APPENDIX C

BIOLOGICAL ASSESSMENT

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BIOLOGICAL ASSESSMENT FOR IMPACTS TO ENDANGERED AND THREATENED SPECIES RELATIVE TO THE CORPUS CHRISTI SHIP CHANNEL IMPROVEMENTS PROJECT IN NUECES AND SAN PATRICIO COUNTIES, TEXAS

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1.0 INTRODUCTION

1.1 PURPOSE OF THE BIOLOGICAL ASSESSMENT

This Biological Assessment (BA) is being prepared for the purpose of fulfilling the U.S. Army Corps of Engineer's (USACE) requirements as outlined under Section 7(c) of the Endangered Species Act (ESA) of 1973 as amended. The proposed Federal action requiring the assessment is the dredging of the Corpus Christi Ship Channel (including alternatives found in Section 1.2) in Nueces and San Patricio counties, Texas. Table 1 presents a list of Federally listed species addressed in this BA. For the purposes of this BA, the project area is defined as the area where the actual dredging will take place, proposed placement areas, and the proposed beneficial use sites where impacts might be expected.

In 1990, the U.S. Congress authorized the USACE to begin a reconnaissance study to investigate deepening the Corpus Christi Ship Channel system from the current 45 feet (ft) to 50 ft to accommodate large vessels, increase shipping efficiency and enhance navigation safety. The Port of Corpus Christi Authority (POCCA), local sponsor of the existing channel system, began consideration of additional channel improvements upon the 1989 completion of the 45-ft deepening project.

The USACE completed the reconnaissance study in 1994, concluding that the benefits of channel improvements would be 2.5 times greater than the project cost. In 1999, the USACE and the Port signed an agreement to conduct a Feasibility Study, including an Environmental Impact Statement (EIS). The project is being led by the USACE, but cost shared with the Port.

The Feasibility Study involves multidisciplinary studies determining the specific improvements needed and the benefit-cost ratios of various alternatives. Several technical workgroups involved in the Feasibility Study phase are defining scopes of work and reviewing the results of certain studies. Workgroups include the Regulatory Agency Coordination Team (RACT), Shoreline Erosion, Cumulative Assessment, Mitigation, Hydrodynamic and Salinity Modeling, Water and Sediment Quality, and Beneficial Uses. Several Federal and State regulatory agencies are participating in the workgroups. This BA is being prepared to assist the U.S. Fish and Wildlife Service (FWS) and National Marine Fisheries Service (NMFS) personnel in fulfilling their obligations under the ESA. An EIS is being prepared to address the impacts of the project.

1.2 DESCRIPTION OF THE PROPOSED ACTIONS

The study area for the Corpus Christi Ship Channel – Channel Improvements Project encompasses Corpus Christi Bay, including the southern section of Redfish Bay and the northern section of the Laguna Madre, Nueces Bay, the lower Nueces River (12 miles), Tule Lake Channel, Viola Channel, La Quinta Channel and the watershed surrounding these water bodies up to roughly 0.5 mile

TABLE 1

FEDERALLY ENDANGERED AND THREATENED SPECIES OF POTENTIAL OCCURRENCE IN THE CORPUS CHRISTI SHIP CHANNEL IMPROVEMENTS PROJECT AREA IN NUECES AND SAN PATRICIO COUNTIES, TEXAS[1]

Common Name	Scientific Name	Status[2]
South Texas ambrosia	*Ambrosia cheiranthifolia*	E
Slender rush-pea	*Hoffmannseggia tenella*	E
Kemp's ridley sea turtle	*Lepidochelys kempii*	E
Green sea turtle	*Chelonia mydas*	T
Loggerhead sea turtle	*Caretta caretta*	T
Hawksbill sea turtle	*Eretmochelys imbricata*	E
Leatherback sea turtle	*Dermochelys coriacea*	E
Brown pelican	*Pelecanus occidentalis*	E
Bald eagle	*Haliaeetus leucocephalus*	T/PDL
Whooping crane	*Grus americana*	E
Northern aplomado falcon	*Falco femoralis septentrionalis*	E
Piping plover	*Charadrius melodus*	T
Mountain plover	*Charadrius montanus*	PT
Eskimo curlew	*Numenius borealis*	E
Ocelot	*Leopardus pardalis*	E
Jaguarundi	*Herpailurus yagouaroundi*	E
West Indian manatee	*Trichechus manatus*	E

[1] According to U.S. Fish & Wildlife Service (FWS, 2000a).
[2] E Endangered; in danger of extinction.
T Threatened; severely depleted or impacted by man.
PT Proposed for listing as threatened.
T/PDL Currently classified as threatened but proposed for delisting in lower 48 states.

inland from all shorelines (Figure 1-1). The coastline of this area extends across Nueces and San Patricio counties and is adjacent to the cities of Corpus Christi, Portland, Ingleside by the Bay, and Port Aransas.

The Corpus Christi Ship Channel is located in Corpus Christi Bay on the southern portion of the Texas coast, 200 miles southwest of Galveston and 150 miles north of the mouth of the Rio Grande. This channel ranks seventh in the nation for tonnage shipped on oceangoing vessels, and in Texas only the Houston Ship Channel handles more tonnage.

The authorized Federal navigation project consists of channels and turning basins suitable for oceangoing vessels, rubblestone jetties, and a stone dike. The channel begins at deep water in the Gulf of Mexico about 4.3 miles offshore, passes through the jettied inlet, and extends about 21 miles westward to Corpus Christi. Continuing west, the channel extends about 8.5 miles through the harbor area before terminating at the Viola Turning Basin. The jetties are 11,190 and 8,610 ft long and extend into the Gulf from San Jose (formerly St. Josephs) and Mustang Islands, respectively, and stabilize the natural inlet of Aransas Pass. The stone dike on San Jose Island connects with the north jetty and extends 20,991 ft up the island. The La Quinta Channel extends from the basin and mooring facilities at Ingleside Point, which is about half-way between the Gulf of Mexico and Corpus Christi, about 5.7 miles to La Quinta.

The Corpus Christi Ship Channel – Channel Improvements Project initially began with 17 alternatives. These alternatives have been continually screened based on information developed from public outreach efforts and environmental, economic, and engineering studies. As of June 2001, the proposed alternatives include the following:

- Deepen the Corpus Christi Ship Channel from –45 ft mean low tide (MLT) to –52 ft MLT, plus advanced maintenance and allowable over-depth. No deepening of La Quinta Channel. Depths will be increased roughly 10,000 ft into the Gulf of Mexico to the –56-ft isobath.
- Widen the Corpus Christi Ship Channel from Port Aransas to the Harbor Bridge to 530 ft. (Existing widths are 500 ft between Port Aransas and La Quinta Junction and 400 ft between La Quinta Junction and the Harbor Bridge.)
- Extend the La Quinta Channel 7,200 ft at a depth of –40 ft MLT and a width of 300 ft and include a turning basin.
- Add 200-ft-wide barge shelves (-12 ft MLT) on both sides of the ship channel from La Quinta Junction to the Harbor Bridge. Shelf width measured from the toe of the widened and deepened ship channel. For most of the reach, no dredging would be required, only the addition of navigation aids.

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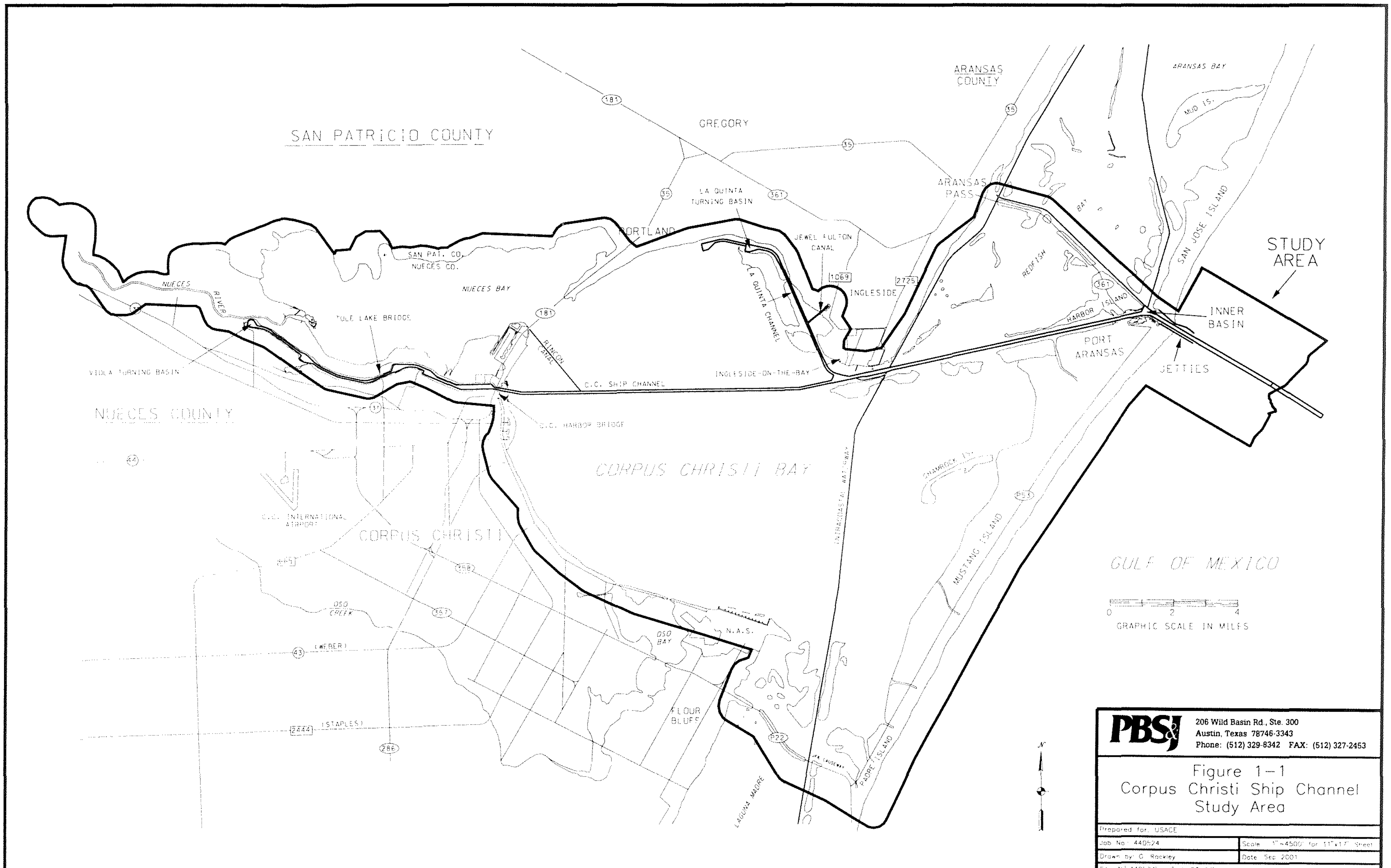

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Figure 1-1
Corpus Christi Ship Channel
Study Area

Prepared for: USACE
Job No.: 440524
Scale: 1"=4500' for 11"x17" Sheet
Drawn by: C. Rockley
Date: Sep 2001
File: N:\440524\cad\utm83_14\usace_study.dgn

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These alternatives have been screened and refined according to benefit-cost analyses, which take into account economic, construction, and environmental costs as compared to their benefits. The USACE and PCCA are prepared to have the Feasibility Study/EIS completed in 2002 to allow for project authorization by Congress in that year.

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2.0 IMPACT ASSESSMENT FOR LISTED SPECIES

To assess the potential impacts of the proposed project on endangered and threatened species, PBS&J personnel (1) conducted a literature review and searched for other scientific data to determine species distributions, habitat needs and other biological requirements; (2) interviewed recognized experts on the listed species, including local and regional authorities and Federal and State wildlife personnel; and (3) conducted an on-site inspection of the biological resources of the project area.

Significant literature sources consulted for this report include the FWS series on endangered species of the seacoast of the U.S. (National Fish and Wildlife Laboratories (NFWL), 1980), Federal status reports and recovery plans, and job reports of the Texas Parks and Wildlife Department (TPWD). A field survey of the project area was performed by PBS&J ecologists in August 2000.

2.1 SOUTH TEXAS AMBROSIA

South Texas ambrosia (*Ambrosia cheiranthifolia*), also known as south Texas ragweed, was Federally listed as endangered in August 1994 (50 CFR Part 17; 23 September 1994). Primary threats to the survival of this species include a low natural reproductive rate and destruction or disturbance of its habitat (FWS, 1987). Most of the deep clay soils occurring in south Texas that could support habitat for south Texas ambrosia have been converted into agricultural use. Known stands of this species occur in ROWs along highways and railways, where the species is subject to weed-control measures, including mowing and herbicide applications (Turner, 1983). In addition, introduced species such as buffalograss (*Cenchrus ciliaris*) and King Ranch bluestem (*Bothriochloa ischaemum* var. *songarica*) compete with south Texas ambrosia and other native plants.

