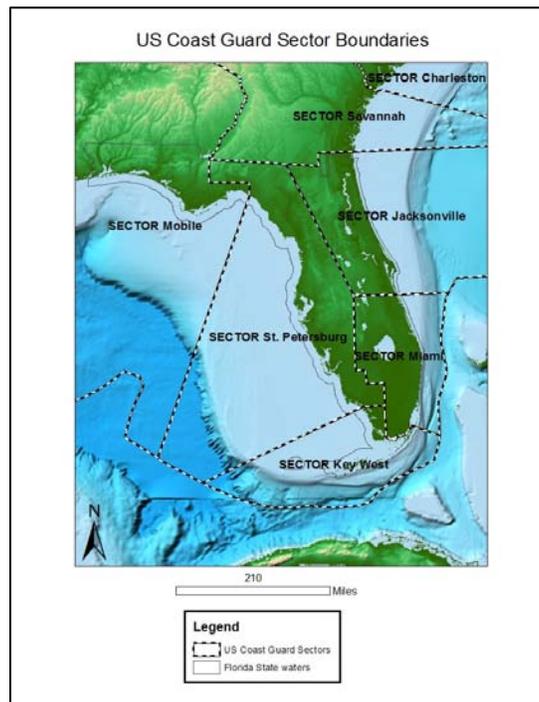


**Detailed Wildlife Resources At Risk by Region (US Coast Guard Sector)**

The following reports are offered for informational purposes in order to indicate the types of wildlife and habitats that could be at risk in any given region by an oil spill. The following Resources at Risk Reports are listed by USCG Sector in a counter-clockwise direction around the State of Florida.

- [Sector Mobile – Potential Wildlife and Habitat Resources at Risk](#)
- [Sector Saint Petersburg – Potential Wildlife and Habitat Resources at Risk](#)
- [Sector Key West – Potential Wildlife and Habitat Resources at Risk](#)
- [Sector Miami – Potential Wildlife and Habitat Resources at Risk](#)
- [Sector Jacksonville – Potential Wildlife and Habitat Resources at Risk](#)



**Sector Mobile – Potential Wildlife and Habitat Resources at Risk**

**Potential Resources at Risk for an Offshore Drilling Spill Scenario: Panhandle, Florida**

**I. Spill Source Information**

This report was prepared on 25 June 2010. Information presented in this report are based on an offshore drilling accident and spill scenario with an extended oil release period >80 days

**II. Geographic Region Covered**

This report covers the western shoreline of the Florida Panhandle from Perdido Bay (just west of Pensacola) to Apalachee Bay. This corresponds to the USCG Sector Mobile Geographic Response Plan Maps in the state of Florida.

### **III. Expected Type of Spilled Material For the Area**

Tarballs, emulsified oil, and/or oil mats are expected to be observed on the shoreline of the Panhandle. The oil may stick to aquatic vegetation, birds, fur-bearing mammals, and reptiles. Oil coming ashore will be weathered so oil effects are likely to be a result of coating and smothering of wildlife and other shoreline resources, ingestion of tarballs by sea turtles and other marine species, and the persistence of oil in sediments.

### **IV. Shoreline Resources at Risk**

#### **Shoreline Types by Region**

##### **Perdido Bay to Choctawhatchee Bay:**

The majority of outer coast shoreline is fine-grained sand beaches. Shorelines along the bays and sounds are primarily fine-grained sand beaches, sheltered and exposed marshes, sheltered and exposed tidal flats, sheltered manmade structures/seawalls/vegetated banks, and some gravel beaches/riprap (e.g., Pensacola Bay). Large stretches of tidal flats are found along Perdido Bay, Escambia Bay, Santa Rosa Sound, Blackwater Bay, East Bay, and the western portion of Choctawhatchee Bay.

##### **Choctawhatchee Bay to St. Joseph Bay/Port St. Joe:**

The majority of outer coast shoreline is fine-grained sand beaches. Small bodies of water along the coastline (e.g., Morris Lake, Campbell Lake, Western Lake) may contain sheltered and exposed marshes, and sheltered tidal flats. The major bays (e.g., West Bay, St. Andrew Bay, and St. Joseph Bay) are composed of fine-grained sand beach, exposed marshes, sheltered manmade structures/seawalls/vegetated banks, and exposed vertical seawalls. Exposed and sheltered tidal flats occur in West Bay and St. Joseph Bay; exposed tidal flats occur in North Bay, St. Andrews Sound, and St. Andrew Bay.

##### **St. Joseph Bay/Port St. Joe to Apalachee Bay:**

The majority of outer coast shoreline along the barrier islands (St. Vincent, St. George Island, and Dog Island) is fine-to-course grained sand beach with some exposed and sheltered marshes on the sound shorelines. The mainland is also composed of fine-grained sand beaches, exposed marshes, and sheltered manmade structures/seawalls/vegetated banks. East Bay, Ochlockonee Bay, and Apalachee Bay are primarily exposed and sheltered marshes with some smaller areas of fine-grained sand beach, riprap, and sheltered manmade structures/seawalls/vegetated banks. Apalachicola Bay is composed of fine-grained sand beach and exposed marshes. Exposed tidal flats are found on the eastern shoreline of St. Vincent Island, the sound side of most barrier islands, Oyster Bay, entrance of St. Marks River, and within Big Bend Seagrasses Aquatic Preserve. An expansive tidal flat is found at the mouth of the Carrabelle River. Sheltered tidal flats are present in Big Bayou, mouth of Carrabelle River, cove on Dog Island, Oyster Bay, and St. Marks River.

#### **Oil behavior by shoreline type:**

##### **Fine-grained sand beaches:**

Tarballs and tar patties may strand along outer coast beaches. Light oil accumulations will be deposited as oily swashes or bands along the upper intertidal zone. In the hot sun, the tarballs and patties can partially “melt” into the upper layer of sand. Depending on how sticky the tarballs and tar patties are, they may adhere to the sandy substrate, become coated with sand, and not refloat with the rising tide. Also, waves can roll the tarballs up and down the beach face, causing

them to become coated with sand. If they become heavy enough, they can accumulate in the nearshore subtidal zone. Depending on the beach cycle, the tarballs and patties can become buried during depositional cycles. Therefore, rapid removal is important.

#### **Sheltered and exposed marshes:**

These are the most sensitive shorelines. Oil adheres readily to intertidal vegetation. The band of oil coating will vary widely, depending upon the water level at the time oil is in the vegetation. There may be multiple bands. Heavy and emulsified oil can be trapped within marsh vegetation. The oil could also adhere to and foul attached biota on vegetation.

#### **Large exposed and sheltered tidal flats:**

Oil does not usually adhere to the surface of exposed or sheltered tidal flats, but rather moves across the flat and accumulates at the high-tide line. Deposition of oil as sheen or tarballs on the flat may occur on a falling tide. Depending on how sticky the tarballs are, they may adhere to the substrate and not refloat with the rising tides. Oil will not penetrate the water-saturated sediments, but could penetrate burrows and mud cracked sediments of sheltered tidal flats.

#### **Coarse-grained sand beaches:**

Behavior of tarballs and patties will be similar as described above, with the exception of a greater potential for penetration and burial.

#### **Exposed and sheltered manmade structures/seawalls/vegetated banks:**

Oil will adhere readily to the rough surface, particularly along the high-tide line, forming a distinct oil band. The lower intertidal zone usually stays wet (particularly if algae covered), preventing oil from adhering to the surface. In high-use areas, manmade structures can be cleaned using high-pressure, warm-water flushing with deluge systems to flush the released oil to the water surface for recovery with sorbents.

#### **Gravel beach/riprap:**

Coating of the surface and deep penetration of oil/tarballs between riprap boulders is likely. Oil adheres readily to rough surfaces. If oil is left uncleaned, it may cause chronic leaching. In high-use areas, riprap will be cleaned using high-pressure, warm-water flushing with deluge systems to flush the released oil to the water surface for recovery with skimming systems or sorbents, depending on the amount of oil present. It is very difficult to remove oil that has penetrated between the boulders, thus sorbents are used to recover oil released by tidal and wave action over time.

### **V. Biological Resources at Risk (state and federally threatened and endangered – S/F T/E; state species of concern - SSC)**

#### **Birds**

##### **Perdido Bay to Choctawhatchee Bay:**

Least tern (ST; ~275; nesting Apr.-Aug.) may be present at Big Lagoon State Recreation Area (SRA), Perdido Key, entrance of Bayou Grande, Santa Rosa Island (high numbers; bay and outer shorelines), Henderson SRA (~245), entrance of Pensacola Bay, eastern shoreline of Escambia Bay, entrance and along shorelines within Choctawhatchee Bay, and Moreno Point. Snowy plover (ST; high; nesting Mar.-Jul.) present on sand beaches of Perdido Key, Santa Rosa Island (bay and outer shorelines), entrance of Choctawhatchee Bay, and Moreno Point. Piping plover (S/F T/T; Aug.-May) may be present near Big Lagoon SRA and along outer beaches of Santa

Rosa Island. Black skimmer (SSC: May-Sep.) may be nesting on Perdido Key, Santa Rosa Island (high), entrance of Pensacola Bay, entrance and along shorelines within Choctawhatchee Bay, and Moreno Point. Great blue heron may be nesting in Escambia Bay (Nov.-Jul.). Seaside sparrow (low; nesting Mar.-Aug.) and wintering waterfowl may be present on the shoreline north of Hogtown Bayou. Shorebirds may be present on the sheltered marshes of Escambia Bay. Shorebirds (e.g., sandpipers, dowitchers, and plovers) may also be foraging year round on outer coast sand beaches. The entrance of Choctawhatchee Bay and Moreno Point is an important area for gulls, terns, wading birds, and shorebirds. Waterfowl may be present along Hogtown Bayou and Jolly Bay in Choctawhatchee Bay during the winter months.

Bald eagle nests may be located on Escambia Bay and along Choctawhatchee Bay. Eagles nest from November-June, but they are year round residents. High concentrations of brown pelicans (SSC) and double-crested cormorants are common in nearshore and inshore waters year round. Other diving ducks and birds (e.g., loons, mergansers, buffleheads, and redheads) winter in the area. Northern gannet may be found offshore in low numbers from December to April.

### **Choctawhatchee Bay to St. Joseph Bay/Port St. Joe:**

Least tern (ST; nesting Apr.-Aug.) may be nesting on the outer shoreline near Grayton Beach, entrance of Eastern Lake, western shoreline of St. Andrew Bay, St. Andrews SRA, Hurricane Island (east end; ~300), Crooked Island (high), St. Joseph Peninsula State Park, near Port St. Joe, and Cape San Blas (high). Snowy plover (ST; nesting Mar.-Jul.) may be present on the outer shoreline near Grayton Beach, entrance of Eastern Lake, Port Panama City (high), western shoreline of St. Andrew Bay, St. Andrews SRA, Hurricane Island (east end), Crooked Island (high), St. Joseph Peninsula (high), near Port St. Joe, and Cape San Blas. Piping plover (S/F T/T) may be present near the entrance of Eastern Lake, western shoreline of St. Andrew Bay, St. Andrews SRA, Hurricane Island (east end), Crooked Island, St. Joseph Peninsula, near Port St. Joe, and Cape San Blas (high). Wintering waterfowl may be present in the smaller bodies of water along the coastline between Grayton Beach and Powell Lake, as well as along West Bay, North Bay, and at St. Andrew SRA. Warren Bayou and Johnson Bayou have high concentrations of wading birds, shorebirds, and piping plover (S/F T/T). A heron and egret rookery (Nov.-Aug.) is located near Grand Lagoon in St. Andrew Bay Aquatic Preserve. Brown pelican (high) may also be found near Port Panama City. Double crested cormorant (~150; year round), shorebirds, gulls, and terns may be found at the entrance of St. Andrew Bay. Laughing gull (~100; nesting May-Aug.) may be nesting near Port Panama City. Peregrine falcon (S/F E/T; Sep.-May) may be present at St. Andrew SRA, Crooked Island, and on St. Joseph Peninsula State Park. Hundreds of birds including American oystercatcher (nesting Mar.-Jul.), black skimmer (SSC; nesting May-Sep.), gulls (nesting May-Aug.), shorebirds, and diving birds use the south end of Crooked Island year round. Thousands of shorebirds use St. Joseph Peninsula State Park year round. An island on the eastern side of St. Joseph Bay may be a year round rookery (low) for snowy egret (SSC), great egret, tricolored heron, and brown pelican.

Bald Eagle may be nesting (Nov.-Jun.) northeast of Doyle Point in West Bay, Fannin Bayou off of North Bay, near the dam at Deer Point Lake, along St. Joseph Bay, and at Cape San Blas. High concentrations of brown pelicans (SSC) and double-crested cormorants are common in nearshore and inshore waters year round. Other diving ducks and waterfowl (e.g., loons, mergansers, buffleheads, and redheads) winter in the area. Northern gannet may be found offshore in low numbers from December to April.

### **St. Joseph Bay/Port St. Joe to Apalachee Bay:**

Least tern (ST; nesting Apr.-Aug.) may be nesting on St. Vincent Island, eastern end of St. George Island, islands east of Eastpoint, islands within Carrabelle River, Dog Island (high), St. James Island, Bald Point State Park, peninsula at Alligator Harbor, and near Dickerson Bay. Snowy plover (ST) may be present on sand beaches of St. Vincent Island (high), St. George Island (high; nesting Mar.-Jul.), Dog Island (nesting), St. James Island, Bald Point State Park, and the peninsula at Alligator Harbor (nesting). Piping plover (S/F T/T) may be present near Indian Pass, St. Vincent Island, St. George Island (sound and coastal beaches), on mainland beaches between Eastpoint and Carrabelle River, Dog Island, St. James Island, Bald Point State Park, peninsula at Alligator Harbor, and marshes along St. Marks National Wildlife Refuge (NWR). American oystercatcher may be nesting (Mar.-Jul.) on islands in Indian Lagoon, St. Vincent Island, and St. George Island (high). The small strip of land on the bridge from Eastpoint to St. George Island and islands south of the John Gorrie Memorial Bridge (near Apalachicola) may have hundreds of laughing gull, black skimmer (SSC), least tern (ST), and royal tern nesting from April to September. Islands south of the John Gorrie Memorial Bridge near Apalachicola may also have 400 brown pelican (SSC; nesting Nov.-Sep.). Wood duck (high; nesting Feb.-Jul.) may be present in Apalachicola NERR, along Ochlockonee River, and in marshes of St. Marks NWR. Shorebirds may be using any tidal flats or sand beaches in the area. Islands in St. George Sound off of Lanark Village have high concentrations of shorebirds (~2500), and is a nesting hot spot for laughing gull (~2500; nesting May-Aug.), willet (nesting Apr.-Jul), herons (nesting Nov.-Sep.), egrets (nesting Dec.-Aug.), black skimmer (SSC; nesting May-Sep.), brown pelicans (nesting Nov.-Sep.), least tern (nesting Apr.-Aug.), and clapper rail (nesting Mar.-Jul). Shorebirds may be found year round on shorelines of St. Vincent Island, St. James Island (~5000), peninsula at Alligator Harbor, Oyster Bay, marshes along St. Marks NWR (~1000), and Cobb Rocks (~600). Great egrets (~100; nesting Jan.-Jul.), brown pelican (Nov.-Sep.), laughing gull (nesting May-Aug.), American oystercatcher (Mar.-Jul.) may be present and nesting in Oyster Bay. Wading birds (e.g., great egret, little blue heron (SSC), and great blue heron) may be found in marshes throughout the area. Woodstork (S/F E/E) may be present year round on the eastern shoreline of Apalachee Bay (near Big Bayou).

Bald Eagle may be nesting (Nov.-Jun.) on St. Vincent Island, St. George Island, Carrabelle River, St. James Island, and in St. Marks NWR. Peregrine falcon (S/F E/T; Sep.-May) may be present on St. Vincent, St. George Island, Apalachicola River, Dog Island, and Ochlockonee River. High concentrations of brown pelicans (SSC; year round), double-crested cormorants (year round), lesser scaup (Oct.-Apr.), common loon (Nov.-Apr.), and redhead (Oct.-Apr.) are common in nearshore waters. Other diving ducks and waterfowl (e.g., mergansers, buffleheads) winter in the area. High numbers of wintering waterfowl occur in Apalachee Bay (redhead, scaup, common loon) and in marshes along Ochlockonee River, and St. Marks NWR (teal, gadwall, wigeon). Northern gannet may be found offshore in low numbers from December to April.

All birds are at significant risk of oiling from emulsified oil. At greatest risk are those who spend most of their time on the water surface, such as pelicans and ducks. Direct oiling of birds reduces the buoyancy, water repellency, and insulation provided by feathers, and may result in death by drowning or hypothermia. Preening of oiled feathers may also result in the ingestion of oil, resulting in irritation, sickness, or death. Gulls and terns do not appear to avoid oil while feeding in nearshore areas, particularly if the oil is weathered. During the nesting season, they could bring oil back to the nests.

## **Fish**

The following species are present in estuaries along the Panhandle (e.g., Perdido Bay, Pensacola Bay, Choctawhatchee Bay, St. Andrew Bay, Apalachicola Bay, and Apalachee Bay): bull shark, stingrays, seahorses, pipefish, tarpon, Alabama shad (spawning in Apalachicola Bay, Mar.-Apr.), Gulf menhaden (abundant: juveniles, adults), gizzard shad (spawning Mar.-Aug.), bay anchovy (highly abundant: all life stages; spawning Jan.-Nov.), largemouth bass (abundant: all life stages; year round), redear sunfish (abundant: all life stages; year round), bluegill (all life stages; year round), hardhead catfish (highly abundant: all life stages; spawning May-Aug.), sheepshead minnow (abundant: all life stages, spawning Mar.-Nov.), Gulf killifish (abundant; spawning Mar.-Sep.), silversides (highly abundant; spawning Mar.-Sep.), snook, bluefish (abundant: adults), blue runner, crevalle jack, Florida pompano, gray snapper, sheepshead, pinfish (highly abundant: larvae, juveniles, adults), silver perch (abundant: all life stages; spawning Mar.-Aug.), sand seatrout (highly abundant: juveniles; spawning Mar.-Aug.), spotted seatrout (abundant: juveniles, adults; spawning Apr.-Aug.), spot (abundant: larvae, juveniles, adults), Atlantic croaker (abundant: larvae, juveniles, adults), black drum (spawning in St. Andrew Bay, Jan.-Apr.), red drum, striped mullet (abundant to highly abundant: larvae, juveniles, adults), code goby (spawning Mar.-Dec.), Spanish mackerel (abundant: adults), Gulf flounder, and Southern flounder. Juveniles and adults are present for the majority of species listed above.

Emulsified oil that becomes trapped in marshes may affect early life stages of fish that are found in shallow vegetated waters.

