



United States Department of the Interior

FISH AND WILDLIFE SERVICE
South Florida Ecological Services Office
1339 20th Street
Vero Beach, Florida 32960



March 10, 2005

Colonel Robert Carpenter
District Engineer
U.S. Army Corps of Engineers
701 San Marco Boulevard, Room 372
Jacksonville, Florida 32207-8175

Service Log No.: 4-1-05-PL-10544
Corps Application No: SAJ-2001-6440 (NW-JWS)
Date Received: November 5, 2004
Applicant: Stella Maris, Master Association
County: Collier

Dear Colonel Carpenter:

This document is the Fish and Wildlife Service's (Service) biological opinion for a proposed 10-slip private boat ramp. The applicant proposes to construct a 10-slip boat ramp within Reach 26 of the U.S. Army Corps of Engineers' (Corps) Reach Characterization for Florida Waters (Corps 2001) in Collier County, Florida. Reach 26 encompasses the waters of the Ten Thousand Islands and all connecting tributaries and residential canal systems in Collier County, Florida.

This biological opinion addresses the potential effects of this project on the Southwest subpopulation of the West Indian (= Florida) manatee (*Trichechus manatus*) (manatee) within Reach 26 in accordance with section 7 of the Endangered Species Act of 1973, as amended (ESA) (16 U.S.C. 1531 *et seq.*) and the Marine Mammal Protection Act of 1972, as amended (MMPA) (16 U.S.C. 1461 *et seq.*). No other listed species will be affected by the proposed action.

This biological opinion was prepared based on information provided by the Corps, the Corps' Reach Characterization (Corps 2001), the *Florida Manatee Recovery Plan* (Service 2001), the *South Florida Multi-Species Recovery Plan* (Service 1999), data supplied by the Florida Fish and Wildlife Conservation Commission (FWC) and by the Florida Marine Research Institute (FMRI), and other sources of information. A complete administrative record of this consultation is on file at the Service's South Florida Ecological Services Office in Vero Beach, Florida.



CONSULTATION HISTORY

On the date listed above, the Service received a public notice from the Corps stating the proposed project “may affect” the manatee and requested initiation of formal consultation for the proposed action.

By letter dated February 25, 2005, Collier County stated that the proposed boat ramp was not in compliance with the Collier County Manatee Protection Plan (MPP).

This project is one that, by applying the January 2, 2001, Manatee Key (Corps and Florida Department of Environmental Protection [DEP] 2001), resulted in a “may affect” determination.

The Corps has provided the Service with a database that characterizes reaches or segments of manatee habitat. The database includes general and specific information on factors in the area that may contribute to manatee-watercraft interactions including dock density, watercraft destinations, watercraft density, and watercraft traffic patterns. This database was used to assist in our review of these Corps permit applications. The Corps also provided the Service with the applicant’s completed Manatee Checklist which provides additional site-specific information on the factors defined in the reach characterization database.

The Service acknowledges the Corps’ determination of “may affect” for the manatee.

FISH AND WILDLIFE RESOURCES

The proposed action is not expected to significantly impact native habitat resources or submerged aquatic vegetation based on the information provided. Therefore, the Service does not object to the proposed action as it relates fish and wildlife habitat resources.

BIOLOGICAL OPINION

DESCRIPTION OF PROPOSED ACTION

The proposed action would authorize the construction of a 10-slip private boat ramp in Collier County, Florida. The proposed facility consists of a 20-foot by 96-foot boat ramp, and a trailer parking area that accommodates 10 vehicles. The proposed project is located at 385 Stella Maris Drive North, on the Faka Union Canal, in Section 9, Township 52 South, Range 28 East, Collier County, Florida. The Corps has assigned application number SAJ-2001-6440 (NW-JWS) to this project. To reduce direct construction-related impacts to the manatee, the Corps has agreed to include, as a condition of the permit, the *Standard Manatee Construction Conditions* (FWC 2001). Seagrasses, if present, are avoided through modifications in the project design during the permit review process and/or the application of *Dock Construction Guidelines for Florida* developed by the Corps and National Marine Fisheries Service (NOAA Fisheries) (Corps and NOAA Fisheries 2001). The applicant has agreed to include manatee informational brochures in the closing documents of all real estate transactions. This brochure will include

general information on manatees and how to spot them, along with details of the Faka Union Canal area speed zones and the fines for violating these zones. General information on the manatees and details of the speed zones will also be presented at the annual meeting of the home owners. The ramp use agreements, signed by property owners, renters or ramp users, will incorporate a description of the speed zones and potential fines for violating these zones.

STATUS OF THE SPECIES/CRITICAL HABITAT

Species/Critical Habitat Description

West Indian (= Florida) manatees are massive fusiform-shaped mammals with skin that is uniformly dark grey, wrinkled, sparsely haired, and rubber-like. Manatees possess paddle-like forelimbs, no hind limbs, and a spatulate, horizontally flattened tail. Females have two axillary mammae, one at the posterior base of each forelimb. Their bones are massive and heavy with no marrow cavities in the ribs or long bones of the forearms (Odell 1982). Adults average about 10 feet in length and 2,200 pounds in weight, but may reach lengths of up to 15 feet (Gunter 1941) and weigh as much as 3,570 pounds (Rathbun et al. 1990). Newborns average 4 to 4.5 feet in length and weigh about 66 pounds (Odell 1981). The nostrils located on the upper snout, open and close by means of muscular valves as the animals surface and dive (Husar 1977; Hartman 1979). A muscular flexible upper lip is used with the forelimbs to manipulate food into the mouth (Odell 1982). Bristles are located on the upper and lower lip pads. Molars designed to crush vegetation form continuously at the back of the jaw and move forward as older ones wear down (Domning and Hayek 1986). The eyes are very small, close with sphincter action, and are equipped with inner membranes that can be drawn across the eyeball for protection. The ears are external, minute, with no pinnae. The anatomy of the internal ear structure indicates that they can hear sounds within a relatively narrow low frequency range, that their hearing is not acute, and that they have difficulty in localizing sound (Ketten et al. 1992). However, Gerstein (1995) suggested that manatees may have a greater low-frequency sensitivity than other marine mammal species that have been tested.

Critical habitat for any species is described as the specific area within the geographic area occupied by the species, at the time it is listed under the provisions of section 4 of the ESA, on which are found those physical or biological features (*i.e.*, constituent elements): (1) essential to the conservation of the species; and (2) which may require special management considerations or protection.

Critical habitat for this species was designated in 1976 (50 CFR 17.95). Designated critical habitat on the west coast of Florida includes Crystal River in Citrus County, portions of the Little Manatee River in Hillsborough County, the Manatee River in Manatee County, the Myakka River in Sarasota and Charlotte counties, the Peace River in Desoto and Charlotte Counties, and the Caloosahatchee River in Lee County. It also includes all the coastal waters in Lee, Collier, and Monroe Counties between Gordon's Pass (Collier County) and Whitewater Bay (Monroe County).

Designated manatee critical habitat on the Atlantic Coast of Florida includes those intracoastal waters connecting rivers and bays from the Florida/Georgia border south to Key Largo in Monroe County, excluding those waters in Broward County, Florida. The Atlantic subpopulation of manatees also uses critical habitat identified between Key Largo and mainland Miami-Dade County in Florida Bay.

Constituent elements for any designated critical habitat include those physical and biological features essential to the conservation of the species. No specific primary or secondary constituent elements were included in the critical habitat designation. However, researchers agree that essential habitat features for the manatee include seagrasses for foraging, shallow areas for resting and calving, channels for travel and migration, warmwater refuges during cold weather, and freshwater for drinking (Service 2001).

Life History

Manatees are herbivores that feed opportunistically on a wide variety of aquatic vegetation. Feeding rates and food preferences depend, in part, on the season and available plant species. Manatees frequently feed in water depths of 3 to 9 feet where aquatic vegetation is abundant. Seagrasses appear to be a staple of the manatee diet in coastal areas (Ledder 1986; Provancha and Hall 1991; Kadel and Patton 1992; Koelsch 1997; Lefebvre et al. 2000). Manatees can remain submerged for several minutes with the longest submergence record lasting 24 minutes (Reynolds 1981).

Breeding takes place when one or more males (ranging from 5 to 22 individuals) are attracted to an estrous female to form a temporary mating herd (Rathbun et al. 1995). Mating herds can last up to 4 weeks, with different males joining and leaving the herd daily (Hartman 1979; Bengston 1981; Rathbun et al. 1995; Rathbun 1999). Permanent bonds between males and females do not form. During peak activity, the males in mating herds compete intensely for access to the female (Hartman 1979). Successive copulations involving different males have been reported. Some observations suggest that larger, presumably older, males dominate access to females early in the formation of mating herds and are responsible for most pregnancies (Rathbun et al. 1995). Although breeding has been reported in all seasons, Hernandez et al. (1995) reported that histological studies of reproductive organs from carcasses of males found evidence of sperm production in 94 percent of adult males found between March and November. Females appear to reach sexual maturity by about age 5 but have given birth as early as 4 (Marmontel 1995; Odell et al. 1995; O'Shea and Hartley 1995; Rathbun et al. 1995), and males may reach sexual maturity at 3 to 4 years of age (Hernandez et al. 1995). Manatees may live in excess of 50 years (Marmontel 1995), and evidence for reproductive aging is unclear (Marmontel 1995; Rathbun et al. 1995).

Calf dependency usually lasts 1 to 2 years after birth (Hartman 1979; O'Shea and Hartley 1995; Rathbun et al. 1995; Reid et al. 1995). Calving intervals vary greatly among females, with an average birth cycle of 2 to 2.5 years, but may be considerably longer depending on age and perhaps other factors (Marmontel 1995; Odell et al. 1995; Rathbun et al. 1995; Reid et al. 1995).