South Texas ambrosia is known only from the southern tip of Texas and from Tamaulipas, Mexico (Correll and Johnston, 1970; Turner, 1983). It was first collected by J.L. Berlandier in San Fernando, Tamaulipas, Mexico, in 1835 (Turner, 1983), but it was not until 1859 that Gray described this species as new to science. Historically, south Texas ambrosia was known only from Kleberg, Nueces, Jim Wells, and Cameron counties in the U.S. and Tamaulipas in Mexico. Currently, the species occurs in Nueces, Kleberg, and Jim Wells counties (Poole et al., 2000). The status of the Mexican populations is unknown.

An erect, silvery to grayish-green, herbaceous perennial 4 to 12 inches tall, south Texas ambrosia is an inhabitant of open, clay-loam to sandy loam prairies and savannahs. It occurs in the Gulf coastal grassland in a vegetation type containing dominant shrubs typical of a local edaphic phase of the Tamaulipan brushland (e.g., species of acacia (*Acacia* spp.), Texas ebony (*Pithecellobium flexicaule*), and cenizo (*Leucophyllum frutescens*). Grasses typically occurring with south Texas ambrosia include perennials such as bluestems, paspalums (*Paspalum* spp.), and lovegrasses (*Eragrostis* spp.). South Texas ambrosia occurs in flat, deep, largely undisturbed clay soils or occasionally on wind-blown clay dunes along streams. Clay soils of extreme south Texas derived from the Beaumont clay series could be considered suitable for establishment of this species. Most known remnant populations are found along roadways, railways, and on disturbed sites (Lonard, 1987). South Texas ambrosia is difficult to detect because it is generally overtopped by grasses (Turner, 1983).

This species is not expected to occur in the project area due to the lack of suitable soils. No specimens of this species were encountered in the project area during PBS&J's field efforts and no impacts to this endangered plant are anticipated.

2.2 SLENDER RUSH-PEA

The slender rush-pea (*Hoffmanseggia tenella*) was Federally listed as endangered on 1 November 1985 (50 FR 45614) and is also listed by the State of Texas as endangered. The proposal to list the slender rush-pea as endangered used the correct spelling of the scientific name (*Hoffmanseggia tenella*) (49 FR 45884). The final rule for listing, however, used an incorrect spelling (*Hoffmannseggia tenella*) (40 FR 45614), which has been used in subsequent Federal and State documents. The slender rush-pea is known from only four populations in Kleberg and Nueces counties. It grows on calcareous, clayey soils in association with short and midgrasses such as buffalograss, Texas wintergrass (*Stipa leucotricha*), and Texas grama. Woody plants such as honey mesquite, huisache, huisachillo (*Acacia tortuosa*), granjeno, brasil (*Condalia hookeri*), retama, lotebush (*Zizyphus obtusifolia*), tasajillo (*Opuntia leptocaulis*), and pricklypear (*Opuntia* spp.) are also common at the known sites. The greatest threats to this species are conversion of coastal prairie habitat to other land uses, herbicide use, and competition from non-native grasses such as King Ranch bluestem, Kleberg bluestem (*Dichanthium annulatum*), and bermudagrass (*Cynodon dactylon*) (TPWD, 1997).

This species is unlikely to occur in the project area due to the lack of suitable soils and habitat. No impacts on the slender rush-pea are expected from this project.

2.3 KEMP'S RIDLEY SEA TURTLE

2.3.1 Reasons for Status

Kemp's ridley (*Lepidochelys kempii*) was listed as endangered throughout its range on 2 December 1970 (35 FR 18320). Populations of this species have declined since 1947, when an estimated 42,000 females nested in one day, to a total nesting population of approximately 1,000 in the mid-1980s. The decline of this species was primarily due to human activities including collection of eggs, fishing for juveniles and adults, killing adults for meat and other products, and direct take for indigenous use. In addition to these sources of mortality, Kemp's ridleys have been subject to high levels of incidental take by shrimp trawlers (FWS and NMFS, 1992; NMFS, 2000). The National Research Council's (NRC's) Committee on Sea Turtle Conservation estimated in 1990 that 86% of the human-caused deaths of juvenile and adult loggerheads and Kemp's ridleys resulted from shrimp trawling (Campbell, 1995). It is estimated that before the implementation of turtle excluder devices (TEDs) the commercial shrimp fleet killed between 500 and 5,000 Kemp's ridleys each year (NMFS, 2000). Kemp's ridleys have also been taken by pound nets, gill nets, hook and line, crab traps, and longlines.

Another problem shared by adult and juvenile sea turtles is the ingestion of manmade debris and garbage. Postmortem examinations of sea turtles found stranded on the south Texas coast from 1986 through 1988 revealed 54% (60 of the 111 examined) of the sea turtles had eaten some type of marine debris. Plastic materials were most frequently ingested and included pieces of plastic bags, styrofoam, plastic pellets, balloons, rope, and fishing line. Non-plastic debris such as glass, tar, and aluminum foil were also ingested by the sea turtles examined. Much of this debris comes from offshore oil rigs, cargo ships, commercial and recreational fishing boats, research vessels, naval ships, and other vessels operating in the Gulf of Mexico. Laws enacted during the late-1980s to regulate this dumping are difficult to enforce over vast expanses of water. In addition to trash, pollution from heavy spills of oil or waste products pose additional threats (Campbell, 1995).

Further threats to this species include collisions with boats, explosives used to remove oil rigs, and entrapment in coastal power plant intake pipes (Campbell, 1995). Dredging operations affect Kemp's ridley turtles through incidental take and by degrading the habitat. Incidental take of ridleys has been documented with hopper dredges, but not pipeline dredges. In addition to direct take, channelization of the inshore and nearshore areas can degrade foraging and migratory habitat through spoil dumping, degraded water quality/clarity and altered current flow (FWS and NMFS, 1992).

Sea turtles are especially subject to human impacts during the time the females come ashore for nesting. Modifications to nesting areas can have a devastating effect on sea turtle populations. In many cases, prime sea turtle nesting sites are also prime real estate. If a nesting site has been disturbed or destroyed, female turtles may nest in inferior locations where the hatchlings are less likely to survive, or they may not lay any eggs at all. Artificial lighting from developed beachfront areas often disorients nesting females and hatchling sea turtles, causing them to head inland by mistake, often with fatal results. Adult females also may avoid brightly lit areas that would otherwise provide suitable nesting sites (FWS, 1998).

Today, under strict protection, the population appears to be in the early stages of recovery. Approximately 6,000 Kemp's ridley nests were recorded on Mexican beaches during the 2000 nesting season (Shaver, 2000). The increase likely can be attributed to two primary factors: full protection of nesting females and their nests in Mexico, and the requirement to use TEDs in shrimp trawlers both in the U.S. and in Mexico (NMFS, 2000).

2.3.2 Habitat

Kemp's ridleys inhabit shallow coastal and estuarine waters, usually over sand or mud bottoms. Along the Texas coast, the following stranding information was recorded for Kemp's ridleys: 100 strandings in 2000, 115 strandings in 2001, and 93 strandings through September 2002 (Shaver, 2002). Adults are primarily shallow-water benthic feeders that specialize on crabs, especially portunid crabs, while juveniles feed on sargassum (*Sargassum* sp.) and associated infauna, and other epipelagic species of the Gulf of Mexico (FWS and NMFS, 1992). In some regions the blue crab (*Callinectes sapidus*) is the most common food item of adults and juveniles. Other food items include shrimp, snails, bivalves, sea urchins, jellyfish, sea stars, fish, and occasional marine plants (Pritchard and Marquez, 1973; Shaver, 1991; Campbell, 1995).

2.3.3 Range

Adults are primarily restricted to the Gulf of Mexico, although juveniles may range throughout the Atlantic Ocean since they have been observed as far north as Nova Scotia (Musick, 1979) and in coastal waters of Europe (Brongersma, 1972). Important foraging areas include Campeche Bay, Mexico, and Louisiana coastal waters.

Almost the entire population of Kemp's ridleys nests on an 11-mile stretch of coastline near Rancho Nuevo, Tamaulipas, Mexico, some 190 miles south of the Rio Grande. A secondary nesting area occurs at Tuxpan, Veracruz, and sporadic nesting has been reported from Mustang Island, Texas, southward to Isla Aquada, Campeche. There have been several isolated nesting attempts scattered from North Carolina to Colombia.

Because of the dangerous population decline at the time, a head-starting program was carried out from 1978 to 1988. Eggs were collected from Rancho Nuevo and placed into polystyrene foam boxes containing Padre Island sand so that the eggs never touched the Ranch Nuevo sand. The eggs were flown to the U.S. and placed in a hatchery on Padre Island and incubated. The resulting hatchlings were allowed to crawl over the Padre Island beaches into the surf for imprinting purposes before being recovered from the surf and taken to Galveston for rearing. They were fed a diet of high-protein commercial floating pellets for 7 to 15 months before being released into Texas (mainly) or Florida waters (Caillouet et al., 1995). This program has shown some results. The first nesting from one of these head-started individuals occurred at Padre Island in 1996, and more nestings have occurred since (Shaver, 2000).

2.3.4 Distribution in Texas

Kemp's ridley occurs in Texas in small numbers and in many cases may well be in transit between crustacean-rich feeding areas in the northern Gulf of Mexico and breeding grounds in Mexico. It has nested sporadically in Texas in the last 50 years. Nests were found near Yarborough Pass in 1948 and 1950, and in 1960 a single nest was located at Port Aransas. The number of nestings, however, has increased in recent years. In 1999, 16 confirmed Kemp's ridley nests were recorded in Texas and 12 nests were confirmed for 2000 (Shaver, 2000). Eight Kemp's ridley nests were found on the Texas coast in 2001, and 38 nests were found in 2002 (Shaver, 2002). Several of the ridley nests were from head-started individuals. Such nestings, together with the proximity of the Rancho Nuevo rookery, probably accounts for the occurrence of hatchlings and subadults in Texas. According to Hildebrand (1982, 1986, 1987), sporadic ridley nesting in Texas has always been the case. This is in direct contradiction, however, to Lund (1974), who believed that Padre Island historically supported large numbers of nesting Kemp's ridleys, but that the population became extirpated because of excessive egg collection.

2.3.5 Presence in the Project Area

Kemp's ridley has been recorded from Nueces County (Dixon, 2000) and from Corpus Christi Bay (Shaver, 2000). Thus, it is of potential occurrence in the project area.

2.3.6 Effects of the Project

If it occurs in the project area, Kemp's ridley could be negatively impacted by dredging activities during construction or by maintenance activities after construction. This species could be attracted to feeding opportunities at the proposed jetties, where it would be exposed to additional risks from boat traffic, contaminants, fishing activities, tangled fishing lines, and accumulated plastic detritus.

However, project impacts are temporary and local in nature. A pipeline dredge will be used in the bay and a hopper dredge will be used in the entrance channel. Sea turtles easily avoid pipeline dredges due to the slow movement of the dredge. Incidental take of sea turtles by hopper dredges is reduced by using draghead deflectors and scheduling offshore dredging during the winter months when sea turtles are most likely to be elsewhere in warmer waters. Also, an agreement between NMFS and USACE is in place and implemented regarding take of sea turtles with hopper dredges and the use of observers to document incidental take to ensure that significant impacts do not occur. Therefore, no significant adverse impacts are expected to sea turtles.

2.4 GREEN SEA TURTLE

2.4.1 Reasons for Status

The green turtle (*Chelonia mydas*) was listed on 28 July 1978 as threatened except for Florida and the Pacific coast of Mexico (including the Gulf of California) where it was listed as endangered (43 FR 32808). The greatest cause of decline in green turtle populations is commercial harvest for eggs and food. Other turtle parts are used for leather and jewelry, and small turtles are sometimes stuffed for curios. Incidental catch during commercial shrimp trawling is a continued source of mortality that adversely affects recovery. It is estimated that before the implementation of TED requirements, the offshore commercial shrimp fleet captured about 925 green turtles a year, of which approximately 225 would die. Most turtles killed are juveniles and subadults. Various other fishing operations also negatively impact this species (NMFS, 2000). Epidemic outbreaks of fibropapilloma or "tumor" infections recently have occurred on green sea turtles, especially in Hawaii and Florida, posing a severe threat. The cause of these outbreaks is largely unknown, but it could be caused by a viral infection (Barrett, 1996). Some scientists suspect this disease to be linked to environmental alteration of sea turtle habitat by pollution and contaminants (FWS, 1998). This species is also subject to various negative impacts shared by sea turtles in general.

2.4.2 Habitat

The green turtle primarily utilizes shallow habitats such as lagoons, bays, inlets, shoals, estuaries, and other areas with an abundance of marine algae and seagrasses. Individuals observed in the open ocean are believed to be migrants en route to feeding grounds or nesting beaches (Meylan, 1982). Hatchlings often float in masses of sea plants (e.g., Sargassum) in convergence zones. Coral reefs and rocky outcrops near feeding pastures often are used as resting areas. The adults are primarily herbivorous, while the juveniles consume more invertebrates. Foods consumed include seagrasses, macroalgae and other marine plants, molluscs, sponges crustaceans, and jellyfish (Mortimer, 1982; Green, unpubl. data).

