Chapter D1: Background

Tampa Bay is Florida's largest estuary and is at the heart of a fast-growing region of more than 2 million people (TBNEP, 1996a). Tampa Bay was selected for a case study to represent CWIS impacts and potential benefits for facilities located on estuaries of the Southeastern Atlantic and Gulf coasts. Section D1-1 of this background chapter provides a brief description of the Tampa Bay facilities considered in this case study, Section D1-2 describes the environmental setting and current stressors, and Section D1-3 presents information on the area's socioeconomic characteristics.

Chapter Contents

D1-1 Overview of Case Study Facilities

Industry surveys conducted by EPA in support of the §316(b) rulemaking identified five steam electric utility plants, one nonutility plant, and two manufacturing plants located in the five watersheds draining into Tampa Bay. This case study focuses on the four facilities that are in scope of the Phase II rule:

- PL Bartow (Florida Power Corporation)
- Big Bend (Tampa Electric Company)
- FJ Gannon (Tampa Electric Company)
- Hooker's Point[1] (Tampa Electric Company).

The location of these facilities is indicated in Figure D1-1.

Many of the aquatic species impacted by these facilities are also impinged and entrained at two facilities north of Tampa Bay, the Anclote power plant and the Crystal River power plant.

Big Bend is a 1,988 MW power plant located in Middle Tampa Bay. The facility began commercial service in 1969. Big Bend currently operates four steam-electric coal units. In addition, it has three oil-fired gas turbines that do not require cooling water. In 1999, Big Bend had 346 employees and generated 9.1 million MWh of electricity.[2] Estimated 1999 revenues for the Big Bend plant were approximately $653 million, based on the plant's 1999 estimated electricity sales of 8.7 million MWh and the 1999 company-level electricity revenues of $74.99 per MWh. Big Bend's 1999 production expenses totaled $250 million, or 2.743 cents per kWh, for an operating income of $403 million.

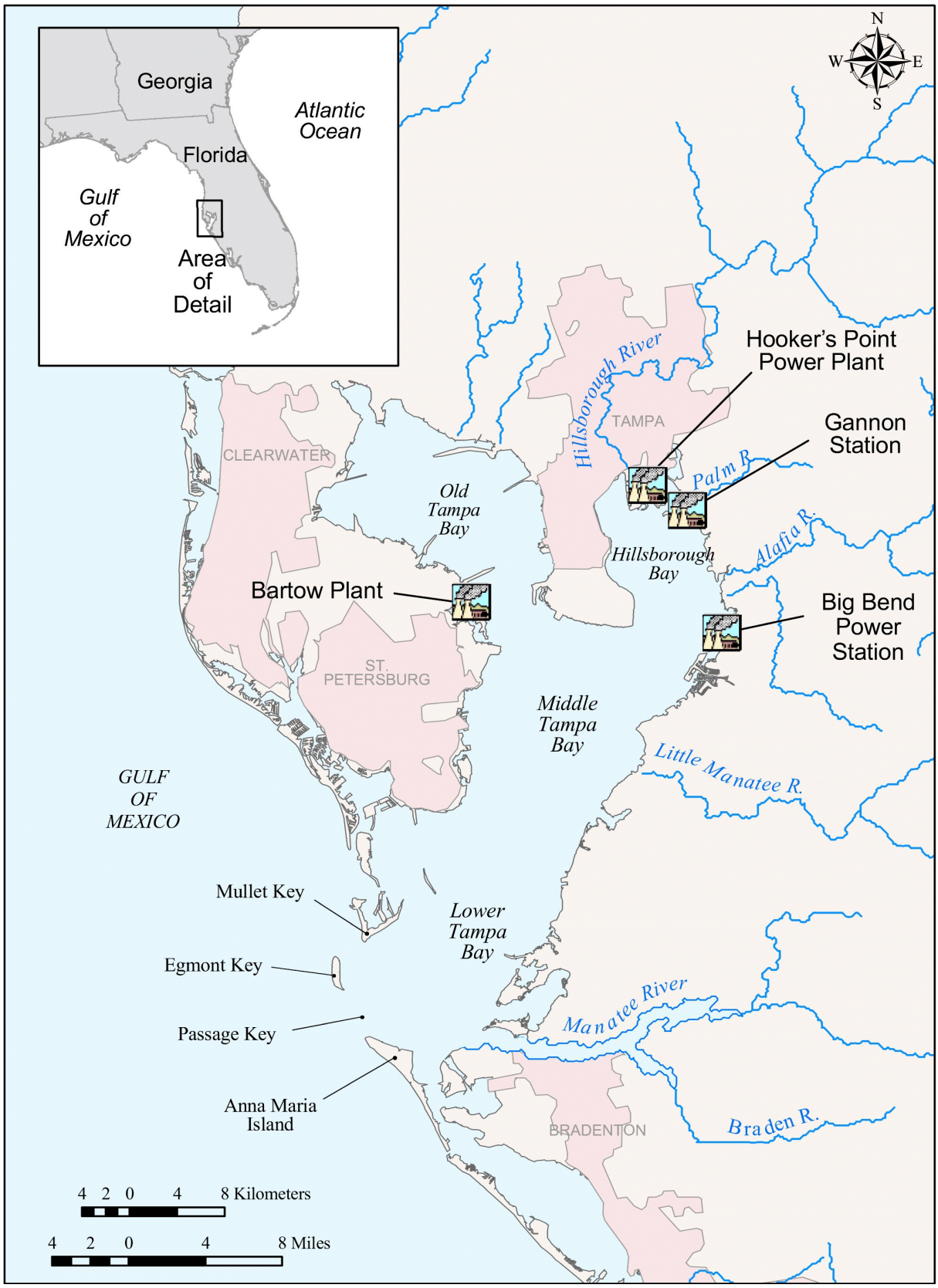
❖ ***Big Bend, FJ Gannon, and Hooker's Point Ownership Information***