Females that abort or lose a calf due to perinatal death (small manatees, less than 60 inches in length) (O'Shea and Hartley 1995), may become pregnant again within a few months (Odell et al. 1995), or even weeks (Hartman 1979).

Manatees often use secluded canals, creeks, embayments, and lagoons, particularly near the mouths of coastal rivers and sloughs, for feeding, resting, playing, mating, and calving (Marine Mammal Commission [MMC] 1986 and 1988). Manatees frequent coastal, estuarine, and riverine habitats and are capable of extensive north-south migrations. Based on telemetry, aerial surveys, photo-identification sighting records, and other studies over the past 20 years, manatee distribution in the southeastern United States is now well known (Beeler and O'Shea 1988; O'Shea 1988; MMC 1984 and 1986; Lefebvre et al. 1989). In general, the data reveal that manatees exhibit opportunism, as well as predictable patterns in their distribution and movement. They are able to undertake extensive north-south migrations with seasonal distribution determined by water temperature below 68 degrees Fahrenheit (20 degrees Celsius). Manatees depend on areas with access to natural springs, manmade warmwater refugia, areas with vascular plants, and freshwater sources. Manatees normally migrate along shorelines and use deeper corridors to access shallow water feeding and resting areas. When ambient water temperatures drop below 68 degrees Fahrenheit in autumn and winter, manatees aggregate within the confines of natural or artificial warmwater refuges (Lefebvre et al. 1989) or move to the southern tip of Florida (Snow 1991). Most warmwater artificial refuges are created by outfalls from power plants or paper mills. As water temperatures rise, manatees disperse from these winter aggregation areas. While some remain near their winter refuges, others undertake extensive migrations along the coast of Florida and far up rivers and canals. Most manatees return to the same warmwater refuges each year. However, some manatees use different refuges in different years, and others use two or more refuges in the same winter (Reid and Rathbun 1984; Rathbun et al. 1990; Reid et al. 1991). There are many lesser known, minor aggregation areas used as temporary thermal refuges. Most of these are canals or boat basins where warmwater temperatures persist as temperatures in adjacent bays and rivers decline.

Population Dynamics

The Florida manatee population is divided into four subpopulations: Northwest, Southwest, Atlantic, and Upper St. Johns River. Long-term studies suggest four regional populations of manatees in Florida: (a) the Northwest subpopulation, comprising approximately 12 percent of the total Florida manatee population, and consisting of the counties along the Gulf of Mexico from Escambia County east and south to Hernando County, Lafayette, and Gilchrist Counties, and Marion County adjacent to the Withlacoochee River; (b) the Upper St. Johns River subpopulation, comprising approximately 4 percent of the total Florida manatee population, and consisting of Putnam County from Palatka south, Volusia, Flagler, and Marion Counties adjacent to the St. Johns River or its tributaries, and Lake and Seminole Counties; (c) the Atlantic subpopulation, comprising approximately 42 percent of the total Florida manatee population, and consisting of counties along the Atlantic coast from Nassau County south to Miami-Dade County, the portion of Monroe County adjacent to the Florida Bay and the Florida Keys,

Okeechobee County, and counties along the lower portion of the St. Johns River north of Palatka, which includes Putnam, St. Johns, Clay, and Duval Counties; and (d) the Southwest subpopulation, comprising approximately 42 percent of the total Florida manatee population and consisting of the counties along the Gulf of Mexico from Pasco County south to Whitewater Bay in Monroe County and DeSoto, Glades, and Hendry Counties. These divisions are based primarily on documented manatee use of wintering sites and from radio-tracking studies of individuals' movements (Bengston 1981; MMC 1988; Rathbun et al. 1990; Beck and Reid 1995; Rathbun et al. 1995; Reid et al. 1995; Deutsch et al. 1998).

The previous recovery plan (Service 1996) identified the need for a population status working group to assess manatee population size and trends. The first meeting of the Manatee Population Status Working Group (MPSWG), a subcommittee of the Recovery Team, was held in March 1998. The goals of the MPSWG are to: (1) assess the status of the Florida manatee population; (2) advise the Service on population recovery criteria for determining when recovery has been achieved; (3) provide interpretation of available information on manatee population biology to managers; (4) make recommendations concerning needed research directions and methods; and (5) obtain rigorous external review of manatee population data, conclusions, and research methods by independent researchers with expertise in population biology.

In 2001, the MPSWG provided a statement summarizing what they believed to be the status of the Florida manatee at that time (Wildlife Trust 2001). The MPSWG stated that, for the Northwest and Upper St. Johns River subpopulations, available evidence indicated that there had been a steady increase in animals over the last 25 years. The statement was less optimistic for the Atlantic subpopulation due to an adult survival rate that was lower than the rate necessary to sustain population growth. The MPSWG believed that this subpopulation had likely been growing slowly in the 1980s, but then may have leveled off or even possibly declined. They considered the status of the Atlantic subpopulation to be "too close to call." Such finding was consistent with high levels of human-related and, in some years, cold-related deaths in this subpopulation.

Regarding the Southwest subpopulation, the MPSWG acknowledged that further data collection and analysis would be necessary to provide an assessment of the manatee's status in this subpopulation. Preliminary estimates of adult survival available to the MPSWG at that time indicated that the Southwest subpopulation was similar to the Atlantic subpopulation and "had substantially lower [adult survival estimates] than for the Northwest and Upper St. Johns River [subpopulations]." The Southwest subpopulation was noted for having high levels of watercraft-related manatee deaths and injuries and natural mortality events (*i.e.*, red tide and severe cold). According to more recent analyses by Runge et al. (In Review), growth rates in the Southwest subpopulation approximate a rate of -1.1 percent per year (95 percent confidence interval of -5.4 to 2.4). Estimated growth rates are thought to be highest in the Upper St. Johns River subpopulation (+6.2 percent per year [95 percent confidence interval of 3.7 to 8.1]), followed by the Northwest subpopulation (+3.7 percent per year [95 percent confidence interval of 1.6 to 5.6]), and the Atlantic subpopulation (+1.0 percent per year [95 percent confidence interval of -1.2 to 2.9]).

A Population Viability Analysis (PVA), in which random events (such as red tide, extremely cold winters, and loss of warmwater sites) are incorporated into a model, was carried out for manatees based on age-specific mortality rates estimated from the age distribution of manatees found dead throughout Florida from 1979 through 1992 (Marmontel et al. 1997). This method of estimating survival relied on certain assumptions that were not fully testable; despite this, the results again pointed out the importance of adult survival to population persistence. Given a population size that reflected a 1992 minimum population estimate, the PVA showed that if adult mortality as estimated for the study period were reduced by a modest amount (for example, from 11 percent down to 9 percent), the Florida manatee population would likely remain viable for many years. However, the PVA also showed that slight increases in adult mortality would result in extinction of manatees within the next 1,000 years.

Status and Distribution

Based on telemetry studies, aerial surveys, photo-identification studies, and other research over the past 20 years, manatee distribution in the southeastern United States is better understood (Beeler and O'Shea 1988; O'Shea 1988; MMC 1984, 1986; and Lefebvre et al. 1989). Florida manatees can be found in Florida waters throughout the year, and nearly all manatees use the waters of peninsular Florida during the winter months. In winter months, most manatees rely on warm water from industrial discharges and natural springs for warmth. In warmer months, they expand their range and occasionally are seen as far north as Rhode Island on the Atlantic Coast and as far west as Texas on the Gulf Coast.

Despite significant efforts dating back to the late 1970s and early 1980s, scientists have been unable to develop a statistically and scientifically repeatable means of estimating or monitoring trends in the size of the overall manatee population in the southeastern United States (O'Shea 1988; O'Shea et al. 1992; Lefebvre et al. 1995). Even though many manatees aggregate at warmwater refuges in winter and most, if not all, such refuges are known, direct counting methods (*i.e.*, by aerial and ground surveys) are unable to account for the number of animals that may be away from these refuges at any given time, the number of animals not seen because of turbid water, and other factors. The use of mark-resighting techniques to estimate manatee population size based on known animals in the manatee photo-identification database is also not a statistically and scientifically repeatable method.

It is possible, however, to monitor the number of manatees using the Blue Spring (Volusia County) and Crystal River (Citrus County) warmwater refuges. At Blue Spring (in the Upper St. Johns River subpopulation), with its unique combination of clear water and confined spring area, it has been possible to count the number of resident animals by identifying individual manatees from scar patterns. The data indicate that this group of animals has increased steadily since the early 1970s when it was first studied. During the 1970s the number of manatees using the spring increased from 11 to 25 (Bengston 1981). In the mid 1980s about 50 manatees used the spring (Service 2001), and by the winter of 1999-2000, the number had increased to 147 (W.C. Hartley, DEP, personal communication 2001).

In the Northwest subpopulation, the clear, shallow waters of Kings Bay (Citrus County) have made it possible to monitor the number of manatees using this warmwater refuge at the head of Crystal River. Large aggregations of manatees apparently did not exist there until recent times (Service 2001). The first careful counts were made in the late 1960s. Since then, manatee numbers have increased significantly. From 1967 to 1968, Hartman (1979) counted 38 animals in Kings Bay. By 1981-1982, the maximum winter count had increased to 114 manatees (Powell and Rathbun 1984), and in November 2000, the maximum count was 301 (J. Kleen, Service, personal communication).

In the Atlantic and Southwest subpopulations, no similar shallow, clear water areas are present that make it possible to monitor the number of manatees using warmwater refugia, although such refugia are present. In these locations, visual counts of those manatees that can be seen by aerial surveys are the basis of the population estimates and estimates of adult survival and population growth.