Terrestrial habitat is typically limited to nesting activities, although in some areas, such as Hawaii and the Galápagos Islands, they will bask on beaches (Balazs, 1980; Green, unpubl. data). They prefer high energy beaches with deep sand, which may be coarse to fine, with little organic content. At least in some regions, they generally nest consistently at the same beach, which is apparently their natal beach (Meylan et al.,1990; Allard et al., 1994), although an individual might switch to a different nesting beach within a single nesting season (Green, unpubl. data).

2.4.3 Range

The green turtle is a circumglobal species in tropical and sub-tropical waters. In U.S. Atlantic waters, it is found around the U.S. Virgin Islands, Puerto Rico, and continental U.S. from Massachusetts to Texas. Major nesting activity occurs on Ascension Island, Aves Island (Venezuela), Costa Rica, and in Surinam. Relatively small numbers nest in Florida, with even smaller numbers in Georgia, North Carolina, and Texas (NMFS and FWS, 1991a; Hirth, 1997).

2.4.4 Distribution in Texas

The green turtle in Texas inhabits shallow bays and estuaries where its principal foods, the various marine grasses, grow (Bartlett and Bartlett, 1999). Its population in Texas has suffered a decline similar to that of its world population. In the mid- to late-nineteenth century, Texas waters supported a green turtle fishery. Most of the turtles were caught in Matagorda Bay, Aransas Bay, and the lower Laguna Madre, although a few also came from Galveston Bay. Many live turtles were shipped to places such as New Orleans or New York and from there to other areas. Others were processed into canned products such as meat or soup prior to shipment. By 1900, however, the fishery had virtually ceased to exist. Turtles continued to be hunted sporadically for a while, the last Texas turtler hanging up his nets in 1935. Incidental catches by fisherman and shrimpers were sometimes marked prior to 1963, when it became illegal to do so (Hildebrand, 1982).

Green turtles can still be found in these same bays today but in much-reduced numbers (Hildebrand, 1982). While green turtles prefer to inhabit bays with seagrass meadows, they may also be found in bays that are devoid of seagrasses. The green turtles in these Texas bays are mainly small juveniles. Adults, juveniles, and even hatchlings are occasionally caught on trotlines or by offshore shrimpers or are washed ashore in a moribund condition. Along the Texas coast, the following stranding information was recorded for green sea turtles: 90 strandings in 2000, 73 strandings in 2001, and 42 strandings through September 2002 (Shaver, 2002).

Green sea turtle nests are rare in Texas. Two green sea turtle nests were recorded in Texas in 2002. No green sea turtle nests were found on the Texas coast in 2001. A single nest occurred in 2000; no green sea turtle nests were recorded in 1999. In comparison, eight Kemp's ridley and three loggerhead nests were recorded in 2001 and 38 Kemp's ridley and one loggerhead nest were recorded in 2002 (Shaver, 2002). Green turtles, however, nest in Florida and in Mexico. Since long migrations of green turtles from their nesting beaches to distant feedings grounds are well documented (Meylan, 1982; Green, 1984), the adult green turtles occurring in Texas may either be at their feeding grounds or in the process of migrating to or from their nesting beaches. The juveniles frequenting the seagrass meadows of the bay areas may remain there until such time as they move to other feeding grounds or, perhaps, once having attained sexual maturity, return to their natal beaches outside of Texas to nest.

2.4.5 Presence in the Project Area

The green turtle has been recorded from Nueces County (Dixon, 2000) and has been recorded from Corpus Christi Bay (Shaver, 2000). It is of potential occurrence in the project area.

2.4.6 Effects of the Project

The green turtle, should it occur in the project area, could be negatively impacted by dredging activities during construction or by maintenance activities after construction. This species could be attracted to feeding opportunities at the proposed jetties and channel, where it would be exposed to additional risks from boat traffic, contaminants, fishing activities, tangled fishing lines, and accumulated plastic detritus. The channel might facilitate passage by the turtles between the open Gulf of Mexico and feeding areas in the seagrass beds of the Laguna Madre. It is not known what the long-range impacts the proposed project might have upon these seagrass beds related to salinity changes, tidal flow, scouring, increased boat activity, pollution, and dredging activities.

However, project impacts are temporary and local in nature. A pipeline dredge will be used in the bay and a hopper dredge will be used in the entrance channel. Sea turtles easily avoid pipeline dredges due to the slow movement of the dredge. Incidental take of sea turtles by hopper dredges is reduced by using draghead deflectors and scheduling offshore dredging during the winter months when sea turtles are most likely to be elsewhere in warmer waters. Also, an agreement between NMFS and USACE is in place and implemented regarding take of sea turtles with hopper dredges and the use of observers to document incidental take to ensure that significant impacts do not occur. Therefore, no significant adverse impacts are expected to sea turtles.

2.5 LOGGERHEAD SEA TURTLE

2.5.1 Reasons for Status

The loggerhead turtle (*Caretta caretta*) was listed as threatened throughout its range on 28 July 1978 (43 FR 32808). The decline of the loggerhead, like that of most sea turtles, can be attributed to overexploitation by man, inadvertent mortality associated with fishing and trawling activities, and natural predatation. The most significant threats to its population are coastal development, commercial fisheries, and pollution (NMFS, 2000).

2.5.2 Habitat

The loggerhead is found in the open seas as far as 500 miles from shore, but mainly over the continental shelf, and in bays, estuaries, lagoons, creeks, and mouths of rivers. It favors warm temperate and sub-tropical regions not far from shorelines. The adults occupy various habitats, from turbid bays to clear waters of reefs. Subadults occur mainly in nearshore and estuarine waters. Hatchlings move directly to sea after hatching, and often float in masses of sargassum. They may remain associated with sargassum for perhaps 3 to 5 years (NMFS and FWS, 1991b).

Commensurate with their use of varied habitats, loggerheads consume a wide variety of both benthic and pelagic food items, which they crush before swallowing. Conches, shellfish, horseshoe crabs, prawns and other crustacea, squid, sponges, jellyfish, basket starts, fish (carrion or slow-moving species), and even hatchling loggerheads have all been recorded as loggerhead prey (Rebel, 1974; Hughes, 1974; Mortimer, 1982). Adults forage primarily on the bottom, but also take jellyfish from the surface. The young feed on prey concentrated at the surface, such as gastropods, fragments of crustaceans, and sargassum.

Nesting occurs usually on open sandy beaches above high-tide mark and seaward of well developed dunes. They nest primarily on high-energy beaches on barrier islands adjacent to continental land masses in warm-temperate and sub-tropical regions. Steeply sloped beaches with gradually sloped offshore approaches are favored. In Florida, nesting on urban beaches was strongly correlated with the presence of tall objects (trees or buildings), which apparently shield the beach from city lights (Salmon et al., 1995).

2.5.3 Range

The loggerhead is widely distributed in tropical and subtropical seas, being found in the Atlantic Ocean from Nova Scotia to Argentina, Gulf of Mexico, Indian and Pacific oceans (although it is rare in the eastern and central Pacific) and the Mediterranean Sea (Rebel, 1974; Ross, 1982; Iverson, 1986). In the continental U.S., loggerheads nest along the Atlantic coast from Florida to as far north as New Jersey (Musick, 1979) and sporadically along the Gulf coast. In recent years a few have nested on barrier islands along the Texas coast.

2.5.4 Distribution in Texas

The loggerhead is considered to be the most abundant turtle in Texas marine waters, preferring shallow inner continental shelf waters and occurring only very infrequently in the bays. It is also the species most commonly sighted around offshore oil rig platforms and reefs and jetties. Loggerheads are probably present year-round but are most noticeable in the spring when one of their food items, the Portuguese Man-of-War, is abundant. Loggerheads constitute a major portion of the dead or moribund turtles washed ashore (stranded) on the Texas coast each year. The latest stranding information for loggerheads include 163 strandings in 2000, 165 strandings in 2001, and 101 strandings through September 2002 (Shaver, 2002). A large proportion of these deaths is due to the activities of shrimp trawlers where turtles are accidentally caught in the nets and drown and their bodies dumped overboard. Prior to 1977, no positive documentation of loggerhead nests in Texas existed (Hildebrand, 1982). Since that time, several nests have been recorded along the Texas coast. In 1999, two loggerhead nests were confirmed in Texas, while in 2000, five loggerhead nests were confirmed (Shaver, 2000). Like the worldwide population, the population of loggerheads in Texas has declined. Three loggerhead nests were found on the Texas coast in 2001, and one nest was found in 2002 (Shaver, 2002). Prior to World War I, the species was taken in Texas for local consumption and a few were marketed (Hildebrand, 1982). Today, even without protection, insufficient loggerheads exist to support a fishery.

2.5.5 Presence in the Project Area

The loggerhead has been recorded in Nueces County (Dixon, 2000) and from Corpus Christi Bay (Shaver, 2000). It is of potential occurrence in the project area.

2.5.6 Effects of the Project

The loggerhead, if it occurs in the project area, could be negatively impacted by dredging activities during construction or by maintenance activities after construction. This species could be attracted to feeding opportunities at the proposed jetties and channel, where it would be exposed to additional risks from boat traffic, contaminants, fishing activities, tangled fishing lines, and accumulated plastic detritus.

However, project impacts are temporary and local in nature. A pipeline dredge will be used in the bay and a hopper dredge will be used in the entrance channel. Sea turtles easily avoid pipeline dredges due to the slow movement of the dredge. Incidental take of sea turtles by hopper dredges is reduced by using draghead deflectors and scheduling offshore dredging during the winter months when sea turtles are most likely to be elsewhere in warmer waters. Also, an agreement between NMFS and USACE is in place and implemented regarding take of sea turtles with hopper dredges and the use of observers to document incidental take to ensure that significant impacts do not occur. Therefore, no significant adverse impacts are expected to sea turtles.

2.6 HAWKSBILL SEA TURTLE

2.6.1 Reasons for Status

The hawksbill turtle (*Eretmochelys imbricata*) was Federally listed as endangered on 2 June 1970 (35 FR 8495) with critical habitat designated in Puerto Rico on 24 May 1978 (43 FR 22224). The greatest threat to this species is harvest to supply the market for tortoiseshell and stuffed turtle curios (Meylan and Donnelly, 1999). Hawksbill shell (bekko) commands high prices (recently $225/kilogram (kg)). Japanese imports of raw bekko between 1970 and 1989 totaled 713,850 kg, representing more than 670,000 turtles. The hawksbill is also used in the manufacture of leather, oil, perfume, and cosmetics (NMFS, 2000).

2.6.2 Habitat

Hawksbills generally inhabit coastal reefs, bays, rocky areas, passes, estuaries, and lagoons, where they are typically found at depths of less than 70 ft. Like some other sea turtle species, hatchlings are sometimes found floating in masses of marine plants (e.g., sargassum rafts) in the open ocean (NFWL, 1980). Hawksbills reenter coastal waters when they reach a carapace length of approximately 20 to 25 centimeters. Coral reefs are widely recognized as the resident foraging habitat of juveniles, subadults, and adults. This habitat association is undoubtedly related to their diet of sponges, which need solid substrate for attachment. Hawksbills are also found around rocky outcrops and high-energy shoals, which are also optimum sites for sponge growth. In Texas, juvenile hawksbills are associated with stone jetties (NMFS, 2000).

While this species is omnivorous, it prefers invertebrates, especially encrusting organisms, such as sponges, tunicates, bryozoans, mollusks, corals, barnacles, and sea urchins. Pelagic species consumed include jellyfish and fish, and plant material such as algae, sea grasses and mangroves, has also been reported as food items for this turtle (Carr, 1952; Rebel, 1974; Pritchard, 1977; Musick, 1979; Mortimer, 1982). The young are reported to be somewhat more herbivorous than the adults (Ernst and Barbour, 1972).

Terrestrial habitat is typically limited to nesting activities. They nest on undisturbed, deep-sand beaches, from high-energy ocean beaches to tiny pocket beaches several meters wide bounded by crevices of cliff walls. Typically, the sand beaches are low energy, with woody vegetation, such as sea grape (*Coccoloba uvifera*), near the waterline (NRC, 1990). The hawksbill is typically a solitary nester, which makes it harder to monitor nesting activity and success (NMFS, 2000).

2.6.3 Range

The hawksbill is circumtropical, occurring in tropical and subtropical seas of the Atlantic, Pacific, and Indian oceans (Witzell, 1983). This species is probably the most tropical of all marine turtles, although it does occur in many temperate regions. The hawksbill turtle is widely distributed in the Caribbean Sea and western Atlantic Ocean, with representatives of at least some life history stages regularly occurring in southern Florida and the northern Gulf of Mexico (especially Texas), south to Brazil (NMFS, 2000). In the continental U.S., the hawksbill nests only in Florida where it is sporadic at best (NFWL, 1980). However, a major nesting beach exists on Mona Island, Puerto Rico. Elsewhere in the western Atlantic, hawksbills nest in small numbers along the Gulf coast of Mexico, the West Indies, and along the Caribbean coasts of Central and South America (Musick, 1979).

2.6.4 Distribution in Texas

Texas is the only state outside of Florida where hawksbills are sighted with any regularity. Most of these sightings involve posthatchlings and juveniles, and are primarily associated with stone jetties. These small turtles are believed to originate from nesting beaches in Mexico (NMFS, 2000). Along the Texas coast, the following stranding information was recorded for hawksbills: 28 strandings in 2000, 30 strandings in 2001, and 45 strandings through September 2002 (Shaver, 2002).

