaesyce deltoidea pinetorum* appears to occur even farther southwest, from the Homestead / Florida City, Florida, vicinity to Long Pine Key in Everglades National Park.

As with all of the endangered or threatened plant species endemic to the Miami ridge pine rocklands, the major threat to the deltoid spurge is the loss of suitable habitat due to the conversion of the remaining habitat fragments to agriculture, residential, or commercial development. The remaining habitat fragments are mostly very small and highly susceptible to invasion by aggressive, weedy exotic species such as Burma-reed (*Neyraudia reynaudiana*), Brazilian pepper, and others. Most of the rare pine rockland species appear to depend on a regular fire regime with a burn frequency of from 3 to 15 years to minimize the development of a thick wood overstory and to minimize organic litter accumulation.

There are known populations of both the *C. deltoidea deltoidea* and *C. deltoidea adhaerens* subspecies within 1.5 km (1 mi) of the transmission corridors associated with Turkey Point Units 3 and 4, and there are potential habitat areas within or adjacent to the corridors at several locations. However, neither of the listed subspecies of *C. deltoidea* were observed during the surveys of the transmission corridors performed during the Spring of 2001. Therefore, it is concluded that the continued operation of Turkey Point Units 3 and 4 and continued operation and maintenance of the associated transmission lines is NOT LIKELY TO ADVERSELY AFFECT the continued existence of the deltoid spurge.

### **6.17 Garber's Spurge (*Chamaesyce garberi*)**

Garber's spurge is a prostrate, short-lived perennial herb that is restricted to Miami-Dade and Monroe counties. It has been found in pine rocklands, coastal flats and grasslands, and beach ridges. Some local populations are relatively large but they are disjunct and widely separated. Garber's spurge requires open sunny areas, and appears to rely on periodic fires to maintain habitat suitability. It tends to occur at low elevations on thin soils, either Pamlico sands or directly on limestone. In pine rocklands it may grow out of crevices in oolitic limestone.

Garber's spurge is most abundant on Cape Sable, and it probably occurs in small populations throughout the Keys. Larger populations have been reported from Long Pine Key in Everglades National Park and Big Pine Key. Historically, it also occurred in pine rocklands near Perrine,

south of Miami, and a population was found in that area following a fire on the Charles Deering Estate, but that population appears to be decreasing.

The primary threats to Garber's spurge are loss of suitable habitat and invasion of exotic species. Most of the pine rockland habitat in Miami-Dade County has been converted to agricultural, residential, or commercial uses. Much of the remaining potential habitat areas have been heavily invaded by exotic species. The Cape Sable populations have been seriously threatened by invasive species.

Most of the known populations of Garber's spurge are located well to the south and southwest of the Turkey Point site and transmission lines. It could occur along certain portions of the transmission corridors, but most of the suitable substrates are currently used for agriculture. Garber's spurge was not observed during the Spring 2001 surveys of the transmission line corridors.

Considering that this species was not observed during the recent site surveys, and that there are no known populations in the near vicinity of the Turkey Point site or associated transmission lines, it is determined that the continued operation and maintenance of Turkey Point Units 3 and 4 and associated transmission lines will have NO EFFECT on the continued existence of the Garber's spurge.

#### **6.18 Tiny Polygala (*Polygala smallii*)**

Tiny polygala is a short-lived herbaceous species, often completing its life cycle within one year. It forms small rosettes and grows no more than 8 cm (3.1 in) tall. Once thought to be endemic to Broward and Miami-Dade Counties, it is now known from at least 11 sites from Miami to St. Lucie County. All of the known sites are located within 9.7 km (6 mi) of the Atlantic coast. Tiny polygala is found in pine rocklands, open sand pine scrub, slash pine, high pine, and well drained coastal spoil. Regardless of the general vegetation community type, it requires high light levels and open sand, with little to no organic litter accumulation.

In Miami-Dade County, tiny polygala occupy sand deposits within pine rocklands that are primarily in the central to southern portion of the county. The sand deposits are interspersed throughout the Opalocka rock outcrop soil complex. Plants were not found in sands less than 2 cm (0.8 in) deep or in areas with more than 2.5 cm (1 in) of organic litter.