The only data on population size include uncalibrated indices based on maximum counts of animals at winter refuges made within 1 or 2 days of each other. Based on such information in the late 1980s, the total number of manatees throughout Florida was originally thought to include at least 1,200 animals (Service 2001a). Because aerial and ground counts at winter refuges are highly variable depending on the weather, water clarity, manatee behavior, and other factors (Packard et al. 1985; Lefebvre et al. 1995), interpretation of these data to assess short-term trends is difficult (Packard and Mulholland 1983; Garrott et al. 1994).

Beginning in 1991, the State of Florida initiated a statewide, synoptic, aerial survey program to count manatees in potential winter aggregation areas during periods of severe cold weather (Ackerman 1995). The highest statewide minimum count from these surveys was 3,276 manatees in January 2001 with 1,520 individuals on the east coast and 1,756 individuals on the west coasts. A more recent survey conducted on January 21-22, 2003, provides a minimum population estimate that includes 3,113 individuals with 1,814 and 1,299 manatees on the east and west coasts, respectively (<http://www.floridamarine.org>).

While aircraft synoptic surveys provide a “best estimate” of the minimum Florida manatee population size, there are no confidence intervals (derived through reliable, statistically based, population-estimation techniques) for these estimates. With the exception of a few places where manatees may aggregate in clear, shallow water, not all manatees can be seen from aircraft because of water turbidity, depth, surface conditions, variable times spent submerged and other considerations (Lefebvre et al. 1995). While these results are of value in providing information on where manatees occur, likely relative abundance in various areas, and seasonal shifts in manatee abundance, they do not provide good population estimates nor can they reliably measure trends in the manatee population. Consequently, the *Florida Manatee Recovery Plan* (Service 2001) concludes that “despite considerable effort in the early 1980s, scientists have been unable to develop a useful means of estimating or monitoring trends in size of the overall manatee populations in the southeastern United States.”

At the end of winter, manatees leave warmwater aggregation sites and head for warm weather use areas. There appears to be no significant spring aggregation areas on the west coast, although Charlotte Harbor was visited in the spring by almost half of 35 manatees radio-tagged at the Fort Myers Power Plant in Lee County in the early 1980s (Lefebvre and Frohlich 1986). During the summer, manatees can be found throughout Florida where water depths and access channels are greater than 1 to 2 meters (3.3 to 6.6 feet) (O'Shea 1988). Summer use areas are generally typified by extensive foraging resources. Seagrasses and other food sources occur throughout coastal Florida.

Reasons for Legal Protection

In 1967, both the Florida and Antillean subspecies of manatees (*T. manatus latirostris* and *T. manatus manatus*) were listed as endangered (32 FR 4061) and received Federal protection with the passage of the ESA in 1973. However, since the manatee was designated as an endangered species prior to enactment of the ESA, there was no formal listing package identifying threats to the species, as required by section 4(a)(1) of the ESA. However, since that time, threats to the manatee (discussed below) have been identified.

Manatees are also protected under the MMPA. The MMPA establishes, as national policy, maintenance of the health and stability of marine ecosystems, and whenever consistent with this primary objective, obtains and maintains optimum sustainable populations of marine mammals. It also establishes a moratorium on the taking of marine mammals, which includes harassing, hunting, capturing, killing, or attempting to harass, hunt, capture, or kill any marine mammal. Section 101(a)(5)(A) of the MMPA allows the Service, upon request, to authorize by specific regulation the incidental, unintentional take of marine mammals by persons engaged in identified activities within specific geographic areas, if the Service determines that such taking would have a negligible impact on the species or subpopulation. Since the manatee, which is comprised of the Florida and Antillean manatee subpopulations, is currently listed as "endangered" under the ESA, they are considered "depleted" under the MMPA.

Section 115(b) of the MMPA requires that conservation plans be developed for marine mammals considered "depleted." In the case of the Florida manatee, the Service developed the initial recovery plan for the manatee in 1980. This initial plan focused primarily on manatees in Florida, but included Antillean manatees in the Commonwealth of Puerto Rico and the United States Virgin Islands. In 1986, the Service adopted a separate recovery plan for manatees in Puerto Rico. To reflect new information and planning needs for manatees in Florida, the Service revised the original plan in 1989 and focused exclusively on the Florida manatee. This first revision covered a 5-year planning period ending in 1994. The Service revised and updated the plan again in 1996, which again covered a five-year planning period ending in 2000. In 1999, the Service initiated the process to revise the plan for a third time. An 18-member recovery team, consisting of representatives of the public, agencies, and groups that have an interest in

manatee recovery and/or could be affected by proposed recovery actions, was established to draft the third revision. The latest manatee recovery plan, which also covers a 5-year planning period, was finalized in October 2001.

Threats

The main threat faced by manatees in Florida is death or serious injury from watercraft strikes. Another threat includes uncertainty in the availability of warmwater refuges as deregulation of the power industry in Florida occurs. Consequences of an increasing human population and intensive coastal development are also long-term threats to the manatee. Their survival will depend on maintaining the integrity of ecosystems and habitat sufficient to support a viable manatee population. A viable manatee population includes values that are indicative of a stable or increasing population for the periods of analysis and provide us with additional positive recovery indicators, such as progressively higher minimum counts, and increasing adult manatee survival, reproduction (cows with calves), and population growth rates.

The largest identified human cause of manatee deaths is collisions with watercraft and/or propellers of watercraft. Between 1976 and 2002, watercraft-related manatee deaths accounted for 25 percent of the total mortality. Data on manatee deaths in the southeastern United States have been collected since 1974 (O'Shea et al. 1985; Ackerman et al. 1995; FWC unpublished data). Data since 1976 were used in the following summary, as carcass collection efforts were more consistent following that year. These data indicate an increase in manatee deaths over the last 25 years (Ackerman et al. 1995; FWC unpublished data). This is an increase of an average of 7.2 percent per year (Ackerman et al. 1995; FWC unpublished data). Watercraft-related manatee deaths were lower in 1992 and 1993, but increased thereafter. From 1996 to 2002, watercraft-related manatee deaths were the highest on record, which also corresponds to an increase in the manatee population and an increase in registered watercraft.

In a parallel fashion, residential growth and visitation to Florida have increased dramatically. It is expected that Florida will have 83 million visitors annually by the year 2020, up from 48.7 million visitors in 1998. In concert with this increase of human population growth and visitation is the increase in the number of watercraft that travel Florida waterways. In 2002, 961,719 watercraft were registered in the State of Florida (Division of Motor Vehicles 2003). This represents an increase of 59 percent since 1993. The Florida Department of Community Affairs estimates that, in addition to watercraft belonging to Florida residents, between 300,000 and 400,000 watercraft registered in other States use Florida waters each year.

As noted above, there has been an increasing trend in watercraft-related manatee mortality in all four subpopulations over the past decade. This is reflected in increases in the average annual number of watercraft-related manatee mortalities as the period over which the average is taken becomes more recent. For instance, in the Atlantic subpopulation, the mean observed mortality due to watercraft was 25.8 deaths per year for the period 1990-1999, 29.8 per year for the period 1993-2002, and 37 per year for the 5-year period from 1998-2002. This trend is statistically significant in all four subpopulations. The slope of the increase (as fit to the period 1992-2002)

does not differ between the Upper St. Johns River and Northwest subpopulations (5.96 percent), nor does it differ between the Atlantic and Southwest subpopulations (9.53 percent). To interpret these mortality rates of increase, however, it is important to compare them to the historic growth rates (1990-1999) in each subpopulation, to account for the increase in manatee mortalities that would be expected due to increases in manatee population size. In the Atlantic and Southwest subpopulations, the rate of increase in watercraft-related manatee mortality over that period exceeded the estimated growth rate of those populations (by 8.5 percent in the Atlantic and 10.6 percent in the Southwest). In the Northwest subpopulation, the rate of increase in mortality (6.0 percent) is somewhat larger than the estimated growth rate (3.7 percent).

The next largest human-related cause of manatee deaths is entrapment or crushing in water control structures and navigational locks, and this accounts for approximately 4 percent of the total mortalities recorded between 1976 and 2002 (Ackerman et al. 1995; FWC unpublished data). These deaths were first recognized in the 1970s (Odell and Reynolds 1979), and steps have been taken to eliminate this source of mortality. Beginning first in the early 1980s, gate-opening procedures were modified. Annual numbers of deaths initially decreased after this modification. However, the number of deaths subsequently increased and, in 1994, a record 16 deaths were documented. Manatee mortality decreased during 2000-2002 with 14 manatee mortalities for the 3-year period. An ad hoc interagency task force was established in the early 1990s and now includes representatives from the South Florida Water Management District, Corps, Service, Miami-Dade Department of Environmental Research Management, FWC and the DEP. This group meets annually to discuss recent manatee deaths and develop measures to protect manatees at water control structures and navigational locks as well as to prevent entrapment in culverts and pipes. The overall goal is to eliminate structure-related manatee deaths.

Other known causes of human-related manatee deaths include poaching and vandalism, entanglement in shrimp nets, monofilament line (and other fishing gear), and ingestion of debris. These account for about 3 percent of the total mortality from 1976 to 2002. Together, deaths attributable to these causes have remained constant and have accounted for a low percentage of total known deaths, *i.e.*, about 4 percent between 1976 and 1980, 3 percent between 1981 and 1985, 2 percent between 1986 and 1991, and 2 percent between 1992 and 2002 (Ackerman et al. 1995; FWC unpublished data). Entrapment in shrimp nets is the largest component of this category. Eleven deaths between 1976 and 1998 (seven in Florida, four in other states) were thought to be related to shrimping activities (Nill 1998). These deaths have become less common since regulations on inshore shrimping, the 1995 Florida Net Ban regulations, and education efforts about protecting manatees were implemented.

These data on causes of manatee mortality, particularly the increasing number of watercraft-related manatee deaths, should be viewed in the context of Florida's growing human population, which increased by 130 percent since 1970, from 6.8 to 15.7 million people (Florida Office of

Economic and Demographic Research 2001). The rise in manatee deaths during this period is, at least in part, the result of the increasing numbers of people and watercraft sharing the same waterways.