2.6.5 Presence in the Project Area

The hawksbill has been recorded from Nueces County (Dixon, 2000) and from Corpus Christi Bay (Shaver, 2000). It is of potential, though unlikely, occurrence in the area to be dredged.

2.6.6 Effects of the Project

Because most of the sightings of the hawksbill sea turtle in the northern Gulf of Mexico occur at stone jetties, this species could occur near the jetties and bulkheads. If it occurs in the project area, it could be negatively impacted by dredging activities during construction or by maintenance activities after construction. This species could be attracted to feeding opportunities at the proposed jetties and channel, where it would be exposed to additional risks from boat traffic, contaminants, fishing activities, tangled fishing lines, and accumulated plastic detritus.

However, project impacts are temporary and local in nature. A pipeline dredge will be used in the bay and a hopper dredge will be used in the entrance channel. Sea turtles easily avoid pipeline dredges due to the slow movement of the dredge. Incidental take of sea turtles by hopper dredges is reduced by using draghead deflectors and scheduling offshore dredging during the winter months when sea turtles are most likely to be elsewhere in warmer waters. Also, an agreement between NMFS and USACE is in place and implemented regarding take of sea turtles with hopper dredges and the use of observers to document incidental take to ensure that significant impacts do not occur. Therefore, no significant adverse impacts are expected to sea turtles.

2.7 LEATHERBACK SEA TURTLE

2.7.1 Reasons for Status

The leatherback turtle (*Dermochelys coriacea*) was listed as endangered throughout its range on 2 June 1970 (35 FR 8495), with critical habitat designated in the U.S. Virgin Islands on 26 September 1978 and 23 March 1979 (43 FR 43688/43689 and 44 FR 17710/17712, respectively). Its decline is attributable to overexploitation by man and incidental mortality associated with commercial shrimping and fishing activities. Use of turtle meat for fish bait and the consumption of litter by turtles have also been mentioned as causes for mortality, the latter phenomenon apparently occurring when plastic is mistaken for jellyfish (Rebel, 1974). While nesting populations of leatherback sea turtles are especially difficult to discern because the females frequently change nesting beaches, current estimates are that 20,000 to 30,000 female leatherbacks exist worldwide. The major threat is egg collecting, although they are jeopardized to some extent by destruction or degradation of nesting habitat (NatureServe, 2000). Egg collecting is not currently a problem in Florida, but remains a problem in Puerto Rico and the U.S. Virgin Islands (NMFS and FWS, 1992). This species is probably more susceptible than other turtles to drowning in shrimp trawlers equipped with TEDs because adult leatherbacks are too large to pass through the TED exit opening. Because leatherbacks nest in the tropics during hurricane season, a potential exists for storm-generated waves and wind to erode nesting beaches, resulting in nest loss (NMFS and FWS, 1992).

2.7.2 Habitat

The leatherback turtle is mainly pelagic, inhabiting the open ocean, and seldom approaches land except for nesting (Eckert, 1992). It is most often found in coastal waters only when nesting or when following concentrations of jellyfish (TPWD, 2000), when it can be found in inshore waters, bays, and estuaries. It dives almost continuously, often to great depths.

Despite their large size, the diet of leatherbacks consists largely of jellyfish and sea squirts. They also consume sea urchins, squid, crustaceans, fish, blue-green algae, and floating seaweed (NFWL, 1980). The leatherback typically nests on beaches with a deepwater approach (Pritchard, 1971).

2.7.3 Range

The leatherback is probably the most wide-ranging of all sea turtle species. It is found in the Atlantic, Pacific and Indian oceans; as far north as British Columbia, Newfoundland, Great Britain and Norway; as far south as Australia, Cape of Good Hope, and Argentina; and in other water bodies such as the Mediterranean Sea (NFWL, 1980). Leatherbacks nest primarily in tropical regions; major nesting beaches include Malaysia, Mexico, French Guiana, Surinam, Costa Rica, and Trinidad (Ross, 1982). Leatherbacks nest only sporadically in some of the Atlantic and Gulf states of the continental U.S., with one nesting reported as far north as North Carolina (Schwartz, 1976). In the Atlantic and Caribbean, the largest nesting assemblages are found in the U.S. Virgin Islands, Puerto Rico, and Florida (NMFS, 2000).

The leatherback migrates further and ventures into colder water than any other marine reptile. Adults appear to engage in routine migrations between boreal, temperate, and tropical waters, presumably to optimize both foraging and nesting opportunities. The longest-known movement is that of an adult female that traveled 5,900 km to Ghana, West Africa, after nesting in Surinam (NMFS and FWS, 1992). During the summer, leatherbacks tend to be found along the east coast of the U.S. from the Gulf of Maine south to the middle of Florida.

2.7.4 Distribution in Texas

Apart from occasional feeding aggregations such as the large one of 100 animals reported by Leary (1957) off Port Aransas in December 1956, or possible concentrations in the Brownsville Eddy in winter (Hildebrand, 1983), leatherbacks are rare along the Texas coast, tending to keep to deeper offshore waters where their primary food source, jellyfish, occurs. In the Gulf of Mexico the leatherback is often associated with two species of jellyfish: the cabbagehead (*Stomolophus* sp.) and the moon jellyfish (*Aurelia* sp.) (NMFS and FWS, 1992). According to FWS (1981), leatherbacks never have been common in Texas waters. No nests of this species have been recorded for at least 60 years. The last two, one from the late 1920s and one from the mid-1930s, were both from Padre Island (Hildebrand, 1982, 1986). Along the Texas coast, the following stranding information was recorded for leatherbacks: 14 strandings in 2000, 6 strandings in 2001, and 17 strandings through September 2002 (Shaver, 2002).

2.7.5 Presence in the Project Area

While the leatherback has been recorded from Nueces County (Dixon, 2000), it is unlikely to occur in the project area.

2.7.6 Effects of the Project

Of the five species of sea turtles occurring in Texas waters, the leatherback is the species least likely to be affected by the proposed project because of its rare occurrence and pelagic nature.

However, project impacts are temporary and local in nature. A pipeline dredge will be used in the bay and a hopper dredge will be used in the entrance channel. Sea turtles easily avoid pipeline dredges due to the slow movement of the dredge. Incidental take of sea turtles by hopper dredges is reduced by using draghead deflectors and scheduling offshore dredging during the winter months when sea turtles are most likely to be elsewhere in warmer waters. Also, an agreement between NMFS and USACE is in place and implemented regarding take of sea turtles with hopper dredges and the use of observers to document incidental take to ensure that significant impacts do not occur. Therefore, no significant adverse impacts are expected to sea turtles.

2.8 BROWN PELICAN

2.8.1 Reasons for Status

The brown pelican (*Pelecanus occidentalis*) was listed as endangered throughout its foreign range on 2 June 1970 (35 FR 8495) and throughout its U.S. range on 13 October 1970 (35 FR 16047). Population declines were attributed largely to chlorinated hydrocarbon residues from the use of pesticides, such as DDT compounds (DDE, DDD and DDT), polychlorinated biphenyls (PCBs), dieldrin, and endrin which caused eggshell thinning; thus eggs became dessiccated and were more easily broken during incubation (NFWL, 1980). Other factors included human disturbance and loss of habitat due to commercial and residential development (FWS, 1995). Pelicans are large, heavy birds and easily flushed from the nest. Flushing exposes the eggs and young to predation, temperature stress and permanent abandonment by the parents.

A ban on the use of DDT in the U.S. in 1972, together with efforts to conserve and improve remaining populations, has led to increased numbers of brown pelicans. Populations in some areas have increased to historical breeding levels or above, with stable population numbers and productivity. The brown pelican has been delisted along the U.S. Atlantic coast and, in Florida and Alabama, along the Gulf coast. It remains endangered throughout the rest of its range, which includes Mississippi, Louisiana, Texas, California, Mexico, Central and South America, and the West Indies. In May 1998, the FWS announced its intention to either delist or downlist to threatened status numerous species, including the brown pelican (63 FR 25502-25512; 8 May 1998).

2.8.2 Habitat

Brown pelicans inhabit shallow coastal waters with water depths up to 80 ft (Palmer, 1962; NFWL, 1980; Fritts et al., 1983). They are rarely found inland and do not venture more than 20 miles out to sea except to take advantage of particularly good feeding situations (FWS, 1980). Distances of 61 miles from shore have been recorded (Fritts et al., 1983). Brown pelicans, which are colonial nesters, usually nest on undisturbed offshore islands in small bushes and trees, including mangroves, and in humid forests (NFWL, 1980; Guzman and Schreiber, 1987). Occasionally they nest on the ground. Preferred sites are those free from human disturbance, flooding and terrestrial predators such as raccoons. Brown pelicans utilize beaches, sandbars, sandspits, mudflats and even manmade structures such as piers, wharves, pilings, oil/gas platforms, and docks for loafing (NFWL, 1980).

2.8.3 Range

The brown pelican occurs along the Pacific coast of the Americas from southern British Columbia south to Cape Horn, and throughout the Atlantic, Gulf and Caribbean coastal areas from New Jersey south to eastern Venezuela. In North America, it occasionally ventures inland north to North Dakota, Ontario and Nova Scotia. Its breeding range is more restricted: along the Pacific coast from central California south to Chile, including the Galápagos Islands; and from North Carolina, south to eastern Venezuela, the West Indies, Greater Antilles, and Virgin Islands (American Ornithologists' Union (AOU), 1998).

In North America, two subspecies are recognized: the eastern brown pelican (*P. o. carolinensis*) ranging from North Carolina south through Florida and west to Texas, and the California brown pelican (*P. o. californicus*) in California (NFWL, 1980). For the eastern subspecies, the present range is the same as the historical one, but in reduced numbers. It became extirpated in Louisiana in 1966, but has since (beginning in 1968) been reintroduced from Florida. It has never been known to nest in Mississippi or Georgia (FWS, 1980; 50 FR 4938, 9 February 1985). Brown pelican colonies are known to occur on the east coast of Mexico off the eastern tip of the Yucatan Peninsula (Mabie, 1986, 1988).

While some migration occurs after nesting in both subspecies, many individuals overwinter close to their breeding grounds (FWS, 1980). Atlantic coast populations move southward in the fall, with most birds wintering in the U.S., particularly in Florida. Some birds, however, disperse to the Cuban coast (Clapp et al., 1982). Gulf coast birds tend to remain on the Gulf coast, although Texas and Louisiana birds have been recovered in Mexico and Cuba (Palmer, 1962; Clapp et al., 1982).

2.8.4 Distribution in Texas

Historically, the brown pelican was a common bird of the Texas Gulf coast with an estimated breeding population of 5,000 pairs residing in 17 colonies in 1918 (Mabie, 1990). By the 1960s, however, it was almost extirpated. In 1963, only 14 breeding pairs were recorded along the Texas coast; in 1964 no known nesting occurred (Mabie, 1986). The decline started during the 1920s and 1930s due to human disturbance (Oberholser, 1974), but has continued due to pesticide contamination (King et al., 1977; Mabie, 1986). Since the 1960s, the brown pelican has made a gradual comeback in Texas with an estimated 2,400 breeding pairs in 1995 (Campbell, 1995). Most of the breeding birds are found on Pelican Island in Corpus Christi Bay, Nueces County, and Sundown Island near Port O'Connor in Matagorda County. Smaller groups or colonies occasionally nest on Bird Island in Matagorda Bay, a series of older dredged material islands in West Matagorda Bay, Dressing Point Island in East Matagorda Bay, and islands in Aransas Bay (Campbell, 1995). No nesting sites are known from the lower Texas Coast. Although brown pelican colonies are not monitored every year, 1,100 pairs nested on Pelican Island in 2000, while on Sundown Island, 698 pairs nested in 2000 and 1,200 pairs nested in 1999 (FWS, 2000b).

2.8.5 Presence in the Project Area

In Texas, the brown pelican occurs from Chambers County to Cameron County (Campbell, 1995) and primarily along the lower and middle coasts. Occasional sightings are reported on the upper coast and inland to central, north-central, and eastern Texas (Texas Ornithological Society (TOS), 1995), usually on large freshwater lakes. Such occurrences are relatively uncommon. Pelican Island, a known nesting area for brown pelicans, is located in Corpus Christi Bay within the proposed project area.

2.8.6 Effects of the Project

This species is expected to forage in the project area or general vicinity. An active nesting colony occurs on Pelican Island within the proposed project area. A beneficial use site (BU Site Pelican) is proposed and located adjacent to and south of the channel, on the east side and south of Pelican Island. In the past, dredged maintenance materials have been placed on the south side of the island after coordination with the National Audubon Society (NAS) and allowed to flow out into the open water as a part of the ongoing rookery island enhancement, and this practice will continue. Rock revetment (1,500 ft) was placed on the northeast corner of the island in 1984 to protect that part of the island from erosion, but is has since been lost over the years to erosion flanking the rock.

There is a potential for young pelicans not fully fledged to be washing into the channel by large waves on the north side of the island if they wander around from the back side of the island or fall over the edge of the 10-ft bluff overlooking the beach. The USFWS and NAS have requested the USACE to armor the northeast corner of the island again to prevent erosion, but to pull the armoring away from the bluff and put it onto the beach or in the water. Additional requests include coordination with the USFWS and NAS on the location for placing dredged maintenance material and to delete and plans for fencing on the bluff to prevent young pelicans from falling over the edge.