## **Invertebrates**

### **Perdido Bay to Choctawhatchee Bay:**

High concentrations of larvae/juvenile blue crab, brown shrimp, pink shrimp, white shrimp (spawning Mar.-Nov.), and stone crab are present year round in inshore waters. High concentrations of blue crab are found in offshore waters (off Santa Rosa Island) spawning from March to November. Low concentrations of brown shrimp (Jan.-Dec.), pink shrimp (Mar.-Nov.), white shrimp (Mar.-Nov.), and stone crab (Mar.-Oct.) are spawning in offshore waters. American oyster (spawning Mar.-Oct.) may be present in Escambia Bay, Blackwater Bay (common), East Bay (high), and Choctawhatchee Bay.

### **Choctawhatchee Bay to St. Joseph Bay/Port St. Joe:**

Small inland bodies of water between Miramar and Grayton Beach have high larvae/juvenile concentrations of blue crab (Jan.-Dec.), brown shrimp (Feb.-Nov.), pink shrimp (Jan.-Dec.), stone crab (Jan.-Dec.), and white shrimp (spawning Mar.-Nov.). High concentrations of larvae/juvenile blue crab, brown shrimp, pink shrimp, white shrimp (spawning Mar.-Nov.), and stone crab are present year round in inshore waters. Low concentrations of these same species are present in offshore waters and may be spawning. Spiny lobster (low; Jun.-Nov.) may be present in inshore waters from Panama City Beach to Crooked Island. American oyster (spawning Mar.-Oct.) is present in West Bay (high) and in North Bay. Atlantic bay scallop (spawning Aug.-Sep.) is present in St. Andrew Bay, St. Andrew Sound (high), and the southern portion of St. Joseph Bay (high). Southern quahog (high; spawning Apr.-Sep.) is present in St. Joseph Bay.

### **St. Joseph Bay/Port St. Joe to Apalachee Bay:**

High concentrations of blue crab, brown shrimp, pink shrimp, white shrimp (spawning Mar.-Nov.), and stone crab are present year round in inshore waters. Low concentrations of these same

species are present in offshore waters and may be spawning. Blue crab (high) may be spawning in Apalachicola Bay from March to November. American oyster (spawning Mar.-Oct.) is present in Indian Lagoon, St. Vincent Sound, St. George Sound, Oyster Bay, Goose Creek Bay, Alligator Harbor, and Ochlockonee Bay. Blue crab, pink shrimp, and stone crab are present in Apalachee Bay and may be spawning.

### **Reptiles**

Loggerhead sea turtle (S/F T/T), green sea turtle (S/F E/E), leatherback sea turtle (S/F E/E) and Kemp's ridley sea turtle (S/F E/E) are the most common species found in nearshore and inshore waters. They use harbors, bays, and sounds for foraging year round. The following are some of the more important habitats:

#### **Perdido Bay to Choctawhatchee Bay:**

Loggerhead sea turtle (nesting Apr.-Sep., hatching Jun.-Nov.) nesting on outer coast sand beaches of Perdido Key, Santa Rosa Island, and sand beaches near the entrance to Choctawhatchee Bay. Green sea turtle (nesting May-Sep., hatching Jul.-Nov.) may be nesting on outer coast sand beaches of Santa Rosa Island, and Moreno Point.

#### **Choctawhatchee Bay to St. Joseph Bay/Port St. Joe:**

Loggerhead sea turtle (nesting Apr.-Sep., hatching Jun.-Nov.) nesting on outer coast sand beaches at Miramar Beach, Grayton Beach State Park, Panama City Beach, St. Andrew SRA, Hurricane Island, Crooked Island, St. Joseph Peninsula State Park, and Cape San Blas. Green sea turtles (nesting May-Sep., hatching Jul.-Nov.) may be nesting on Hurricane Island, Crooked Island, St. Joseph Peninsula State Park, and Cape San Blas. Leatherback sea turtle is present in high concentrations from January to May in offshore waters near Grayton Beach to Crooked Island. Leatherback sea turtle may be nesting (nesting Apr.-Jul.; hatching Jun.-Sep.) in low numbers on St. Joseph Peninsula. Leatherback (Mar.-Jul.), Kemp's ridley (year round), loggerhead (May-Aug.), and green sea turtles (year round) are present in inshore waters from Panama City Beach to St. Andrew Sound. Kemp's ridley, loggerhead, and green sea turtles are present year round in inshore waters of St. Joseph Bay.

#### **St. Joseph Bay/Port St. Joe to Apalachee Bay:**

Loggerhead sea turtles (nesting Apr.-Sep., hatching Jun.-Nov.) may be nesting on outer coast shorelines of St. Vincent Island, St. George State Park, and Dog Island. Leatherback sea turtles (nesting Apr.-Jul.; hatching Jun.-Sep.) may be nesting on St. George State Park. Green (year round), Kemp's ridley (high; year round), leatherback (Mar.-Jul.), and loggerhead (May-Aug.) sea turtles are present in inshore waters from St. Vincent Sound to Apalachee Bay.

Oil may irritate the eyes, mouth, and nostrils of sea turtles. In addition, there is a risk of turtles ingesting tarballs. The toxicity of the oil as well as intestinal blockage can result in death. There is also the risk of nests becoming oiled and causing mortality of future hatchlings.

## **Terrestrial mammals**

Rice rats, cotton rats, mink, and river otter are common to marshes (salt or freshwater) and vegetated shores along the entire Panhandle. Species specific to certain locations are described below.

### **Perdido Bay to Choctawhatchee Bay:**

Perdido Key Beach mouse (S/F E/E) is present on Perdido Key (high concentrations on western end and Perdido Key State Park) and eastern end of Gulf Islands National Seashore. Santa Rosa Beach mouse is present in high concentrations on Santa Rosa Island. Florida black bear (ST) is present in upland areas of Eglin Air Force Base and East Bay Swamp.

**Choctawhatchee Bay to St. Joseph Bay/Port St. Joe:** Choctawhatchee Beach mouse (S/F E/E) is present near Topsail Hill Preserve State Park, Grayton Beach, Shell Island (high), Hurricane Island (high), and West Crooked Island (high). Florida black bear (S/T) is present in forested areas of Tyndall Air Force Base and inland of St. Joseph Bay. St. Andrew beach mouse (S/F E/E; high) is present year round on East Crooked Island and St. Joseph Peninsula. Round-tailed muskrat has been recorded along the northern shore of Choctawhatchee Bay.

### **St. Joseph Bay/Port St. Joe to Apalachee Bay:**

Florida black bear (S/T) is present in forested areas along the shoreline.

The fur of terrestrial mammals may become oiled and oil may be ingested as animals attempt to clean themselves.

## **Marine mammals**

The Florida manatee (S/F E/E) inhabits the coastal waters, estuaries, tidal creeks, and freshwater river systems of Florida. Manatees will be most susceptible to contaminant exposure if the oil enters estuaries, river mouths, nearshore waters, and intracoastal waters inshore of barrier islands, particularly where there are seagrass beds upon which manatees forage. Manatees can be found feeding on seagrass or other aquatic vegetation year-round. During winter (November/December to February/March), manatees thermoregulate during cold weather by seeking shelter at a limited number of warm-water sites. Most manatees in this region migrate south in late fall to overwinter at Crystal River or other warm-water refuges; however, a number have recently started overwintering at Wakulla Springs, at the head of the Wakulla River. Manatee abundance is relatively higher in the eastern portion of the region where they are typically found near the mouths of rivers (and sometimes within the rivers themselves), including the Aucilla, St. Marks, Wakulla, Ochlocknee, and Apalachicola Rivers. Some other important areas for this region include: Oyster Bay near St. Marks National Wildlife Refuge (off of Apalachee Bay), Apalachicola Bay, and St. George Sound. Less is known about manatee distribution west of Apalachicola, but available information on sightings and suitable foraging habitat suggest that the intracoastal waters of St. Joseph Bay, St. Andrews Bay, West Bay, Choctawhatchee Bay, Santa Rosa Sound, Pensacola Bay, Escambia Bay, and Perdido Bay may all provide habitat for a relatively smaller number of manatees during the warm season.

A variety of dolphins and whales are expected to be present in waters throughout the region. The most common is the bottlenose dolphin which is likely present in nearshore, inshore, and offshore waters of the Gulf of Mexico. Sperm whales (S/F E/E) are widely distributed in the region's continental slope and oceanic waters in all seasons.

## **Habitats**

### **Perdido Bay to Choctawhatchee Bay:**

Submerged aquatic vegetation (SAV) is present in waters near Perdido Key State Park, Big Lagoon, entrance of Pensacola Bay, Santa Rosa Sound, Blackwater Bay, and Choctawhatchee Bay. Deep sea coral and sponge habitat is present in offshore waters south of Pensacola Bay

### **Choctawhatchee Bay to St. Joseph Bay/Port St. Joe:**

SAV is present in West Bay, St. Andrew Bay, North Bay, Goose Lagoon, and St. Joseph Bay.

### **St. Joseph Bay/Port St. Joe to Apalachee Bay:**

SAV is present along the sound side of St. George Island, the mainland shoreline of St. George Sound, Dog Island, Alligator Harbor, Oyster Bay, Goose Creek Bay, and Apalachee Bay.

## **VI. Human-Use Resources**

### **Archaeological/historical:**

Archaeological/historical sites are abundant. Contact the Bureau of Archaeological Research, Florida Department of State (904-487-2299).

### **USCG bases:**

A U.S. Coast Guard Station is near the entrance of Pensacola Bay.

### **Boat ramps/Marinas:**

There are numerous marinas and boat ramps throughout the region.

### **Aquaculture lease site:**

Oyster Resource Development Projects in Escambia Bay, East Bay, Choctawhatchee Bay, West Bay, St. Vincent Sound, Indian Lagoon, Apalachicola Bay, St. George Sound, and Oyster Bay (FDEP BMRRD; Mark Berrigan; 904-488-5471); shellfish lease sites occur in West Bay, St. Vincent Sound, Indian Lagoon, Apalachicola Bay (FDEP BMRRD; Mark Berrigan; 904-488-5471). This list may not include all aquaculture sites.

### **Water intakes:**

Christ Power Plant (Gulf Power Co.) in Escambia River, Smith Power Plant (Gulf Power Co.) in North Bay, and Purdon Power Plant (City of Tallahassee, 904-891-5900) in St. Marks River. This list may not include all water intake sites. See the most recent ESI data for more information.

### **Apalachicola National Estuarine Research Reserve (NERR):**

Located near the mouth of the Apalachicola River.

### **Federal Managed Lands:**

Gulf Islands National Seashore, St. Vincent National Wildlife Refuge, St. Marks National Wildlife Refuge, Naval Air Station, Eglin Air Force Base, and Tyndall Air Force Base.

### **State Managed Areas:**

Perdido Key State Preserve, Big Lagoon SRA, Henderson Beach SRA, Fred Gannon Rocky Bayou State Park, Grayton Beach State Park, Deer Lake State Park, Camp Helen State Park, St. Andrews SRA, St. Joseph Peninsula State Park, St. George State Park, Dr. Julian G. Bruce George Island State Park, Cape St. George State Preserve, Tate's Hell State Forest, Bald Point State Park, Aucilla State Wildlife Management Area, Big Bend State Wildlife Management Area, and Econfina River State Park.

### **Aquatic Preserves:**

Fort Pickens Aquatic Preserve, Yellow River Marsh Aquatic Preserve, Rocky Bayou Aquatic Preserve, St. Andrew Bay Aquatic Preserve, St. Joseph Bay Aquatic Preserve, Apalachicola Bay Aquatic Preserve, Alligator Harbor Aquatic Preserve, and Big Bend Seagrasses Aquatic Preserve.

### **Recreational Beaches:**

Several recreational beaches are in the area including: Perdido Key State Preserve, Santa Rosa Island, Destin, Moreno Point, Grayton Beach State Park, Panama City Beach, Cape San Blas, and St. George Island.

### **Dive sites include:**

Fort Pickens Aquatic Preserve, entrance of Pensacola Bay, offshore of Panama City Beach, St. Andrew Bay, St. Andrew Bay Aquatic Preserve, offshore of Crooked Island, St. Joseph Bay, offshore of St. Joseph Peninsula, and offshore of Big Bend Seagrasses Aquatic Preserve.

### **Essential Fish Habitat (EFH)**

EFH occurs along the Florida Panhandle (inshore, nearshore, and offshore) for coastal migratory pelagics, reef fish, and shrimp. EFH in nearshore and inshore waters of the Panhandle occurs for stone crab and red drum. EFH for coral occurs in localized areas in offshore waters.

### **Management Areas**

Seasonal or area closures for the Gulf (50 CFR 622.34) in the nearshore/offshore areas in proximity to the Mobile Sector include:

- Reef fish longline and buoy gear restricted area
- Madison and Swanson Sites

These closures indicate that this region is important habitat for reef fish.

### **Critical Habitat**

Designated Critical Habitat occurs for gulf sturgeon in Pensacola Bay, Choctawhatchee Bay, and Apalachicola Bay, as well as the outer coastline from Pensacola Bay to Apalachicola Bay.

## **VII. Cleanup Recommendations**

### **Sheltered and exposed marshes:**

Under light oiling, the best practice is to let the area recover naturally. Natural removal processes and rates should be evaluated prior to conducting cleanup. Heavy accumulations of pooled oil can be removed by vacuum, sorbents, or low-pressure flushing. During flushing, care must be taken to prevent transporting oil to sensitive areas down slope or along shore. Cleanup activities should be carefully supervised to avoid vegetation damage. Any cleanup activity must not mix the oil deeper into the sediments. Trampling of the roots must be minimized.

**Exposed tidal flats:**

Currents and waves can be very effective in natural removal of oil on tidal flats. Cleanup is very difficult (and possible only during low tides). Larger tarballs and patties stranded on the upper flats can be manually removed where the substrate can support foot traffic.

**Sheltered tidal flats:**

These are high-priority areas necessitating the use of spill protection devices to limit oil-spill impact; deflection or sorbent booms and open water skimmers should be used. Cleanup of the flat surface is very difficult because of the soft substrate and many methods may be restricted. Low-pressure flushing and deployment of sorbents from shallow draft boats may be helpful.

**Fine-grained sand beaches:**

These are the easiest shoreline type to clean. Cleanup should concentrate on removing oil, oily debris, or tarballs/patties. Manual cleanup, rather than road graders and front-end loaders, is advised to minimize the volume of sand removed from the shore and requiring disposal. Beach-cleaning equipment is being tested on its effectiveness in removing tarballs/patties and minimizing sediment removal. Mechanical reworking of lightly oiled sediments from the high-tide zone to the upper intertidal zone can be effective along outer beaches once the threat of oiling has reduced.

**Coarse-grained sand beaches:**

Coarse sand sediments are less trafficable, increasing the risk of mixing oil into the substrate by foot and vehicular traffic. Use similar methods as fine-grained sand beaches.

**Sheltered seawalls/manmade structures:**

Cleanup of seawalls is usually conducted for aesthetic reasons or to prevent leaching of oil. Low- to high-pressure spraying at ambient water temperatures is most effective when the oil is fresh.

**Exposed vertical seawalls:**

Cleanup is usually not required. High-pressure water spraying may be used to remove oil if necessary.

**Gravel beach/rirap:**

In high-use areas, riprap will be cleaned using high-pressure, warm-water flushing with deluge systems to flush the released oil to the water surface for recovery with skimming systems or sorbents, depending on the amount of oil present. It is very difficult to remove oil that has penetrated between the boulders, thus sorbents are used to recover oil released by tidal and wave action over time.

## **Sector Saint Petersburg – Potential Wildlife and Habitat Resources at Risk**

### **Potential Resources at Risk for a Large Offshore Release Scenario: Sector Saint Petersburg**

#### **VIII. Spill Source Information**

This report was prepared in September 2011. Information presented in this report is meant to capture resources potentially at risk in Sector St. Petersburg, Florida in the event of a catastrophic release of medium crude oil associated with International drilling activities.

#### **IX. Geographic Region Covered**

This report covers the western shoreline of the Florida Peninsula from Big Bend Wildlife Management Area (BBWMA) to Ten Thousand Islands National Wildlife Refuge (NWR). This corresponds to the USCG Sector St. Petersburg's Geographic Response Plan Maps.

#### **X. Expected Type and Behavior of Spilled Material For the Area**

Crude oils can vary widely by origin, but the rule of thumb is that up to one-third will be lost by evaporation and dissolution. The fate and behavior of a spill of medium crude oil will depend on the release conditions. For a deep subsurface release, a significant fraction of the oil will be naturally dispersed and dissolved into the water column during its rise to the surface. During the Deepwater Horizon spill of a light crude oil, an estimated 12% naturally dispersed and 20-25% evaporated or dissolved. Therefore, a subsurface release can result in up to 40% of the oil mixed into the water column. The soluble fraction in crude oil contains some of the more acutely toxic components. For a surface release of fresh oil, it is expected that the oil will form extensive slicks that would be subject to evaporation, emulsification, and other weathering processes that tend to eventually form fields of tarballs. When stranded on the shoreline, the oil will coat animals and intertidal habitats. If the stranded oil is relatively fresh and of low viscosity, it will readily penetrate porous sediments. Over time, the floating oil will weather and become more viscous. Impacts from weathered oil are associated with smothering and long-term sediment contamination.

#### **XI. Shoreline Resources at Risk**

##### Marshes:

The majority of shoreline from Big Bend Wildlife Management Area (BBWMA, Taylor County) to St. Joseph Sound (Pinellas County) is sheltered and exposed marshes and/or mangroves. Marshes and/or mangroves occur in Lemon Bay, Charlotte Harbor, Pine Island Sound, and Ten Thousand Island NWR. Marshes and mangroves are the most sensitive shorelines. Oil adheres readily to intertidal vegetation. The band of coating will vary widely, depending upon the water level at the time oil is in the vegetation. There may be multiple bands. Oil can wash through mangroves if oil comes ashore at high tide. If there is a berm or shoreline present in front of the mangroves, oil tends to concentrate and penetrate into the berm sediments or accumulated wrack/litter. Heavy and emulsified oil can be trapped in thickets of red mangrove prop roots. The oil will likely adhere to prop roots, tree trunks, and pneumatophores, particularly on dry surfaces. The oil could also adhere to and foul attached biota on the prop roots.

##### Tidal flats:

Large exposed and sheltered tidal flats are present just south of Cedar Key Scrub State Reserve and Waccasassa Bay State Preserve, as well as in Withlacoochee Bay, Sand Bay, St. Joseph Sound, Tampa Bay shorelines, and Sarasota Bay. Oil does not usually adhere to the surface of exposed or sheltered tidal flats, but rather moves across the flat and accumulates at the high-tide line. Deposition of oil as sheen or tarballs on the flat may occur on a falling tide. Depending on how sticky the tarballs are, they may adhere to the substrate and not refloat with the rising tides. Oil will not penetrate the water-saturated sediments, but could penetrate burrows and mud-cracked sediments of sheltered tidal flats.