Populations reported within Miami-Dade County include the Charles Deering Estate, the Ludlam Pineland tract (including a non-Turkey Point associated transmission corridor), Ned Glenn Preserve (where it co-occurs with Small's milkpea (*Galactia smallii*)), and in Pine Shore Park (IRC 2001 - website database). The Pine Shore Park population is located approximately 0.5 km (0.3 mi) north of the Turkey Point transmission corridors, approximately 2.5 km (1.5 mi) east of the Davis substation.

Principal threats to tiny polygala include habitat loss due to urban expansion, fire suppression, and exotic species infestations. Most of the historic habitat for tiny polygala has been lost to development, leaving small, isolated habitat fragments. These small areas are difficult to manage because they are easily invaded by weedy species, and it is difficult to maintain natural fire cycles. Many of the habitat fragments are in the midst of residential areas where regular burning can be difficult and / or highly unpopular.

If tiny polygala occurs within the Turkey Point transmission corridors, it appears to be most likely in the general vicinity of the Davis substation and potentially in other areas along the line between Davis and the Flagami substation. However, no individuals were observed during the Spring 2001 field survey of the transmission corridors.

Based on these considerations, including the existence of known populations relatively close to the transmission corridors, it is determined that the continued operation and maintenance of Turkey Point Units 3 and 4 and associated transmission lines is **NOT LIKELY TO ADVERSELY AFFECT** the continued existence of the tiny polygala.

#### **6.19 Small's milkpea (*Galactia smallii*)**

Small's milkpea is a prostrate, leguminous vine that may cover an area of up to 4 m (13 ft) in diameter. This species is primarily known from the Redland form of pine rocklands in Miami-Dade County. The Redland pine rocklands extend from Long Pine Key on the south to approximately SW 216 Street in the vicinity of Cutler Ridge. The distribution of Small's milkpea appears to be correlated with soil depth and color, and it prefers areas with relatively low shrub cover. It does not occur in sites with high amounts of exotic plant cover such as Australian pine and Burma reed (*Neyraudia reynaudiana*).

When this species was originally listed as endangered in 1985, there were only two known populations, both located near Homestead, Florida. Since the initial listing, several additional populations have been located, including three remnant pine rockland stands on the former Homestead Airforce Base (USAF 2000), Pine Island -- approximately 0.8 km (0.5 mi) south of the intersection of the Turkey Point transmission lines and the Homestead extension of the Florida Turnpike, and the Goulds rocklands -- approximately 2.1 km (1.3 mi) east of the transmission lines between Homestead and Cutler Ridge. Most of the publicly owned populations are actively managed by the Miami-Dade County Park and Recreation Department. Small numbers of Small's milkpea have also been reported on privately owned rockland fragments. Most of these small sites have not been well managed and are invaded by exotic vegetation that threatens the continued existence of the milkpea on these sites.

The greatest threats to Small's milkpea are habitat destruction and invasion of exotic species. Over 98% of the original pine rockland communities have been converted to agricultural, residential, or commercial uses. Much of the remaining rockland habitat is highly susceptible to invasion by aggressive exotic species such as Australian pine and Burma reed. Pine rockland

communities also require periodic fires to minimize organic buildup, and to reduce overstory canopy cover.

The Turkey Point transmission system intersects the known distribution of Small's milkpea in the area between the former Homestead Air Force Base and Cutler Ridge. Most of the land within the transmission corridors in this area is currently used for row crops, citrus plantations, and plant nurseries. It is possible that there are small, isolated remnants of suitable habitat within the corridors. However, no individuals were observed during the Spring 2001 field surveys of the transmission line corridors.

Based on the available information, it is determined that the continued operation and maintenance of Turkey Point Units 3 and 4 and associated transmission lines is NOT LIKELY TO ADVERSELY AFFECT the continued existence of Small's milkpea.