Human activity has other effects on manatees besides direct mortality. Dredge and fill activities, polluted runoff, and propeller scarring have resulted in the loss of vegetated areas. Quiet backwaters have been made more accessible to human activities, and increasing levels of vessel traffic have made manatees increasingly vulnerable to watercraft collisions in travel corridors. For example, industrial warmwater discharges and deep-dredged areas are now used as wintering sites, stormwater pipes and freshwater discharges in marinas provide manatees with drinking water, and the imported exotic plant, hydrilla (*Hydrilla verticillata*, which has supplanted native aquatic species), has become an important food source at wintering sites.

While some changes substitute for natural biological needs, some activities have an adverse effect on the species. The loss of industrial warmwater discharges can result in the deaths of individuals using these sites. Other activities may also affect manatees, albeit on a much more subtle level. Harassment by watercraft and swimmers may drive animals away from preferred natal areas and winter refugia, and the loss of vegetation in certain areas (*e.g.*, winter foraging areas) may require manatees to travel greater distances to feed. The impact of these kinds of activities on the survival, recovery, and mortality of the species is not fully understood.

Natural causes of death include disease, parasitism, reproductive complications, and other nonhuman-related injuries, as well as occasional exposure to cold and red tide (O'Shea et al. 1985; Ackerman et al. 1995). These natural causes of death accounted for 13 percent of all deaths between 1976 and 2002 (FWC unpublished data). Perinatal deaths accounted for 20 percent of all deaths in the same period. A prominent natural cause of death in some years is exposure to cold. Following a severe winter cold spell at the end of 1989, at least 46 manatee carcasses were recovered in 1990; cause of death for each was attributed to cold stress. Exposure to cold is believed to have caused many deaths in the winters of 1977, 1981, 1984, 1990, 1996, and 2001; and have been documented as early as the 19th century (Ackerman et al. 1995; O'Shea et al. 1985; FWC unpublished data).

In 1982, a large number of manatees also died coincidentally with a red tide dinoflagellate (*Gymnodinium breve*) outbreak between February and March in Lee County, Florida (O'Shea et al. 1991). At least 37 manatees died, perhaps in part, due to incidental ingestion of filter-feeding tunicates that had accumulated the neurotoxin-producing dinoflagellates responsible for causing the red tide. In 1996, from March to May, at least 149 manatees died in a red tide event over a larger region of southwest Florida (Bossart et al. 1998; Landsberg and Steidinger 1998). Although the exact mechanism of manatee exposure to the red tide brevetoxin is unknown in the 1982 and 1996 outbreaks, ingestion, inhalation, or both are suspected (Bossart et al. 1998). Since January 2003, the current red tide outbreak has been responsible for the deaths of 75 manatees (<http://www.floridamarine.org>). The critical circumstances

contributing to red tide-related deaths are concentration and distribution of the red tide, timing and scale of manatee aggregations, salinity, and timing and persistence of the outbreak (Landsberg and Steidinger 1998).

Perinatal deaths include aborted fetuses, stillborn, or those that die of natural causes within a few days of birth. Some may die from disease, reproductive complications, and/or congenital abnormalities. The cause of many perinatal deaths cannot be determined, because these carcasses are generally in an advanced state of decomposition at the time of recovery. Additionally, watercraft-related manatee injuries or disturbance, or other human-related factors affecting pregnant and nursing mothers may also be responsible for some of the perinatal deaths. It has been suggested that some may die from harassment by adult males (O'Shea and Hartley 1995). Between 1976 and 2002, perinatal deaths increased at an average of 9.2 percent per year (Ackerman et al. 1995; FWC unpublished data).

Status and Distribution of the Southwest Subpopulation

Manatee distribution and dispersal patterns, and numbers of individuals within an area, can vary considerably from year-to-year and season-to-season. This variability in dispersal patterns is dependent on a variety of biotic and abiotic factors, such as warmwater discharges, freshwater supplies, high quality feeding areas, and mating season.

The project discussed in this biological opinion is located in waters accessible to the Southwest subpopulation of manatees. The Southwest subpopulation comprises approximately 42 percent of the total Florida manatee population. The Southwest subpopulation of manatees includes all coastal areas from Pasco County south to Whitewater Bay in Monroe County as well as DeSoto, Glades, and Hendry Counties.

Collection of life history data for the Southwest subpopulation only began in 1995 and is not sufficient to estimate survival rates. The Service understands that the current status statement of the Southwest subpopulation presented by the MPSWG is incomplete. However, we also understand that the other qualitative information warrants consideration in developing a complete view of the overall status of the subpopulation. We believe that there are more manatees now than there were in the 1970s and 1980s. However, this does not mean that the threats have been reduced. For instance, when compared with manatee mortality resulting from watercraft collisions (17 deaths), red tide (75 deaths) has had a greater effect on the Southwest subpopulation for the same time period (January-June 2003).

Threats to the Southwest Subpopulation

Data on manatee deaths in the Southwest subpopulation have been collected since 1974 (O'Shea et al. 1985; Ackerman et al. 1995; FWC unpublished data). Data since 1976 were used in the following summary as carcass collection efforts were more consistent following that year. These data indicate an increase in manatee deaths over the last 26 years. Most of the increase can be

attributed to increases in watercraft-related manatee mortality and perinatal deaths (MMC 1993), which also corresponds to an increase in the human population and registered watercraft.

Between 1976 and 2002, 1,887 manatee deaths were recorded within the Southwest subpopulation. The cause of death categories includes watercraft, flood gate/canal lock, other human causes, perinatal, cold stress, natural, and undetermined. Death category quantities for the period above are as follows:

watercraft	gate/lock	other human	perinatal	cold stress	natural	undetermined
455	31	34	334	62	373	598

Other threats include uncertainty in the availability of warmwater refuges as deregulation of the power industry in Florida occurs. We believe that an increasing human population and intensive coastal development are long-term threats to the manatee. As Florida's human population increases, particularly in coastal counties, threats to submerged aquatic vegetation communities may increase. These submerged aquatic vegetation communities are an important component in the survival and recovery of the manatee. The combined effects of propeller scarring of seagrass beds, water pollution from stormwater discharges, new docks, dredging, and filling may further degrade the seagrass beds. These activities may continue to degrade habitat reducing foraging opportunities for manatees.

Manatee Protection Plans

Countywide MPPs are identified in the Manatee Recovery Plan as a method for protecting manatees, and manatee habitat. In 1989, the State of Florida directed 13 key manatee counties to develop MPPs. The purpose of an MPP is to present a summary of existing information about manatee use and watercraft use within the county and to develop strategies to balance manatee protection, resource protection, water resource uses, facility siting, speed zones, boating safety, and provide for public education.

Citrus County was the first county to have a State-approved MPP in 1991. The county's MPP identified actions that address manatee mortality and included a boating facility siting plan. The MPP also discussed conservation measures to protect manatee habitat. Subsequent to its approval, the State established regulatory speed zones for watercraft. The State of Florida subsequently approved MPPs for Collier County in May 1995 followed by Miami-Dade County in December 1995; Duval County in June 1999; Indian River County in August 2000 which was amended in February 2002; St. Lucie County in March 2002; Martin County in June 2002; Brevard County in February 2003; Sarasota County in February 2004; and Lee County in August 2004.

The Service believes that county MPPs are one of the best vehicles to address such issues as boating facilities (marinas, docks, boat ramps, dry storage areas); boating activity patterns; manatee information; a boat facility siting plan; manatee protection measures; and an education

and awareness program for the boating public. They are valuable planning tools and provide an excellent venue for local manatee protection efforts. In addition, it is our view that an effective MPP must contain components that address manatee protection areas (*e.g.*, manatee refuges), speed zone enforcement, funding for manatee protection efforts, and a reporting/monitoring element. Implementation of a State-approved MPP will have met State standards and addressed our concerns in maximizing benefits to the manatee while providing regulatory certainty to the public.

Analysis of the Species/Critical Habitat Likely to be Affected

Due to the increase in the number of watercraft resulting from the proposed action, the Corps has determined that the proposed project “may affect” the manatee. We acknowledge the Corps’ determination, and as directed by our January 14, 2003, memorandum have engaged in formal consultation in an effort to provide a more complete analysis of the effects of the proposed action in order to determine whether or not the proposed activity is likely to jeopardize the continued existence of the manatee through impacts to the Southwest subpopulation.

The construction of this facility will likely affect the manatee and its critical habitat by increasing watercraft in the action area, and increasing the potential to adversely affect submerged aquatic resources (*i.e.*, seagrasses). An analysis of increased watercraft access and impacts to seagrasses will be considered further in the remaining sections of this document.

ENVIRONMENTAL BASELINE

This section analyzes all past and ongoing human and natural factors leading to the current status of the manatee in the action area. In the previous discussion of the threats to the species, the Service identified specific human related actions that combined have both negative and positive benefits to the manatee, and the Service believes that the best method to address these threats is through a basic geographic analysis area process.

The project analyzed in this document is located in Collier County, Florida. After reviewing the Corps’ Reach Characterization Analysis (2001), we have determined that Reaches 27, 28, 29, the northern portion of Reach 26, and the southern tip of Reach 30, all occur within Collier County. This biological opinion will address all relevant biological and physical factors that may affect the manatee, resulting from the construction of this multi-slip dock project within Reach 26, in Collier County, Florida.