### Beaches:

Fine-grained sand beaches are found along the outer shorelines from St. Joseph Sound (Pinellas County) south to Sarasota and also include Anclote Key, Caladesi Island, and Don Pedro Island. Coarse-grained sand beaches are found along Cedar Keys, Snake Key, Atsena Otie Key, Anclote Keys, Honeymoon Island, and the outer shoreline south of Little Sarasota Bay. Light oil accumulations will be deposited as oily swashes or bands along the upper intertidal zone. Heavy oil accumulations will cover the entire beach surface; oil will be lifted off the lower beach with the rising tide. Maximum oil penetration is about 10 cm in fine-grained sediments and 20 cm in coarse-grained sediments. Tarballs and tar patties may strand along outer coast beaches. In the hot sun, the tarballs and patties can partially “melt” into the upper layer of sand. Again, depending on how sticky the tarballs and tar patties are, they may adhere to the sandy substrate, become coated with sand, and not refloat with the rising tide. Also, waves can roll the tarballs up and down the beach face, causing them to become coated with sand. If they become heavy enough, they can accumulate in the nearshore subtidal zone, usually between the toe of the beach and the first offshore bar. Depending on the beach cycle, the tarballs and patties can become buried during depositional cycles. Therefore, rapid removal is important.

### Manmade structures:

Sheltered seawalls/manmade structures (e.g., Steinhatchee River, St. Joseph Sound, Manatee river), riprap (e.g., Hillsborough Bay), and exposed seawalls (e.g., Old Tampa Bay, Hillsborough Bay) are also present, although more commonly along the southern portion of the peninsula. Oil will adhere readily to the rough surface, particularly along the high-tide line, forming a distinct oil band. The lower intertidal zone usually stays wet (particularly if algae covered), preventing oil from adhering to the surface.

## **XII. Biological Resources at Risk**

### Birds

Bald eagle nests are present all along the western peninsula shoreline. They nest from November-June but eagles are year round residents. Double crested cormorants and brown pelicans are abundant in nearshore waters year round. Cormorants may be nesting March-August. Specifics by geography are described in the tables below. The state and federal statuses are listed in parentheses next to the first time a species name is mentioned (e.g. FT/SE: listed federally or state threatened or endangered, SSC: species of special concern).

**Table 1. Bird Hot Spots from Big Bend WMA to St. Joseph Sound:**

<b>Species Group</b>	<b>Species and Geography</b>	<b>Seasonal Presence</b>
Wading birds	Egrets, herons, ibises nesting in marshes	Summer months
Shorebirds	American oystercatcher (state SSC): marshes, beaches Piping plover (state and federally T): sand beaches and tidal flats near Sponge Point, Anclote Key, Honeymoon Island, and Caladesi Island Shorebirds: high concentrations at Anclote Key, Honeymoon Island and Caladesi Island	Summer August-May Spring/Fall migration
Gulls and Terns	Least tern (state T): beaches and flats Laughing gull (6500), black skimmer (400; state SSC), and royal tern (500) are found on the island just south of Anclote Key	Apr.-Aug. Apr.-Sept. Apr.-Sept.

	Skimmers, gulls, terns nesting in area	
Waterfowl	Dabblers and divers: Big Bend Seagrasses Aquatic Preserve (e.g., teal, gadwall, coot, scaup, merganser, shoveler)	Aug.-Oct. to overwinter

**Table 2. Bird Hot Spots from St. Petersburg to Charlotte Harbor:**

Species Group	Species and Geography	Seasonal Presence
Shorebirds	Piping plover: Egmont Key, several smaller islands west of the entrance of Tampa Bay; outer coastal sand beaches of Pine Island Sound (Cayo Costa State Park)	Fall through Spring
Gulls, terns, and diving birds	Least tern: coastal islands near the entrance of Tampa Bay and Egmont Key  Egmont Key: rookery for laughing gulls (24,000), sandwich terns (700), royal terns (5000), and black skimmer (120)  Island just southeast of Egmont Key: rookery for pelicans (400, state SSC), laughing gull (1400), black skimmer (500), and royal tern (200)  High concentrations of shorebirds, diving birds, gulls/terns at Greater Pinellas Point in Tampa Bay	Spring through Fall  Spring through Fall  Pelicans: Nov.-Sept., others Apr.-Sept.  Year round/varies
Wading birds	1000s of egrets, herons, and ibis: nesting on the southern shoreline near Terra Cia Aquatic Preserve	Egrets: Jan.-June Herons: Year-round Ibis: Mar.-May
Diving birds and seabirds	Pinellas NWR: habitat for hundreds of brown pelican, cormorants, egrets, and some offshore species (anhinga, magnificent frigatebird)	Year round

**Table 3. Bird Hot Spots from Charlotte Harbor to Ten Thousand Islands:**

Species Group	Species and Geography	Seasonal Presence
Shorebirds, gulls, and terns, wading birds	Marco Island: piping plover, least tern and 100s to 1000s of shorebirds (red knot, dunlin, western sandpiper, and snowy plover (state T)).  Piping plover: Pine Island Sound (Cayo Costa State Park), near Ft. Meyers Beach and Estero Bay  Least tern: Pine Island Sound (Cayo Costa State Park)  Shorebirds: high numbers outer islands of Charlotte Harbor near Foster Bay  Shorebirds, waders, and diving birds: high concentrations at JN (Ding) Darling NWR and	Mostly Fall through Spring  Fall through Spring  Spring through Fall  Fall through Spring

	Estero Bay marshes	Varies/year round
Waterfowl and diving birds	Charlotte Harbor: mottled duck (nesting), blue-winged teal, and American coot Pine Island Sound: cormorants and brown pelicans (high concentrations)	Nesting summer; others Fall and Spring migration/winter Year round

All birds are at significant risk of oiling from crude oil. At greatest risk are those who spend most of their time on the water surface, such as pelicans and ducks. Direct oiling of birds reduces the buoyancy, water repellency, and insulation provided by feathers, and may result in death by drowning or hypothermia. Preening of oiled feathers may also result in the ingestion of oil, resulting in irritation, sickness, or death. Gulls and terns do not appear to avoid oil while feeding in nearshore areas, particularly if the oil is weathered. During the nesting season, they could bring oil back to the nests. Use of dispersants may lessen impacts to species using the water surface or shoreline habitats.

### **Fish**

The following species are present in estuaries along the western peninsula of Florida (e.g., Suwannee River, Tampa Bay, Charlotte Harbor, Caloosahatchee River, Ten Thousand Islands; \* indicates spawning and/or sensitive life-stages potentially present): bull shark, tarpon, Alabama shad, Gulf menhaden (northern estuaries), gizzard shad, bay anchovy\* (highly abundant), hardhead catfish\* (highly abundant), sheepshead minnow\* (highly abundant), Gulf killifish\*, silversides\* (highly abundant), snook\* (southern estuaries), bluefish, blue runner, crevalle jack, gray snapper, sheepshead, pinfish (highly abundant), silver perch\*, sand seatrout\*, spotted seatrout\*, spot, Atlantic croaker, black drum, red drum, striped mullet, code goby\* (highly abundant), Spanish mackerel, Gulf flounder, Southern flounder.

Gulf sturgeon (FT) may be present in/near the Lower Suwannee NWR. Smalltooth sawfish (FE) occurs in Charlotte Harbor.

Larval and juvenile life-stages are especially sensitive to spilled oil because they inhabit shallow, protected waters around salt marshes, mangroves, and seagrass, are less mobile, and are more sensitive to oil toxicity. Use of dispersants may increase mixing of oil into the water column, possibly resulting in greater impacts to water column and benthic organisms depending on the location and effectiveness of any dispersant applications. Emulsified oil that gets trapped in the marshes is most likely to affect the early life stages of these fishes because they tend to seek out shallow vegetated areas to feed and for protection from prey. They are not as mobile so could be exposed to low amounts of PAHs that could dissolve out of the emulsified oil, or higher amounts of the emulsions break while stranded in the marsh.

### **Invertebrates**

Crabs, shrimp, lobsters, and bivalves are found throughout the area. Specifics on their geography and life history are included in Table 4.

**Table 4. Invertebrate Geography and Life History from Big Bend to Ten Thousand Islands:**

<b>Species</b>	<b>Geography</b>	<b>Sensitive Life Stages/Seasonality</b>
Blue crab	Nearshore waters: BBSAP to St. Joseph Sound; St. Pete to Charlotte Harbor; Charlotte Harbor to Ten Thousand Islands (TTI)	High concentrations, offshore spawning year-round, larvae and juveniles
Pink shrimp	Nearshore waters: BBSAP to St. Joseph Sound and Charlotte Harbor to TTI	High conc., offshore spawning Mar.-Nov.,

	St. Pete to Charlotte Harbor	larvae and juveniles Low to high, spawning
Stone crab	Nearshore waters: BBSAP to St. Joseph Sound; Charlotte Harbor to Ten Thousand Islands (TTI) St. Pete to Charlotte Harbor	High conc., offshore spawning Mar.-Oct., larvae and juveniles Low conc.
Spiny lobster	Charlotte Harbor to TTI	Low-med. conc. offshore waters
American oyster	Nearshore waters of Big Bend Seagrasses AP, Cape Haze AP, Old Tampa Bay, Long Bayou, Pine Island Sound, and Estero Bay	Common; spawning
Hard clam	Nearshore waters of Big Bend Seagrasses Aquatic Preserve, Cape Haze Aquatic Preserve, Tampa Bay (medium), Lemon Bay, and Gasparilla Sound	Common; spawning
Bay scallop	Big Bend Seagrasses Aquatic Preserve, Crystal River Buffer Preserve, and offshore of Bayonet Point	Common - abundant; spawning Aug.-Dec

Larval and juvenile invertebrates in shallow water areas could possibly experience sublethal impacts or lethal effects. Crude oils may smother bivalves if stranded on intertidal or subtidal areas. Use of dispersants may increase mixing of oil into the water column, possibly resulting in greater impacts to water column and benthic organisms depending on the location and effectiveness of any dispersant applications.

### **Reptiles**

Loggerhead sea turtle (state and federally threatened), green sea turtle (state and federally endangered), and Kemp's ridley sea turtle (state and federally endangered) are the most common species found in nearshore and inshore waters. They use harbors, bays, passes, and sounds for foraging year round. High numbers of turtles forage in the BBSAP area and nesting habitat may occur on any outer coast sand beaches. Table 5 includes some of the more important nesting habitats:

**Table 5. Sea Turtle Nesting Locations, Tampa to Ten Thousand Islands:**

<b>Region</b>	<b>Locations</b>	<b>Species</b>	<b>Seasonality/ Concentration</b>
Tampa to St. Pete	Anclote Key, Honeymoon Isl., Caladesi Isl. (sand beaches)	Loggerhead	Nest: Apr.-Sept.; Hatch: June-Nov.
Tampa to St. Pete	Caladesi Isl.	Kemp's ridley	Nest: Apr.-July (low)
Tampa to St. Pete	Sand beaches near Clearwater	Loggerhead Kemp's ridley	Same as above (low)
St. Pete to Ten Thousand	Pinellas County Aquatic	Loggerhead and Kemp's	Same as above (low)

Islands	Preserve (AP)	ridley	
St. Pete to Ten Thousand Islands	Don Pedro Isl., North Naples, Lemon Bay Aquatic Preserve	Loggerhead	Same as above (high)
St. Pete to Ten Thousand Islands	Rookery Bay Aquatic Preserve, Cape Romano-Ten Thousand Islands Aquatic Preserve	Kemp's ridley	Same as above (high)
St. Pete to Ten Thousand Islands	Lemon Bay AP	Green	Nest: June-Aug.; Hatch: July-Oct. (high)

Offshore Sargassum mats are an important habitat and concentration area for juvenile turtles in the Gulf of Mexico. The mats concentrate in convergence zones, where the oil may also concentrate (this was observed during the Deepwater Horizon spill and juvenile turtles were heavily oiled in these areas). Oil may irritate the eyes, mouth, and nostrils of sea turtles. In addition, if the crude oil forms tarballs, there is a risk of turtles ingesting the tarballs. The toxicity of the oil as well as intestinal blockage can result in death. An added concern is that, during the summer, the oil in these convergence zones can become very hot, posing additional thermal stress and death to small juvenile turtles that become trapped in these areas. Stranded oil on beaches can oil nests or nesting females, causing mortality of future hatchlings.

American crocodile (state and federally endangered) are found year round in sheltered marshes/mangrove areas in low concentrations. They may be present near Pine Island Sound, Estero Bay, Rookery Bay Aquatic Preserve, and Cape Romano-Ten Thousand Island Aquatic Preserve.

### **Terrestrial mammals**

The following species are present along Florida's coast: Florida saltmarsh vole (S/F E/E), Florida black bear (ST), Southern mink (ST), Florida mouse (State SSC), Sanibel Island rice rat (State SSC), and Northern river otter.

Big Bend Wildlife Management Area to St. Joseph Sound: Florida black bear may occur in Big Bend Wildlife Management Area and along the coast. Florida saltmarsh voles are found at Cedar Key NWR; Mink and river otter may be present along marshes and in inshore waters.

Charlotte Harbor to Ten Thousand Islands: Sanibel Island rice rat is found on marsh communities of Sanibel Island. Florida black bear may be present in inland areas of Ten Thousand Island NWRs (Collier-Seminole State Park); mink may be found on Charlotte Harbor's eastern shoreline.

The fur of terrestrial mammals may become oiled and oil may be ingested as animals attempt to clean themselves.

### **Marine mammals**

A variety of dolphins and whales are expected to be present in waters throughout the region. The most common is the bottlenose dolphin which is relatively abundant in estuarine, nearshore, and offshore waters. Sperm whales (S/F E/E) are widely distributed in this region's continental slope and oceanic waters in all seasons.

The Florida manatee (S/F E/E) inhabits the coastal waters, estuaries, tidal creeks, and freshwater river systems of Florida. Manatees will be most susceptible to contaminant exposure if the oil enters estuaries, river mouths, nearshore waters, and intracoastal waters inshore of barrier islands, particularly where there are seagrass beds upon which manatees forage. Manatees can be found feeding on seagrass or other aquatic vegetation year-round. During winter (November/December to February/March), manatees

thermoregulate during cold weather by seeking shelter at a limited number of warm-water sites (e.g., natural springs, power plants). They are common along inshore waters of the entire coast of Florida but some important areas are included in Table 6.

**Table 6. Manatee Concentration Areas BBSAP to Ten Thousand Islands:**

Region	Location	Concentration/ Seasons
BBSAP to St. Joseph Sound	Relatively high manatee abundance at the mouths of rivers (and sometimes within the rivers themselves), including: Steinhatchee, Suwannee, Waccasassa, Withlacoochee, Crystal, Homosassa, and Anclote River.	Suwanee: high in warm season; Crystal: high in Kings Bay in winter; Homosassa: high in upper river in winter
BBSAP to St. Joseph Sound	Above rivers and associated seagrass beds throughout the area.	Warm season (Mar./Apr. to Oct./Nov.)
St. Pete to Charlotte Harbor	Tampa Bay: high conc. associated with power plants along northeast and northwest bay; Upper Charlotte: aggregation at Warm Mineral Springs off the Myaka River.	Cold season (Nov./Dec. to Feb./Mar.)
St. Pete to Charlotte Harbor	Bays, rivers, and intracoastal waters throughout this region, including Tampa Bay, Sarasota Bay, Lemon Bay, and Charlotte Harbor and adjacent water bodies.	Warm season
Charlotte Harbor to Ten Thousand Islands	Concentration areas: Matlacha Pass, Caloosahatchee River and San Carlos Bay with aggregation at FPL Ft. Myers power plant on Orange River; Marco Island, Port of the Islands, and thermal basins in nearby waterways	Cold season
Charlotte Harbor to Ten Thousand Islands	All of the above winter areas plus Charlotte Harbor, Peace and Myakka Rivers, Gasparilla Sound, Pine Island Sound, Estero Bay, Rookery Bay, Cape Romano, and Ten Thousand Island Islands.	Warm season

### **Habitats**

Seagrass, coral, and sponge habitat are present along the west peninsula of Florida. Seagrasses in Florida consist of monospecific or mixed beds of shoal grass (*Halodule wrightii*), manatee grass (*Syringodium filiforme*), and turtle grass (*Thalassia testudinum*). Less common seagrasses may include *Halophila* spp. and widgeon grass (*Ruppia maritima*). Seagrasses are common in all nearshore areas on the west Peninsula of Florida, however some important areas include: St. Joseph Sound, Little Sarasota Bay, Old Tampa Bay, Tampa Bay, Anna Maria Sound, Sarasota Bay, Palm Sola Bay, Cape Haze Aquatic Preserve, Lemon Bay, Estero Bay, Charlotte Harbor, Pine Island Sound, Matlacha Pass, San Carlos Bay, and Gullivan Bay.

Coral reef is present in coastal waters near Crystal River. Deep sea coral and sponge habitat may be present in offshore waters (greater than 35 fathoms) from St. Petersburg to Ten Thousand Islands.

Intertidal seagrass beds are at greatest risk of impacts from floating oil; the oil can adhere to and coat the subaerial leaves. The abundant animals associated with seagrass habitats are often at greater risk than the vegetation, because the roots are protected from sediment contamination. In all seagrass areas physical damage to seagrass vegetation and sediments should be strictly avoided. Response operations in estuaries with seagrass vegetation would require very experienced personnel to avoid boat groundings, prop scarring, etc., which could impact the grass beds. Extensive foot traffic in shallow seagrass areas should also be avoided. Because of the sensitivity of these habitats, dispersant use will be restricted in such areas.

Many species associated with reef areas may be at high risk during oil spills depending on their particular oil vulnerability and sensitivity. In addition, physical damage caused by vessels or response activities can be severely damaging to coral and hardbottom reef communities.

### **XIII. Human-Use Resources**

#### **Archaeological/historical sites are abundant:**

Contact the Bureau of Archaeological Research, Florida Department of State (904-487-2299).

#### **Aquaculture lease sites:**

5 sites near Horseshoe Cove (near BBSAP; Mark Berrigan; 904-488-5471), 11 sites near Cedar Key Scrub State Reserve near Cape Haze Aquatic Preserve (Mark Berrigan; 904-488-5471), and 2 sites in Gasparilla Sound (Johnson Engineering, 941-334-0046). This list may not include all aquaculture lease sites.

#### **Water intakes:**

One site near Cedar Key NWR (Frank Maturo; 904-392-1107); 2 near power plant south of Drum Island; one site near North River Point (Cathy Gay; 813-938-2418); Big Bend Power Habitat (Greg Benton: 813-677-2030); Weedon Island Power Habitat (Chuck Lucas; 813-576-1405); Florida SERF Aquaculture Facility (Chris Young 941-723-4505). This list may not include all water intake sites.

#### **Rookery Bay National Estuarine Research Reserve:**

(941-775-8845) is present in the southern portion of the peninsula.