#### **6.20 Beach Jacquemontia (*Jacquemontia reclinata*)**

The beach jacquemontia is a small vine that is endemic to the coastal barrier islands of southern Florida. The vines tend to be relatively short (~1 m [3 ft]), but are woody at the base and may twine over other plants. The beach jacquemontia inhabits coastal strand or open areas in maritime hammock communities. They are typically found on the crest and lee sides of stable sand dunes, though they can colonize other areas after disturbances such as tropical storms. They are often found in association with sea grape (*Coccoloba uvifera*) as well as more weedy species such as Madagascar periwinkle (*Catharanthus roseus*) and sand spurs (*Cenchrus* sp.).

Beach jacquemontia is distributed in a number of very small populations on the coastal barrier islands from Palm Beach County south to Miami-Dade County, at least as far south as Key Biscayne. There is very little of the land area on these barrier islands that has not been developed for residential or commercial purposes. Almost all of the known populations are on public land, and even those are under threat due to development and maintenance of parks and recreation areas. Most of the known populations have fewer than 50 individuals.

There are no known populations of the beach jacquemontia near the Turkey Point site or the associated transmission corridors. The species presumably could occur on the barrier islands or keys further south in Biscayne Bay, but there is no suitable coastal strand habitat or sand dunes along the shoreline of Biscayne Bay at the Turkey Point site, and the transmission system is well removed from the shoreline. Therefore, it is determined that the continued operation of Turkey Point Units 3 and 4 and the continued operation and maintenance of the associated transmission system during the license renewal term will have NO EFFECT on the continued existence of the beach jacquemontia.

## 6.21 Candidate Plant Species

There are a number of plant species in the vicinity of the Turkey Point plant or associated transmission lines that are currently listed as candidates for protection under the Endangered Species Act. These species include Blodgett's wild-mercury (*Argythamnia blodgettii*), Florida thoroughwort brickell-bush (*Brickellia eupatorioides* var *floridana* [= *B. mosieri*]), few-flowered crabgrass (*Digitaria pauciflora*), Carter's small-flowered flax (*Linum carteri* var *carteri*), sand flax (*Linum arenicola*), and the pineland spurge (*Chamaesyce deltoidea pinetorum*).

All the candidate species are dependent on the pine rockland habitat, although two will also occur in other habitat types - Blodgett's wild-mercury can also be found in tropical hardwood hammocks, and the few-flowered crabgrass can be found in seepage swamps or freshwater marshes. Therefore, these species are subject to the same primary threats that threaten the fully listed pine rockland species. These threats are loss of habitat due to urbanization, alterations of ecosystem process such as the natural fire regime, and the encroachment of aggressive exotic plant species.

None of the species currently candidates for protection under the Endangered Species Act were observed within the transmission line corridors during the Spring 2001 field survey. However, most have been reported to occur within between 0.5 and 5 km (0.3 and 3.1 mi) of the transmission lines. None of these species has been reported from the Turkey Point site. Therefore, it is concluded that the continued operation and maintenance of Turkey Point Units 3 and 4 and associated transmission lines will either have NO EFFECT or IS NOT LIKELY TO ADVERSELY AFFECT the continued existence of these species, and will not have an effect on potential future listing actions for these species.

## 6.22 Candidate Fish Species

Two candidate species, the mangrove rivulus (*Rivulus marmoratus*) and the small-toothed sawfish (*Pristis pectinata*) are candidates for listing. The mangrove rivulus is found in mangrove habitats and may be present adjacent to the plant site or along the transmission corridors. The small-toothed sawfish is present in Biscayne Bay.

Mangrove rivulus is a small killifish that lives in holes and under debris in mangrove habitats and marine marshes. It is widely distributed but locally rare. This species is notable in part because it is the only self-fertilizing vertebrate. Local populations consist of homozygous clones. Major risks to the species are from habitat alternation and impoundment of marshes for mosquito control. Preferred habitat for the species are the stagnant water of crab holes and pools where competition from other fishes is not present (NMFS 2001a). Parts of Biscayne Bay adjacent to the Turkey Point site may be suitable habitat, but the species has not been collected in surveys of the plant site. Activities associated with plant operations include maintenance of a short segment of transmission corridor in mangrove habitat. Individuals of the species may be disturbed by occasional vegetation control in mangrove habitats.