The USACE will coordinate with the USFWS and NAS on the location and design of the armoring system during the design phase of the project. The USACE will determine the engineering feasibility of several armoring designs and the foundation conditions that could limit the armoring locations and present these to the USFWS. Also, the USACE will continue to coordinate the dredged material disposal locations on the island with the USFWS and NAS prior to disposal as it has in the past. Fencing will not be considered as a protection option for pelicans.

In addition to armoring the northeast corner of the island, approximately 2,200 linear ft of hydraulically filled embankment, protected by geotube and riprap, will extend bayward from the east end of the island. The purpose of this hydraulically filled embankment is to contain the dredged maintenance material flowing off the south side of the island to maintain an open-water channel between Pelican and Mustang Islands, thereby preventing land bridge access to Pelican Island from Mustang Island by predators. This embankment will also protect the island from shoreline erosion. This embankment alternative will be coordinated with the USFWS during the design phase, as well. Based on this analysis, the project is expected to have a beneficial impact on this endangered species.

2.9 BALD EAGLE

2.9.1 Reasons for Status

The bald eagle (*Haliaeetus leucocephalus*) was first granted legal protection with the Eagle Protection Act, passed on 8 June 1940 and amended 23 October 1972. The species was listed as endangered below the 40th parallel on 11 March 1967 (32 FR 4001) and later received protection under the Endangered Species Act of 1973. The legal status of the species was changed on 14 February 1978 (43 FR 6233) to endangered in the conterminous U.S. except for Washington, Oregon, Minnesota, Wisconsin, and Michigan, where it was designated as threatened (FWS, 1984). The bald eagle recovered sufficiently to be downlisted to threatened throughout its range and FWS has proposed to completely delist the species in the near future (64 FR 36453-36464; 6 July 1999).

Several factors have contributed to the decline of the bald eagle since the settling of North America. The primary factor in direct loss is shooting (Snow, 1981). Mortality through shooting, however, is on the decline. Between 1975 and 1981, 18% of the total reported mortalities were due to shooting, compared to 62% between 1961 and 1965 (FWS, 1984).

Historically, increase in human population has resulted in extensive alterations in land use. Because the eagles nest near water, increased recreation and other human use of water resources have had negative effects on the bald eagle. The greater use of boats, off-road vehicles, and snowmobiles, and increased development of waterfront property have severely altered eagle habitat (Snow, 1981). New wintering and non-nesting habitat, however, is now being created by the construction of reservoirs, which may also be used more in the future by nesting eagles, potentially resulting in a major redistribution of nesting (FWS, 1984).

Environmental contaminants are responsible for the greatest decline in eagle populations. Organochloride pesticides inhibit calcium metabolism, resulting in thin eggshells and, thus, reproductive failure. Since the use of DDT and other organochloride pesticides was banned in the U.S., the eagles have slowly recovered. Most populations of bald eagles appear to be producing young at a normal rate (FWS, 1984).

2.9.2 Habitat

The bald eagle inhabits coastal areas, rivers and large bodies of water. Water is the common feature of its nesting habitat (Green, 1985). Because fish and waterfowl comprise the bulk of the bald eagle's diet, nests of the species are seldom far from a river, lake, bay, or other water body. Nests are generally built in trees, and usually positioned so that a clear flight path exists to at least one side of the nest as well as providing excellent visibility, often with an unobstructed view of water. Nest trees may be in woodlands, woodland edges, or open areas, and are frequently the dominant or co-dominant trees in the area (Green, 1985). Nests on cliffs and rock pinnacles have been reported in parts of the U.S.; nests on manmade structures are rare.

Water is also an important element of the winter habitat, with eagles usually frequenting lakes and major river systems. Wintering bald eagles also use habitats with little or no open water, if rabbits, carrion, or other food items are regularly available (Green, 1985). Winter roosting sites may often be used by several eagles.

2.9.3 Range

The bald eagle ranges throughout North America. Two subspecies are currently recognized based on size and weight: the northern bald eagle (*H. l. alascanus*) and the southern bald eagle (*H. l. leucocephalus*), the former being larger and heavier than the latter. This delineation, however, is of questionable merit due to a continuous size gradient from north to south throughout the range; eagles in the central part of the U.S. are intermediate in size. The northern population nests from central Alaska and the Aleutian Islands, east through Canada, and in the northern states of the U.S. The southern population nests primarily in the estuarine areas of the Atlantic and Gulf coasts from New Jersey to Texas and the lower Mississippi Valley, northern California to Baja California (both coasts), Arizona and New Mexico (Snow, 1981). Wintering ranges of the two populations overlap. Many of the northern bald eagles migrate south for the winter and can even be found as far south as Texas.

The southern eagles tend to be more resident although there is some northward movement during the summer (Snow, 1981). The largest wintering group is in Alaska, where over 3,000 have congregated in the Chilkat Valley during the fall and winter months (Steenhof, 1978).

2.9.4 Distribution in Texas

The southern subspecies nests in Texas along the Gulf coast and on major inland lakes during the winter months, and migrates to more-northern latitudes during the summer. The 1999 bald eagle nesting survey identified 82 nesting territories Statewide, the southernmost being in Refugio, Goliad, Victoria, and Matagorda counties. Of these nesting territories, 64 were occupied and 47 nests fledged 73 young (Mitchell, 1999). The northern bald eagle nests in the northern U.S. and Canada during spring and summer, and migrates to the southern U.S., including Texas, during the fall and winter. Concentrations of wintering northern eagles are often found around the shores of reservoirs in Texas, with most wintering concentrations occurring in the eastern part of the State. In Texas, wintering bald eagles have been observed as far south as Cameron County (Oberholser, 1974; Mabie, 1990). They are considered to be a rare permanent resident in the Coastal Bend (Rappole and Blacklock, 1985)

2.9.5 Presence in the Project Area

No nests are known to occur in the project area, nor have any been reported from Nueces or San Patricio counties, the nearest known nest being in Refugio County (Mitchell, 1999). The checklist of birds of Mustang Island State Park does not list the bald eagle (Pulich et al., 1985), while the checklist of birds of Padre Island National Seashore (PINS) lists the bald eagle as rare in winter (Southwest Parks and Monuments Association (SPMA), 1990). If the bald eagle should occur in the project area, it would be only as a rare migrant or post-nesting visitor.

2.9.6 Effects of the Project

Given the infrequent occurrence of bald eagles in the general area, no impacts to this species are anticipated as a result of the project.

2.10 WHOOPING CRANE

2.10.1 Reasons for Status

The whooping crane (*Grus americana*) was Federally listed as endangered on 11 March 1967 (32 FR 4001). Critical habitat has been designated in Aransas, Calhoun, and Refugio counties in Texas, and includes the Aransas National Wildlife Refuge (NWR). Two experimentally introduced flocks are listed as experimental nonessential populations; in Florida (FR, 22 January 1993) and New Mexico (62 FR 38932). The main factors for the decline of the whooping crane were loss of habitat to agriculture, human disturbance of nesting areas, uncontrolled hunting, and collisions with power lines (NatureServe, 2000). Biological factors, such as delayed sexual maturity and small clutch size prevent rapid population recovery. Drought during the breeding season presents serious hazards to this species (Campbell, 1995). Whooping cranes are vulnerable to loss of habitat along their long migration route (NatureServe, 2000), along which they are still subject to cataclysmic weather events, accidental shooting, collision with power lines, and predators. They are susceptible to avian tuberculosis, avian cholera and lead poisoning (Campbell, 1995). Exposure to disease is a special problem when large numbers of birds are concentrated in limited areas, as often happens during times of drought.

While in Texas, the main population is at risk from chemical spills along the Gulf Intracoastal Waterway (GIWW), which passes through the center of their winter range (Campbell, 1995). The presence of contaminants in the food base is another potential problem on their wintering grounds (Oberholser, 1974), and a late season hurricane or other weather event could be disastrous to this concentrated population.

2.10.2 Habitat

Nesting habitat in Canada is freshwater marshes and wet prairies (NatureServe, 2000), interspersed with numerous potholes and narrow-wooded ridges. Whooping cranes use a variety of habitats during migration (Campbell, 1995). They feed on grain in croplands (Lewis, 1995), and large wetland areas are used for feeding and roosting. Riverine habitats, such as submerged sandbars, are often used for roosting. The principle winter habitat in Texas is brackish bays, marshes, and salt flats, although whooping cranes sometimes feed in upland sites characterized by oak mottes, grassland swales, and ponds on gently rolling sandy soils (Campbell, 1995).

Summer foods include large insect nymphs or larvae, frogs, rodents, small birds, minnows and berries. During the winter in Texas they eat a wide variety of plant and animal foods. Blue crabs, clams, and berries of Carolina wolfberry (*Lycium carolinianum*) predominate the diet. Foods taken at upland sites include acorns, snails, crayfish, and insects (Campbell, 1995).

2.10.3 Range

Whooping cranes were originally found throughout most of North America. In the nineteenth century, the main breeding area was from the Northwest Territories to the prairie provinces in Canada, and the northern prairie states to Illinois. A non-migratory flock existed in Louisiana, but is now extirpated. Whooping cranes wintered from Florida to New Jersey along the Atlantic Coast, along the Texas Gulf Coast, and in the high plateaus of central Mexico. They now breed in isolated, marshy areas of Wood Buffalo National Park, Northwest Territories, Canada. They winter primarily in the Aransas NWR and adjacent areas of the central Texas Gulf Coast (FWS, 1995). During migration they use various stopover areas in western Canada and the American Midwest.

Two experimental flocks have been established by incubating eggs and rearing the young in captivity before releasing them into the wild. Whoopers were introduced in Grays Lake NWR in Idaho in 1975; these birds winter at Bosque del Apache NWR in central New Mexico. This population is not successfully breeding and will become extirpated. Introduction of another flock to Kissimmee Prairie in Florida began in 1993. The Florida population will be non-migratory (NatureServe, 2000).

2.10.4 Distribution in Texas

The natural wild population of whooping cranes spends its winters at the Aransas NWR, Matagorda Island, Isla San Jose, portions of the Lamar Peninsula, and Welder Point on the east side of San Antonio Bay (NatureServe, 2000). The main stopover points in Texas for migrating birds are in the central and eastern panhandle (FWS, 1995).

2.10.5 Presence in the Project Area

Although the leeward side and interior of Padre Island could provide suitable winter habitat for whooping cranes, Nueces and San Patricio counties are outside the migration range of the whooping crane (FWS, 1995). The whooping crane in South Texas is generally restricted to the Aransas NWR in Aransas, Refugio, and Calhoun counties. This species is unlikely to occur in the project area.

2.10.6 Effects of the Project

No effects to the whooping crane are expected from this project.

2.11 NORTHERN APLOMADO FALCON

2.11.1 Reasons for Status

The northern aplomado falcon (*Falco femoralis septentrionalis*) was proposed for endangered status on 20 May 1985 (50 FR 20810). The listing was published as final on 25 February

1986 and the rule became effective on 27 March 1986 (51 FR 6686). Although reasons for the decline of the aplomado falcon are not known (Hector, 1987), habitat degradation due to brush encroachment is probably the main factor in the disappearance of this bird from the U.S. (Hector, 1983). Overcollecting of the falcons and their eggs may have contributed to the decline on a local basis (Hector, 1983, 1987). The NAS (comments published in the Federal Register, 51 FR 6686, 25 February 1986) identified the decline as being through the loss of open grassland habitat through overgrazing and other excessive range practices. Currently, the most serious threat is reproductive failure caused by continued use of organochlorine pesticides such as DDT and DDE in Latin America, which affect both the aplomado falcon and its prey species (Hector, 1983).

2.11.2 Habitat

Typical habitat of this species is open country, especially savannah rangeland and open woodland, containing scattered mesquites (*Prosopis* spp.), yuccas (*Yucca* spp.), oaks (*Quercus* spp.), and acacias (*Acacia* spp.) (Hector, 1983; 51 FR 6686, 25 February 1986; AOU, 1998). Open terrain with scattered trees (for nesting and observation perches), relatively low ground cover (less concealment for prey), an abundance of small- to medium-sized birds, and nesting platforms (e.g., stick nests or large bromeliads), particularly in yuccas and mesquites, are the habitat requirements for this bird (Hector, 1981; FWS, 1995). The preferred habitat of the aplomado falcon in southern Texas was coastal prairie with widely scattered mesquites and yuccas (Hector, 1987).

2.11.3 Range

The aplomado falcon is resident throughout much of Central and South America (AOU, 1998). Three subspecies are recognized: the northern aplomado falcon (*F. f. septentrionalis*) and two others (*F. f. femoralis* and *F. f. pichinchae*) (Hector, 1983). The subspecies *septentrionalis* historically occurred in southeastern Arizona, southern New Mexico, southern Texas, much of Mexico, the Pacific coast of Guatemala, and perhaps Nicaragua where it intergrades with *F. f. femoralis*. Highest nesting densities in the U.S. were formerly in New Mexico and Texas; today this bird is virtually absent from the U.S. (Homerstad, 1990) and nests regularly only in the coastal plains of eastern Mexico (Vera Cruz, Chiapas, Campeche and Tabasco) in the palm and oak savannah and is rarely seen outside this area (Hector, 1981, 1983).