#### **National Park Service Lands:**

Lower Suwannee NWR, Cedar Keys NWR, Chassahowitzka NWR, Caloosahatchee NWR, Pine Island NWR, Matlacha Pass NWR, Ten Thousand Islands NWR, JN (Ding) Darling NWR, Everglades National Park, DeSoto National Memorial (on Manatee River).

#### **State Managed Areas:**

Big Bend WMA, Jena WMA, Perpetual WMA, Cedar Key Scrub State Reserve, Anclote Key State Preserve, Caladesi Island State Park, Honeymoon Island State Recreation Area (SRA), Gasparilla SRA, Port Charlotte Beach SRA, Gasparilla Island State Park, Cayo Costo State Park, Lovers Key SRA, and Delnor-Wiggins Pass SRA.

#### **Aquatic Preserves:**

Big Bend Seagrasses Aquatic Preserve, Crystal River Buffer Preserve, St. Martins Marsh Aquatic Preserve, Pinellas County Aquatic Preserve, Cockroach Bay Aquatic preserve, Terra Ceia Aquatic Preserve, Gasparilla Sound-Charlotte Harbor Aquatic Preserve, Cape Haze Aquatic Preserve, Cape Romano-Ten Thousand Islands Aquatic Preserve, Lemon Bay Aquatic Preserve, Pine Island Sound Aquatic Preserve, Rookery Bay Aquatic Preserve, and Estero Bay Aquatic Preserve.

#### **Several recreational beaches are in the area including:**

Englewood Beach, Port Charlotte Beach, Don Pedro Island, Sanibel Island, Fort Meyers Beach, Lovers Key, Caladesi Island State Park, Honeymoon Island, and St. Petersburg.

**Dive sites include:**

Gasparilla Sound, Boca Grande (outer coast), and the entrance of Charlotte Harbor.

**Essential Fish Habitat (EFH):**

EFH occurs along the west coast of Florida (inshore, nearshore, and offshore) for coastal migratory pelagics, coral, red drum, reef fish, shrimp, spiny lobster, and stone crab.

**Management Areas:**

Seasonal or area closures for the Gulf (50 CFR 622.34) in the nearshore/offshore areas in proximity to the Saint Petersburg Sector include:

- Reef fish longline and buoy gear restricted area
- Reef fish stressed area
- Florida middle grounds Habitat Area of Particular Concern
- Shrimp/stone crab separation zones

These closures indicate that this region is important for reef fish, shrimp, and stone crab.

**Critical Habitat:**

Designated Critical Habitat occurs for gulf sturgeon in/near the Lower Suwannee NWR and Cedar Keys NWR. Critical Habitat for smalltooth sawfish occurs in Charlotte Harbor.

## **Sector Key West – Potential Wildlife and Habitat Resources at Risk**

### **Potential Resources at Risk for an Offshore Drilling Release Scenarios: Sector Key West**

#### **XIV. Spill Source Information**

This report was prepared in October 2011. Information presented in this report is meant to capture resources potentially at risk in Sector Key West, Florida in the event of a catastrophic release of medium crude oil associated with International drilling activities.

#### **XV. Geographic Region Covered**

The area included in this report includes the shoreline and waters within USCG Sector Key West in South Florida. This area is bounded by Everglades City on the west coast of Florida and Elliot Key on the east coast (southern Biscayne Bay) and includes all of the Florida Keys, Florida Bay, and the Dry Tortugas.

#### **XVI. Expected Type of Spilled Material For the Area**

Crude oils can vary widely by origin, but the rule of thumb is that up to one-third will be lost by evaporation and dissolution. The fate and behavior of a spill of medium crude oil will depend on the release conditions. For a deep subsurface release, a significant fraction of the oil will be naturally dispersed and dissolved into the water column during its rise to the surface. During the Deepwater Horizon spill of a light crude oil, an estimated 12% naturally dispersed and 20-25% evaporated or dissolved. Therefore, a subsurface release can result in up to 40% of the oil mixed into the water column. The soluble fraction in crude oil contains some of the more acutely toxic components. For a surface release of fresh oil, it is expected that the oil will form extensive slicks that would be subject to evaporation, emulsification, and other weathering processes that tend to eventually form fields of tarballs. When stranded on the shoreline, the oil will coat animals and intertidal habitats. If the stranded oil is relatively fresh and of low viscosity, it will readily penetrate porous sediments. Over time, the floating oil will weather and become more viscous. Impacts from weathered oil are associated with smothering and long-term sediment contamination.

#### **XVII. Shoreline Resources at Risk**

##### **Marshes/Mangroves:**

The dominant natural shoreline type from Everglades City to Elliott Key is exposed mangroves. Red, black, and white mangroves dominate the intertidal forests of Florida. Exposed salt marshes occur along the northern shore of Florida Bay (from East Cape to Big Key) and in the shallow flats north of the Lower Keys. Sheltered salt marshes occur inland of the mangrove forests along the west coast of the mainland peninsula and sporadically throughout the rest of the area covered.

Oil adheres readily to intertidal vegetation. The location and vertical width of coating is dependent on the water level at the time oil is in the vegetation and can vary widely. There may be multiple bands. Oil can wash through mangroves if oil comes ashore at high tide. If there is a berm or shoreline present in front of the mangroves, oil tends to concentrate and penetrate into the berm sediments or accumulated wrack/litter. Heavy and emulsified oil can be trapped in thickets of red mangrove prop roots. The oil will likely adhere to prop roots, tree trunks, and pneumatophores, particularly on dry surfaces. The oil could also adhere to and foul attached biota on the prop roots.

##### **Tidal flats:**

Large areas of sheltered tidal flats occur inland of mangrove shorelines along the southeast shoreline of the mainland peninsula from Little Madeira Bay to Card Sound. Exposed tidal flats are present on Bahia Honda Key, Vaca Key, and Lower Matecumbe Key. Oil does not usually adhere to the surface of exposed

or sheltered tidal flats, but rather moves across the flat and accumulates at the high-tide line. Deposition of oil as sheen or tarballs on the flat may occur on a falling tide. Stickier tarballs may adhere to the substrate and not refloat with the rising tides. Oil will not penetrate the water-saturated sediments, but could penetrate burrows and mud-cracked sediments of sheltered tidal flats.

### **Beaches:**

Small, isolated coarse-grained sand beaches and shell hash are interspersed throughout the mangrove forests across the region. On the western coast of the peninsula, larger reaches of coarse-grained sand beaches are present at Highland Beach and the capes surrounding Lake Ingraham. Coarse-grained sand beaches comprise most of the shoreline of the Dry Tortugas. Sand beaches (mostly coarse sediments) are found bordering the Straits of Florida on the Marquesas, Key West, Big Pine Key, Grassy Key, Upper and Lower Matecumbe Keys, and Largo Key. Fine-grained sand beaches are found on Bahia Honda Key and Ohio Key. Sheltered areas of mixed sand/gravel beaches occur in the Lower Keys.

Light oil accumulations will be deposited as oily swashes or bands along the upper intertidal zone. Soft, emulsified oil is expected to stick to and stain the porous surfaces of carbonate shell and fill material. Heavy oil accumulations will cover the entire beach surface; oil will be lifted off the lower beach with the rising tide. Maximum oil penetration is about 10 cm in fine-grained sediments and 20 cm in coarse-grained sediments. Tarballs and tar patties may strand along outer coast beaches. In the hot sun, the tarballs and patties can partially “melt” into the upper layer of sand. Again, depending on how sticky the tarballs and tar patties are, they may adhere to sand or shell substrate, become coated with sediment, and not refloat with the rising tide. Waves can accelerate this process by rolling the tarballs along the beach face. If they become heavy enough, they can accumulate in the nearshore subtidal zone, usually between the toe of the beach and the first offshore bar. Tarballs and patties can become buried during depositional cycles; therefore, rapid removal is important. The potential for penetration and burial is greater on coarse-grained sand beaches compared to fine-grained sand beaches.

### **Exposed and sheltered, solid, man-made structures, riprap, and limestone bedrock:**

Solid man-made structures (seawalls) and riprap structures are common along inhabited portions of the Keys. Areas with an especially high density of seawalls include Key West, Stock Island, Vaca Key, Duck Key, Lower Matecumbe Key, Plantation Key and Largo Key. Some seawalls are present on the southwestern shore of Biscayne Bay. Exposed limestone bedrock occurs intermittently throughout the Keys. Larger areas are present on the Dry Tortugas, Indian Key, Upper Matecumbe Key, Plantation Key, and Largo Key. Often, access canals are cut into the limestone bedrock. The more populated keys also have extensive marinas, docks, and riprap amongst the seawalls and more natural habitats.

Oil adheres readily to rough surfaces such as riprap. Deep penetration of oil/tarballs between riprap boulders is likely, and could cause chronic oil leaching. Oil will adhere readily to the rough surfaces of exposed and sheltered manmade structures/seawalls, particularly along the high-tide line, forming a distinct oil band. The lower intertidal zone usually stays wet (particularly if algae covered), preventing oil from adhering to the surface. Bedrock platforms have an irregular surface with many crevices. Emulsified oil and tarballs will accumulate in wrack and depressions in bedrock platforms at the high-tide line. Tarballs tend to melt into crevices and depressions, persisting for longer periods.

## **XVIII. Biological Resources at Risk**

### **Birds**

Bald eagle and osprey (SSC) nests are present along the Gulf shore of the area, from Everglades City to Manatee Bay, and in the Lower Keys (Key West National Wildlife Refuge (KW NWR)). Osprey nest year round and eagles nest November-June. Double crested cormorants and brown pelicans are abundant in

nearshore waters year round. Cormorants may be nesting March-August. Wading birds and diving birds may be nesting in high numbers through the summer and into the fall throughout the marsh and mangrove islands in the area. Other diving ducks and birds (e.g., loons, mergansers, buffleheads, and redheads) winter in the area. Northern gannet may be found offshore in low numbers from December to April. Several species of shorebirds are utilizing keys most of the year, with lower numbers typical in June and July.

Dry Tortugas, Marquesas Keys, and Key West NWR: These islands support a tropical fauna not observed elsewhere in the region, and are important nesting grounds for a variety of species. Birds present in waters in these areas include: blue-faced booby, brown booby, brown pelican, common loon, double-crested cormorant, magnificent frigatebird, northern gannet, peregrine falcon, red-breasted merganser, and white-tailed tropicbird. Shorebirds and diving birds are present on the keys year round. Raptors may be migrating through the area (e.g., northern harrier, peregrine falcon, sharp-shinned hawk).

Specifics by geography are described in the table below. The state and federal statuses are listed in parentheses next to the first time a species name is mentioned (e.g. FT/FE or ST/SE: listed federally or state threatened or endangered, SSC: State Species of Special concern).

**Table 1. Bird Nesting and Concentration Areas: Sector Key West**

Location	Species	Seasonality <i>Species not listed are present year round</i>
Gullivan Bay	White pelican, least tern (ST), and roseate tern (FT)	Pelican: Dec-Jul Least tern: Mar-Sept (nest Apr-Aug)
Northwest Cape	Least tern, white-crowned pigeon (ST)	Least tern: Mar-Sept (nest Apr-Aug)
Pavilion Key	Brown pelican (250 birds; SSC)	Year round
Lake Ingraham	Shorebirds	Year round (lower numbers in summer)
Whitewater Bay	Wood stork (FE)	Year round (nest Nov-May)
Cuthbert Lake and Everglades	Wood stork (FE)	Year round (nest Nov-May)
Manatee Bay (Everglades)	Roseate spoonbill (SSC)	Year round (nest Nov-Dec)
Rankin and Santini Bights, Madeira Bay	White-crowned pigeons (ST)	Year round (May-Oct)
Florida Bay Keys: Tern Keys, Park Key, DWS King Key, Bob Allen Keys, Cluett Key, Oyster Keys, Frank Key, and Sandy Key	Roseate spoonbill (SSC), least tern (ST), white ibis (SSC), tricolored heron (SSC), little blue heron (SSC), snowy egret (SSC), reddish egret (SSC), white-crowned pigeon	<u>Nesting seasons</u> Feb-Jul: tricolored heron Feb-Sept: little blue heron Mar-May: white ibis May-Oct: white crowned pigeon Nov-Dec: roseate spoonbill Dec-Aug: snowy egret Dec-June: reddish egret
Everglades	Peregrine falcon	Sep-May

Dry Tortugas	Brown noddy, brown pelican, magnificent frigatebird, roseate tern (FT), sooty tern, blue-faced booby	<u>Nesting seasons</u> Mar-Oct: brown noddy (present Mar-August) Feb-Apr: frigatebird May-Aug: royal tern Apr-May: blue-faced booby (present Apr-Aug) Nov-Sep: brown pelican
Marquesas Keys	Magnificent frigatebird, white-crowned pigeon (ST), little blue heron (SSC), white ibis (SSC), great white heron, wading birds	Nesting: Spring through Fall
Key West NWR	Great blue heron, reddish egret (SSC), black-necked stilt, least tern (ST), piping plover (FT), royal tern, magnificent frigatebird, laughing gull, ruddy turnstone, sanderling, semipalmated plover, short-billed dowitcher, white-crowned pigeon, great white heron, great egret, yellow-crowned night-heron	Piping plover: Jul-Mar <u>Nesting</u> Nov-Jul: great blue heron Dec-Jun: reddish egret Jun-Nov: least tern Apr-Sept: black-necked stilt
Key West	Least terns (ST) ~ 900 birds, roseate tern (S/F T/T), white-crowned night-pigeon (ST)	Least tern: Mar-Sept (nest Apr-Aug)
Great White Heron National Wildlife Refuge (Key West to Seven mile Bridge) and Pelican Shoal	White-crowned pigeon (ST), little blue heron (SSC), white ibis (SSC), great blue heron, great white heron, great egret, snowy egret, yellow-crowned night-heron, mangrove clapper rail, roseate spoonbill (SSC), tricolored heron (SSC), green-backed heron, cattle egret  Piping plover, black-necked stilt laughing gull, ruddy turnstone, sanderling, semipalmated plover, short-billed dowitcher, black-bellied plover, willet, western sandpiper  Least tern, royal tern, bridled tern, roseate tern (ST), gulls  Peregrine Falcon	Least tern – Mar-Sept (Apr-Aug) Peregrine falcon - wintering <u>Nesting</u> Nov-Jul: great blue heron Spring-Fall: other wading birds
Pelican Shoal	Bridled tern and roseate tern (S/F T/T; 500 birds)	May-Aug

Marathon to Key Largo	Brown pelican, double-crested cormorant, great blue heron, least tern, great egret, roseate tern, white-crowned pigeon, roseate spoonbill, bald eagle, osprey, laughing gull, Wilson’s plover, anhinga, green-backed heron, little blue heron, reddish egret, roseate spoonbill, snowy egret, tricolored heron, white ibis, greater yellowlegs, lesser yellowlegs, and willet	Wading birds nest spring to fall except great blue heron (Nov-Jul)  Least terns: Mar-Sept, nest Apr-Aug  Piping plover: wintering
Craig Key	Piping plover	Wintering
Lower Biscayne Bay	Shorebirds, magnificent frigatebird, least tern, Wilson’s plover, brown pelican, double-crested cormorant, great blue heron, great egret, snowy egret, and white-crowned pigeon	Present year round

All birds are at significant risk of oiling from emulsified oil. At greatest risk are those who spend most of their time on the water surface, such as pelicans and ducks. Direct oiling of birds reduces the buoyancy, water repellency, and insulation provided by feathers, and may result in death by drowning or hypothermia. Preening of oiled feathers may also result in the ingestion of oil, resulting in irritation, sickness, or death. Gulls and terns do not appear to avoid oil while feeding in nearshore areas, particularly if the oil is weathered. During the nesting season, they could bring oil back to the nests.

### **Fish**

Habitats found in the Keys support high diversity and abundance of fish. Federally endangered smalltooth sawfish are present throughout the Everglades and in the northern part of Florida Bay. Mangroves are important habitats for juvenile sawfish and many other inshore and offshore species. Some areas of the Dry Tortugas (especially Riley’s Hump) and Lower Keys are sites of spawning aggregations of reef fish species. A list of fish common to the region is in table 2, and is focused on economically important species or ecologically sensitive species.

**Table 2. Distribution and life history information for species commonly found in the South Florida estuaries**

Location	Adult (A), larval (L) and juvenile(J) presence in South Florida Estuaries
Florida Bay Estuary	<i>Resident species:</i> hardhead catfish (spawn May-Aug), silversides, silver perch (spawn during summer), code goby, snook (spawn in inlets), crevalle jack, bull shark (mate during summer), spotted seatrout (spawn during summer), Spanish mackerel, black drum (L: Aug-Mar), red drum (L: July-Mar), sheepshead (L: May-July), pinfish (L: Nov-Apr), striped mullet (L: Jan-Mar), Florida pompano (J: Mar-Oct)  <i>Estuarine nursery, adults transient:</i> tarpon (A: Fall-Spring), yellowfin menhaden (L: Dec-May, adults not present), gray snapper (adults not present)

	<i>Transient:</i> gulf flounder (A: Mar-Oct, L:Dec-Mar, J: Feb-Nov,), bluefish (A, J: Apr-Jun)
Biscayne Bay Estuary	<i>Resident:</i> Ladyfish, bay anchovy, Atlantic silversides, spotted seatrout (all life stages present year round), gulf flounder (L: Oct-Feb), spot (L: Dec-May), pinfish (L: Dec-Apr), gray snapper (L:May-Sept)  <i>Transient:</i> Spanish mackerel (L:Feb-Apr, A:Sept-Apr) American eel (adults winter in estuary, no juvenile or larval presence)

Many commercially/economically important species are associated with reef habitats, including black grouper, red grouper, goliath grouper, gag grouper, scamp, gray snapper, red snapper, hogfish, lane snapper, greater amberjack, lesser amberjack and barracuda. In general, the snapper-grouper species spawn during the summer. Mangroves and seagrass beds are important nursery areas for some of these species. Some reef species (i.e. mutton snapper) form spawning aggregations at specific sites throughout the region, including Riley’s Hump in the Tortugas Ecological Reserve.

The Gulf Stream is important habitat for many prized game fish. Sailfish, skipjack tuna, yellowfin tuna, bluefin tuna, and swordfish all spawn in the Gulf Stream in the spring. Larvae and juveniles of these species are likely present in the Gulf Stream at this time, and can be associated with *sargassum* mats. Juvenile jacks and triggerfish have also been found in floating *sargassum* mats. Adult blue marlin, white marlin, sailfish, yellowfin tuna, swordfish and wahoo can be found in this region at different times of the year. Species such as wahoo that feed in surface waters could potentially ingest oil while feeding either incidentally or ingesting oiled prey.