Big Bend, FJ Gannon, and Hooker's Point are regulated utility plants owned by Tampa Electric Company. TECO Energy is the parent of Tampa Electric Company. TECO Energy is a domestic energy company with almost 6,000 employees and sales of $2.3 billion in 2000. TECO Energy owns or controls 3,900 MW of electric generating capacity. In 2000, TECO Energy had retail sales of 16.6 million MWh of electricity (TECO, 2002; Hoover's Online, 2001j).

[1] Note that Hooker's Point is scheduled for closure in 2003.

[2] One MWh equals 1,000 kWh.

Figure D1-1: Locations of the Tampa Bay Case Study Facilities



The **FJ Gannon Power Station** is a coal-fired facility that began commercial operation in 1957 and is located in Hillsborough Bay. The facility used to operate six coal-fired units, with a combined capacity of 1,302 MW, and one small gas turbine. However, TECO recently entered into a settlement of a lawsuit for alleged Clean Air Act violations, brought against TECO by the U.S. Justice Department on behalf of the EPA. As part of the settlement, TECO will convert FJ Gannon from a coal burning to a natural gas-fired combined-cycle facility. The repowering is slated to be completed in 2004 (Lazaroff, 2000).

In 1999, FJ Gannon reported having 284 employees and generating 5.0 million MWh of electricity. Estimated 1999 revenues for the FJ Gannon plant were approximately $356 million, based on the plant's 1999 estimated electricity sales of 4.7 million MWh and the 1999 company-level electricity revenues of $74.99 per MWh. FJ Gannon's 1999 production expenses totaled $163 million, or 3.280 cents per kWh, for an operating income of $193 million. It should be noted that this information represents pre-conversion operating conditions and may no longer be applicable once the conversion to combined-cycle units is completed.

Hooker's Point is a 233 MW power plant located in Hillsborough Bay. The facility began commercial service in 1948 and has been operated as a peaking plant for the past 20 years. Hooker's Point has five active, oil-fired generating units. In 1999, Hooker's Point had 35 employees and generated 0.18 million MWh of electricity. Estimated 1999 revenues for the Hooker's Point plant were $13.2 million, based on the plant's 1999 estimated electricity sales of 0.17 million MWh and the 1999 company-level electricity revenues of $74.99 per MWh. Hooker's Point's 1999 production expenses totaled $13.0 million, or 7.083 cents per kWh, for an operating income of $0.14 million. Hooker's Point is scheduled for closure in 2003.

PL Bartow is a 717 MW power plant located in Old Tampa Bay. The plant began commercial service in 1958. PL Bartow operates seven units: two oil-fired steam-electric units, one natural gas-fired steam-electric unit, two oil-fired gas turbines, and two natural gas-fired gas turbines. In 1999, PL Bartow had 71 employees and generated approximately 2.6 million MWh of electricity. Estimated 1999 revenues for the PL Bartow plant were approximately $184 million, based on the plant's 1999 estimated electricity sales of 2.4 million MWh and the 1999 company-level electricity revenues of $76.09 per MWh. PL Bartow's 1999 production expenses totaled $82 million, or 3.214 cents per kWh, for an operating income of $101 million.

❖ ***PL Bartow Ownership Information***

PL Bartow is owned by Florida Power Corporation, a subsidiary of Progress Energy, which was founded in 2000 when utility holding company Carolina Power & Light (CP&L) Energy acquired Florida Power. Progress Energy is a domestic energy company with 16,000 employees and sales of $4.1 billion in 2000. The firm owns 21 million MW of electric generating capacity and sold almost 60 million MWh of electricity in 2000 (Progress Energy, 2001; Hoover's Online, 2001j).

Table D1-1 summarizes the important economic characteristics of the four Tampa Bay power plants.

Table D1-1: Summary of Big Bend, FJ Gannon, Hooker's Point, and PL Bartow Plant Characteristics, 1999

	Big Bend	FJ Gannon	Hooker's Point	PL Bartow
Plant EIA code	645	646	647	634
NERC region	FRCC	FRCC	FRCC	FRCC
Total capacity (MW)	1,998	1,320	233	717
Primary fuel	Coal	Coal	Oil-H	Oil-H
Number of employees	346	284	35	71
Net generation (million MWh)	9.1	5.0	0.2	2.6
Estimated revenues (million)	$653	$356	$13	$184
Total production expense (million)	$250	$163	$13	$82
Production expense (¢/kWh)	2.743¢	3.280¢	7.083¢	3.214¢
Estimated operating income (million)	$403	$193	$0.14	$101

Notes: NERC = North American Electric Reliability Council
FRCC = Florida Reliability Coordinating Council
Dollars are in $2001.