We also evaluated this project using the Service’s Interim Strategy. During the development of the Interim Strategy, the Service identified four basic prerequisites necessary to ensure that incidental take is unlikely to occur. These four basic prerequisites are: (1) adequate speed zones; (2) adequate signage; (3) sufficient speed zone enforcement to prevent watercraft collisions from occurring as a result of the project; and (4) placement of these measures prior to project implementation. If these prerequisites are met, we may find that a new facility would be

unlikely to result in the incidental take of manatees. If the four prerequisites are not met, we cannot reasonably conclude that the project is unlikely to result in incidental take. If any of the four prerequisites were absent, then the Service identified the area as an area with inadequate protection and formal consultation should be initiated by the Federal action agency.

Consultation was initiated on this project, and the Service evaluated the specific conditions of the areas expected to be affected by the project to determine whether the project is likely to result in incidental take of manatees. If this analysis determines that incidental take is likely, the Service would normally issue a biological opinion with an incidental take statement. However, the Service cannot provide an incidental take statement for a facility under ESA until and unless incidental take is authorized under MMPA. If a special regulation is promulgated that authorizes incidental take under the MMPA, then we would consider this information in our determination as to whether incidental take could be authorized under the ESA. However, it is ultimately the Corps' responsibility to decide whether or not to issue a permit.

Other factors were considered, including the State's law enforcement efforts and the Service's Interim Strategy. For the action area and in general the species throughout its Florida range, the Service concluded, in consultation with the FWC, that the absence of speed zones and speed zone enforcement were the most significant threat factors to the survival and recovery of the manatee. During the statewide speed zone enforcement evaluation conducted in 2001, the State acknowledged the lack of enforcement and committed to providing an additional 215 officers for on-the-water enforcement. In determining the effectiveness of the State's law enforcement efforts, watercraft-related manatee mortality data for 2001 was compared to mortality data for 2000. Also considered in the comparison was the increase in law enforcement personnel with the State, as well as the number of new slips for watercraft access projects approved by the Service in 2001.

The following changes occurred from January 1, 2001, to January 1, 2002, for the 32 counties inhabited by manatees: (1) manatee mortalities increased from 78 to 80, (2) law enforcement positions increased from 187 to 402, including 21 positions currently vacant, and (3) 3,625 new slips were determined "not likely to adversely affect" the manatee by the Service.

The information illustrates that from January 2001 to January 2002 there was an increase, in almost every county, in the number of State law enforcement positions that conduct on-the-water law enforcement. Based on the increase in law enforcement positions (215 more) from January 1, 2001, to January 1, 2002, when compared to the number of registered vessels for 2000 and 2001, our analysis indicates that the ratio of vessels per officer decreases or the amount of officer time (in minutes) available for each vessel increases.

Since July 2001, the State of Florida, through the FWC Division of Law Enforcement, has reassigned and hired 86 law enforcement officers to increase and improve enforcement of manatee protection laws statewide. The FWC has also reorganized 316 existing law enforcement

officers to refocus a portion of their enforcement activities toward manatee protection. Furthermore, the State has allocated \$2 million for those officers willing to work overtime, which will fund additional hours of manatee protection.

Enforcement of posted speed zones in Collier County are provided by the FWC, local city enforcement officers, Collier County Sheriff Deputies, and the U.S. Coast Guard. The FWC has 14 officers that patrol the waters of Collier County. Designated manatee speed zones are enforced by members of all duly authorized law enforcement agencies within the county. The U.S. Coast Guard and the Service also provide speed zone enforcement through special task force events.

The Service also considered impacts from alteration of manatee habitat through dredge and fill activities associated with construction of new watercraft access projects and potential direct harm or harassment of manatees during construction activities. These types of anticipated direct impacts to habitat are addressed through facilities siting and through modifications in the project design during the permit review process. Direct impacts to manatees during construction are dealt with through application of the *Standard Manatee Protection Construction Conditions*, which are routinely included as conditions of Department of the Army permits issued for construction projects in manatee habitat.

ACTION AREA

The proposed project is located on a manmade canal adjoining the Faka Union Canal in Reach 26. Vessels using the new multi-slip facility would likely travel through waters of the Ten Thousand Islands and all connecting tributaries and residential canal systems in Collier County, Florida. These waters closely correspond to the area defined as Reach 26 by the Corps' Reach Characterization for Florida waters (Corps 2001). Therefore, for the purposes of this consultation, the Service defines the action area for this biological opinion as all waters within Reach 26, in Collier County, Florida.

Status of the Species Within the Action Area

The Southwest subpopulation of manatees migrates through Collier County. Manatee distribution and dispersal patterns, and numbers of individuals within an area, can vary considerably from year-to-year and season-to-season. This variability in dispersal patterns is dependent on a variety of biotic and abiotic factors, such as warmwater discharges, freshwater supplies, high quality feeding areas, and mating season.

During January 2003, there were three synoptic aerial surveys covering Florida. Each survey counted 1,166; 1,299; and 1,324 manatees on the west coast of Florida. These surveys did not delineate how many manatees were seen within Collier County.

Designated manatee critical habitat is found within the action area (all coastal waters in Collier County). No specific primary or secondary constituent elements were defined in the critical habitat designation. However, important components of manatee critical habitat within Collier County include seagrasses for foraging, shallow areas for resting and calving, channels for travel and migration, warmwater refugia for cold weather events, and fresh water for drinking. In the action area, manatees congregate at the Faka Union Canal.

Factors Affecting the Species' Environment Within the Action Area

Watercraft-related death and serious injury is the most important human-related factor affecting manatees within the action area. Between 1976 and 2004, 464 manatee deaths were recorded within Collier County. The cause of death categories includes watercraft, flood gate/canal lock, other human causes, perinatal, cold stress, natural, and undetermined. Death category quantities are as follows: watercraft, 126; flood gate/canal lock, 0; other human causes, 6; perinatal, 67; cold stress, 27; natural, 77; and undetermined, 161.

The continued growth of the human population in the action area is adversely affecting the quality of coastal ecosystems used by the manatee. Areas of submerged aquatic vegetation that provide important foraging habitat to the manatee are being degraded by the combined effects of propeller scarring of seagrass beds by boats, water pollution from stormwater discharges, new docks, and dredging, and filling activities. As the human population increases, threats to submerged aquatic vegetation communities will likely increase. Commercial and recreational boat use in the action area appears to be increasing. According to information provided by the State of Florida, a total of 19,232 vessels were registered in Collier County in 2000. The number of registered vessels decreased to 19,182 in 2001, increased to 22,332 in 2002, and 22,581 in 2003.

On November 30, 1999, Florida Administrative Code 68C-22.007 established manatee speed zones on Collier County waterways. The zones were established for the purpose of regulating the speed and operation of motorboats within Collier County, including all associated and navigable tributaries, lakes, creeks, coves, bends, backwaters, canals, channels and boat basins, unless otherwise designated or excluded.

Watercraft speed zones within Collier County include "No Entry" zones, "Idle Speed/Channel Included" zones, "Slow Speed/Channel Included" zones, "25 mph in Marked Channel/Slow Speed Outside of Channel" zones, "35 mph" zones, and areas of open water that are unregulated. These zones were established by the DEP in Rule 62N-22.010. Zone types and locations were based on manatee congregation data, manatee death data, watercraft usage data, and other manatee natural resource needs. The DEP and the West Coast Inland Navigation District install and maintain speed zone signs in Collier County waters. The Collier County Department of Natural Resources is responsible for placement and maintenance of manatee signs throughout Collier County. Manatee speed zone areas are inspected by Collier County to ensure that adequate marking is present, and that no hazards to navigation exist. Collier County has a DEP approved MPP. The plan was adopted in 1995. The zones were established for the purpose of

regulating the speed and operation of motorboats within Collier County, including all associated and navigable tributaries, lakes, creeks, coves, bends, backwaters, canals, channels and boat basins, unless otherwise designated or excluded.

Within the action area, speed zones have been established in the majority of Faka Union Canal, Port of the Islands, Pumpkin Bay, Blackwater Bay, Palm Bay, Barron River, Chokoloskee Bay, the Ten Thousand Islands and Faka Union Bay. The first manatee speed zones were established in the action area in October 1999. The State passed a rule establishing manatee speed zones throughout Collier County in November 1999 (68C-22.005 Florida Administrative Code).

All Collier County posted manatee speed zone signs are in compliance with both the State-approved design parameters and Chapter 68D-23 "Uniform Waterway Markers in Florida Waters." The intent of Chapter 68D-23 is to provide for uniformity in design, construction and coloring of markers so that all vessel operators may readily recognize, identify, and distinguish between authorized markers and unlawfully placed markers, and to provide a means by which the FWC law enforcement officers and all other law enforcement officers charged with the enforcement of this chapter may determine with reasonable certainty which boating areas are lawfully established and marked.

Waterways adjoining the area designated as a "Idle Speed-All Year (Channel Included)" zone, and "Slow Speed-All Year (Channel Included)" within Faka Union Canal, year round. The nearest open water areas, Faka Union Bay, is designated as a "Slow Speed" zone year round in some places, and "30 miles per hour" zone within the channel, and "20 miles per hour" outside of the channel, year round in the remaining portions. The open water zone in the vicinity of the project encompasses an area that the manatee would reasonably be expected to utilize. There are no documented seagrass beds, or documented migration travel routes within this open water area.

We know that sublethal forms of take (such as injury and harassment) occur, but some of these forms are immeasurable. Sublethal injury to manatees due to boat interactions has the potential to be a significant negative factor with regards to ensuring a healthy and viable population. In that regard, most manatee carcasses examined bear scars from previous strikes with watercraft (Wright et al. 1995), and a significant number of living, but scarred, manatees exist. A photo-identification system and database of scarred manatees currently maintained by the Sirenia Project (Beck and Reid 1995) contain only individuals with distinct scars, the vast majority of which appear to have been inflicted by propeller blades or keels. This database now documents 1,184 living individuals scarred from collisions with boats. Most of these manatees (1,153, or 97 percent) have more than one scar pattern, indicating multiple strikes with boats. Carcasses examined at necropsy also bear healed scars of multiple past strikes by boats; one extreme case, recently noted by the FMRI, had evidence of more than 50 past boat collisions (O'Shea et al. 2001). The severity of these boat strikes, including completely severed tails, major tail mutilations, and multiple disfiguring dorsal lacerations, is thought by some manatee researchers to impact population processes by reducing calf production (and survival) in wounded females,

although there are no reliable data to establish this cause and effect relationship. Overall, the full effects of harm to manatee population dynamics resulting from boat strikes remain largely unknown.