Emulsified oil that becomes trapped in marshes/mangroves or other important nursery areas (e.g., seagrasses) may affect early life stages of fish that are found in shallow vegetated waters. Ingestion of oil and/or oil adhesion to gill tissues could also cause sublethal reductions in health to adult fish. Surface oil can also accumulate in floating *sargassum* mats, which are important habitat for eggs, larvae and juveniles of pelagic species.

**Invertebrates**

Crabs, shrimp, lobsters, and bivalves are found throughout the area. Specifics on their geography and life history are included in Table 3.

**Table 3. Distribution of economically important or threatened invertebrates: Sector Key West.**

<b>Species</b>	<b>Range/Habitat</b>	<b>Concentration</b>	<b>Life history notes</b>
Blue crab	Coastal waters throughout the entire study area	High: Coastal GOM and Atlantic Ocean  Medium: Florida Bay  Low: Biscayne Bay	Spawn year round
Pink shrimp	All coastal waters	High: GOM, Florida Bay, Dry Tortugas to Key Largo  Med: Upper Keys to Biscayne Bay	Spawn Mar-Nov  Juveniles/larvae present year round in Florida Bay

Stone crab	Present in all coastal waters, associated with structure	High: Florida Bay, Gulf side of the Keys Med: coastal Atlantic	Spawn Mar-Oct
Spiny lobster	Coastal waters except upper Florida Bay; often associated with structure	Very high: Keys coastal waters High: Keys reefs High: Biscayne Bay High/med: Coastal GOM	Spawn Mar-Aug
Atlantic bay scallop	Florida bay waters N. of Upper Matecumbe Key	Medium concentration throughout range	Spawn Sep-Dec
Queen conch	Keys coastal ocean, reef habitats	Common along ocean side of keys from Marquesas to Elliott Key; large areas of habitat around Bahia Honda & Big Pine Key	Spawn Mar-Oct

Emulsified oil that becomes trapped in marshes/mangroves and other nursery areas may affect early life stages of invertebrates that are found in shallow vegetated waters (e.g., increase larval mortality). If the oil is weathered, as expected, by the time it reaches reef and other nearshore habitats, the toxic fractions that might normally cause lethal effects to invertebrates should be limited. However, even patches of stranded oil could be a source of contamination of motile organisms such as crabs and snails. In large quantities, the oil may cause smothering of some species, particularly those in shallow, nearshore waters.

### **Reptiles**

Five species of federally listed sea turtles are present in Sector Key West, including Kemp’s ridley sea turtle (FE), green sea turtle (FE), loggerhead sea turtle (FT), hawksbill sea turtle (FE), and leatherback sea turtle (FE). Greens, hawksbills, and loggerheads are nesting in the region (details in table 4).

**Table 4. Distribution of reptiles sensitive to oiling: Sector Key West**

<b>Species</b>	<b>Areas of high concentration</b>	<b>Nesting Locations and Seasonality</b>
American Crocodile (FT)  <i>Habitat</i> - Marshes/mangroves from Everglades City to Turkey Point	Shark River, Whitewater Bay, Oyster Bay, Lake Ingraham, other Everglades lakes and mangroves, Crocodile Lake NWR, Barnes sound, Blackwater sound, Long Sound in Florida Bay  Alligator Bay, Davis Cove, Little Madeira Bay, Lake Ingraham, and surrounding lakes, bights, mangroves, and keys in Everglades NP	Nest: April-May Juveniles present: Jul-Aug  Nesting: Alligator Bay, Davis Cove, Flamingo Canal, Crocodile Lake NWR – Barnes Sound, Little Madeira Bay, Lake Ingraham, and surrounding lakes, bights, mangroves, and keys in Everglades NP

	High concentrations in Card Sound and very high concentrations in cooling canals along the mainland	
American alligator (FT due to similarity of appearance)	Mangroves, marshes, and swamps, estuarine areas, and freshwater areas of the coastal mainland peninsula	Nest: May - Sept
Green sea turtle (FE) Hawksbill sea turtle (FE) Loggerhead sea turtle (FT)  <i>Habitat</i> - Common in all coastal waters - Juveniles common in <i>Sargassum</i> mats present in the gulf stream	Very high concentrations of greens in the Marquesas  High concentrations of greens, hawksbills and loggerheads in portions of Florida Bay, Dry Tortugas and Marquesas Keys, Biscayne Bay  Greens and loggerheads: Key West to Key Largo	Nesting season (Apr/May-Oct): Greens and loggerheads nest on sand beaches throughout the area in low-med concentrations  High concentrations of loggerheads nest on sand beaches near Lake Ingraham  Hawksbills nest in the western Keys of KWNWR (Boca Grande) in low concentrations
Leatherback sea turtle (FE)	Coastal Atlantic (Jun-Aug)	None in the region
Kemp's Ridley sea turtle (FE)  <i>Habitat</i> - Coastal waters - Juveniles associated with <i>Sargassum</i>	High concentrations in Gulf coastal waters year round (Everglades City to Lake Ingraham)  High concentrations in portions of Florida Bay and Dry Tortugas	None in the region
Mangrove diamondback terrapin  <i>Habitat:</i> - Mangroves of the Lower Keys	Western Keys of Key West NWR, Marquesas Key	Spring

Direct contact with oil may irritate the eyes, mouth, and nostrils of turtles, alligators, and crocodiles. Juvenile turtles are associated with *Sargassum* habitats, both of which end up accumulating in the same areas as surface oil, due to prevailing currents. Turtles may also ingest tarballs while foraging and may bioaccumulate PAHs through ingestion of oiled prey. Oiled turtles dive less frequently, which could mean less foraging effort. Large juvenile and adult green sea turtles feed on seagrasses and algae and may ingest oil while feeding directly on these items. The toxicity of the oil as well as intestinal blockage can result in death. There is also the risk of nests becoming oiled and causing mortality of eggs and hatchlings

### **Terrestrial Mammals**

Only threatened or endangered mammals that may contact oil are presented here.

**Table 5. Distribution of threatened/endangered terrestrial mammals sensitive to oil spills; Sector Key West**

<b>Species</b>	<b>Habitat</b>
Lower keys marsh rabbit (FE)	Boca Chica Key, Saddlebunch Key, Sugarloaf Key, Annette Key, Cudloe Key, Big Pine Key, Newfound Harbor Keys, Mayo Key, and Porpoise Key
Florida key deer (FE)	National Key Deer Refuge, Saddlebunch Key
Silver rice rat (FE)	Saddlebunch Key, Johnston Key, Water Keys, Cudjoe Key, Summerland Key, Big Torch Key, and Little Pine Key
Key Largo woodrat (FE)	Lignumvitae Key and Key Largo
Key Largo cotton mouse (FE)	Lower Matecumbe Key and Key Largo

The fur of terrestrial mammals may become oiled, and oil may be ingested as animals attempt to clean themselves.

### **Marine Mammals**

The Florida manatee (FE) inhabits the coastal waters, estuaries, tidal creeks, and freshwater river systems of Florida. Manatees will be most susceptible to contaminant exposure if the oil enters estuaries, river mouths, nearshore waters, and intracoastal waters inshore of barrier and mangrove islands, particularly where there are seagrass beds upon which manatees forage. Manatees can be found feeding on seagrass or other aquatic vegetation year-round. During winter months (November/December to February/March), manatees thermoregulate during cold weather by seeking shelter at a limited number of warm-water sites (mostly passive natural and manmade thermal basins in this region). They are common along inshore and nearshore waters of this region of Florida, but some important areas include: Ten Thousand Islands from Everglades City south into Everglades National Park; Whitewater Bay, Coot Bay, and associated rivers; Florida Bay off of Flamingo; Little Madeira Bay, Joe Bay, Blackwater Sound, Manatee Bay, Barnes Sound, Card Sound; upper and middle Florida Keys, especially Key Largo including Tarpon Basin; and southern Biscayne Bay, including Turkey Point power plant canals.

A variety of dolphins and whales are expected to be present in waters throughout the region. The most common is the bottlenose dolphin which is likely present in nearshore, inshore, and offshore waters of the Gulf of Mexico, Florida Straits, Florida Bay, Biscayne Bay, and the Atlantic Ocean. Atlantic spotted dolphin can be found along the shelf break. Sperm whales (FE) are present in the deep waters of the Straits of Florida. Other mammals present in offshore waters (beyond the shelf break) include Bryde's whale, Pygmy sperm whale, Dwarf sperm whale, Gervais' beaked whale, Blainville's beaked whale, Shortfinned pilot whales, False killer whales (summer), Risso's dolphin, Pygmy killer whale, Melonheaded whale, Rough-toothed dolphin, striped dolphin (winter), Pantropical spotted dolphin, Spinner dolphin, and Clymene dolphin. Dolphins and whales come into contact with oil while at the surface breathing. Oil can irritate sensitive tissues, both externally and internally. Ingestion of oil is not likely for many of these species because they feed in the water column and not at the surface. In baleen whales (Bryde's is the only one in this region) oil can adhere to the baleen and interrupt feeding.

## **Habitats**

Seagrasses are present around many of the keys in the GOM, along the Everglades, in Dry Tortugas National Park, and throughout the entire study area of South Florida and the Florida Keys, including Florida Bay, Hawk Channel, and Biscayne Bay. Seagrasses in South Florida consist of monospecific or mixed beds of shoal grass, manatee grass, or turtle grass (generally the most abundant species).

Intertidal seagrass beds are at greatest risk of impacts from floating oil; the oil can adhere to and coat the subaerial leaves. The abundant animals associated with seagrass habitats are often at greater risk than the vegetation, because the roots are protected from sediment contamination. In all seagrass areas, but particularly in Florida Bay where extensive seagrass meadows occur in a complex, very shallow system of banks and basins, physical damage to seagrass vegetation and sediments should be strictly avoided. Response operations in Florida Bay would require very experienced personnel to avoid boat groundings, prop scarring, etc., which could impact the grass beds. Extensive foot traffic in shallow seagrass areas should also be avoided.

Coral reefs and hardbottom reefs occur along the Florida Keys/South Florida in the Dry Tortugas, Hawk Channel, the Straits of Florida, the Atlantic, and in Biscayne Bay. These reefs include the major coral reef tract and adjacent patch reef areas where intact, living, reef-building, stony coral species (e.g., *Acropora*) occur as well as hardbottom reefs. Elkhorn (FT) and staghorn coral (FT) are common in this region and mass spawn in late August or early September. Hardbottom reefs include all other reef types or live-bottom areas, such as limestone outcrops, gorgonian soft-coral flats, coralline algae reefs, etc. There is deep sea coral and sponge habitat offshore of the Keys in the Atlantic Ocean. Many species associated with reef areas may be at high risk during oil spills depending on their particular oil vulnerability and sensitivity. In addition, physical damage caused by vessels or response activities can be severely damaging to coral and hardbottom reef communities. Spill occurring during the spawning period for corals could affect spawning success.

*Sargassum* mats occur in the Gulf Stream and are important habitats for many larval and juvenile fish. *Sargassum* can become concentrated in the same currents that accumulate surface oil and become oiled. If enough of the plant structure is coated with oil, respiration can be interrupted and the mats may die. Accumulation of oil in the same locations as floating *sargassum* mats can also have lethal and sublethal effects to larval and juvenile fishes and turtles associated with those habitats

## **XIX. Human-Use Resources**

### **Management Areas**

#### **National Park Service Lands:**

Everglades National Park, Big Cypress National Park, Dry Tortugas National Park, Biscayne National Park.

#### **NOAA National Marine Sanctuaries:**

Florida Keys National Marine Sanctuary, Looe Key National Marine Sanctuary, Key Largo National Marine Sanctuary.

#### **USFWS Lands:**

Key West National Wildlife Refuge, Great White Heron National Wildlife Refuge, National Key Deer Refuge, Crocodile Lake National Wildlife Refuge.

#### **Aquatic Preserves:**

Coupon Bight State Aquatic Preserve, San Pedro State Underwater Archaeological Preserve, Lignumvitae Key State Aquatic Preserve.

## **State Lands:**

Bahia Honda State Park, Long Key State Recreation Area/Park, Lignumvitae Key State Botanical Site, Indian Key State Historic Site/Park, Windley Key Fossil Reef SGS, John Pennekamp Coral Reef State Park.

Seasonal or area closures for the Gulf (50 CFR 622.34) in the nearshore/offshore areas in South Florida include:

- Reef fish longline and buoy gear restricted area
- Reef fish stressed area
- Southwest Florida seasonal trawl closure
- Tortugas shrimp sanctuary
- Tortugas marine reserves

## **Critical Habitat**

Designated Critical Habitat occurs for smalltooth sawfish along the Everglades and *Acropora* along the Florida Keys and Dry Tortugas.

## **Essential Fish Habitat (EFH)**

EFH occurs along the west coast of Florida (inshore, nearshore, and offshore) for coastal migratory pelagics, coral, red drum, reef fish, shrimp, spiny lobster, and stone crab.

EFH occurs in the Atlantic for many highly migratory species, snapper-grouper species, shrimp, golden crab, and red drum.

The Pourtales Terrace HAPC is present in the deep waters offshore of the reef tract in the middle keys.

## **Socioeconomic Resources:**

### **Archaeological/Historical:**

Archaeological/historical sites are abundant. Contact the Bureau of Archaeological Research, Florida Department of State (904-487-2299).

### **Boat ramps and marinas:**

Numerous and occur throughout the region.

### **USCG Stations:**

There is a USCG station on Plantation Key.

### **Dive sites:**

Abundant throughout the Florida Keys.

### **Recreational Beaches:**

Several recreational beaches occur throughout the area, including: Key West, Flamingo, and Bahia Honda.

### **Water intakes:**

Florida Keys Electric Generating Plant and Turkey Point Power Plant. This list may not include all water intake sites.

## **Sector Miami – Potential Wildlife and Habitat Resources at Risk**

### **Potential Resources at Risk for an Offshore Drilling Release Scenario: Sector Miami**

#### **XX. Spill Source Information**

This report was prepared in November 2011. Information presented in this report is meant to capture resources potentially at risk in Sector Miami, Florida in the event of a catastrophic release of medium crude oil associated with International drilling efforts.

#### **XXI. Geographic Region Covered**

This report covers the southeastern shoreline of the Florida Peninsula from Palm Bay to the Miami-Dade/Monroe County line. This area corresponds with the USCG Sector Miami Geographic Response Plan Maps.

#### **XXII. Expected Type of Spilled Material For the Area**

Crude oils can vary widely by origin, but the rule of thumb is that up to one-third will be lost by evaporation and dissolution. The fate and behavior of a spill of medium crude oil will depend on the release conditions. For a deep subsurface release, a significant fraction of the oil will be naturally dispersed and dissolved into the water column during its rise to the surface. During the Deepwater Horizon spill of a light crude oil, an estimated 12% naturally dispersed and 20-25% evaporated or dissolved. Therefore, a subsurface release can result in up to 40% of the oil mixed into the water column. The soluble fraction in crude oil contains some of the more acutely toxic components. For a surface release of fresh oil, it is expected that the oil will form extensive slicks that would be subject to evaporation, emulsification, and other weathering processes that tend to eventually form fields of tarballs. When stranded on the shoreline, the oil will coat animals and intertidal habitats. If the stranded oil is relatively fresh and of low viscosity, it will readily penetrate porous sediments. Over time, the floating oil will weather and become more viscous. Impacts from weathered oil are associated with smothering and long-term sediment contamination.

#### **XXIII. Shoreline Resources at Risk**

The majority of Atlantic shoreline from Palm Bay to North Miami Beach is a mixture of fine-grained sand beach and coarse-grained sand beach. The outer islands of Biscayne Bay are composed of coarse-grained sand beach on the eastern side and exposed seawall, exposed rocky platform, and exposed marshes and mangroves on the western, bay-side. There are some smaller areas with mixed sand and shell beaches (e.g., North Miami Beach). Shorelines along inshore waters (e.g., Indian River, St. Lucie River, Loxahatchee River, Lake Worth, Hobe Sound, and Jupiter Inlet) and the western shoreline of Biscayne Bay are composed primarily of exposed and sheltered mangroves, fine-grained sand beaches, and coarse-grained sand beaches. Exposed seawalls and sheltered solid man-made structures are common. The northern portion of Biscayne Bay is primarily sheltered rocky shores/seawalls and man-made structures. Most inlets are protected by riprap jetties. Exposed tidal flats are found in the Indian River, Loxahatchee River and Lake Worth. The shorelines of Florida Bay that fall within Sector Miami are primarily salt marsh and mangroves (Everglades NP) with extensive tidal flats seaward. The shorelines of the small keys within Florida Bay are salt marshes and mangroves. The larger keys (Key Largo) have large expanses of gravel beaches/riprap and sheltered solid, man-made structures amidst marshes and mangroves.

## **Oil behavior by shoreline type**

### **Marshes and mangroves:**

These are the most sensitive shorelines because they occur along the upper intertidal zone where the oil tends to accumulate, they are difficult to clean, and the recovery time can be long (5-20 years). Emulsified oil adheres readily to intertidal vegetation. The band of coating will vary widely, depending on the amount of oil that strands and the length of time oil persists. The heaviest oiling is expected along the mangrove/marsh fringe. If there is a berm inside the mangrove forest, oil tends to concentrate at the berm sediments or accumulated wrack/ litter, causing increased impacts in this area. Heavy and emulsified oil can be trapped in thickets of red mangrove prop roots and pneumatophores of black mangroves. The oil will likely adhere to prop roots, tree trunks, and pneumatophores, particularly on dry surfaces. The oil could also adhere to and foul attached biota on the prop roots.

### **Tidal flats:**

Oil does not usually adhere to the surface of exposed or sheltered tidal flats, but rather moves across the flat and accumulates at the high-tide line. Deposition of oil as sheen or tarballs on the flat may occur on a falling tide. Depending on how sticky the tarballs are, they may adhere to the substrate and not refloat with the rising tides. Oil will not penetrate the water-saturated sediments, but could penetrate burrows and mud cracked sediments of sheltered tidal flats.

### **Riprap:**

Deep penetration of oil/tarballs between riprap boulders is likely. Oil adheres readily to rough surfaces. If oil is not recovered, it may cause chronic sheening.

### **Shell beaches/mixed sand and shell beaches/fill:**

Light oil accumulations will be deposited as oily swashes or bands along the upper intertidal zone. Heavy oil accumulations will cover the entire beach surface; oil will be lifted off the lower beach with the rising tide. Soft, emulsified oil is expected to stick to and stain the porous surfaces of carbonate shell and fill material. Tarballs and patties can become coated with shell material as they roll around on the beach face, and could eventually become heavy enough to accumulate in the nearshore subtidal zone. The viscous oil deposits are not expected to penetrate much into the sediments; however, they could soften in the sun and “melt” into the surface sediments.