2.11.4 Distribution in Texas

In Texas, the northern aplomado falcon formerly ranged from Cameron County northward to San Patricio County, and west from Ector and Midland counties to El Paso County (Oberholser, 1974). Around the turn of the century, the southeast corner of Cameron County was an important nesting area for the aplomado falcon, with over 100 nests being recorded (Hector, 1983). Other breeding records in Texas have come from Hidalgo, Kenedy, Brooks, Pecos, Ector and Midland counties, with the last nesting pair recorded from Brooks County in 1941 (Oberholser, 1974). Until recently, the last confirmed nesting in the U.S. was near Deming, New Mexico in 1952 (FWS, 1995). Since 1985, reintroduction efforts have been underway at several sites in south Texas in order to reestablish populations in the U.S. Reintroduction sites have included the Laguna Atascosa NWR and the King Ranch. These birds are hatched in California, flown to Texas at age 3 to 4 weeks, reared in hack boxes, and fed periodically following fledging. In 1995, a pair of these released birds successfully nested on a transmission line pole near Brownsville. In 1996 this same pair nested in a nearby mesquite, but the female and young were subsequently killed by a great horned owl (*Bubo virginianus*) (Anonymous, 1996).

2.11.5 Presence in the Project Area

No aplomado falcons were observed in the project area during PBS&J's field survey, and it is unlikely that this bird occurs there. Even if this species recovers sufficiently from its present decline and spreads into its former range, lack of suitable nesting habitat in the project area would preclude its occurrence there.

2.11.6 Effects of the Project

Because this falcon is not expected at present to occur in the project area, no impacts are anticipated.

2.12 PIPING PLOVER

2.12.1 Reasons for Status

The piping plover (*Charadrius melodus*) was Federally listed as endangered on 11 December 1985 for the Great Lakes watershed and was listed as threatened throughout the remainder of its range (50 FR 50726). The rule became effective on 10 January 1986. In 1986, an estimated 2,100 to 2,300 breeding pairs occurred in North America: 1,337 to 1,409 pairs in the northern Great Plains, 19 to 24 pairs in the Great Lakes, and 799 pairs along the Atlantic coast (Haig et al., 1987). Shorebird hunting during the early 1900s caused the first known major decline of piping plovers (Bent, 1929). Since then, loss or modification of habitat due to commercial, residential, and recreational developments, dune stabilization, damming and channelization of rivers (eliminating sandbars, encroachment of vegetation, and altering water flows), and wetland drainage have further contributed to the decline of the species (FWS, 1995). Additional threats include human disturbances through recreational use of habitat, and predation of eggs by feral pets (FWS, 1995).

2.12.2 Habitat

Piping plovers typically inhabit shorelines of oceans, rivers and inland lakes. Nest sites include sandy beaches, especially where scattered tufts of grass are present; sandbars; causeways; bare areas on dredge-created and natural alluvial islands in rivers; gravel pits along rivers; silty flats; and salt-encrusted bare areas of sand, gravel, or pebbly mud on interior alkali lakes and ponds. In the wintering grounds these birds utilize beaches, mudflats, sandflats, dunes, and offshore spoil islands (AOU, 1998; FWS, 1995). One of the most important wintering areas for this species, the Laguna Madre in Mexico, became unsuitable when its water level was stabilized for a fisheries lagoon. In Texas, an estimated 30% of wintering habitat had been lost over a 20-year period (50 FR 50726; 11 December 1985).

2.12.3 Range

The piping plover breeds on the northern Great Plains (Iowa, northwestern Minnesota, Montana, Nebraska, North and South Dakota, Alberta, Manitoba, and Saskatchewan), in the Great Lakes (Illinois, Indiana, Michigan, Minnesota, New York, Ohio, Pennsylvania, Wisconsin and Ontario), and along the Atlantic coast from Newfoundland to Virginia and (formerly) North Carolina. It winters on the Atlantic and Gulf of Mexico coasts from North Carolina to Mexico, including coastal Texas, and, less commonly, in the Bahamas and West Indies (AOU, 1998; 50 FR 50726, 11 December 1985). Migration occurs both through the interior of North America east of the Rocky Mountains (especially in the Mississippi Valley) and along the Atlantic coast (AOU, 1998). Little is known about the migration routes of this species.

2.12.4 Distribution in Texas

The piping plover begins arriving to its post-breeding and wintering grounds in Texas in mid- to late-July. Haig and Oring (1985, 1987) found that early in the post-breeding season, piping plovers frequented beaches, but later tended to inhabit ephemeral sandflats along the backside of barrier islands. Observations of wintering piping plovers in Alabama did not indicate a seasonal preference between habitats, but that wintering plovers spent more than 85% of their time on sand flats or mudflats each month (Johnson and Baldassarre, 1988). Along the Texas coast, a correlation appears to exist between tidal height and habitat selection, with piping plovers actively feeding on tidal flats during periods of low tides, and on the Gulf beaches during high tides (Eubanks, 1991; Zonick, et al., 1998; Drake et al., 2000). Winter distribution studies along the Atlantic and Gulf coasts found piping plovers usually occurring in small, unevenly distributed groups along the coast; however, the sites with largest concentrations of plovers consisted of expansive sand flats or mud flats with sandy beach in close proximity (Nicholls and Baldassarre, 1990). Piping plover concentrations in Texas occur in the following counties: Aransas, Brazoria, Calhoun, Cameron, Chambers, Galveston, Jefferson, Kleberg, Matagorda, Nueces, San Patricio and Willacy (FWS, 1988).

Several areas along the Texas coast have been identified by the FWS as essential wintering habitat for the piping plover. Essential wintering habitat for the piping plover provides the space and requisite resources necessary for the continued existence and growth of piping plover populations and consist of coastal beach, sandflat and mudflat habitats. Critical habitat has recently been designated in Texas (see below).

2.12.5 Presence in the Project Area

The piping plover is a regular migrant and winter resident along the lower Texas coast (Oberholser 1974; Haig and Oring, 1985, 1987; Haig and Plissner, 1993; TOS, 1995) and wintering birds have been reported along the length of the Texas coast. The checklist of birds of Mustang Island State Park lists the piping plover as a fairly common winter resident and a common migrant (Pulich et al., 1985). Piping plovers have been recorded from the project area (PBS&J, in-house data).

PBS&J conducted a piping plover survey in the Corpus Christi Bay project area between September 2000 and April 2001 (PBS&J, 2001). Survey protocol and sites were established during coordination with FWS and TPWD in August 2000. The four study sites, which were visited monthly, are shown in Figure 2-1. They are as follows: Oso Bay, Gulf Intracoastal Waterway (GIWW), Fish Pass, and Port Aransas. During the 8-month study, 1,687 piping plovers were recorded at the four study sites in 428.4 hours of observation, at a frequency of 3.9 birds per hour. The number of birds observed at the four study sites each month ranged from 131 in November 2000 to 473 in March 2001, while the number of piping plovers encountered per hour at the four sites ranged from 2.1 in September 2000 to 9.0 in March 2001. While many of these individuals were undoubtedly seen on more than one occasion, a minimum of 473 piping plovers utilized the four study sites during the 2000-2001 survey.

At the Oso Bay study site, 115 piping plovers were recorded in 64.4 hours of observation at a frequency of 1.8 birds per hour. The number of individuals ranged from 6 in November 2000 to 22 in September 2000, while the number of birds encountered per hour ranged from 1.0 for December 2000 to 4.2 for February 2001. Thus, a minimum of 22 piping plovers utilized the Oso Bay study site during the 2000-2001 survey.

Altogether, 652 piping plovers were recorded at the GIWW study site in 185.6 hours of observation at a rate of 3.5 birds per hour. The number of individuals at the GIWW site ranged from 27 in October 2000 to 182 in March 2001, while the number of birds encountered per hour ranged from 1.5 for October 2000 to 7.8 for March 2001. Thus, a minimum of 182 piping plovers utilized the GIWW study site during the 2000-2001 survey.

At the Fish Pass study site, 148 piping plovers were recorded during 122.8 hours of observation at a rate of 1.2 birds per hour. Apart from December 2000 when no piping plovers were recorded, the number of individuals ranged from 8 in November 2000 to 45 in March 2001, while the

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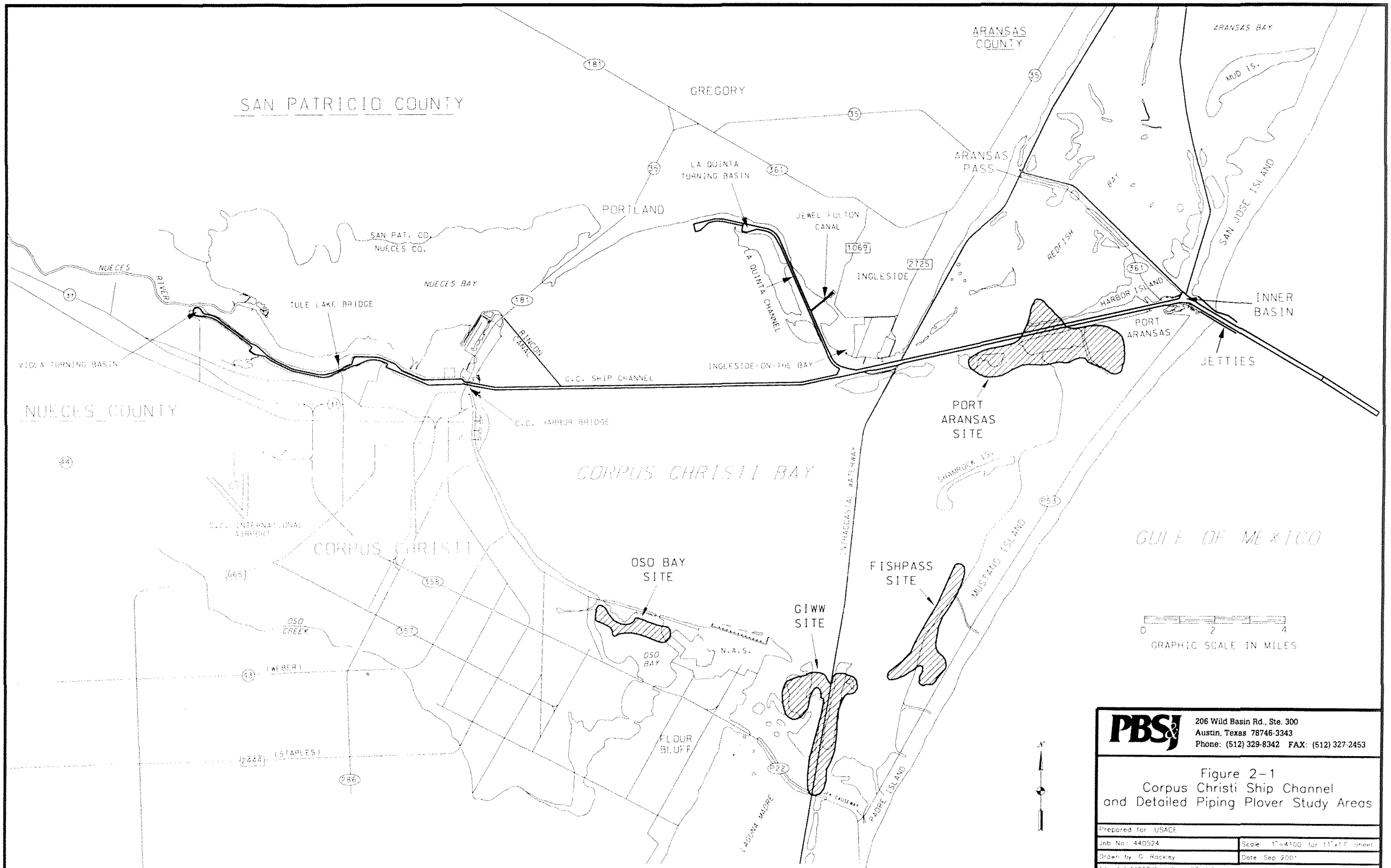

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Figure 2–1
Corpus Christi Ship Channel and Detailed Piping Plover Study Areas

Prepared for USACE	
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number of birds encountered per hour ranged from 0.6 for February 2001 to 3.4 for March 2001. Thus, at least 45 piping plovers utilized the Fish Pass study site. No surveys were conducted at the MBHC.

At the Port Aransas study site, 772 piping plovers were recorded during 55.6 hours of observation at a frequency of 13.9 birds per hour. The number of individuals ranged from 33 in December 2000 to 233 in March 2001, while the number of birds encountered per hour ranged from 4.8 for December 2000 to 38.2 for March 2001. Thus, a minimum of 233 piping plovers utilized the Port Aransas study site during the 2000-2001 survey.