In addition to direct injury due to boat strikes, harassment by boats and swimmers may drive animals away from preferred sites thus altering manatee behavior and movement patterns. Significant and/or long-term harassment may require manatees to travel greater distances to feed or to reach warmwater refugia. Furthermore, some researchers are concerned that manatee calves can be separated from their mothers and some individuals may be driven from preferred warmwater refuges due to harassment.

EFFECTS OF THE ACTION

This section includes an analysis of the direct and indirect effects of the proposed action on the manatee and its interrelated and interdependent activities.

Factors to be Considered

New watercraft access projects may have a number of direct and indirect effects on manatees and manatee habitat. Direct impacts include potential direct harm or harassment of manatees during construction activities and are generally addressed through application of the *Standard Manatee Construction Conditions* (FWC 2001). Anticipated direct impacts to habitat, such as the presence of seagrasses within the project footprint are minimized through modifications in the project design during the permit review process and/or the application of *Dock Construction Guidelines for Florida* developed by the Corps and the NOAA Fisheries (Corps and NOAA Fisheries 2001). These two minimization efforts are routinely included as conditions of Department of the Army permits issued for construction projects in manatee habitat, and have previously undergone section 7 consultation.

Indirect effects to manatees include effects to routine movement and migration patterns to freshwater, foraging, calving, and breeding areas, and associated behavior patterns. Indirect effects also include effects to manatee habitat caused by operation of the proposed watercraft access project. Construction of the proposed watercraft access project may provide increased access by watercraft to areas frequented by manatees or may alter watercraft traffic patterns in such a way as to increase watercraft-manatee interactions. The lack of protective measures for manatees, such as speed zones, signage, and enforcement, may lead to increased harassment of manatees or increased watercraft collisions with manatees. Depending on the location, construction of watercraft access projects may encourage watercraft to travel through important manatee habitat features such as submerged aquatic vegetation, warmwater refugia, and freshwater, foraging, calving, and breeding areas, thereby potentially altering manatee habitat and manatee habitat use patterns.

The proposed action is in an area that is occupied by the manatee and within designated critical habitat. The timing of construction for this project (when they it be constructed) as it relates to

sensitive periods of the manatee's life cycle is unknown. Manatees may be found adjacent to the proposed construction footprint during any time of the year. However, due to cooler water temperatures generally present during midwinter, there is a lower likelihood that manatees will be adjacent to the construction footprints during this time. There is a high probability that, during the cooler months, manatees will be present at warmwater sites located within and outside of the action area. This dock project will be constructed in a single, disruptive event, which depending on the design of the structure can take from 1-2 days to 4-5 days for single-family docks and several weeks for the multi-slip facilities. Once construction is completed, perpetual activities certain to follow include maintenance of the dock structure and watercraft entering and leaving the dock. According to the marine industry, the decking on docks (single-family and multi-slip) lasts from 10-15 years whereas the undercarriage of a dock (the pilings and framework) lasts 20-30 years.

Analyses for Effects of the Action

The Corps has determined that the proposed project is located within Reach 26 as defined by the Corps' Reach Characterization Analysis. Manatees are found in the waters surrounding the project site. Designated manatee critical habitat is present within the action area. Important components of designated manatee critical habitat in the action area include seagrasses for foraging, shallow areas for resting and calving, channels for travel and migration, and deepwater refugia for cold weather events.

The project covered in this biological opinion is located within the boundaries of the Port of the Islands. As discussed above, manatee speed zones have been designated in the Port of the Islands. However, marina siting criteria in the Collier County MPP, state that expansion of existing or construction of new boat ramps is prohibited within the Port of the Islands basin. Without compliance to the Collier County MPP marina facility siting criteria within the Port of the Islands basin, and throughout Faka Union Canal, the Service believes that take of manatees is reasonably certain to occur from watercraft activities associated with the authorization of this new watercraft access project.

This project is in proximity to areas that are occupied by the manatee in Collier County. The project is also located in the south area of the geographic range of the Southwest subpopulation of the manatee. The timing of construction for this project (when it will be constructed) as it relates to sensitive periods of the manatee's lifecycle is unknown. Manatees may be found adjacent to the proposed construction footprint during the spring, summer, and fall. There is a high probability that during the cooler months manatees will be present at warmwater in the Faka Union Canal area. This project will be constructed in a single, disruptive event, followed by perpetual activities, such as maintenance of the dock structures and watercraft entering and leaving the dock. The entire construction sequence is expected to be completed in less than 12 months. Although users of watercraft associated with this project must operate at posted speeds within the action area, and must be cautioned about the possible presence of manatees; physical contact or harassment is still theoretically possible.

The Corps has determined that the project addressed in the biological opinion is within Reach 26, as defined by the Corps' Reach Characterization Analysis. Furthermore, the Corps has determined that all projects within Reach 26 cause an increased risk to the manatee due to several Reach characteristics including: (1) the presence of critical habitat; (2) the attractive shape of the Reach for high speed boat use; (3) the high extent of shallowness in high speed areas; (4) the high potential for boats to stray in seagrass areas; (5) the high boating density; (6) the high potential of boats to cross aggregation areas; (7) the proximity of the reach to a aggregation area; (8) the high grouping of manatee mortalities; and (9) 28 watercraft-related mortalities in the past 10 years. Designated critical habitat within the action area includes all coastal waters in Collier County.

Beneficial Effects - There are no known beneficial effects to manatees from the proposed activity.

Direct Effects- Direct effects are those effects that are caused by the proposed action, at the time of construction, and are reasonably certain to occur. The direct effects that this project will have on the manatee and critical habitat within the action area include noise from barge operation and construction equipment; in-water movement of construction equipment and work watercraft; placing and securing dock support structures and mooring piles; and barge ingress and egress to the construction site.

To reduce potential construction-related impacts to the manatee and critical habitat, the Corps has agreed to include as a condition of this permit, if issued, the *Standard Manatee Construction Conditions* (FWC 2001), which are as follows:

- a. The permittee shall instruct all personnel associated with the project of the potential presence of manatees and the need to avoid collisions with manatees. All construction personnel are responsible for observing water-related activities for the presence of manatee(s).
- b. The permittee shall advise all construction personnel that there are civil and criminal penalties for harming, harassing, or killing manatees which are protected under the MMPA of 1972, the ESA of 1973, and the Florida Manatee Sanctuary Act.
- c. Siltation barriers shall be made of material in which manatees cannot become entangled, are properly secured, and are regularly monitored to avoid manatee entrapment. Barriers must not block manatee entry to or exit from essential habitat.
- d. All vessels associated with the construction project shall operate at "no wake/idle" speeds at all times while in the construction area and while in water where the draft of the vessel provides less than a 4-foot clearance from the bottom. All vessels will follow routes of deep water whenever possible.

- e. If manatee(s) are seen within 100 yards of the active daily construction/dredging operation or vessel movement, all appropriate precautions shall be implemented to ensure protection of the manatee. These precautions shall include the operation of all moving equipment no closer than 50 feet to a manatee. Operation of any equipment closer than 50 feet to a manatee shall necessitate immediate shutdown of that equipment. Activities will not resume until the manatee(s) has departed the project area of its own volition.
- f. Any collision with and/or injury to a manatee shall be reported immediately to the FWC Hotline at 1-888-404-FWCC. Collision and/or injury should also be reported to the U.S. Fish and Wildlife Service in Jacksonville (1-904-232-2580) for north Florida or Vero Beach (1-772-562-3909) in south Florida.
- g. Temporary signs concerning manatees shall be posted prior to and during all construction/dredging activities. All signs are to be removed by the permittee upon completion of the project. A sign measuring at least 3 feet by 4 feet which reads *Caution: Manatee Area* will be posted in a location prominently visible to water related construction crews. A second sign should be posted if vessels are associated with the construction, and should be placed visible to the vessel operator. The second sign should be at least 8-1/2" by 11" which reads *Caution: Manatee Habitat. Idle speed is required if operating a vessel in the construction area. All equipment must be shutdown if a manatee comes within 50 feet of operation. Any collision with and/or injury to a manatee shall be reported immediately to the FWC Hotline at 1-888-404-FWCC. The U.S. Fish and Wildlife Service should also be contacted in Jacksonville (1-904-232-2580) for north Florida or in Vero Beach (1-772-562-3909) for south Florida.*

Seagrasses may occur in the project area. If present, the Corps will require the applicant to avoid impacts to seagrasses by constructing the project based on the *Dock Construction Guidelines for Florida* developed by the Corps and NOAA Fisheries (Corps and NOAA Fisheries 2001).

With the incorporation of the above *Standard Manatee Construction Conditions* (FWC 2001) and the *Dock Construction Guidelines for Florida* developed by the Corps and NOAA Fisheries (Corps and NOAA Fisheries 2001) into the project permit by the Corps, the Service believes that the construction of the proposed project will not directly affect the manatee.

Interrelated and Interdependent Actions- There are no interdependent or interrelated actions associated with the proposed activity that are expected to impact manatees.