### **Sand beaches:**

Light oil accumulations will be deposited as oily swashes or bands along the upper intertidal zone. Heavy oil accumulations will cover the entire beach surface; oil will be lifted off the lower beach with the rising tide. A greater potential for penetration and burial occurs in coarse-grained sand beaches as compared to fine-grained sand beaches. Maximum oil penetration is about 10 cm in fine-grained sediments and 20 cm in coarse-grained sediments. Tarballs and tar patties may strand along outer coast beaches. In the hot sun, the tarballs and patties can partially melt into the upper layer of sand. Again, depending on how sticky the tarballs and tar patties are, they may adhere to the sandy substrate, become coated with sand, and not refloat with the rising tide. Also, waves can roll the tarballs up and down the beach face, causing them to become coated with sand. If they become heavy enough, they can accumulate in the nearshore subtidal zone. Depending on the beach cycle, the tarballs and patties can become buried during depositional cycles. Therefore, rapid removal is important.

### **Exposed rocky platforms/limestone bedrock:**

The platform surface is irregular and tide pools/crevices are common. Large accumulations of seagrass wrack are present if the rocky formation is a platform. Emulsified oil and tarballs will accumulate in

wrack and depressions in bedrock platforms at the high-tide line. Tarballs tend to melt into crevices and depressions, persisting for longer periods.

Exposed and sheltered manmade structures/seawalls:

Oil will adhere readily to the rough surface, particularly along the high-tide line, forming a distinct oil band. The lower intertidal zone usually stays wet (particularly if algae covered), preventing oil from adhering to the surface.

**XXIV. Biological Resources at Risk**

*Threatened/endangered species are noted using the following abbreviations: FE – federally endangered, FT – federally threatened, SE – state endangered, ST – State threatened, SSC – state species of special concern*

**Birds**

Double crested cormorant and brown pelican (SSC) are abundant in nearshore waters year round from Palm Bay to Biscayne Bay. Cormorants may be nesting (Mar.-Aug.). Northern gannet may be found in offshore waters in winter months.

**Table 1. Bird Nesting and Concentration Areas: Sector Miami**

<b>Location</b>	<b>Species</b>	<b>Seasonality</b> <i>Species not listed are present year round</i>
Indian River Malabar – Vero Beach Aquatic Preserve: small islands	Double-crested cormorant (> 500) Brown pelican (SSC) Great egret	<u>Nesting seasons</u> Mar.-Aug.: cormorant Nov.-Sep.: pelican (present year round) Jan.-Jun.: great egret
Pelican Island (Indian River)	Brown pelican (> 500, SSC) Snowy egret (100, SSC) Wood stork (250, S/F E/E)	<u>Nesting seasons</u> Nov.-Sep.: pelican Dec.-Aug.: snowy egret Nov.-May: wood stork
Palm Bay to Vero Beach	Waterfowl: Very high Scaup (60-80,000) Green-winged teal: high American wigeon: high Northern pintail: high Mottled duck: high	Wintering Mottled duck nest Feb.-Sep.
Fort Pierce Inlet and inshore islands	Herons and egrets nesting; Peregrine falcon, piping plover (FT), least tern (ST), black skimmer (SSC); anhinga: high	<u>Nesting seasons</u> Dec.-Aug.: wading birds Mar.-Jun.: anhinga
Indian River islands near Fort	Royal tern (~ 50)	

Pierce		
Savannah State Preserve (Indian River)	Sandhill crane (ST), wading birds, bald eagle, least tern (ST)	<u>Nesting seasons</u> Jan.-Jun.: sandhill crane Nov.-Jun.: bald eagle Mar.-Sep.: least tern
Indian River and Melbourne Beaches, Jupiter Inlet, Hobe Sound, Jupiter Island, Lake Little Worth	Florida scrub jay (FT)  Peregrine falcon, waterfowl in Jupiter Inlet	Nesting: Mar.-Jun.  Wintering: Sep.-May
John D. MacArthur State Park	Least tern (ST), wading birds	Summer months: terns Year round: wading birds
Lake Worth Inlet  Lake Worth: island near Henry M. Flagler Museum	Least tern (ST) and black skimmer (SSC) Yellow-crowned night heron	Nesting: Mar.-Jun.
Inshore waters near Delray Beach	Florida scrub jay (FT; <5)	Year round
North Pompano Beach and Harbour Inlet at Ft. Lauderdale (both coastal and bay side beaches)	Least tern (ST)	Nesting: Mar.-Sep.
Islands just south of Pelican Harbor Park (south of N. Bay Causeway) in Biscayne Bay  Pelican Harbor Park	Brown pelican (~50-250, SSC)  Osprey (SSC)	<u>Nesting seasons</u> Nov.-Sep.: pelican Year round: osprey
Outer islands (Key Biscayne and Islandia) of Biscayne Bay; Inlet of Harbour Isles of Fort Lauderdale	Least tern (ST)	Nesting: May-Sep.
Virginia Key, Key Biscayne, and Miami Beach	Piping plover (FT) and other shorebirds	Aug.-May
Chapman Field Park, Biscayne Bay State Aquatic Preserve	Waders and divers: high concentrations White-crowned pigeon (ST)	Year round
Biscayne National Park	Peregrine falcon (S/F E/T) Diving birds (high) and wading birds White-crowned pigeon (ST)	Winter: falcons Diving birds: year round, nesting Nov.-Sep. Wading birds: year round, nesting Nov.-Aug.
Key Largo	Least tern (ST, >350) White-crowned pigeon (ST)	Apr.-Aug.: tern nesting Year round: pigeons

Oleta State Park, West Lake Park, Hugh Taylor Birch State Park	Wading birds in marshes	Nesting: Dec.-Jul.
Bill Baggs Cape Florida State Park	Black-necked stilt (~200) Least tern (ST; <100)	Apr.-Sep.: nesting stilt
Everglades National Park, Cuthbert Lake	Roseate spoonbill (40, SSC) Wood stork (S/F E/E)	Year round: spoonbill Nov.-May: wood stork
Barnes Sound/Blackwater Sound	Osprey and bald eagle nesting, high diving birds and wading birds	Year round Eagles nest Nov.-Jun.
Duck Key, Whaleback Key, Tern Keys, Deer Key and others (Florida Bay)	Diving birds (high), roseate spoonbill (high, SSC), wading birds (high), white-crowned pigeon (ST), osprey (high), reddish egret (SSC), bald eagle	Nesting seasons: Nov.-Dec.: roseate spoonbill Nov./Dec.-Sep.: others
Rankin and Santini Bights and Keys (Florida Bay)	Wood stork (S/F E/E), bald eagle, white-crowned pigeon (ST), osprey (high), diving birds (high), wading birds (high)	<u>Nesting seasons:</u> Jan.-Dec.: osprey Nov.-Sep.: diving birds Dec.-Sep.: wading birds Nov.-Jun.: bald eagle Nov.-May: wood stork

All birds are at significant risk of oiling from emulsified oil. At greatest risk are those who spend most of their time on the water surface, such as pelicans and ducks. Direct oiling of birds reduces the buoyancy, water repellency, and insulation provided by feathers, and may result in death by drowning or hypothermia. Preening of oiled feathers may also result in the ingestion of oil, resulting in irritation, sickness, or death. Gulls and terns do not appear to avoid oil while feeding in nearshore areas, particularly if the oil is weathered. During the nesting season they could bring oil back to the nests, as could wading birds oiled by direct contact with contaminated marsh vegetation. Direct mortality rates are generally less for shorebirds because they rarely enter the water. Shorebirds, which feed along shoreline habitats where oil strands and persists, are at higher risk of sublethal effects from either contaminated or reduced population of prey.

### **Fish**

Habitats found in sector Miami are home to a diversity of fish species, both in estuarine and offshore environments. Biscayne Bay and the Indian River Lagoon support a diversity of species and are important nursery grounds for many coastal species (Table 2). Smalltooth sawfish (FE) and shortnose sturgeon (FE) can occur in the Indian River Lagoon or other inshore waters, but are rare. Mangrove rivulus (State/NOAA SCC) can be found in mangrove habitats throughout the region. Striped croakers (NOAA species of concern) occupy nearshore hard bottom habitats from Sebastian Inlet north.

**Table 2. Distribution and life history information for species commonly found in the South Florida estuaries**

Location	Adult (A), larval (L) and juvenile(J) presence in South Florida Estuaries
Biscayne Bay Estuary	<i>Resident:</i> Ladyfish, bay anchovy, Atlantic silversides, spotted seatrout (all life stages present year round), Gulf flounder (L: Oct-Feb), Spot (L: Dec-May), pinfish

	(L: Dec-Apr), gray snapper (L:May-Sept) <i>Transient:</i> Spanish mackerel (L:Feb-Apr, A:Sept-Apr) American eel (adults migrate through the estuary in the winter)
Indian River Lagoon	<i>Resident:</i> Bay anchovy, black drum (spawn in winter; L: Dec-Apr, J:May-Sept), gray snapper (year round), spotted seatrout (spawn Apr-Oct), sheepshead <i>Resident offshore spawner (spawn in fall/winter offshore):</i> Atlantic croaker, gulf flounder, southern flounder, ladyfish, pinfish, red drum, striped mullet, bluefish (adults more common in the winter) <i>Catadromous:</i> American eel (A:winter, J: present year round)

Many commercially/economically important species are associated with nearshore and reef habitats, including black grouper, red grouper, goliath grouper, gag grouper, scamp, gray snapper, red snapper, hogfish, black sea bass, lane snapper, greater amberjack, lesser amberjack and barracuda. In general, the snapper-grouper species spawn during the summer. Mangroves and seagrass beds are important nursery areas for some of these species. Large aggregations of sharks (i.e. lemon sharks, bull sharks) can be found by nearshore ledges in the winter.

The Gulf Stream is important habitat for many prized game fishes. Larval and juvenile sailfish, skipjack tuna, yellowfin tuna, bluefin tuna, and swordfish are likely present in the Gulf Stream during the spring, and can be associated with *sargassum* mats. Juvenile jacks and triggerfish have also been found in floating *sargassum* mats. Adult blue marlin, white marlin, sailfish, yellowfin tuna, swordfish and wahoo can be found in this region at different times of the year.

Emulsified oil that becomes trapped in marshes/mangroves or other important nursery areas (e.g., seagrasses) may affect early life stages of fish that are found in shallow vegetated waters. Ingestion of oil and/or oil adhesion to gill tissues could also cause sublethal reductions in health to adult fish. Surface oil can also accumulate in floating *sargassum* mats, increasing the exposure of these communities (much of which are larvae/juveniles) to oiling. Tarballs and emulsified oil that become trapped in subtidal zones or marshes may affect early life stages of fish that are found in shallow vegetated waters. Species such as wahoo that feed in surface waters could potentially ingest oil while feeding either incidentally or ingesting oiled prey.

**Invertebrates**

Crabs, shrimp, lobsters, and bivalves are found throughout the area. Specifics on their geography and life history are included in Table 3. Inshore waters are important nurseries for juvenile and larval invertebrates.

**Table 3: Distribution, abundance and seasonality of invertebrate species: Sector Miami**

Species	Distribution	Life-history
<i>Ubiquitous species</i>		
Blue crab	Fresh, estuarine and shallow coastal waters throughout the region  High concentrations inshore near Palm Bay	Spawn year round in lower estuaries or inlets

Stone crab	Seagrass beds and rocks in higher salinity waters throughout the study area	Spawn Mar.-Oct.
Spiny lobster	Inshore and offshore waters throughout sector Miami; hide in benthic structures  Higher concentrations in Biscayne bay	Spawn offshore Spring-summer
Pink shrimp	Estuaries and coastal Atlantic throughout the study area	Spawn Mar.-Nov. offshore
White shrimp	Estuaries and coastal Atlantic throughout the study area	Apr.-Oct., usually offshore but can spawn inshore
<i>Species with more localized distributions</i>		
Brown shrimp	Estuaries and coastal Atlantic north of Boca Raton	Spawn offshore year round
Rock shrimp	Offshore near Jupiter Inlet; deeper waters than <i>peneiad</i> shrimp	Spawn year round
Quahog	High concentrations Palm Bay to Sebastian Inlet inshore	Spawn Mar.-Nov.
Eastern oyster	Indian River	Spawn Apr.-Nov.
Bay scallop	Indian River	Spawn Oct.-Nov.
Queen conch	High concentrations in Biscayne bay	

Emulsified oil that becomes trapped in marshes/mangroves and other nursery areas may affect early life stages of invertebrates that are found in shallow vegetated waters. If the oil is weathered, as expected, by the time it reaches reef and other nearshore habitats, the toxic fractions that might normally cause lethal effects to invertebrates should be limited. However, even patches of stranded oil could be a source of contamination of motile organisms such as crabs. In large quantities, oil can strand on exposed oyster reefs, and cause smothering of oysters and associated species.

### **Reptiles**

Loggerhead sea turtle (FT), green sea turtle (FE), hawksbill sea turtle (FE), leatherback sea turtle (FE), and Kemp's ridley sea turtle (FE) are found in nearshore and inshore waters. Loggerhead and green sea turtles use harbors, bays, reefs and estuaries for foraging year round. Leatherback sea turtles are abundant in offshore waters from Palm Bay to Sebastian Inlet from January-March. High numbers of turtles forage in the Biscayne Bay State Aquatic Preserve, offshore of Vero Beach and Hutchinson Island, and in Florida Bay. Nesting habitat may occur on any outer coast sand beach. The following are some of the more important nesting habitats:

**Table x. Distribution, abundance and seasonality of sea turtles sensitive to oiling: Sector Miami**

<b>Species</b>	<b>Distribution &amp; abundance</b>	<b>Seasonality</b>
Loggerhead sea turtle (FT)	Present in coastal waters, estuaries, inshore and on reef habitats  Nesting on sand beaches in high concentrations throughout the region	Nest Apr.-Sep. Hatch Jun.-Nov.
Green sea turtle (FE)	Adults can be found in coastal waters, estuaries, inshore and on reef habitats  <i>Nesting:</i> <ul style="list-style-type: none"> <li>• High concentrations around Boca Raton</li> <li>• Medium concentrations from N. Palm to Jupiter Island, N of Sebastian inlet</li> <li>• Low concentrations nesting on most beaches in the area</li> </ul>	Nest Apr.-Oct. Hatch May.-Nov.
Leatherback sea turtle (FE)	High concentrations from Wabasso Island to Palm Bay (Jan-Mar)  Low concentrations elsewhere  Nesting locations: Virginia Key to Boynton Inlet beaches, John D. MacArthur Beach SP to North Hutchinson Island, Vero Beach to Palm Bay	Nest Feb.-Aug. Hatch Mar.-Sep.
Hawksbill sea turtle (FE)	Adults can be found in coastal waters in low concentrations  Nesting from south of Boca Raton to north Miami Beach	Nest Jun.-Nov. Hatch Jul.-Dec.
Kemp's ridley sea turtle (FE)	Low concentrations present in coastal waters near Northern Biscayne bay	No nesting in the region

American crocodile (FE) are found year round in sheltered marshes/mangrove areas in low concentrations. They may be present in waters near Hugh Taylor Birch State Recreation Area (SRA), in marshes west of John. U. Lloyd SRA, and along the western shoreline of Biscayne Bay. Crocodiles are present in high concentrations in bays, coves, and mangroves of Florida Bay/Everglades NP and Crocodile Lake NWR. Very high concentrations occur in cooling canals. The nesting season is from April through August. American alligators are common to inland marshes and mangrove areas throughout the region and nest in the summer.

Oil may irritate the eyes, mouth, and nostrils of sea turtles and other reptiles. In addition, there is a risk of turtles feeding on tarballs or oil-coated vegetation (green turtles). The toxicity of the oil as well as intestinal blockage can result in death. There is also the risk of turtle nests becoming oiled and causing mortality of future hatchlings.

**Terrestrial mammals**

Southeastern beach mouse (FT) is present on the beaches south of Sebastian Inlet, Indian River Shores and Fort Pierce Inlet State Park. Key Largo wood rat (FE) and cotton mouse (FE) are present on Key Largo. The fur of terrestrial mammals may become oiled and oil may be ingested as animals attempt to clean themselves. More importantly for federally listed rats and mice, attempts should be made to not disturb their habitats and precautions may be needed during cleanup.

### **Marine mammals**

The Florida manatee (FE) inhabits the coastal waters, estuaries, tidal creeks, and freshwater river systems of Florida. In this region of Florida they are common along inshore and nearshore waters, primarily in the intracoastal waters inside of barrier islands but occasionally in inlets and near the surf zone of the ocean side of the coastline. Manatees feed on seagrass or other aquatic vegetation year-round. During winter months (November/December to February/March), manatees seek shelter at a limited number of warm-water sites (e.g., mostly power plants and manmade thermal basins such as deep canals). Power plants and deeper canals can serve as thermal refuges during cold weather events.

*Palm Bay to St. Lucie Inlet:* Manatees can be found in all coastal waters. High concentrations can be found year-round at Turkey Creek in Palm Bay, Mullet Creek, Sebastian Inlet and San Sebastian River Buffer Preserve, Indian River Narrows from Pine to Barker Islands, Porpoise Bay, Round Island, Indian River Aquatic Preserve, the Hutchinson Island nuclear power plant, and along the St. Lucie River in Manatee creek and County Line Canal. Aggregation sites include:

- Sebastian River & C-54 canal
- Vero Beach Power Plant
- Henry D. King Electric Station
- Hutchinson Island nuclear power plant

*St. Lucie Inlet to Biscayne Bay:* Winter is the season with the highest abundance of manatees in this portion of the state, as manatees migrate to southeastern Florida in response to cold. High concentrations of manatees are present year-round in the Intracoastal Waterway and adjacent water bodies from the southern terminus at St. Lucie inlet to northern Biscayne Bay, including the waters of the Loxahatchee River Hobe Sound and Jupiter Sound; St. Lucie and Loxahatchee Rivers.

Aggregation sites in the region include:

- Riviera Beach Power Plant
- FPL plant Port Everglades
- FPL plant Ft. Lauderdale
- Little River
- Coral Gables Waterway
- Palmer Lake
- Black Creek Canal

*Florida Bay within Sector Miami* – Aggregation sites occur in Manatee Bay, Barnes Sound, Blackwater Sound, Tarpon Basin, Joe Bay, Little and Madeira Bay.

Manatees will be most susceptible to contaminant exposure if the oil enters estuaries, river mouths, nearshore waters, and intracoastal waters inshore of barrier islands, particularly where there are seagrass beds upon which manatees forage. Oil can irritate sensitive tissues of all mammals, both externally and internally. Inhalation of oil can increase susceptibility to infection and disease.

A variety of dolphins and whales are expected to be present in waters throughout the region. The most common is the bottlenose dolphin which is relatively abundant in estuarine, nearshore, and offshore waters. Atlantic spotted dolphin can be found along the shelf break.