Source: U.S. DOE, 2001a (NERC Region, Total Capacity, Primary Fuel); U.S. DOE, 2001e (Number of Employees, Net Generation, Total Production Expense).

D1-2 Environmental Setting

D1-2.1 Tampa Bay

Tampa Bay is a subtropical estuary that occurs in a transition zone between a temperate climate to the north and a tropical climate to the south (Lewis and Estevez, 1988). The bay is Florida's largest estuary, covering 1,035 km^2 (400 mi^2) at high tide, with an average width of 15 km (9.3 mi). The bay's waters are well-mixed and unstratified because of the large tidal volume, relatively small freshwater input, and the overall shallowness of the estuary, averaging only about 4 m (13.1 ft) in depth.

Tampa Bay can be visualized as an upright "Y" divided into four major sections (Figure D1-1) (Johansson, 1991; TBNEP, 1995; TBNEP, 1996a):

- **Hillsborough Bay** forms the head of the estuary and represents the right arm of the "Y." The City of Tampa borders it on the north and the west. Hillsborough Bay is about 14.5 km (9 mi) long, has a coastline of 207 km (128.5 mi), and is the most industrialized, developed, and degraded of the four sections. It represents about 10 percent of the Tampa Bay surface area. The Hooker's Point, Big Bend, and Gannon facilities are located in Hillsborough Bay.

- **Old Tampa Bay** represents the left arm of the "Y". It is about 19.3 km (12 mi) long, has a coastline of 339.8 km (211 mi), and represents 19.5 percent of the total surface area of Tampa Bay.

- **Middle Tampa Bay** is the central section. It is about 19.3 km (12 mi) long and is bordered along its eastern side by Saint Petersburg. It represents 30 percent of the total surface area of Tampa Bay and has a coastline of 262.8 km (163.2 mi).

- **Lower Tampa Bay** is Tampa Bay's southernmost section. Its entrance to the Gulf is approximately 8 km (5 mi) wide and is lined by several islands, including Anna Maria Island, Passage Key, Egmont Key, and Mullet Key. It is about 20.9 km (13 mi) long, represents 24 percent of the total surface area of Tampa Bay, and has a coastline of 121.6 km (75.5 mi).

The four largest tributaries that enter Tampa Bay are the **Hillsborough** and **Alafia rivers**, which empty into Hillsborough Bay, the **Little Manatee River,** which empties into Middle Tampa Bay, and the **Manatee River**, which empties into Lower Tampa Bay. The **Hillsborough River** has the largest flow of the bay's four major tributaries. It is heavily channelized and has been extensively dredged, so it provides little aquatic habitat. The **Alafia River** is also heavily impacted. Its drainage basin includes phosphate mines and fertilizer processing plants, and lower sections of the river are characterized by poor

water quality. By contrast, the **Little Manatee River** shows little impact of pollution or development. The river's lower reach is classified as an Outstanding Florida Water (OFW), a designation that prohibits any activity that could degrade the river's surface water quality (Boler et al., 1991; Clark, 1991; Flannery et al., 1991). The **Manatee River** is broad, shallow, and relatively unchanneled. Although little of the natural shoreline remains in the river's lower third, which is flanked by the cities of Bradenton and Palmetto, the river's middle and upper sections contain large areas of pristine estuarine habitat, totaling nearly two-thirds of all tidal river wetlands in Tampa Bay (Edwards, 1991; Estevez et al., 1991).

D1-2.2 Aquatic Habitat and Biota

Tampa Bay supports over 200 species of macroalgae, 250 fish species, and some 1200 macroinvertebrate species (including scallops, crabs, and shrimps; Beever, 1997). In terms of primary production, the bay is considered a phytoplankton-based system, although mangroves, sea grasses, and salt marsh vegetation are also important (Lewis and Estevez, 1988). These resources provide food for herbivorous secondary producers, including zooplankton and plankton-feeding fishes such as bay anchovy (*Anchoa mitchilli*). In turn, these animals provide food for carnivorous fishes, including midcarnivores, e.g., striped killifish (*Fundulidae majalis*), and spot (*Leiostomus xanthurus*), and carnivores, e.g., spotted sea trout (*Cynoscion nebulosus*), red drum (*Sciaenops ocellatus*), snook (*Centropomus undecimalis*), and tarpon (*Megalops atlanticus*). Carnivorous fishes in turn provide energy for the many top carnivores that consume fish, particularly birds. A generalized Tampa Bay food web is shown in Figure D1-2.

The major habitat types supporting the Tampa Bay food web include open water habitat, bottom habitat, emergent vegetation (seagrasses, mangroves, and salt marshes), mudflats, and salt barrens (TBNEP, 1996c). Water column habitats include (1) the Lower Bay's high salinity and relatively deep areas, (2) the more brackish shoreline areas, (3) the low salinity but tidally influenced tributaries, and (4) the strictly freshwater tributary portions. Fish species dominate the aquatic life of open water habitats.