Indirect Effects - Indirect effects are those long-term effects that are caused by or result from the proposed action, are later in time, and are reasonably certain to occur. Authorizing a dock or marina or boat ramp in some manatee-inhabited areas indirectly affects manatees by increasing the likelihood of manatee mortality and injury resulting from collisions with new vessels associated with the permitted facility. Placement of watercraft access points has the potential to concentrate boating activities to that particular vicinity. If this area is frequented by manatees,

the likelihood of watercraft collisions with manatees is increased proportional to the number of watercraft using the area, given that the boats are operating at a speed that could result in collisions with manatees. Also, take in the form of harassment from watercraft could increase in certain areas with the addition of more sublethal watercraft-manatee interactions. However, the likelihood of take is reduced if the adequate and appropriate regulatory measures (*i.e.*, designated manatee speed zones with the appropriate signage coupled with the necessary speed zone enforcement to prevent watercraft collisions with manatees from occurring as a result of the proposed project) are in place.

The Service assumes that the proposed boat ramp will increase the number of watercraft in the action area. The project will provide access for potentially 10 vessels. Watercraft in the action area are typically used for fishing, sight-seeing, and recreation by local and seasonal residents. Critical habitat is present and manatee presence has been documented in the action area through aerial surveys, photo-identification studies, telemetry studies, and a carcass salvage program (FWC 2000). Per these studies, it is apparent the entire action area is used throughout the year by manatees.

New watercraft resulting from the proposed project will likely to travel south through the Faka Union Canal and into the Ten Thousand Islands, and into the Gulf of Mexico. The most likely effects to manatees caused by increased watercraft traffic are deaths or injuries from collisions with watercraft.

Collier County has a State-approved MPP that includes a boating facility siting component. Collier County, by letter dated February 25, 2005, stated that the proposed project is inconsistent with the Collier County MPP. Based on Collier County's review of Corps application number SAJ-2001-6440 (NW-JWS), the project is inconsistent with the county's MPP for the following reasons: (1) the MPP does not designate boat ramps as an allowable use within the seawalled basin at Port of the Islands; and (2) the MPP specifies that the only allowable uses within the seawalled basin of Port of the Islands is one marginal wet slip for every 100 feet of shoreline. Because of the reasons listed above, the Service agrees with Collier County's assessment that the facility as proposed is not consistent with the county's MPP and, therefore, may have an adverse effect on the manatee

CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, Tribal, local, or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions are not considered in this section because they require separate consultation under section 7 of the ESA. The Service has considered cumulative effects within the action area and, based on the above discussion, we have not identified any additional cumulative effects beyond those already discussed.

CONCLUSION

After reviewing the current status of the manatee, the environmental baseline for the action area, the effects of the proposed action and the cumulative effects, it is the Service's biological opinion that the action, as proposed, is not likely to jeopardize the continued existence of the manatee and is not likely to destroy or adversely modify designated critical habitat.

However, based on the proposed project's inconsistency with the Collier County MPP, the Service believes that the proposed action is reasonably certain to result in the take of manatees in the form of additional deaths and injuries.

INCIDENTAL TAKE STATEMENT

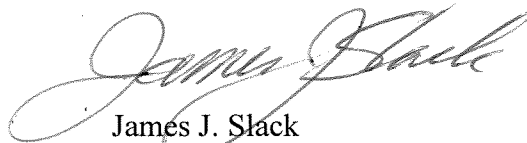
The Service anticipates that the proposed action is reasonably certain to result in the take of manatees. However, the Service is not including an incidental take authorization for marine mammals at this time because the incidental take of marine mammals has not been authorized under section 101(a)(5) of the MMPA and/or its 1994 Amendments. Following issuance of such regulations or authorizations, the Service may amend this biological opinion to include an incidental take statement for marine mammals, as appropriate.

REINITIATION NOTICE

As provided in 50 CFR 402.15, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained and if: (1) the amount or extent of incidental take is exceeded, (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion, (3) the agency action is subsequently modified in a manner that causes an effect to listed species or critical habitat that was not considered in this opinion, or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

Thank you for your cooperation and effort in protecting fish and wildlife resources. If you have any questions regarding this project, please contact Chuck Kelso at 772-562-3909, extension 241.

Sincerely yours,



James J. Slack
Field Supervisor
South Florida Ecological Services Office

cc:

Regional Solicitor, DOI, Atlanta, Georgia (Delores Young)

Service, ARD-ES, Atlanta, Georgia (Noreen Walsh)

FWC (BPSM), Tallahassee, Florida (Mary Duncan)

FWC, Punta Gorda, Florida

DEP, Tallahassee, Florida

NOAA Fisheries, St. Petersburg, Florida

Service, Jacksonville, Florida (Dave Hankla)

Corps, Fort Myers, Florida (Skip Bergmann)

LITERATURE CITED

- Ackerman, B.B. 1995. Aerial surveys of manatee: A summary and progress report. Pages 13-33 in T.J. O'Shea, B.B. Ackerman, and H.F. Percival (eds.). Population Biology of the Florida Manatee. National Biological Service, Information and Technology Report No. 1. Washington D.C.
- Ackerman, B.B., S.D. Wright, R.K. Bonde, D.K. Odell, and D.J. Banowetz. 1995. Trends and patterns in mortality of manatees in Florida, 1974-1992. Pages 13-33 in T.J. O'Shea, B.B. Ackerman, and H.F. Percival, editors. Population Biology of the Florida Manatee. National Biological Service, Information and Technology Report No. 1. Washington, D.C.
- Beck, C.A. and J.P. Reid. 1995. An automated photo-identification catalog for studies of the life history of the Florida manatee. Pages 120-134 in T.J. O'Shea, B.B. Ackerman, and H.F. Percival (eds.). Population Biology of the Florida Manatee. National Biological Service, Information and Technology Report No. 1. Washington, D.C.
- Beeler, I.E. and T.J. O'Shea. 1988. Distribution and mortality of the West Indian manatee (*Trichechus manatus*) in the southeastern United States: A compilation and review of recent information. Prepared by the Fish and Wildlife Service for the U.S. Army Corps of Engineers. Document No. PB 88-207 980/AS. National Technical Information Service. Springfield, Virginia.
- Bengston, J.L. 1981. Ecology of manatees (*Trichechus manatus*) in the St. Johns River, Florida. Ph.D. Thesis. University of Minnesota, Minneapolis, Minnesota.
- Bossart, G.D., D.G. Baden, R.Y. Ewing, B. Roberts, and S.D. Wright. 1998. Brevetoxicosis in manatees (*Trichechus manatus latirostris*) from the 1996 epizootic: gross, histologic, and immunohistochemical features. Toxicologic Pathology Vol. 26(2):276-282.
- Deutsch, C.J., R.K. Bonde, and J.P. Reid. 1998. Radio-tracking manatees from land and space: Tag design, implementation, and lessons learned from long-term study. Marine Technology Society Journal 32(1):18-29.
- Domning, D.P. and L-A.C. Hayek. 1986. Interspecific and intraspecific morphological variation in manatees (Sirenia: *Trichechus*). Marine Mammal Science 2(2):87-144.
- Florida Division of Motor Vehicles. 2000. Vessel registrations by county, Fiscal Year 1998/99. Data Listing Unit. Tallahassee, Florida.
- Florida Division of Motor Vehicles. 2001. Vessel registrations by county, Fiscal Year 2000/01. Data Listing Unit. Tallahassee, Florida.

- Florida Office of Economic and Demographic Research, The Florida Legislature. Florida Population, Components and Change (1950-2000), (last modified March 27, 2001) <<http://www.state.fl.us/edr/index.html>>.
- Garrott, R.A., B.B. Ackerman, J.R. Cary, D.M. Heisey, J.E. Reynolds, III, P.M. Rose, and J.R. Wilcox. 1994. Trends in counts of Florida manatees at winter aggregation sites. *Journal of Wildlife Management* 58(4):642-654.
- Gerstein, E.R. 1995. The underwater audiogram of the West Indian manatee (*Trichechus manatus latirostris*). M.S. Thesis. Florida Atlantic University.
- Gunter, G. 1941. Occurrence of the manatee in the United States, with records from Texas. *Journal of Mammalogy* 22(1):60-64.
- Hartman, D.S. 1979. Ecology and behavior of the manatee (*Trichechus manatus*) in Florida. American Society of Mammalogists Special Publication No. 5.
- Hernandez, P., J.E. Reynolds, III, H. Marsh, and M. Marmontel. 1995. Age and seasonality in spermatogenesis of Florida manatees. Pages 84-97 in T.J. O'Shea, B.B. Ackerman, and H.F. Percival (eds.). Population Biology of the Florida Manatee. National Biological Service, Information and Technology Report No. 1. Washington, D.C.
- Husar, S.L. 1977. The West Indian manatee (*Trichechus manatus*). U.S. Fish and Wildlife Service. Wildlife Resource Report No. 7:1-22.
- Kadel, J.J. and G.W. Patton. 1992. Aerial studies of the West Indian manatee (*Trichechus manatus*) on the west coast of Florida from 1985-1990: A comprehensive 6-year study. Mote Marine Laboratory Technical Report No. 246.
- Ketten, D.R., D.K. Odell, and D.P. Domning. 1992. Structure, function, and adaptation of the manatee ear. Pages 77-95 in J. Thomas, R. Kastelein, and A. Supin (eds.). Marine mammal sensory systems. Plenum Press. New York, New York.
- Koelsch, J.K. 1997. The seasonal occurrence and ecology of Florida manatees (*Trichechus manatus latirostris*) in coastal waters near Sarasota, Florida. M.S. Thesis. University of South Florida.
- Landsberg, J.H. and K.A. Steidinger. 1998. A historical review of *Gymnodinium breve* red tides implicated in mass mortalities of the manatee (*Trichechus manatus latirostris*) in Florida, USA. Pp. 97-100 in Raguera, B., J. Blanco, M.L. Fernández, and T. Wyatt (eds.). Harmful Algae. Xunta de Galicia and Intergovernmental Oceanographic Commission of UNESCO 1998.