North Atlantic right whales (FE) may be found in nearshore and offshore waters throughout the Sector in the winter and are more common in the northern regions. Humpback whales and calves (FE) migrate well offshore of the Florida coast between northern feeding grounds and tropical breeding grounds. Juvenile humpback whales may be present and feeding on small schooling fishes in the nearshore waters during winter and spring. Sperm whales (FE) are present over continental shelf edge, slope, and deep ocean waters in this region. Other mammals present in offshore waters (beyond the shelf break) include pygmy sperm whale, dwarf sperm whale, Gervais' beaked whale, Blainville's beaked whale, short-finned pilot whales, false killer whales (summer), Risso's dolphin, pygmy killer whale, melonheaded whale, rough-toothed dolphin, striped dolphin (winter), pan-tropical spotted dolphin, spinner dolphin, and Clymene's dolphin.

Dolphins and whales come into contact with oil while at the surface breathing. Oil can irritate sensitive tissues, both externally and internally. Inhalation of oil can increase susceptibility to infection and disease. Ingestion of oil is not likely for many whales and dolphins, because they feed in the water column and not at the surface. In baleen whales (i.e. humpback), oil can adhere to the baleen and interrupt feeding.

### **Habitats**

Seagrasses, hardbottom reef, coral reef, and sponge habitat are present along the southeastern coast of Florida. Seagrasses in this region of Florida consist of monospecific or mixed beds of shoal grass (*Halodule wrightii*), manatee grass (*Syringodium filiforme*), and turtle grass (*Thalassia testudinum*). In South Florida, turtle grass is generally the most abundant species. Less common seagrasses may include *Halophila* spp. and widgeon grass (*Ruppia maritima*). Seagrass beds are found in inshore waters throughout the region, including the Indian River, Hobe Sound, Jupiter Inlet, Loxahatchee River, Lake Worth, Dumfoundling Bay, and Biscayne Bay. Intertidal seagrass beds are at greatest risk of impacts from floating oil; the oil can adhere to and coat the subaerial leaves. Seagrass associated fauna can be exposed to oil trapped in grass beds. In all seagrass areas, physical damage to seagrass vegetation and sediments should be strictly avoided. Oiled seagrass may revegetate from the roots, so care should be taken to leave the surrounding sediments undisturbed. Response operations in estuaries with seagrass vegetation would require very experienced personnel to avoid boat groundings, prop scarring, etc., which could impact the grass beds. Extensive foot traffic in shallow seagrass areas should be avoided.

Coral reefs in this area include the major coral reef tract and adjacent patch reef areas, where live reef-building stony coral species occur. Coral reefs are found offshore as far north as Key Biscayne, and are an extension of the Keys reef tract. Hardbottom reefs include all other reef types or live-bottom areas other than coral reefs (as defined above). Included in the hardbottom category are limestone outcrops, gorgonian soft-coral flats, and coralline algae reefs. Hardbottom sites are found in Biscayne Bay and from 0-3 miles offshore throughout the region. Shallow hardbottom habitats are almost continuous from Biscayne Bay to Jupiter Inlet and patchy in the northern part of the study area, but exist scattered across the continental shelf. Deep sea coral and sponge habitats (i.e. *Lophelia* and *Oculina* reefs) are found in offshore waters. Phragmatopoma (worm reefs) are also present off the central east coast of Florida. Reef habitats are diverse areas that support aggregations of fish and other species. Species associated with reef areas may be at high risk during oil spills depending on their particular oil vulnerability and sensitivity. In addition, physical damage caused by vessels or response activities can be severely damaging to coral and shallow hardbottom reef communities.

*Sargassum* mats occur in the Gulf Stream and are important habitats for many larval and juvenile fish. *Sargassum* can become concentrated in the same currents that accumulate surface oil and become oiled. If enough of the plant structure is coated with oil, respiration can be interrupted and the mats may die. Accumulation of oil in the same locations as floating *sargassum* mats can also have lethal and sublethal effects to larval and juvenile fishes and turtles associated with those habitats

## **XXV. Human-Use Resources**

Archaeological/historical sites are abundant. Contact the Bureau of Archaeological Research, Florida Department of State (904-487-2299).

### **Aquaculture lease sites:**

17 sites near Valkaria (Mark Berrigan; 904-488-5471), two sites near Sebastian, Fit Aquaculture Facility north of Vero Beach, Harbor Branch Oceanographic Institute site west of Blue Hole Point (407-465-2400), one site near Fort Pierce: Floating Aquaculture Operations (Mark Berrigan; 904-488-5471). This list may not include all aquaculture lease sites.

### **Water intakes:**

Atlantic Farms South (Craig Clark; 407-727-7633), aquaculture intake near Sebastian, Harbor Branch Oceanographic Institute site west of Blue Hole Point (407-465-2400), power plant near Fort Pierce, St. Lucie Nuclear Power Plant (Florida Power & Light, FP&L (407-465-3550); Juno Beach Marine Life Center off Juno Beach, Riviera Power Plant (FP&L, 407-854-3109) near Lake Worth Inlet; Port Everglades Power Plant (FP&L) near Ft. Lauderdale, Cutler Power Plant (FP&L) on the western shoreline of Biscayne Bay. This list may not include all water intake sites.

### **Nature Conservancy Lands:**

Blowing Rocks Preserve (The Nature Conservancy) is located on Jupiter Island.

### **National Park Service Lands:**

Biscayne National Park, Everglades NP

### **U.S. Fish and Wildlife Service Lands:**

Hobe Sound National Wildlife Refuge, Crocodile Lake NWR

### **NOAA:**

Florida Keys National Marine Sanctuary and Key Largo NMS

### **State Managed Areas:**

Sebastian Inlet State Recreation Area (SRA), Fort Pierce Inlet SRA, Savannah State Preserve, St. Lucie Inlet State Park, Jonathon Dickinson State Park, John D. MacArthur State Park, Hugh Taylor Birch SRA, John U. Lloyd State Recreation Area (SRA), Oleta State Park, Hugh Taylor Birch State Park, Virginia Key State Park, Bill Baggs Cape Florida State Park, Cape Florida SRA, and John Pennekamp Coral Reef State Park.

### **Aquatic Preserves:**

San Sebastian River Buffer Preserve, Banana River Aquatic Preserve, Indian River Malabar–Vero Beach Aquatic Preserve, Indian River Vero Beach-Fort Pierce Aquatic Preserve, North Fork-St. Lucie Aquatic Preserve, Jensen Beach to Jupiter Inlet Aquatic Preserve, Loxahatchee River-Lake Worth Aquatic Preserve, and Biscayne Bay State Aquatic Preserve.

### **Recreational Beaches:**

Several recreational beaches are in the area including; Vero Beach, Hutchinson Island, Jupiter Island, Palm Beach, South Palm Beach, Boynton Beach, Delray Beach, Highland Beach, Boca Raton, Deerfield Beach, Pompano Beach, John U. Lloyd SRA, Miami Beach, Hollywood Beach, Matheson Hammock County Park (Biscayne Bay), Key Biscayne, and Virginia Key.

### **Dive Sites:**

Popular dive sites include: waters off of Vero Beach, St. Lucie Inlet, Jupiter Island, South Palm Beach, Boynton Beach, Highland Beach, Boca Raton, Deerfield Beach, Pompano Beach, Harbour Inlet at Ft. Lauderdale, John U. Lloyd SRA, Biscayne Bay, Atlantic Ocean off of Cape Florida SRA, and Virginia Key.

### **Essential Fish Habitat (EFH)**

EFH occurs along the southeast coast of Florida (inshore, nearshore, and offshore) for coral reef and hardbottom, spiny lobster, coastal sharks and snapper-grouper. EFH also occurs for penaeid shrimp but only for inshore waters. EFH occurs for highly migratory species in the Gulf Stream and for Dolphin-Wahoo at the point off Jupiter Inlet.

### **Coral HAPC (from SAFMC):**

Western boundary of Oculina Banks HAPC

### **Lophelia HAPC:**

E of 400 m depth contour, along the entire study region

### **Critical Habitat**

Designated Critical Habitat occurs for elkhorn and staghorn coral in nearshore waters outside of Biscayne Bay to Palm Beach. Critical Habitat for Johnson's seagrass occurs in the following waters:

- North of Sebastian Inlet Channel
- South of Sebastian Inlet Channel
- Fort Pierce Inlet
- North of St. Lucie Inlet
- Hobe Sound
- South side of Jupiter Inlet
- A portion of Lake Worth Lagoon north of Bingham Island
- A portion of Lake Worth Lagoon, located just north of the Boynton Inlet
- A portion of northeast Lake Wyman, Boca Raton
- A portion of Northern Biscayne Bay

Critical habitat occurs in South Florida for crocodile, manatee, Everglades snail kite and Cape Sable seaside sparrow.

## Sector Jacksonville – Potential Wildlife and Habitat Resources at Risk

### Potential Resources at Risk for an Offshore Drilling Release Scenario: Sector Jacksonville

#### XXVI. Spill Source Information

This report was prepared in November 2011. Information presented in this report is meant to capture resources potentially at risk in Sector Jacksonville, Florida in the event of a catastrophic release of medium crude oil associated with International drilling efforts near Florida

#### XXVII. Geographic Region Covered

This report covers the eastern shoreline and coastal waters of the Florida Peninsula from Palm Bay to the Georgia state line. This corresponds to the USCG Sector Jacksonville Area Response Plan Maps.

#### Expected Type of Spilled Material For the Area

Crude oils can vary widely by origin, but the rule of thumb is that up to one-third will be lost by evaporation and dissolution. The fate and behavior of a spill of medium crude oil will depend on the release conditions. For a deep subsurface release, a significant fraction of the oil will be naturally dispersed and dissolved into the water column during its rise to the surface. During the Deepwater Horizon spill of a light crude oil, an estimated 12% naturally dispersed and 20-25% evaporated or dissolved. Therefore, a subsurface release can result in up to 40% of the oil mixed into the water column. The soluble fraction in crude oil contains some of the more acutely toxic components. For a surface release of fresh oil, it is expected that the oil will form extensive slicks that would be subject to evaporation, emulsification, and other weathering processes that tend to eventually form fields of tarballs. When stranded on the shoreline, the oil will coat animals and intertidal habitats. If the stranded oil is relatively fresh and of low viscosity, it will readily penetrate porous sediments. Over time, the floating oil will weather and become more viscous. Impacts from weathered oil are associated with smothering and long-term sediment contamination.

#### XXVIII. Shoreline Resources at Risk

The outer shoreline in this area is predominately coarse and fine-grained sand beaches (details are in Table 1). Riprap and exposed solid man-made structures are present on the more developed beaches (Cocoa Beach, Daytona Beach, St Augustine Beach, and Jacksonville Beach). Behind the outer shoreline there is a large river/estuary system with extensive marshes and/or mangroves, as well as sheltered seawalls, riprap, and tidal flats. The northern extent of mangroves is around Ponce de Leon Inlet; inshore wetlands south of this area are mangroves and north of this area are salt marsh habitats. Access to this very sensitive area is limited to Sebastian Inlet, Port Canaveral Inlet, Ponce de Leon Inlet, Matanzas Inlet, St. Augustine Inlet, St. Johns River Inlet, Fort George Inlet, Nassau Sound Inlet, and St. Marys entrance. Riprap jetties occur at Port Canaveral inlet, Ponce de Leon inlet, St. John's entrance and St. Mary's entrance. Exposed tidal flats occur in Nassau Sound and around the mouth of Fort George River. Some areas of exposed rocky platforms are present on the Atlantic shoreline near Washington Oaks Gardens State Park.

**Table 1. Dominant beach type by grain size in the region**

Beach Type	Geographic distribution (listed from south to north)
Coarse-grained sand beach	Southern Brevard County to Melbourne Cape Canaveral North to the end of Canaveral National Seashore St Augustine Inlet to Ponte Vedra Beach

Fine-grained sand beach	Melbourne to Cape Canaveral North of Canaveral National Seashore to Daytona Beach Mantanzas Inlet to St. Augustine Inlet Ponte Vedra Beach to the Georgia border
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## **Oil behavior by shoreline type**

### Marshes:

These are the most sensitive shorelines in the area. Oil adheres readily to intertidal vegetation. The band of oil coating will vary widely, depending upon the water level at the time oil is in the vegetation. There may be multiple bands. Heavy and emulsified oil can be trapped within marsh vegetation. The oil could also adhere to and foul attached biota on vegetation..

### Tidal flats:

Oil does not usually adhere to the surface of exposed or sheltered tidal flats, but rather moves across the flat and accumulates at the high-tide line. Deposition of oil as sheen or tarballs on the flat may occur on a falling tide. Depending on how sticky the tarballs are, they may adhere to the substrate and not refloat with the rising tides. Oil will not penetrate the water-saturated sediments, but could penetrate burrows and mud cracked sediments of sheltered tidal flats.

### Manmade structures (exposed and sheltered manmade structures, riprap):

Oil adheres readily to rough surfaces. Deep penetration of oil and/or tarballs between riprap boulders is likely. If oil is left uncleaned, it may cause chronic leaching. The lower intertidal zone usually stays wet (particularly if algae covered), preventing oil from adhering to the surface. In sheltered areas, oil can accumulate around the high tide line, forming a distinct oil band. In exposed areas, wave reflection can keep oil away from hardened shorelines.

### Sand beaches:

Light oil accumulations will be deposited as oily swashes or bands along the upper intertidal zone. Heavy oil accumulations will cover the entire beach surface; oil will be lifted off the lower beach with the rising tide. Maximum oil penetration is about 10 cm in fine-grained sediments and 20 cm in coarse-grained sediments. Tarballs and tar patties may strand along outer coast beaches. In the hot sun, the tarballs and patties can partially melt into the upper layer of sand. Depending on how sticky the tarballs and tar patties are, they may adhere to the sandy substrate, become coated with sand, and not refloat with the rising tide. Also, waves can roll the tarballs up and down the beach face, causing them to become coated with sand. If they become heavy enough, they can accumulate in the nearshore subtidal zone. Depending on the beach cycle, the tarballs and patties can become buried during depositional cycles. Therefore, rapid removal is important.

### Exposed rocky platforms:

The platform surface is irregular and tide pools/crevices are common. Large accumulations of seagrass wrack are present if the rocky formation is a platform. Emulsified oil and tarballs will accumulate in wrack and depressions in bedrock platforms at the high-tide line. Tarballs can melt into crevices and depressions, persisting for longer periods.

## XXIX. Biological Resources at Risk

Threatened/endangered species are noted using the following abbreviations: FE – federally endangered, FT – federally threatened, ST – State threatened, SSC – state species of special concern, NOAA SOC – species of concern

### Birds

Birds present throughout the coastal/offshore area include brown pelican (high), double-crested cormorant (high), bufflehead, lesser scaup (high), northern gannet, red-breasted merganser, redhead (high) and various gulls and terns. Bald eagle nesting sites (Nov.-Jun.) are found throughout Sector Jacksonville. Large concentrations of sea ducks (e.g., scoters) are rarely observed south of Jacksonville. Concentration areas and key nesting sites are detailed in Table 2.

**Table 2. Bird Nesting and Concentration Areas: Sector Jacksonville**

Location	Species	Seasonality <i>Species not listed are present year round</i>
Atlantic Coast off of Indian River	Terns and skimmers nesting; some large least tern (ST) colonies (> 100 birds) throughout area	Nesting: Apr.-Aug.
Indian River Malabar – Vero Beach Aquatic Preserve: small islands	Large colony of egrets, herons, white ibis (~ 700), wood stork (S/F E/E), least tern (ST)	Present: year round Nesting: ranges Jan.-Aug.
Inland and Coastal sides of Indian River	Florida scrub-jay (ST)	Year round
Indian River near Titusville	Least tern (ST, 43 birds)	Nesting: Apr.-Aug.
Merritt Island (between Indian and Banana Rivers)	Least tern colonies (ST, some large >200 birds) Florida scrub-jay (ST)	Nesting: Apr.-Aug. Year round
Banana River Aquatic Preserve	Large colonies, including: brown pelican (SSC, 300), double-crested cormorant (100), great egret (500), white ibis (SSC, 5200), wood stork (S/F E/E, 450), black-crowned night-heron (100), cattle egret (500), tricolored heron (SSC, 500)  Diving ducks: high	Ducks wintering <u>Nesting seasons</u> Nov.-Sep.: pelican Mar.-Aug.: cormorant Jan.-Jun.: great egret Mar.-May: white ibis Dec.-Jul.: black-crowned night-heron Mar.-Aug.: cattle egret Feb.-Jul.: tricolored heron
Cape Canaveral	Wood stork (S/F E/E)	Year round
Cape Canaveral Air Force Station	Florida scrub-jay (ST, 70), least tern (ST, 165)	Apr.-Aug.: least tern
Canaveral Barge Channel	Black skimmer (SSC, 200), black tern, common tern, least tern (ST, 375), black-necked stilt, Wilson's plover	<u>Nesting seasons</u> Range: Apr.-Sep.
City Point	Least tern (ST, 159)	Nesting: Apr.-Aug.
Merritt Isl. NWR	Dabblers and mottled duck (high) Least tern (ST, 100)	Dabblers: winter <u>Nesting seasons:</u>

	Wood stork (S/F E/E) Cattle egret (100) Roseate spoonbill (SSC, 129)	Mar.-Apr.: mottled duck Apr.-Aug.: least tern Mar.-Aug.: cattle egret Apr.-May: roseate spoonbill
Dummit Cove islands	Brown pelican (SSC,1000) White ibis (SSC, 2000) Wood stork (F/S E/E)	Mar.-May: white ibis nesting
Bird Island	Brown pelican (SSC, 120), cormorant (100), black skimmer, gull-billed tern, least tern (ST)	<u>Nesting seasons:</u> Nov.-Sep.: pelican Mar.-Aug.: cormorant
Ponce de Leon Inlet	Piping plover (S/F T/T), least tern (ST, 221), black skimmer (SSC, 60), sanderling (300), cattle egret (750), great egret (180)	Wintering: piping plover, sanderling <u>Nesting seasons:</u> Apr.-Aug: least tern May-Sep.: black skimmer Mar.-Aug.: cattle egret Jan.-Jun.: great egret
Pelican Island and other small islands in Halifax River	Brown pelican (SSC, 500), great egret (500), snowy egret (SSC, 200), least tern ( ST, 47)	<u>Nesting seasons:</u> Nov.-Sep.: pelican Jan.-Jun.: great egret Dec.-Aug.: snowy egret Apr.-Aug: least tern
Inland and coastal banks of Halifax River in Daytona/Ormond Beach areas	Least tern (ST, > 750 nests), red knot and other shorebirds (100s)	Apr.-Aug: least tern Wintering shorebirds
Tomoka Marsh State Aquatic Preserve	Wading birds (high), waterfowl	Year round: wading birds Wintering: waterfowl
Flagler Beach/Silver Lake and Jacksonville Beach	Least tern (ST, > 100 per area)	Nesting: Apr.-Aug.
Matanzas Inlet	Least tern (ST, ~500), American oystercatcher (SSC), willet, Wilson's plover (~60), piping plover (S/F T/T)	<u>Nesting seasons:</u> Apr.-Aug: least tern Apr.-Jul.: willet Aug.-May: plover
Anastasia Island	Least tern (ST, ~83) Piping plover (S/F T/T)	Apr.-Aug.: least tern nest Aug.-May: plover winter
St. Augustine Inlet/Anastasia State Park and Recreation Area	Least tern (ST, ~200), Wilson's plover (10s), American oystercatcher (SSC), black skimmer (SSC), gull-billed tern, royal tern, sandwich tern, piping plover (S/F T/T)	Apr.-Aug.: least tern nest Aug.-May: plover winter Apr.-Jul.: Wilson's plover nest Year round: oystercatcher, royal tern, sandwich tern May-Sep.: skimmer nest Mar.-Dec.: g-b tern
St. John's River: Mill Cove tidal flats, Blount Island and other islands	Shorebirds (1000s): dunlin, sandpipers Colony: willet, gull-billed tern, least tern (ST), Wilson's plover, willet	Shorebirds: year round except June Apr.-Aug.: least tern nest Apr.-Jul.: willet nest Mar.-Dec.: g-b tern

		Apr.-Jul.: Wilson's plover nest
Mouth of St. Johns River/Fort George Inlet/ Huguenot Memorial Park	Brown pelican (very high), gannet (high), shorebirds (high), waterfowl (high), black skimmer (125), laughing gull (4000), royal tern (500), gull-billed tern (15)	Winter peak, some year round <u>Nesting seasons:</u> May-Sep.: black skimmer May-Aug.: laughing gull Apr.-Aug.: royal tern Mar.-Dec.: g-b tern
Lt. Talbot Island	Black skimmer (59), least tern (150), gull-billed tern (10), oystercatcher, Wilson's plover	May-Sep.: black skimmer Apr.-Aug.: least tern Mar.-Dec.: g-b tern Apr.-Jul.: Wilson's plover

All birds are at significant risk of oiling from emulsified oil. At greatest risk are those who spend most of their time on the water surface, such as pelicans and ducks. Direct oiling of birds reduces the buoyancy, water repellency, and insulation provided by feathers, and may result in death by drowning or hypothermia. Preening of oiled feathers may also result in the ingestion of oil, resulting in irritation, sickness, or death. Gulls and terns do not appear to avoid oil while feeding in nearshore areas, particularly if the oil is weathered. During the nesting season they could bring oil back to the nests, as could wading birds oiled by direct contact with contaminated marsh vegetation. Direct mortality rates are generally less for shorebirds because they rarely enter the water. Shorebirds, which feed along shoreline habitats where oil strands and persists, are at higher risk of sublethal effects from either contaminated or reduced population of prey.