Most of the bottom habitat of Tampa Bay is classified as unconsolidated sediment, or soft bottom (Lewis and Estevez, 1988). Soft bottom habitats are used by invertebrates such as clams, worms, conches, and sea squirts. Hard bottom habitats include natural rock outcroppings, bridge and dock pilings, sea walls, oyster reefs, and a number of artificial reefs. Although relatively rare in Tampa Bay, hard bottom habitats are quite valuable because they create attachment sites for shellfish and attract fish species prized by anglers, including snook and redfish. They are also provide important shore bird habitat.

The extensive shallow areas that fringe the bay support large sea grass beds, mangrove forests, and salt marshes. A notable exception is Hillsborough Bay, where all the sea grass beds and most mangrove stands were lost because of eutrophication, shoreline development, and filling operations.

Sea grasses play a vital role in the Tampa Bay ecosystem because they:

- provide nursery habitat and food for juvenile finfish and for shrimp, crabs, and other invertebrates;
- stabilize shifting sands on the bottom of the bay;
- clarify the water column by trapping silt and fine particulate matter; and
- provide food for the endangered manatee.

Large mangrove forests line the eastern shores of Lower Tampa Bay and Middle Tampa Bay, and are also common along Old Tampa Bay. Salt marshes line the bay's tributaries and quiet backwaters.

Both mangroves and salt marshes provide habitat for the juveniles of many highly valued fish species, including mullet, snook, red drum, and tarpon (TBNEP, 1996c). Mangrove-blanketed islands in Tampa Bay support the most diverse colonial waterbird nesting colonies in North America. These islands host 40,000 pairs of 25 different species of birds annually, from the familiar white ibis (*Eudocimus albus*) and great blue heron (*Ardea herodias*) to the reddish egret (*Egretta rufescens*) — the rarest heron in the nation (TBNEP, 2001). An estimated 7,608 hectares (18,800 acres) of mangrove forests and salt marshes currently remain throughout Tampa Bay (TBNEP, 1996a).

Mud flats are low-lying areas of the bay and its backwaters that are exposed with each receding tide. Mud flats are prime foraging habitat for resident wading birds and for migratory birds such as avocets, sandpipers, ducks, and gulls. Today, fewer than 364 hectares (900 acres) of mud flats remain in Tampa Bay, mostly along the southeastern shore (TBNEP, 1996a).