2.12.6 Effects of the Project

The minor changes in salinity and tidal amplitude as a result of the project are not expected to have an impact on the piping plover. Impacts to other areas currently used by piping plover near the project will be eliminated by placing new work dredged material in leveed upland areas or in coordinated open-water beneficial use sites. Dredged maintenance material will be placed in existing PAs that are fully leveed or used beneficially to enhance other areas, such as nesting habitat for pelicans. Some beach nourishment may occur on San Jose Island via PA 2 which is designed to nourish the sand dune field near the jetty channel with the high sand content material from the jetty channel. However, this site is infrequently used and much of the sandy material remains in the dune field which is not piping plover habitat. Although some of the material can leave the semi-confined PA 2, it only flows onto a small area of the beach and replenishes this habitat as well. Placement of dredged materials in PA 6, located east of Pelican Island, will not affect adjacent critical habitat or piping plovers because the area is fully leveed. Based on these findings and the fact that any material reaching the critical habitat on San Jose Island is infrequent, temporary, and limited in size, the project is not expected to have any significant adverse impacts on the species and critical habitat for the piping plover is not expected to be significantly impacted as well.

2.13 MOUNTAIN PLOVER

2.13.1 Reason for Status

The mountain plover (*Charadrius montanus*) was proposed for listing as a threatened species on 16 February 1999 (64 FR 7587). It appears to be declining rapidly. One study indicated recent population declines of 50% to 89%. The breeding distribution has also contracted, with both peripheral populations disappearing and core populations going from widely distributed to only locally present. Early declines were probably at least partly related to market hunting. Historically, many mountain plovers nested in prairie dog towns (NatureServe, 2000), which have declined 98% in landscape coverage since 1900 (Summers and Linder, 1978)

Conversion of shortgrass prairie to agricultural land, primarily for winter wheat, has destroyed nesting habitat, as has planting of taller grasses in native prairie. In the last 25 years, farms on the western Great Plains have become larger and different crops have become more popular. Many farmers now grow extensive crops of millet and sunflower, ironically partially for the birdseed market. Fields for these crops remain fallow until early May, after most mountain plovers have begun nesting, and many nests are destroyed by cultivation activities. The plovers are likely to renest in these fields after planting, only to be forced to abandon all the nests when the crops become too tall for the birds to scan their surroundings for predators. This major shift in regional activity has created a reproductive sink for mountain plovers, and may explain the annual decline since 1966 (Knopf, 1996). Encroachment on native prairies by exotic species such as cheatgrass (*Bromus tectorum*), leafy spurge (*Euphorbia esula*), and knapweed (*Centaurea* spp.) may be a factor (NatureServe, 2000).

2.13.2 Habitat

The mountain plover, which actually avoids mountains, was originally named Rocky Mountain plover because the first specimens were taken within sight of that range. Instead, upland shortgrass plains and level plateaus of the western U.S. are its preferred summer haunts (Oberholser, 1974). Nesting areas are characterized by very short vegetation, and significant areas of bare ground (typically>30%), and flat or gentle slopes (<12%). Areas of moist ground are generally avoided, even for foraging. Non-breeding birds prefer short-grass plains and fields, plowed fields, sandy deserts (NatureServe, 2000), and sod farms (Knopf, 1996). They are attracted to heavily grazed annual grasslands and recent burns. Typical winter habitat in Texas is coastal prairies, alkaline flats, plowed fields, and bermudagrass fields (Oberholser, 1974). Mountain plovers are highly gregarious. Outside the breeding season they forage and roost in loose flocks of changing composition. Flock size may exceed 1,000 on the southern Great Plains in late summer. Mountain plovers may be attracted to cattle, sheep, and prairie dogs (NatureServe, 2000).

2.13.3 Range

The mountain plover's historical breeding range was northern Montana south to central New Mexico, western Texas, and western Oklahoma, with very low numbers in extreme southern Alberta and perhaps Saskatchewan. This species now breeds mainly in Colorado, Wyoming, and Montana. Recent sightings of birds in June and July in the vicinity of Saltillo, Nuevo Leon, may have been of breeding birds. The non-breeding range is central California, southern Arizona, and central and near-coastal Texas, south to southern Baja California and the northern mainland of Mexico to San Luis Potosi. The primary wintering grounds are now in the San Joaquin, Sacramento, and Imperial valleys of California (Knopf, 1996).

2.13.4 Distribution in Texas

The mountain plover is a rare summer resident in the high grasslands of the Trans-Pecos and in the northwest Panhandle. It is a rare migrant east to Delta County in the north and the Colorado River in central Texas. It is a rare to uncommon local winter resident on the coastal plains and inland from south Texas through the Edwards Plateau into the South Plains (TOS, 1995).

2.13.5 Presence in the Project Area

While the mountain plover has been recorded from Nueces County (Oberholser, 1974), it is most likely to occur in the agricultural areas away from the seashore. The mountain plover appears as an uncommon migrant on the checklist for birds of the Corpus Christi area (Audubon Outdoor Club of Corpus Christi (AOCCC), 1994), but is absent from checklists for Mustang Island State Park (Pulich et al., 1985) and PINS (SPMA, 1990). It is not expected to occur in the project area due to lack of suitable habitat.

2.13.6 Effects of the Project

The mountain plover is unlikely to occur in the project area and, thus, will not be impacted by the proposed project.

2.14 ESKIMO CURLEW

2.14.1 Reason for Status

The Eskimo curlew (*Numenius borealis*) was federally listed as endangered on 2 June 1970. It may be extinct; if not, it exists only in perilously low numbers. Only about 70 individuals have been seen anywhere in the last 60 years, and the last confirmed sighting of an Eskimo curlew was in Nebraska in 1987 (FWS, 1990a).

Eskimo curlews were extremely abundant in the nineteenth century and were subject to tremendous pressures from market hunting, especially after the demise of the passenger pigeon. They were held in high esteem as a food item, described by some as "the finest eating of any of our birds." Their abundance and tameness made supplying the demand an easy matter, and they were sold in restaurants and markets from Halifax to Buenos Aires. A pair of hunters on Cape Cod reportedly shot 5,000 curlews during the 1872 flight (Gollop et al., 1986). Market hunting for the Eskimo curlew flourished between 1860 and 1890, and was most intense during the late 1870s and 1890s in response to dwindling supplies of passenger pigeons (Gill et al., 1998).

Hunting was not the sole reason for the decline of the Eskimo curlew, for some population declines were noted several years before market hunting likely had significant impacts (Gill et al., 1998). This species was undoubtedly affected by habitat changes also. Over the last 125 years, a significant reduction has occurred in the amount and quality of habitat available to these birds along their migration routes. Urbanization and industrialization have impacted habitats on the Texas coast. Most of the grasslands used for spring migration feeding in the interior of North America have been converted to cropland. Most of the grassland on the pampas of Argentina have been converted to other uses and wet-meadow foraging habitat on Caribbean islands has been filled for tourism development. Pesticides and chemical contaminants are used widely in all but a few areas throughout the Eskimo curlew's range (FWS, 1990a).

Populations declined suddenly during the 1870s and by the 1890s they had effectively disappeared. Sightings during the first half of the twentieth century were very rare. Between 1945 and 1985, Eskimo curlews were reported in 23 different years, in numbers from 1 to 23 individuals (Gill et al., 1998).

The Eskimo curlew is a relatively long-lived bird with probably a low reproductive rate, and certainly a very long migration route on which it is exposed to a number of factors. Perhaps the most important of these factors, in conjunction with hunting pressures, was the conversion of native prairies to agriculture along its spring migratory route, along with the suppression of fires. These phenomena were related to the extinction of the Rocky Mountain grasshopper (*Melanoplus spretus*), whose localized population irruptions were important to migrating curlews.

The Eskimo curlew fed on various invertebrates, seeds and berries. Berries were the preferred food source during the boreal autumn before migration (Gill et al., 1998).

2.14.2 Habitat

The breeding habitat of the Eskimo curlew was treeless arctic and subarctic tundra (Gill et al., 1998). Non-breeding birds used a variety of habitats, such as grasslands, pastures, plowed fields, and, less frequently, marshes and mudflats (AOU, 1998). They favored headlands and hills within a few kilometers of the sea, and burned-over prairies and marshes were particularly attractive during migration. They roosted on beaches along the coast, but were rarely found near water in the midwestern states (Gollop et al., 1986)

2.14.3 Range

The Eskimo curlew was only known to have nested in a relatively small portion of treeless tundra in the Northwest Territories, Canada, but the nesting range may have extended across northern Alaska into Siberia. They wintered in southern South America, primarily Argentina. Their fall migration took them eastward across Canada to the northeastern U.S., then southward across the Atlantic to South America. In spring they traveled through Texas and the midwestern U.S. (Gill et al., 1998).

2.14.4 Distribution in Texas

The Eskimo curlew was formerly extremely abundant on the prairies of Texas, particularly in the middle portion of the State. It occurred in immense flocks until about 1875 and was observable in small flocks until about 1900 (Oberholser, 1974). The few records in recent years are from Galveston Island (TOS, 1995).

2.14.5 Presence in the Project Area

Although the Eskimo curlew was formerly common in the spring in the Coastal Bend (Rappole and Blacklock, 1985), it is not expected to occur in the project area due to its extreme rarity, if not total extinction, and the lack of recent local records.

2.14.6 Effects of the Project

The Eskimo curlew is highly unlikely to be impacted by this project due to the low probability of its occurrence in the area.

2.15 OCELOT

2.15.1 Reasons for Status

The ocelot (*Leopardus pardalis*) is listed as endangered throughout its present range (FWS, 1995, 2001). Habitat destruction and degradation due to brush-clearing has been the major cause for the population decline, but predator control activities and hunting have also contributed. In Central and South America, exploitation for the fur and pet trade is primarily responsible for population declines (NFWL, 1980; FWS, 1995).

2.15.2 Habitat

The ocelot occupies a variety of habitats throughout its neotropical range including tropical and subtropical forests, riverine forests, swampy savannahs, estuarine mangroves, rocky areas, and upland oak forests (NFWL, 1980; Tewes and Schmidly, 1987; Murray and Gardner, 1997). In Texas, however, ocelots inhabit dense, often thorny and impenetrable brush, mesquite-oak and oak forests, and partially cleared land (NFWL, 1980; Navarro, 1985). Tewes (1986) found honey mesquite, acacias, condalia (Condalia spp.), allthorn goatbush (Castella texana), granjeno, cenizo, and whitebrush (Aloysia texana) to be the dominant brush species of ocelot habitat in south Texas. Approximately 1.6% of the land area in south Texas now supports this type of habitat (Tewes and Everett, 1987).

Tewes and Everett (1987) classified ocelot habitat in Texas according to the amount of foliar canopy. Class A or optimal habitat was 95% canopy cover, Class B or suboptimal habitat was 75%

to 95% canopy cover, and Class C, with 75% or less canopy cover, was considered inadequate. The most critical habitat component is probably dense cover near the ground (<3 ft in height) (Tewes, 1986).

The ocelot is primarily nocturnal, although some diurnal activity has been recorded (Navarro, 1985; Tewes, 1986; Tewes and Schmidly, 1987). Navarro (1985) found ocelots in Texas to have two peaks of activity, one at about midnight and the other at daybreak. Ocelots feed on small and medium-sized mammals such as woodrats (*Neotoma* spp.), rabbits (*Sylvilagus* spp.), young deer (*Odocoileus* spp.), nutria (*Myocastor coypus*), birds, reptiles, amphibians, fish, insects and, in Latin America, spider monkeys (*Ateles* sp.), coatis (*Nasua nasua*), and agoutis (*Agouti* sp.) (Hall and Dalquest, 1963; Guggisberg, 1975; Navarro, 1985; Tewes and Schmidly, 1987; Emmons, 1988).

While breeding occurs throughout the year in the tropics, it occurs primarily in the fall (September through November) in Texas, although births have also been recorded in April, June, July and August. Den sites are usually well hidden and include dense, thorny scrub, caves, hollows in trees or logs, and grass tussocks (Petrides et al., 1951; Navarro, 1985; Tewes, 1986; Laack and Rappole, 1986, 1987a; Tewes and Schmidly, 1987). Gestation is 70 to 80 days. Litter size ranges from two to four, with two being the most common. The mother provides extended parental care to the young because it takes time for them to become proficient at capturing prey. Males are believed to contribute little to direct parental care (Tewes, 1986). Ocelots in the wild become sexually mature at 16 to 18 months (Schauenberg, 1979), but in captivity, maturity may be reached in as little as 10 to 12 months.

Navarro (1985) found that the average home range (the area which an animal occupies during its normal daily activities) for three male ocelots in south Texas was 2.5 square kilometers (km^2) (618 ac), and for one female was 2.1 km^2 (519 ac). Similarly, Twedt and Rappole (1986) reported home ranges of 3.5 km^2 (865 ac) and 1.2 km^2 (296 ac) for two male ocelots on Yturria Ranch in Willacy and Kenedy counties. However, Tewes (1986), using a much larger data base, found the average home range of south Texas ocelots to be 17.7 km^2 (4,372 ac) for males and 11 km^2 (2,717 ac) for females. The overall average for adults was 15.2 km^2 (3,754 ac). Although male ocelots had larger territories than the females and generally covered an extensive area in a short period, females used the home range more intensively (Tewes, 1986; FWS, 1990b). Tewes (1986) also determined that home ranges expanded in the winter and contracted in the summer. Both Navarro (1985) and Tewes (1986) found little overlap in the home ranges of adjacent males, but quite a considerable intersexual spatial overlap in the home ranges. Tewes and Schmidly (1987) and Navarro (1985) also found that the home ranges were closely aligned with the amount of suitable available habitat. At Laguna Atascosa NWR, for example, an increase in the ocelot population has resulted in smaller home ranges, two ocelots occupying an area that had previously supported only one (Tewes, 1988). Some individuals there currently inhabit areas as small as 80 ac (Tewes, 1988).