- Ledder, D.A. 1986. Food habits of the West Indian manatee (*Trichechus manatus latirostris*) in south Florida. M.S. Thesis, University of Miami, Coral Gables, Florida.
- Lefebvre, L.W., J.P. Reid, W.J. Kenworthy, and J.A. Powell. 2000. Characterizing manatee habitat use and seagrass grazing in Florida and Puerto Rico: Implications for conservation and management. *Pacific Conservation Biology* 5(4):289-298.
- Lefebvre, L.W., B.B. Ackerman, K.M. Portier, and K.H. Pollock. 1995. Aerial survey as a technique for estimating trends in manatee population size - problems and prospects. Pages 63-74 in T.J. O'Shea, B.B. Ackerman, and H.F. Percival (eds.). *Population Biology of the Florida Manatee*. National Biological Service, Information and Technology Report No. 1. Washington, D.C.
- Lefebvre, L.W., T.J. O'Shea, G.B. Rathbun, and R.C. Best. 1989. Distribution, status, and biogeography of the West Indian manatee. Pages 567-609 in C.A. Woods (ed.). *Biogeography of the West Indies: Past, Present, and Future*. Sandhill Crane Press. Gainesville, Florida.
- Lefebvre, L.W. and R.K. Frohlich. 1986. Movements of radio-tagged manatees in southwest Florida, January 1985 - March 1986. Unpublished report, U.S. Fish and Wildlife Service and Florida Department of Natural Resources, Gainesville, Florida.
- Marine Mammal Commission. 1993. Marine Mammal Commission Annual Report to Congress 1992. Washington, D.C.
- Marine Mammal Commission. 1988. Preliminary assessment of habitat protection needs for West Indian manatees on the east coast of Florida and Georgia. Document No. PB89-162002, National Technical Information Service. Silver Spring, Maryland.
- Marine Mammal Commission. 1986. Habitat protection needs for the subpopulation of West Indian manatees in the Crystal River area of northwest Florida. Document No. PB86-200250, National Technical Information Service. Silver Spring, Maryland.
- Marine Mammal Commission. 1984. Marine Mammal Commission Annual Report to Congress 1983. Washington, D.C.
- Marmontel, M. 1995. Age and reproduction in female Florida manatees. Pages 98-119 in T.J. O'Shea, B.B. Ackerman, and H.F. Percival (eds.). *Population Biology of the Florida Manatee*. National Biological Service, Information and Technology Report No. 1. Washington, D.C.

- Marmontel, M., S.R. Humphrey, and T.J. O'Shea. 1997. Population Viability Analysis of the Florida Manatee (*Trichechus manatus latirostris*), 1976-1991. *Conservation Biology*. 11(2):467-481.
- Nill, E.K. 1998. Florida manatee entanglement Report. U.S. Fish and Wildlife Contract #40181-98-M146.
- Odell, D.K. 1982. The West Indian manatee, *Trichechus manatus linnaeus*. Pages 828-837 in J.A. Chapman and G.A. Feldhammer (eds.). *Wild Mammals of North America*. Johns Hopkins University Press, Baltimore, Maryland.
- Odell, D.K., G.D. Bossart, M.T. Lowe, and T.D. Hopkins. 1995. Reproduction of the West Indian manatee in captivity. Pages 192-193 in T.J. O'Shea, B.B. Ackerman, and H.F. Percival (eds.). *Population Biology of the Florida Manatee*. National Biological Service, Information and Technology Report No. 1. Washington, D.C.
- Odell, D.K. 1981. Growth of a West Indian manatee, *Trichechus manatus*, born in captivity. pp 131-140 in R. L. Brownell, Jr. and K. Ralls (eds.). *The West Indian manatee in Florida*. Proceedings of a workshop held in Orlando, Florida, March 27-29, 1978. Florida. Department of Natural Resources, Tallahassee, Florida.
- Odell, D.K., and J.E. Reynolds. 1979. Observations on manatee mortality in south Florida. *Journal of Wildlife Management* 43:572-5.
- O'Shea, T.J., G.B. Rathbun, R.K. Bonde, C.D. Buergelt, and D.K. Odell. 1991. An epizootic of Florida manatees associated with a dinoflagellate bloom. *Marine Mammal Science*. 7(2):165-179.
- O'Shea, T.J. and W.C. Hartley. 1995. Reproduction and early-age survival of manatees at Blue Spring, Upper St. Johns River, Florida. Pages 157-170 in T.J. O'Shea, B.B. Ackerman, and H.F. Percival (eds.). *Population Biology of the Florida Manatee*. National Biological Service, Information and Technology Report No. 1. Washington, D.C.
- O'Shea, T.J. 1988. The past, present, and future of manatees in the southeastern United States: Realities, misunderstandings, and enigmas. Pages 184-204 in Odum, R.R., K.A. Riddleberger, and J.C. Ozier (eds.). *Proceedings of the Third Southeastern Nongame and Endangered Wildlife Symposium*. Georgia Department of Natural Resources. Social Circle, Georgia.
- O'Shea, T.J., C.A. Beck, R.K. Bonde, H.I. Kochman, and D.K. Odell. 1985. An analysis of manatee mortality patterns in Florida 1976-1981. *Journal of Wildlife Management*. 49:1-11.

- O'Shea, T.J., B.B. Ackerman, and H.F. Percival (eds.). 1992. Interim report of the technical workshop on manatee population biology. Manatee Population Research Report No. 10. Florida Cooperative Fish and Wildlife Research Unit. Gainesville, Florida.
- Packard, J.M. and R. Mulholland. 1983. Analysis of manatee aerial surveys: a compilation and preliminary analysis of winter aerial surveys conducted in Florida between 1977 and 1982. Manatee Population Research Report No. 2. Florida Cooperative Fish and Wildlife Research Unit. Gainesville, Florida.
- Packard, J.M., R.C. Summers, and L.B. Barnes. 1985. Variation of visibility bias during aerial surveys of manatees. *Journal of Wildlife Management* 49(2):347-351.
- Powell, J.A. and G.B. Rathbun. 1984. Distribution and abundance of manatees along the northern coast of the Gulf of Mexico. *Northeast Gulf Science* 7(1): 1-28.
- Provancha, J.A. and C.R. Hall. 1991. Observations of associations between seagrasses and manatees in East Central Florida. *Florida Scientist* 54(2):87-98.
- Rathbun, G.B. 1999. Sirenians. Pages 390-399 in Chapter 8: Behavior. J.E. Reynolds, III, and S.A. Rommel (eds.). *Biology of Marine Mammals*. Smithsonian Institution Press. Washington, D.C.
- Rathbun, G.B., J.P. Reid, R.K. Bonde, and J.A. Powell. 1995. Reproduction in free-ranging Florida manatees. Pages 135-156 in T.J. O'Shea, B.B. Ackerman, and H.F. Percival (eds.). *Population Biology of the Florida Manatee*. National Biological Service, Information and Technology Report No. 1. Washington, D.C.
- Rathbun, G.B., J.P. Reid, and G. Carowan. 1990. Distribution and movement patterns of manatees (*Trichechus manatus*) in Northwestern peninsular Florida. Florida Marine Research Publication No. 48.
- Reid, J.P., R.K. Bonde, and T.J. O'Shea. 1995. Reproduction and mortality of radio-tagged and recognizable manatees on the Atlantic Coast of Florida. Pages 171-191 in T.J. O'Shea, B.B. Ackerman, and H.F. Percival (eds.). *Population Biology of the Florida Manatee*. National Biological Service, Information and Technology Report No. 1. Washington, D.C.
- Reid, J.P., G.B. Rathbun, and J.R. Wilcox. 1991. Distribution patterns of individually identifiable West Indian manatees (*Trichechus manatus*) in Florida. *Marine Mammal Science* 7(2):180-190.

- Reid, J.P. and G.B. Rathbun. 1984. Manatee identification catalogue, October 1984 update. Unpublished progress report prepared by the U.S. Fish and Wildlife Service, Sirenia Project, Gainesville, Florida for the Florida Power and Light Company.
- Runge, M.C., C.A. Langtimm, and W.L. Kendall. In Review. A stage-based model of manatee population dynamics. *Marine Mammal Science*.
- Snow, R.W. 1991. The distribution and relative abundance of the Florida manatee in Everglades National Park, an annual report, October 1, 1991. South Florida Research Center. Everglades National Park. Homestead, Florida.
- U.S. Army Corps of Engineers and Florida Department of Environmental Protection. 2001. The U.S. Corps of Engineers, Jacksonville District, and the Department of Environmental Protection effect determination key for the manatee in Florida, January 2, 2001. U.S. Army Corps of Engineers, Jacksonville, Florida.
- U.S. Army Corps of Engineers and National Marine Fisheries Service. 2001. Dock Construction Guidelines in Florida for Docks and Other Minor Structures Constructed in or over Submerged Aquatic Vegetation, Marsh, or Mangrove Habitat.
- U.S. Fish and Wildlife Service. 1999. South Florida Multi-Species Recovery Plan. Atlanta, Georgia.
- U.S. Fish and Wildlife Service. 2001a. Technical/Agency Draft, Florida Manatee Recovery Plan, (*Trichechus manatus latirostris*), Third Revision. Atlanta, Georgia.
- U.S. Fish and Wildlife Service. 2001b. Standard Manatee Protection Construction Conditions for Aquatic-Related Activities. Atlanta, Georgia.
- Wildlife Trust. 2001. 2001 Manatee Population Status Statement. March 2001.
- Wright, S.D., B.B. Ackerman, R.K. Bonde, C.A. Beck, and D.J. Banowetz. 1995. Analysis of watercraft-related mortality of manatees in Florida, 1979-1991. Pages 259-268 in T.J. O'Shea, B.B. Ackerman, and H.F. Percival (eds.). *Population Biology of the Florida Manatee*. National Biological Service, Information and Technology Report No. 1. Washington D.C.