Figure D1-2: A Generalized Tampa Bay Food Web

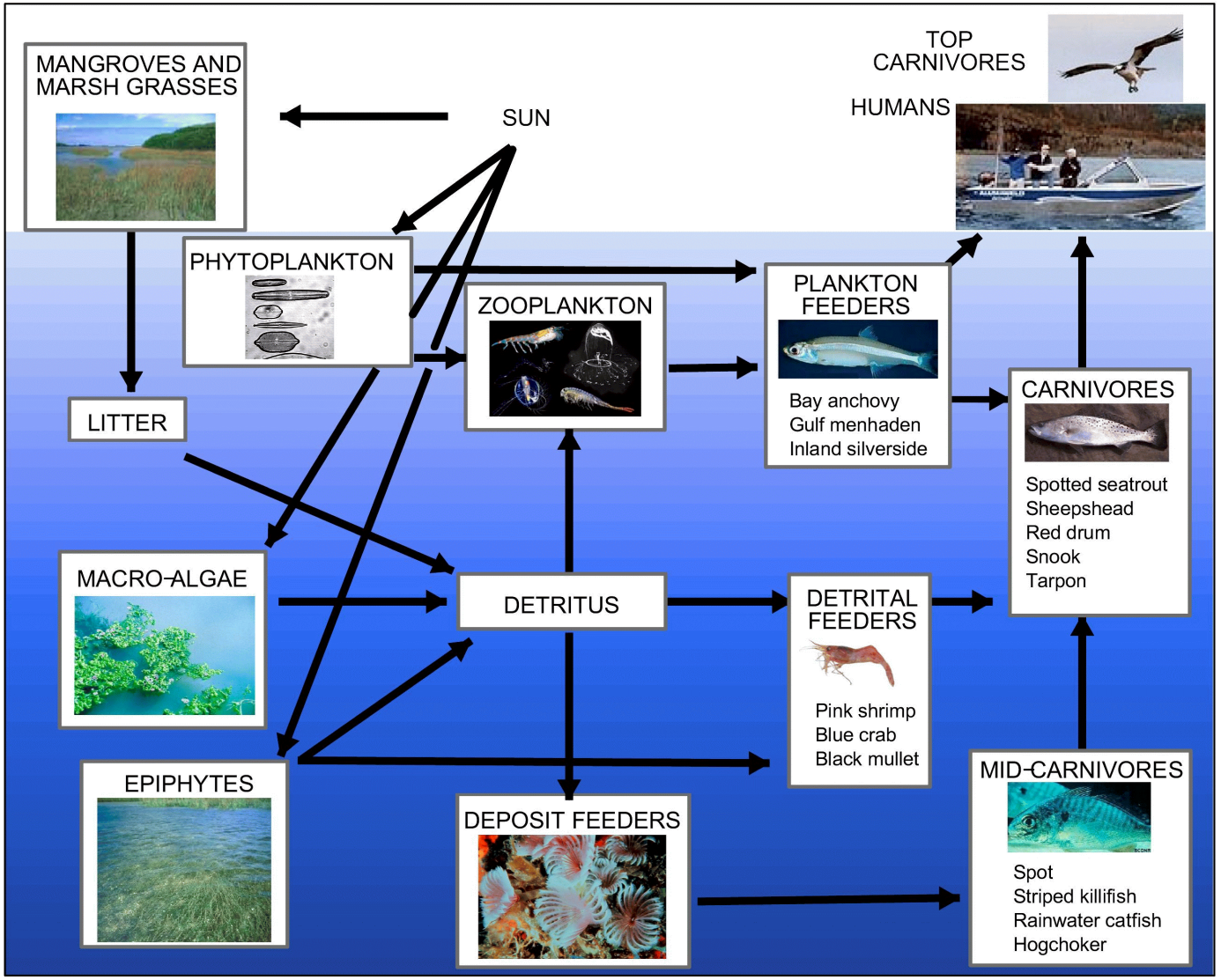


Figure modified from Figure 69 in Lewis and Estevez, 1988.
Photo references: Bay anchovy and spot: NOAA, 2002a; Zooplankton: USGS, 2001a; Osprey: Government of Nova Scotia, 2000; Fishing photo: Washington Department of Fish and Wildlife, 2002; Pink shrimp: NOAA, 2002c; Deposit feeders: NOAA, 2002c; Mangrove and marsh grasses; epiphytes: South Florida Water Management District, 2002; Phytoplankton: NIH, 1999; Macro-algae: NSW Department of Land and Water Conservation, 2001.

Salt barrens (or salt flats or salinas) are created when low-lying land, typically behind a mangrove stand or tidal marsh on slightly higher ground, is flooded once or twice a month during spring tides. After the water recedes or evaporates, the area develops into a hyper-saline habitat that supports low-growing succulent plants and attracts foraging wading birds.

The tidal influence of the bay reaches from 16.7 to 35.4 km (10.4 to 22 mi) upstream into the major bay tributaries, creating vital nursery habitat for many Tampa Bay fish species. Extensive sampling of the Little Manatee River's tidal sections showed heavy use in the lower 16 km (9.9 mi) by early life stages of estuarine fish species (Peebles et al., 1991). Nearly 70 fish species, including Atlantic menhaden, bay anchovy, snook, red drum, spotted seatrout, spot, and striped mullet, use the river as nursery habitat. The Manatee River estuary system encompasses the free-flowing sections of both the Manatee and Braden rivers. This area also provides critical nursery habitat for juvenile snook, spotted seatrout, striped mullet, red drum, and many other Tampa Bay fish species (Edwards, 1991; Heyl and Zimmerman, 1997).

D1-2.3 Major Environmental Stressors

a. Habitat degradation and loss

Intense development has led to profound land use changes in the Tampa Bay region (TBNEP, 1994). Satellite images show that by 1989 developed land made up over 40 percent of Tampa Bay watersheds. Half of the original shoreline has been developed, and nearly half of the bay's marshes and mangrove stands have disappeared over the past 50 years.

The bay itself has been physically modified by shipping channels that were dug to provide ocean vessels access to Tampa Bay's major ports (TBNEP, 1994). Dredging to keep shipping channels open is an ongoing effort, with about 1 million cubic yards of sediment removed annually at a cost of $10 million. Although most dredging occurs in the deeper parts of the bay, away from sensitive habitats, suspended sediments from dredging can be carried to nearby sea grass beds by prevailing water currents, decreasing water clarity and light penetration and thereby inhibiting sea grass growth. Disturbed sediment also contributes to the overall nitrogen load responsible for algal blooms in the bay.

The dredged material itself can have beneficial uses (TBNEP, 1996a; Fonferek, 1997). For example, beach quality dredge spoils placed on local beaches slow the erosion of downdrift beaches, and enhance sea turtle nesting grounds and colonial bird nesting habitat. Most dredge spoils from the upper segments of Tampa Bay are deposited on two large spoils islands in Hillsborough Bay, where they have created bird habitat.

Most Tampa Bay tributaries are altered to one degree or another by dams, channelization, flow alterations, or shoreline hardening as a result of residential and industrial development. The hardening and straightening of waterways affects sensitive shallow water and shoreline habitats, prevents settling of sediments, and changes flow regimes, all of which contribute to species declines (Clark, 1991). The largest dams, located on the Hillsborough and Manatee rivers, divert up to one third of their annual flow to provide water for human uses. Dams blocking the Braden and Manatee rivers have prevented snook and other fish species from using upstream nursery habitats in these rivers (Estevez and Marshall, 1997; Heyl and Zimmerman, 1997).

b. Overfishing

Both commercial and recreational fisheries in Tampa Bay are tightly regulated because of intense fishing pressure. In the past decade, most commercial fishing practices were banned to give depleted stocks a chance to recover. In 1993, purse seining was banned to protect bait fish species (e.g., bay anchovy) and in 1995, gill netting was banned to protect mullet and other highly valued commercial species.

c. Eutrophication

Eutrophication has been a major factor in the long-term decline of the Tampa Bay ecosystem (TBNEP, 1992a). Excess nitrogen from partially treated sewage led to severe algal blooms starting in the early 1950's. These blooms blocked light reaching sea grass beds, reducing growth and survival. As sea grass beds were lost, aquatic species declined because sea grasses provide critical nursery and feeding habitat for aquatic life throughout the bay.