The small-toothed sawfish, a large (up to 7.6 m [25 ft]) shark-like ray with a long saw-toothed rostrum, occurs in coastal and estuarine waters. The saw is used to locate, disturb, and capture prey, primarily crustaceans and fish. The small-toothed sawfish matures slowly (10 years), and has a low reproductive rate. The species incubates its eggs internally and bears 15-20 live young. At one time common in Biscayne Bay, populations of this species have been decimated by fishing, by habitat degradation, and from by-catch in commercial fishing. This fish is now mostly found in remote areas of Florida Bay and the Keys. This species is not present in the Turkey Point cooling canal system.

Based in this information, it is concluded that the continued operation and maintenance of Turkey Point Units 3 and 4 and associated transmission lines will either have NO EFFECT or IS NOT LIKELY TO ADVERSELY AFFECT the continued existence of these species, and will not have an effect on potential future listing actions for these species.

## **7.0 Management Actions**

Based on the data evaluated, it is concluded that no additional management actions are needed to protect the threatened and endangered species in the vicinity of Turkey Point Units 3 and 4. However, it is acknowledged that the licensee should continue its current management and monitoring efforts, and other activities including:

- continuation of monitoring and research on the American crocodile breeding population in the cooling canal system
- maintenance of handling permits for the crocodile, American alligator, and eastern indigo snake
- continuation and enforcement of corporate policies and training for reporting occurrences of endangered or threatened species, including bird collisions or electrocutions, at the plant site and along the transmission corridors.

## **8.0 Summary of Conclusions**

Table 4 provides a summary of the determinations regarding the potential effects of continued operation and maintenance of Turkey Point Units 3 and 4 and the associated transmission lines on endangered and threatened species.

**Table 4. Conclusions Regarding Potential Effects of the Turkey Point Units 3 and 4 on Federal Endangered or Threatened Species**

Species	Common Name	Conclusion
<i>Crocodylus acutus</i>	American crocodile	Not likely to adversely affect
<i>Alligator mississippiensis</i>	American alligator	Not likely to adversely affect
<i>Chelonia mydas</i>	green turtle	No effect
<i>Dermochelys coriacea</i>	leatherback sea turtle	No effect
<i>Eretmochelys imbricata</i>	hawksbill sea turtle	No effect
<i>Caretta caretta</i>	loggerhead sea turtle	No effect
<i>Drymarchon corais couperi</i>	eastern indigo snake	Not likely to adversely affect
<i>Ammodramus maritimus mirabilis</i>	Cape Sable seaside sparrow	No effect
<i>Charadrius melodus</i>	piping plover	No effect
<i>Haliaeetus leucocephalus</i>	bald eagle	Not likely to adversely affect
<i>Mycteria americana</i>	wood stork	Not likely to adversely affect
<i>Rostrhamus sociabilis plumbeus</i>	Everglades snail kite	No effect
<i>Sterna dougallii dougallii</i>	roseate tern	No effect
<i>Felis concolor coryi</i>	Florida panther	No effect
<i>Trichechus manatus</i>	West Indian manatee	Not likely to adversely affect
<i>Heraclides aristodemus</i>	Schaus swallowtail	No effect
<i>Amorpha herbacea var crenulata</i>	crenulate leadplant	No effect
<i>Chamaesyce deltoidea adhaerens</i> and <i>C. deltoidea deltoidea</i>	deltoid spurge	Not likely to adversely affect
<i>Chamaesyce garberi</i>	Garber's spurge	No effect
<i>Galactia smallii</i>	Small's milk pea	Not likely to adversely affect
<i>Halophila johnsonii</i>	Johnson's seagrass	No effect
<i>Jacquemontia reclinata</i>	beach jacquemontia	No effect
<i>Polygala smallii</i>	tiny polygala	Not likely to adversely affect

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