2.15.3 Range

Historically, the ocelot occurred in Arkansas, Arizona, southern California, and south through Central and South America to Peru, Uruguay and northern Argentina (Navarro, 1985). Today it ranges from Arizona and Texas through Central and South America to northern Argentina, but in reduced numbers (Tewes and Everett, 1987; Emmons, 1990; Murray and Gardner, 1997).

2.15.4 Distribution in Texas

The ocelot once occurred in the eastern, central and southern portions of Texas but currently only exists in the extreme south of the State (Davis and Schmidly, 1994). As a first step to determining the status of the ocelot in Texas, a clearinghouse for ocelot (and jaguarundi) sightings was established in October 1981 to coordinate reception and filing of reports. A total of 1,572 questionnaires was mailed to trappers to obtain additional information; of these, 472 (30%) were returned and 87 (6%) contained positive responses (Tewes and Everett, 1987). From these results, it appears that two significant populations of ocelots exist in south Texas. One population inhabits parts of Hidalgo, Starr, Cameron, and Willacy counties, and the other, Jim Wells, Live Oak, McMullen and Atascosa counties. Six or seven smaller populations may also occur. Based on studies of spatial patterns and densities of radio-collared ocelots, Tewes (1986) estimated that only 80 to 120 ocelots occur in Texas. Laack (1998) currently puts this number at 100. A population of approximately 30 to 40 ocelots occurs on the Laguna Atascosa NWR in Cameron County (Laack, 1998). One or two ocelots apparently occur at the Santa Ana NWR (Benn, 1997; Laack, 1998) and one pair of ocelots had territories near the Arroyo Colorado in Cameron County (Laack, 1998). Ocelots have been sighted at the NAS's Sabal Palm Grove Sanctuary (Homerstad, 1986); and at the Loma de Grulla complex north of Laguna Vista, at Moranco Blanco, and at Redhead Ridge (Tewes, 1987). Ocelot sightings have also been reported from the Lower Rio Grande Valley NWR. In addition, Laack and Rappole (1986, 1987a), Tewes (1987) and Homerstad (1987) have documented several other ocelot sightings in Cameron County. The closest ocelot population in Mexico is near San Fernando, approximately 100 miles south of the U.S.-Mexico border (Laack, 1998).

2.15.5 Presence in the Project Area

Ocelots are highly unlikely to occur in the project area due to the lack of suitable brushy habitat. Trapping studies conducted during the Navy Homeport Feasibility (U.S. Navy, 1986) provided no evidence of ocelots in the project area.

2.15.6 Effects of the Project

No impacts to the ocelot are expected from this project.

2.16 JAGUARUNDI

2.16.1 Reasons for Status

The jaguarundi (*Herpailurus yagouaroundi*) was listed by FWS as endangered on 14 June 1976 (41 FR 24064). Habitat loss and alteration due to brush-clearing activities, and human persecution are the main causes for the decline in jaguarundi populations (FWS, 1995).

2.16.2 Habitat

Habitat requirements in Texas are similar to those for the ocelot: thick, dense thorny brushlands or chaparral. Approximately 1.6% of the land area in south Texas is this type of habitat (Tewes and Everett, 1987). The thickets do not have to be continuous but may be interspersed with clear areas. Jaguarundis possibly show a preference for habitat near streams (Goodwyn, 1970; Davis and Schmidly, 1994). In South America, habitat includes high mountain forests, tropical forests, swamp forests, savannahs, overgrown pastures, and thickets (NFWL, 1980; Tewes and Schmidly, 1987).

The most common plants occurring in habitats in the Rio Grande Valley where the jaguarundi is known to occur are huisache, blackbrush acacia, prairie baccharis (*Baccharis texana*), chillipiquin (*Capsicum annuum*), lotebush, allthorn goatbush, Texas persimmon (*Diospyros texana*), coyotillo (*Karwinskia humboldtiana*), common lantana (*Lantana horrida*), berlandier wolfberry (*Lycium berlandieri*), javelinabrush (*Microrhamnus ericoides*), Texas pricklypear (*Opuntia lindheimeri*), retama, honey mesquite, cedar elm (*Ulmus crassifolia*), and lime pricklyash (*Zanthoxylum fagara*) (Goodwyn, 1970).

Jaguarundis have two distinct color phases, red and gray, although the latter phase has also been called blue. The phases are so distinct that at one time they were thought to be separate species, the red one being called *Felis eyra*. A third color phase, black, has also been reported, but apparently does not occur in Texas (Goodwyn, 1970).

Like the ocelot, the jaguarundi is primarily nocturnal, although some diurnal activity has been recorded. Jaguarundis are excellent climbers although they spend most of the time on the ground. Prey is largely birds, but bird eggs, rats, mice, rabbits, reptiles and fish are also taken (Goodwyn 1970; Tewes and Schmidly, 1987; Davis and Schmidly, 1994). Jaguarundis communicate by calls, of which 13 have been identified in captive animals. The largest repertoire occurs during the mating season (Hulley, 1976).

Little is known of jaguarundi reproduction in the wild. Den sites include dense thickets, hollow trees, spaces under fallen logs overgrown with vegetation, and ditches overgrown with shrubs (Tewes and Schmidly, 1987; Davis and Schmidly, 1994). Young have been born in March and August with possibly two litters per year. Usually a litter comprises 2 to 4 young, with litters being either all of one color phase or containing both the red and gray phases. Gestation (for captive jaguarundis) varies from 63 to 75 days (Goodwyn, 1970; Tewes and Schmidly, 1987; Davis and Schmidly, 1994).

2.16.3 Range

The jaguarundi historically occurred in southeast Arizona, south Texas, and Central and South America as far south as northern Argentina. Today this cat has a similar distribution, but in much reduced numbers, although it probably no longer occurs in Arizona (Tewes and Schmidly, 1987). The presence of jaguarundis in Florida is likely the result of human introduction (Nowak and Paradiso, 1983).

Four North American subspecies are recognized, of which two occur in the U.S.: *H. y. cacomitli* from southern Texas to central Vera Cruz, Mexico, and *H. y. tolteca* from southern Arizona, along the Pacific coast of Mexico, and inland to the Mexican Plateau (Goodwyn, 1970; NFWL, 1980).

2.16.4 Distribution in Texas

Tewes and Everett (1987) analyzed the records of a clearinghouse established in 1981 to coordinate reception and filing of reports of jaguarundis (and ocelots) in Texas. Many of the reports were solicited by sending out questionnaires to trappers. Jaguarundis were reported from central Texas and the upper Gulf coast as well as from south Texas. However, due especially to the lack of any tangible evidence such as road kills, most of the sightings in the first two areas are believed to have been of black feral house cats. Two dead jaguarundis were reported in Cameron County and one each in Willacy and Webb counties. Tewes (1987) and Tewes and Everett (1987) documented several other credible reports of jaguarundis in these three counties. One of these was of a road-killed male jaguarundi found near the junction of SH 4 and Farm-to-Market Road (FM) 511 (Kellers Corner) in Cameron County on 21 April 1986 (Tewes, 1987; Laack and Rappole, 1987b). While this was the last confirmed record of a jaguarundi in Texas (Laack, 1998), unconfirmed jaguarundi sightings in Hidalgo County include Bentsen Rio Grande State Park, Santa Ana NWR, Lower Rio Grande Valley NWR, Cimarron Country Club, Wimberley Ranch, and the Anacua Unit of the TPWD Las Palomas Wildlife Management Area (Prieto, 1990, 1991; Benn, 1997). Unconfirmed but reliable sightings of a jaguarundi occurred at the Sabal Palm Grove Sanctuary in Cameron County in 1988 (Anonymous, 1989). Recent jaguarundi sightings have been reported from the Santa Ana NWR for March 1998 (Santa Ana NWR data). Based upon sighting reports, personnel of the Santa Ana NWR suspect the presence of jaguarundis on the refuge (Benn, 1997).

Tewes and Everett (1987) concluded that until verifiable evidence of jaguarundis from central Texas and the upper Gulf coast was forthcoming, jaguarundi distribution in Texas should be considered as restricted to the Rio Grande Valley. The number of jaguarundis in Texas is unknown, but certainly less than that of ocelots.

2.16.5 Presence in the Project Area

Jaguarundis are extremely unlikely to occur in the project area due to the lack of suitable brushy habitat and the lack of any known populations in the area. Trapping studies conducted during the Navy Homeport Feasibility (U.S. Navy, 1986) provided no evidence that jaguarundis were in the project area.

2.16.6 Effects of the Project

No impacts to the jaguarundi are expected from this project.

2.17 WEST INDIAN MANATEE

2.17.1 Reason for Status

The West Indian manatee (*Trichechus manatus*) was listed as endangered on 2 June 1970 (35 FR 8495). The largest known human-related cause of manatee mortality in Florida is collisions with hulls and/or propellers of boats and ships. The second-largest human-related cause of mortality in Florida is entrapment in floodgates and navigation locks. Other known causes of human-related manatee mortality include poaching and vandalism, entrapment in shrimp nets and other fishing gear, entrapment in water pipes, and ingestion of marine debris (FWS, 1993). Hunting and fishing pressures were responsible for much of its original decline, as manatees were heavily hunted for meat, hides, and bones until they were nearly extirpated (FWS, 1995).

A prominent cause of natural mortality in some years in Florida is cold stress, and major die-offs associated with the outbreaks of red tide have occurred, where manatees appear to have died due to ingestion of filter-feeding tunicates that had accumulated the neurotoxin-producing dynoflagellates responsible for causing the red tide (FWS, 1993). The low reproductive rate and habitat loss make it difficult for manatee populations to recover.

2.17.2 Habitat

The manatee inhabits shallow coastal waters, estuaries, bays, rivers, and lakes. Throughout most of its range it appears to prefer rivers and estuaries to marine habitats, although manatees inhabit marine habitats in the Greater Antilles (Lefebvre et al., 1989). It is not averse to traveling through dredged canals or using quiet marinas. Manatees are apparently not able to tolerate prolonged exposure to water colder than 20°C. In the northern portions of their range during October through April they congregate in warmer water bodies, such as spring-fed rivers and outfalls from power plants. They prefer waters that are at least 1 to 2 m in depth; along coasts they are often in water 3 to 5 m deep. They usually avoid areas with strong currents (NatureServe, 2000).

Manatees are primarily dependent upon submergent, emergent, and floating vegetation, with the diet varying according to plant availability. They may opportunistically eat other foods such as acorns in early winter in Florida or fish caught in gill nets in Jamaica (O'Shea and Ludlow, 1992).

2.17.3 Range

The manatee ranges from the southeastern U.S. and coastal regions of the Gulf of Mexico, through the West Indies and Caribbean, to northern South America. U.S. populations occur primarily in Florida (NatureServe, 2000), where they are effectively isolated from other populations by the cooler waters of the northern Gulf of Mexico and the deeper waters of the Straits of Florida (Domning and Hayek, 1986).

2.17.4 Distribution in Texas

Manatees are extremely rare in Texas, although in the late 1800s they apparently were not uncommon in the Laguna Madre. Recent Texas records also include specimens from Cameron, Galveston, Matagorda, and Willacy counties (FWS, 1995). Davis and Schmidly (1994) describe a Texas record of a manatee found dead in the surf near the Bolivar Peninsula near Galveston. Manatees may travel great distances (200 km or more) along the coast or between islands (FWS, 1995).

2.17.5 Presence in the Project Area

Albert Oswald of the Texas State Aquarium spotted a manatee in the inlet between the Texas State Aquarium and the Lexington Museum on 23 September 2001. This is the third and probably most reliable sighting of the manatee in Corpus Christi Bay (Beaver, 2001).

2.17.6 Effects of the Project

While the West Indian manatee has been recently sighted in Corpus Christi Bay, such occurrences are rare. Should a manatee wander into the project area, the greatest threats to it would be from boat traffic or dredging operations. However, project impacts are temporary and local in nature and no significant adverse impacts are expected.

2.18 WHALES

Whales occur in offshore waters and will not be impacted by the proposed ship channel improvements.

2.19 SUMMARY

No Federally threatened or endangered species are expected to be significantly adversely impacted by the proposed ship channel improvements. The following species are unlikely to occur in the project area and, therefore, no impacts are expected: South Texas ambrosia, slender rush-pea, bald eagle, whooping crane, northern aplomado falcon, mountain plover, Eskimo curlew, ocelot, jaguarundi, and whales. No significant adverse impacts are expected for the following species: Kemp's ridley sea turtle, green sea turtle, loggerhead sea turtle, hawksbill sea turtle, leatherback sea turtle, piping plover, and West Indian manatee. The brown pelican will experience a beneficial impact from the project due to improvements to Pelican Island through beneficial use of dredged material.

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