Starting in the late 1970's, improved municipal sewage treatment plants greatly reduced the amount of nitrogen released to the Bay. The waters cleared up enough by the late 1980's to allow sea grasses to recolonize areas from which they had been excluded to insufficient water clarity and light penetration.

Currently, most of the nitrogen loading to the bay comes from stormwater runoff and atmospheric deposition (TBNEP,1996b). The distribution of nitrogen input to the bay is quite uneven. Hillsborough Bay receives by far the largest share, nearly 40 percent of the total annual input. Eutrophication is one of the prime reasons that the extensive sea grass beds that once fringed Hillsborough Bay have disappeared (TBNEP, 1996a).

d. Aquatic toxicants and contaminated sediments

Toxics of concern in Tampa Bay include heavy metals (e.g., cadmium, chromium, copper, lead, mercury, and zinc), polycyclic aromatic hydrocarbons (PAHs), chlorinated hydrocarbons (such as polychlorinated biphenyls, PCBs, and some pesticides) (Carr et al., 1996; TBNEP, 1996a; Zarbock et al., 1997). Some of these compounds bioaccumulate in food chains and represent a long-term hazard to aquatic organisms, wildlife, and humans.

Toxicants enter the bay by several routes, including storm water runoff, atmospheric deposition, and industrial and municipal wastewater outfalls. There is a net transport of sea water and associated material along the axis of the main shipping channel toward the head of the bay (Lewis and Estevez, 1988).

Several surveys and toxicity assessments indicate that high concentrations of contaminated sediments are found around marinas, harbor facilities, large urban centers, storm water outfalls, and industrial outfalls (Carr et al., 1996; TBNEP, 1996a; Zarbock et al., 1997). The upper half of Hillsborough Bay is particularly affected, because of its industrial nature and the presence of the Port of Tampa. Other areas of concern include parts of the western half of Old Tampa Bay, the Port of Saint Petersburg, and sections of Boca Ciega Bay and Bayborough Harbor, both of which are located in Lower Tampa Bay (Pinellas County).

The State of Florida routinely issues fish consumption advisories for Tampa Bay to protect pregnant woman and young children from high levels of methyl mercury in certain fish species, including Spanish mackerel (*Scomberomorus maculatus*), the Crevalle jack (*Caranx hippos*), the gafftopsail catfish (*Bagre marinus*), the ladyfish (*Elops saurus*), and several shark species (TBNEP, 1996a). Women of childbearing age and young children are advised not to consume more than one fish meal per month. Other adults should consume no more than one fish meal per week.

e. Surface water withdrawals by CWIS

Steam electric power generation accounts for the single largest intake of water from the Tampa Bay region, amounting to over 95 percent of all surface water withdrawals (USGS, 1995). PL Bartow, Big Bend, FJ Gannon, and Hooker's Point all withdraw water directly from Tampa Bay. These plants employ once-through systems and do not recirculate their cooling water. Combined, they accounted for an average intake flow of approximately 3,000 MGD in 1997. Table D1-2 summarizes cooling water intake flows of all utility-owned power plants, nonutilities, and manufacturing facilities of Tampa Bay.

Table D1-2: CWIS Characteristics of §316(b) Facilities in the Tampa Bay Estuary, 1997

EIA Plant Code	Plant Name	HUC Watershed Code	Source Water Body (Type)	CWIS Code[a]	CWIS Type[b]	Design Intake Flow (million gallons/day)	Average Annual Intake Flow Rate (million gallons/day)	Distance from Shore (feet)[d]	Depth Below Surface (feet)[c]
Utility Plants									
634	PL Bartow	3100206	Tampa Bay (Estuary)	1	OS	158	495	0	12
645	Big Bend	3100206	Hillsborough Bay (Estuary)	OTC1	OS	346	309	0	9
				OTC2	OS	346	321	0	9
				OTC3	OS	346	310	0	9
				OTC4	OS	359	338	0	9
646	FJ Gannon	3100206	Hillsborough Bay (Estuary)	OTC1	OS	151	114	0	19
				OTC2	OS	151	113	0	19
				OTC3	OS	183	141	0	16
				OTC4	OS	183	137	0	16
				OTC5	OS	253	210	0	16
				OTC6	OS	346	249	0	16
647	Hooker's Point	3100206	Hillsborough Bay (Estuary)	OTC1	OS	43	28	0	23
				OTC2	OS	41	29	0	23
				OTC3	OS	41	29	0	23
				OTC4	OS	54	36	0	23
				OTC5	OS	70	46	0	23
Nonutility Plants[d]									
n/a	Pinellas County Resource Recovery	3100206	Lake or Reservoir	1	Recirculating Towers		0.75		
Manufacturing Facilities[d]									
n/a	Cargill Fertilizer	3100204	Lake or Reservoir	1	Recirculating Towers		4.6		
				2	Recirculating Towers		0.5		
n/a	IMC Agrico — Comp	3100204	Lake or Reservoir	Water Jack Pump	RC		4.13		

Table D1-2: CWIS Characteristics of §316(b) Facilities in the Tampa Bay Estuary, 1997 (cont.)