### **Fish**

Habitats found in sector Jacksonville are home to a diversity of fish species, both in estuarine and offshore environments. The inshore rivers/estuaries (St. Johns River, Matanzas River, Halifax River, Mosquito Lagoon, Banana River, Indian River Lagoon) are important nursery grounds for many coastal species (Table 3).

The St. Johns River supports a spawning population of Atlantic sturgeon (SSC). Adults can be found in coastal waters throughout the region year-round, but move into the river to spawn from February through March. Juveniles are present through the spring/summer in the river and coastal marshes. The northern part of this region is also the southernmost extent of the blueback herring (NOAA species of concern (SOC)) range. Juveniles are present year round in the river and spawning occurs from January through April. American shad also spawn in St. John's River (Dec.-Apr.).

Mangrove rivulus (SSC) can be found year-round in mangroves north to Mosquito Lagoon. Smalltooth sawfish (FE) may be present in Mosquito Lagoon or other inshore waters but no critical habitat is established in the region. Smalltooth sawfish (FE) and shortnose sturgeon (FE) can occur in the Indian River Lagoon or other inshore waters, but are rare. Striped croakers (NOAA species of concern) occupy nearshore hard bottom habitats from Sebastian Inlet north. Nearshore waters north of Cape Canaveral are important juvenile habitat for dusky sharks (NOAA SOC).

**Table 3. Distribution and life history information for species commonly found in the South Florida estuaries**

Location	Adult (A), larval (L) and juvenile(J) presence in South Florida Estuaries
Indian River Lagoon	<p><i>Resident:</i> Bay anchovy, black drum (spawn in winter; L: Dec.-Apr., J: May-Sep.), gray snapper (year round), spotted seatrout (spawn Apr.-Oct.), sheepshead</p> <p><i>Resident offshore spawner (spawn in fall/winter offshore):</i> Atlantic croaker, gulf flounder, southern flounder, ladyfish, pinfish, red drum, striped mullet, bluefish (adults more common in the winter)</p> <p><i>Catadromous:</i> American eel (A: winter, J: present year round)</p>
St. John's River Estuary	<p><i>Resident:</i> Bay anchovy, silversides, mummichog, sheepshead minnow, black drum (spawn in winter; L: Dec-Apr., J: May-Sep.), spotted seatrout (spawn Apr.-Jul.), sheepshead (spawn Feb.-May), cobia (adults and juveniles resident), weakfish (spawn Mar.-Aug.), southern kingfish (L: Apr.-Aug.)</p> <p><i>Resident offshore spawner (spawn in fall/winter offshore, juveniles use estuaries):</i> Atlantic croaker, gulf flounder, southern flounder, summer flounder, ladyfish, pinfish, red drum, striped mullet, bluefish (adults more common in the winter), menhaden, spot, gray snapper (year round)</p> <p><i>Anadromous:</i> Striped bass (spawn Dec.-Feb.), blueback herring (spawn Jan.-Apr.), American shad (spawn Dec.-May), American sturgeon (spawn Feb.-Aug.)</p> <p><i>Catadromous:</i> American eel (L: Jan.-May, J: resident, A: Nov.-Mar.)</p> <p><i>Transient:</i> Bluefish (A: Oct.-May), Spanish mackerel (A: Oct.-Mar., J: resident, L: Jul.-Sep.)</p>

Many commercially/economically important species are associated with hardbottom habitats, including black grouper, red grouper, gag grouper, scamp, gray snapper, red snapper, hogfish, black sea bass, lane snapper, greater amberjack, lesser amberjack and barracuda. In general, the snapper-grouper species spawn during the summer. The Gulf Stream is important habitat for many prized game fishes. Larval and juvenile sailfish, yellowfin tuna, and swordfish are likely present in the Gulf Stream during the spring, and can be associated with *sargassum* mats. Juvenile jacks and triggerfish have also been found in floating *sargassum* mats. Adult blue marlin, white marlin, sailfish, yellowfin tuna, swordfish and wahoo can be found in this region at different times of the year. Species such as wahoo that feed in surface waters could potentially ingest oil while feeding either incidentally or ingesting oiled prey.

Emulsified oil that becomes trapped in marshes/mangroves or other important nursery areas (e.g., seagrasses) may affect early life stages of fish that are found in shallow vegetated waters. Ingestion of oil and/or oil adhesion to gill tissues could also cause sublethal reductions in health to adult fish. Surface oil can also accumulate in floating *sargassum* mats, which are important habitat for eggs, larvae and juveniles of pelagic species. Tarballs and emulsified oil that become trapped in subtidal zones or marshes may affect early life stages of fish that are found in shallow vegetated waters.

**Invertebrates:**

Crabs, shrimp, lobsters, and bivalves are found throughout the area. Specifics on their geography and life history are included in Table 4. Inshore waters are important nurseries for juvenile and larval invertebrates.

**Table 4. Distribution, abundance, and seasonality of invertebrates found in Sector Jacksonville**

Species	Distribution	Life-history
<i>Ubiquitous</i>		
Blue crab	Juveniles and adults can be found inshore and offshore year round in medium concentrations	Spawn year round in inlets/deeper waters
Stone crab	Low concentrations inshore and offshore	Spawn Mar.-Oct.
Spiny lobster	Present offshore in low-med concentrations	Spawn offshore spring-summer
Peneaid shrimp (brown, white, pink)	Brown, white and pink shrimp can be found in estuaries and offshore  Brown and white more important in this region  Juveniles use grass beds and algal mats in estuaries as nursery grounds	Reproduce offshore in the fall-winter in deeper waters; Pink shrimp spawning peaks Mar.-Nov.  White shrimp Apr.-Oct.  Brown shrimp year round, peaks Feb.-Mar.  White shrimp are the only shrimp species that spawn inshore.
<i>Oceanic species</i>		
Rock shrimp, royal red shrimp	Adults found on sand in deeper waters, generally > 50'  Juveniles found on reefs (i.e. oculina)  Royal red shrimp: very deep waters	Peak spawning Dec.-Feb. for rock shrimp
Calico scallop	Found on continental shelf, associated with hard bottom habitat  Cape Canaveral is center of concentration	Spawns year round but peaks in the fall.
<i>Inshore species</i>		
Bay scallop	Indian River	Spawn Oct.-Nov.
Oyster	Inshore rivers/estuaries:  Indian River, Indian River North, Matanzas River	Spawn Apr.-Nov.
Hard clams	Indian River, Indian River North	Spawn Mar.-Nov.

Emulsified oil that becomes trapped in marshes/mangroves and other nursery areas may affect early life stages of invertebrates that are found in shallow vegetated waters. If the oil is weathered, as expected, by the time it reaches reef and other nearshore habitats, the toxic fractions that might normally cause lethal effects to invertebrates should be limited. However, even patches of stranded oil could be a source of contamination of motile organisms such as crabs. In large quantities, the oil may cause

smothering of some species, particularly those in shallow, nearshore waters. Adult mortality is not expected but there is a low risk of tainting and direct smothering effects.

**Reptiles:**

Loggerhead sea turtle (FT), green sea turtle (FT), and leatherback sea turtle (FE) nest on the outer beaches (Table 5.). The beaches at the northern end of Canaveral National Seashore are also hawksbill sea turtles (FE) nesting sites. Newly hatched turtles sometimes forage in the Gulf Stream and can be associated with *sargassum* mats. All of these species of turtles can be found in offshore waters as well. The river/estuary system is foraging habitat for juvenile and adult green and loggerhead sea turtles. Also present in the marshes from Mosquito Lagoon north to Flagler County is the Atlantic salt marsh snake (FT). Alligators occur in inland waters and marshes.

**Table 5. Sea Turtle Seasonality: Sector Jacksonville**

Species	Adult presence	Nesting period	Hatching period
Leatherback	Jan.-Sep.	Feb.-Aug.	Mar.-Sep.
Green	Mar.-Nov.	Apr.-Oct.	May-Nov.
Loggerhead	Mar.-Nov.	Apr.-Oct.	May-Nov.
Hawksbill	May-Dec.	Jun.-Nov.	Jul.-Dec.

Direct contact with oil may irritate the eyes, mouth, and nostrils of reptiles. Oiled turtles dive less frequently, which could mean less foraging effort. In addition, there is a risk of turtles mistaking tarballs for prey or ingesting oiled prey items. The toxicity of the oil as well as intestinal blockage can result in death. There is also the risk of nests becoming oiled and causing mortality of future hatchlings or leading to deformities in hatchlings. Juvenile turtles are associated with *Sargassum* habitats, and may become exposed to oil because surface currents will cause the accumulation of floating material.

**Terrestrial mammals**

The southeastern beach mouse (FT) may be present at the Cape Canaveral Air Force Station. The Anastasia Island beach mouse (FT) may be found on the north side of Matanzas Inlet and the south side of St. Augustine Inlet. Round-tailed muskrat are found in the marshes at the north end of Tomoka State Park.

The fur of terrestrial mammals may become oiled and oil may be ingested as animals attempt to clean themselves. More importantly for federally listed mice, attempts should be made to not disturb their habitats and precautions may be needed during cleanup.

**Marine mammals**

The Florida manatee (FE) inhabits coastal waters, estuaries, tidal creeks, and freshwater river systems of Florida. In this region of Florida they are commonly found in the intracoastal waters inside of barrier islands and occasionally in inlets and near the surf zone of the ocean side of the coastline. Manatees can be found feeding on seagrass or other aquatic vegetation year-round. During colder months, manatees thermoregulate by seeking shelter at a limited number of warm-water sites (e.g., power plants, springs, and manmade thermal basins such as deep canals). Manatees will be most susceptible to contaminant exposure if the oil enters estuaries, river mouths, nearshore waters, and intracoastal waters inshore of barrier islands, particularly where there are seagrass beds upon which manatees forage.

**Table 6. Distribution and seasonality of manatees in Sector Jacksonville**

Location	Habitat/Concentration	Season
Indian and Banana Rivers	High Winter Concentration sites: Port St John at the FPL plant, Sebastian River (C54 canal), Satellite Beach (Berkeley canal)	Year round Calving occurs year-round but peaks in spring
Brevard to St. Augustine	Low concentrations	Year round
St. Augustine to Georgia state line	Low concentrations in inland waters	Spring/Summer
St. Johns River	Freshwater population which winters at Blue Springs	Year round

A variety of dolphins and whales can be found in waters throughout the region. The most common marine mammal is the bottlenose dolphin which is relatively abundant in estuarine, nearshore, and offshore waters. North Atlantic right whales (FE) calve in the nearshore waters off Florida and Georgia from November to April. They can be found in all offshore waters in the sector. Humpback whales and calves (FE) migrate well offshore of the Florida coast between northern feeding grounds and tropical breeding grounds. Juvenile humpback whales may be present and feeding on small schooling fishes in the nearshore waters during winter and spring.

Sperm whales (FE) are present over continental shelf edge, slope, and deep ocean waters in this region. Other mammals that can occur in offshore waters (beyond the shelf break) include pygmy sperm whale, dwarf sperm whale, Gervais' beaked whale, Blainville's beaked whale, short-finned pilot whales, false killer whales (summer), Risso's dolphin, pygmy killer whale, melonheaded whale, rough-toothed dolphin, striped dolphin (winter), pan-tropical spotted dolphin, spinner dolphin, and Clymene's dolphin.

Dolphins and whales come into contact with oil while at the surface breathing. Oil can irritate sensitive tissues, both externally and internally. Inhalation of oil can increase susceptibility to infection and disease. Ingestion of oil is not likely for many of these species because they feed in the water column and not at the surface. Oil can interrupt feeding in baleen whales by adhering to the baleen. Migratory and calving whales (humpbacks and rights) are typically not feeding; therefore, this is likely only applicable to juvenile humpbacks or more offshore species.

### **Habitats**

Extensive seagrass beds are present through Indian River, Banana River, and Mosquito Lagoon. Seagrasses in Florida consist of monospecific or mixed beds of shoal grass (*Halodule wrightii*), manatee grass (*Syringodium filiforme*), and turtle grass (*Thalassia testudinum*). Less common seagrasses may include *Halophila* spp. and widgeon grass (*Ruppia maritima*).

Intertidal seagrass beds are at greatest risk of impacts from floating oil; the oil can adhere to and coat the subaerial leaves. Seagrass associated fauna can be exposed to oil trapped in grass beds. In all seagrass areas physical damage to seagrass vegetation and sediments should be strictly avoided. Oiled seagrass may revegetate from the roots, so care should be taken to leave the surrounding sediments undisturbed. Response operations in estuaries with seagrass vegetation would require very experienced personnel to avoid boat groundings, prop scarring, etc., which could impact the grass beds. Extensive foot traffic in shallow seagrass areas should be avoided.

Hard bottom habitats are sporadic across the continental shelf and support commercial fisheries for many reef associated species. Deep sea coral and sponge habitats (i.e. *Lophelia* and *Oculina* (NOAA species of concern) reefs) are found in offshore waters. Phragmatopoma (worm reefs) are also present off the central east coast of Florida. Reef habitats are diverse areas that support aggregations of fish and other species. Species associated with reef areas may be at high risk during oil spills depending on their particular oil vulnerability and sensitivity. In addition, physical damage caused by vessels or response activities can be severely damaging to coral and shallow hardbottom reef communities.

### **XXX. Human-Use Resources**

#### **Archaeological Sites:**

Archaeological/historical sites are abundant. Contact the Bureau of Archaeological Research, Florida Department of State (904-487-2299).

#### **Aquaculture lease sites:**

There are 34 state administered sites in the Indian River (Mark Berrigan; 904-488-5471), 3 private sites (Lucy Horsh, 407-453-8906; Rick Madrigal, 407-636-6673; Craig Clark, 407-727-7633), 1 site on the Matanzas River near Crescent Beach (Mark Berrigan; 904-488-5471), and 23 sites at the north end of Mosquito Lagoon (Mark Berrigan; 904-488-5471). This list may not include all aquaculture lease sites.

#### **Water intakes:**

There is a water intake just south of the mouth of Saint Sebastian River for an aquaculture facility, one near Micco (Craig Clark, 407-727-7633), one near Pineda (Rick Madrigal, 407-636-6673), 2 near Cocoa (Canaveral Power Plant, 407-633-0200; Indian River Power Plant, 407-267-2155), 2 south of Matanzas Inlet (Marineland and UF Whitney Marine Lab), and 3 power station intakes at the northern end of St Johns River (Stan Stokes, 906-632-6258). This list may not include all water intake sites.

#### **National Park Service Lands:**

Fort Matanzas National Monument, Castillo de San Marcos National Monument, Timucuan Ecological and Historic Preserve, Fort Caroline National Memorial, Ribault Monument, and Canaveral National Seashore.

#### **National Wildlife Refuges (NWR):**

Pelican Island NWR, St. Johns NWR, and Merritt Island NWR.

#### **Aquatic Preserves:**

Indian River Malabar-Vero Beach Aquatic Preserve, San Sebastian River Buffer Reserve, Banana River Aquatic Preserve, Mosquito Lagoon Aquatic Preserve, Tomoka Marsh Aquatic Preserve, Pellicer Creek Aquatic Preserve, Ft. Clinch State Park Aquatic Preserve, Nassau River-St. Johns River Marshes Aquatic Preserve, Guana River Marsh Aquatic Preserve, and Guana-Tolomato-Matanzas National Estuarine Research Reserve.

#### **Recreational beaches:**

Recreational beaches are present on most of the outer shoreline. Ponce de Leon Inlet is a popular diving area. Several fishing piers are present (Daytona Beach, Flagler Beach, St. Augustine Beach, Jacksonville Beach, Fernandina Beach).

**Fisheries management areas: Essential Fish Habitat (EFH) and Habitat Areas of Particular Concern (HAPC):**

EFH occurs in offshore waters along the east coast of Florida for coastal migratory pelagic fish; EFH occurs in coastal ocean waters snapper-grouper. EFH for red drum and shrimp occurs in the inlets; Oculina banks HAPC is runs from Ft. Pierce to Cape Canaveral; Deepwater coral HAPC is east of the 400m depth contour over the entire sector; *Sargassum* HAPC occurs in the Gulf Stream.

**Critical Habitat**

Designated Critical Habitat occurs for right whale (FE) along the northeast Florida coastline. There is also a critical habitat for piping plover (FT) around Ponce de Leon Inlet, St. Johns River mouth to Nassau Sound, and the mouth of St. Marys River.