[a] CWIS codes as listed in U.S. DOE, 2001a (utility plants only).
[b] U.S. DOE, 2001a Codes for CWIS types:
- OC: Once through, with cooling pond or canal;
- OF: Once through, fresh water;
- OS: Once through, saline water;
- RC: Recirculating with cooling pond or canal;
- RF: Recirculating with forced draft cooling tower;
- RN: Recirculating with natural draft cooling tower.

[c] U.S. DOE, 2001a (utility plants only).
[d] Data from U.S. EPA, 1998a (§316(b) Industry Screener Questionnaire: Phase I Cooling Water Intake Structures, October 1998).

D1-3 SOCIOECONOMIC CHARACTERISTICS

Over 2 million people live in the three counties bordering Tampa Bay. The region's three largest cities are Tampa (291,000 people), Saint Petersburg (241,000 people), and Clearwater (104,000 people).

D1-3.1 Major Industrial Activities

Tampa Bay is home to three international harbors (TBNEP, 1996a). Petroleum product shipment is one of Tampa Bay's main trade activities. On an average day, more than 4 million gallons of petroleum products and many other hazardous materials pass in and out of Tampa Bay (TBNEP, 2001). Tampa Bay's three major ports are described below.

- The ***Port of Tampa*** is Florida's largest harbor and ranks among the top 10 harbors nationwide in trade activity. Bulk cargo ships are responsible for the movement of 25 million tons of phosphate and related products in Tampa Bay, more than any other port in the world. The Port of Tampa is also becoming a premier cruise ship destination.

- ***Port Manatee*** is the fifth largest of Florida's 14 deepwater seaports. According to the Tampa Port Authority, the Port of Tampa is responsible for 93,000 jobs and $10.6 billion in spending (Port Manatee, 2000; TPA, 2002).

- The ***Port of St. Petersburg*** specializes in one-day cruises, and is also the homeport for cruises to Mexico.

D1-3.2 Commercial Fishing

The once-active commercial fishing industry in Tampa Bay has declined dramatically because of overharvesting and habitat deterioration (TBNEP, 1992b). The commercial fishery for snook has been closed since the 1950's. Commercial landings of spotted seatrout dropped fourfold from the early 1950's to the early 1980's. The red drum harvest decreased by 82 percent until the fishery was closed in 1987. In 1993, purse seining was banned to protect bait fish species (e.g., bay anchovy) that are important prey for other fish and birds. A ban on gill netting (the "Florida net ban"), implemented in 1995, seeks to save declining stocks of mullet, which previously made up about half of all commercial landings of finfish and shellfish in Tampa Bay. The ban also benefits other highly valued species, such as the spotted seatrout and sheepshead. Commercial landings of finfish decreased by 47 percent between 1995 and 1996 as a result of the gill net ban (TBNEP, 1996a; Nelson et al., 1997).

Although commercial shrimping is the most important commercial fishery in Florida, a viable commercial shrimp fishery no longer exists in Tampa Bay. There remains only minor activity in food and bait shrimping of pink shrimp and other penaeid species. The blue crab commercial fishery is the fourth largest in Florida, but the harvest of blue crab in Tampa Bay generates less than 5 percent of Florida's west coast commercial landings (TBNEP, 1992b). The harvest of oysters and clams has been severely restricted or closed altogether because of documented or presumed contamination by fecal pathogens that enter the bay from various point and nonpoint sources (TBNEP, 1996a).

D1-3.3 Recreational Fishing

Tampa Bay provides recreational fishing opportunities for many sought-after species, including snook, spotted sea trout, tarpon, and red drum (TBNEP, 1992b). To characterize recreational fishing in the Tampa Bay area, EPA relied on the Marine Recreational Fisheries Statistics Survey (MRFSS) (NMFS, 2001a). The MRFSS found that each year anglers fishing from shore and private or rental boats spend 60.3 and 53.5 days fishing in Tampa Bay and adjacent coastal sites, respectively. Tampa Bay fishermen tend to travel relatively short distances, on average 15.1 miles for single-day trips. Fishermen taking single day trips spend an average of $21.37 per day in pursuit of their target species. [1]

From 1997 to 1999, recreational anglers in Tampa Bay caught an annual average of:

- 72,233 black drum
- 45,411,292 spotted seatrout
- 783,407 sheephead

[1] Includes travel and boat expenditures for single-day trips and travel, lodging, and boat expenditures for multiple day trips.

Table D1-3 shows that anglers spent an estimated 6.4 million days fishing in Tampa Bay and adjacent coastal sites. The NMFS data indicate that the number of angler days spent in the case study area accounts for 88.004 percent of the total angler days in western Florida.

Table D1-3: Results of MRFSS Analysis of Fishing Participation in Tampa Bay and Adjacent Coastal Sites

Fishing Mode	Total Number of Fishing Days at Tampa Bay NMFS Sites
Private or Rental Boat	3,285,506
Shore	2,783,465
Charter Boat	361,258
Total	**6,430,229**

D1-3.4 Other Water-Based Recreation

a. Recreational viewing

Six state parks are located within the Tampa Bay region. These parks offer the opportunity to view popular marine species such as sea turtles, bottlenose dolphins, and the endangered manatee. Sea turtles can occasionally be seen nesting on beaches and within state parks. Dolphins are plentiful, and more than 500 reside in the bay year-round. They can be viewed from the shore or from charter boats offering sightseeing tours.

Tampa Bay is also home to two national wildlife refuges:

- ***Chassahowitzka National Wildlife Refuge*** is composed of 12,343 hectares (30,500 acres) of saltwater bays, estuaries, and brackish marshes. The variety of habitats found in the refuge support approximately 250 species of birds, 50 species of reptiles and amphibians, and 25 species of mammals. Endangered and threatened species on the refuge include manatees, sea turtles, and bald eagles.

- ***Egmont Key National Wildlife Refuge*** encompasses approximately 142 hectares (350 acres) and was established to provide nesting, feeding, and resting habitat for brown pelicans and other migratory birds (National Audubon Society, 2000).

Tampa Bay provides bird watchers with numerous species to observe. From year-round residents to species that over-winter in the region or pass through on their way to points further south, thousands of birds are seen daily in the Tampa Bay area. Wintering species join the thousands of birds rearing their young in several breeding colonies found on islands in the bay, where nests are safe from predators and disturbance. Many parks provide prime viewing spots for the avid birder, both on the mainland and on Tampa Bay islands. Five of Florida's 45 Audubon Society chapters are located in the Tampa Bay area.

Table D1-4 presents information from EPA's 1994 Survey of National Demand for recreational viewing in the Tampa Bay estuary.[1] The table lists all U.S. states from which at least one resident visited Tampa Bay on their last viewing trip during 1993. EPA estimated that about 7.1 million people used the Tampa Bay estuary for recreational viewing in 1993. These visitors accounted for 18.4 million visits to the area. The survey results show that visitors came from 20 different states. Ohio and Pennsylvania residents were the most frequent visitors, representing approximately 18.4 percent and 15.7 percent of all viewers to the bay, respectively. Florida residents accounted for the highest absolute number of visits, 8.1 million, representing roughly 44 percent of all recreational viewing trips to Tampa Bay.

b. Swimming and boating

Tampa Bay has some 30 miles of sandy shoreline and seawalls (Tampa Bay Beaches, 2001), which feature some of the nicest beaches in the Gulf of Mexico. Three Pinellas beaches — Caledesi Island, Fort DeSoto Park, and Sand Key Park — rank consistently among the top 20 beaches in the nation for cleanliness, parking availability, and color and composition of the surf and sand (Towery Publishing, 2000). These beaches offer various water-based recreational activities, including boating, swimming, snorkeling/scuba diving, parasailing, jet ski rentals, aqua bikes, and paddle boats.

[1] Table D1-4 presents information from EPA's 1994 NDS Survey of National Demand for Recreational viewing in Tampa Bay.

Table D1-4: Recreational Viewing in the Tampa Bay Estuary[a]

Home State	1993 State Population (18 & over)	Number of Survey Respondents	Number of Respondents with Last Recreational Trip to the Tampa Bay Estuary		Extrapolated Number of Participants in Recreational Viewing in the Tampa Bay Estuary	Number of Recreational Viewing Trips to the Tampa Bay Estuary by Last Trip Participants	Average Number of Recreational Viewing Trips per Respondent	Extrapolated Number of Recreational Viewing Trips in the Tampa Bay Estuary
			Total	% of Survey Respondents				
AR	1,789,229	128	1	7.69%	137,633	1	1	137,633
CT	2,494,772	159	1	2.50%	62,369	1	1	62,369
FL	10,509,197	662	38	5.80%	609,694	504	13	8,086,466
GA	5,049,783	373	4	8.33%	420,815	5	1	526,019
IL	8,628,335	466	4	7.14%	616,310	4	1	616,310
IN	4,240,268	300	4	12.12%	513,972	8	2	1,027,944
KY	2,829,980	219	1	5.00%	141,499	1	1	141,499
MA	4,607,944	249	1	5.88%	271,056	1	1	271,056
MI	7,019,973	576	2	1.14%	79,772	3	2	119,659
MN	3,302,335	245	2	3.77%	124,616	3	2	186,925
MO	3,880,036	277	2	6.06%	235,154	4	2	470,307
NJ	5,959,401	347	2	0.98%	58,140	4	2	116,281
NM	1,134,379	105	1	14.29%	162,054	1	1	162,054
NY	13,678,730	774	7	3.68%	503,953	7	1	503,953
OH	8,226,211	650	12	16.00%	1,316,194	16	1	1,754,925
OK	2,364,758	143	1	4.55%	107,489	2	2	214,978
PA	9,153,391	742	6	12.24%	1,120,823	18	3	3,362,470
SC	2,687,675	181	1	0.43%	11,686	1	1	11,686
TN	3,812,044	296	3	11.54%	439,851	3	1	439,851
VA	4,884,288	389	2	2.11%	102,827	2	1	102,827
WI	3,706,711	299	2	2.60%	96,278	2	1	96,278
Total		**7,580**	**97**		**7,132,185**	**591**		**18,411,490**

[a] Extrapolated numbers may not add up due to independent rounding.

Source: U.S. EPA, 1994b.