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A. General Setting

The Florida manatee (*Trichechus manatus latirostris*), a subspecies of the West Indian manatee, is a year-round inhabitant of the coastal waters and rivers of Volusia County. The animal is listed as an endangered species and is the marine mammal of Florida. It is characterized by having thick skin, sparse body hair, paddle-shaped forelimbs, horizontally flattened tails and no hind limbs. The average adult is 8-9 feet in length and weighs 1,000 pounds. Manatees are slow moving, but capable of swimming rapidly over short distances (15-20 mph). They are herbivores, feeding primarily on aquatic plants. They are generally found in water 3-6 feet deep and cannot tolerate water temperatures below 20 degrees centigrade (68 degrees Fahrenheit) for long periods of time. When the water temperature drops below this threshold, the animals inhabiting Volusia County waters leave the county or head to warm water refuges, most notably Blue Spring State Park. Blue Spring State Park has been identified numerous times as the single most important natural warm water refuge on the central east coast of Florida. As the waters begin to warm in the spring, the manatees move out of Blue Spring into the SJR system. The east coast population returns to the ICW, predominantly from areas south of Volusia County. Any manatee mortality data cited within this document will be from 1974 through 1998.

The proportion of reproducing females at Blue Springs was found to be high with 83% of the females either pregnant or nursing a calf (O'Shea and Hartley, 1995). The gestation period was approximately thirteen months and most females gave birth to a single calf, although instances of twins have been recorded. The interval between births calculated from Blue Springs manatees averaged 2.6 +/- 0.81 years, although a female losing her calf soon after birth could have another calf within two years. This was consistent with manatees studied at Crystal River. Females known to be in their 20's had been observed giving birth. Calving appeared to be suppressed during the winter, with most births occurring in the spring (March, April and May). Newborn calves ranged in length from 1.2-1.4 meters (4.0- 4.5 feet) and weighed about 30 kg (66 pounds). Calves remained dependant upon their mothers for up to two years. Calf survival rates increased after the first winter, and by the third winter, rates essentially matched those of adults (O'Shea and Hartley, 1995). The 2000/2001 manatee count at Blue Spring was 120 animals.

Assessing the manatee population has been difficult. Weather conditions, manatee behavior, and waterway conditions are some factors which create difficulties in counting manatees (LeFebvre, 1995). The synoptic survey, a population assessment method to determine the minimum manatee population size, was begun in 1991. The survey conducted following cold weather, involves aerial flights over manatee warm water aggregation sites and other areas where they may be located (Ackerman, 1995). The January, 2000, synoptic survey documented 3,276 manatees. This is the highest manatee count to date (FWC, 2000.) Because of Blue Spring's unique characteristics, the winter manatee population at Blue Spring has been assessed through land- and canoe-based counts since 1970, with the exception of the winters of 1972-73 and 1973-74. The results reveal an increase in the Blue Spring manatee population. A minimum of 67 percent of the net population growth was from internal recruitment (reproduction) with the remaindering population increase attributed to immigrants (Ackerman, 1995).

The historic range of the West Indian manatee is from northern Brazil, up to Mexico and the southeastern U.S. (Florida and Georgia), and through the Caribbean. The U.S. population (the Florida manatee) is centered along Florida's coastline, with South Georgia being essentially the northern end of their range. During the summer, however, animals have been reported as far north as Chesapeake Bay, with one animal traveling as far north as Rhode Island in 1995.

Statewide, most human-related manatee deaths are caused by collisions with watercraft. The number of manatee mortalities in Florida due to vessel collisions has been rising in recent years, along with the number of registered boats (Figure 1). However, the number of manatee mortalities in Volusia County attributed to watercraft (37 deaths through 1998) has not followed the statewide trend (Figure 2). Manatee mortality due to vessel collision has, on the average, remained relatively constant between one and two deaths per year, with the highest number of watercraft-related deaths being recorded at 8 for 1998.

In relation to boat registration, there have been some years of decline, although the general trend has been upward. In Volusia County, the number of boats generally increased until 1993, when the upward trend began to reverse itself. It is believed that the recent decrease in the number of registered boats in the County can be partially attributed to the Volusia County Vessel Registration Fee Ordinance (50% add-on fee) that was enacted several years ago (personal communication, Jamie Stewart, Volusia County Tax and Tag Officer Manager). This fee, enacted pursuant to section 327.22, F.S. (1987), was intended to contribute to waterway enforcement and boating improvement.

There are other forms of human-related manatee deaths: locks/flood gates, entanglement and drowning in nets, fishing lines and crab trap lines, ingestion of marine debris, and poaching. There are no locks/flood gates in Volusia County. Manatee deaths due to entanglement and drowning in nets, fishing lines and crab trap lines, or ingestion of marine debris accounted for 5 of the 143 manatee deaths in the County. In some cases, if death does not result, mutilation of entangled animals can occur. In addition, entanglement in monofilament line can prevent female manatees from nursing their calves (personal communication, Sharon Tyson, National Biological Survey). Since 1992, 3 manatees in Volusia County were rescued because of entanglement in monofilament line. Two of these rescues occurred in February, 1996 (FMRI, 1996).

The Executive Summary of the Florida Manatee Recovery Plan (1996) states, “Increasing number of manatees killed by boats and tremendous increases in boat traffic are the most important problem presently faced by manatees in Florida. Intensive coastal development is perhaps the greatest long-term threat to the Florida Manatee. Their survival will depend upon maintaining the integrity of ecosystems and habitat sufficient to support a sustainable manatee population”. As more people move into Florida each year, with the greatest number of them moving within 16 miles of the coastlines, the quality of the estuaries and rivers declines. Pollution, dredging and filling, dock and seawall construction, and other factors have contributed to the decline of the overall marine habitat. By protecting the fragile ecosystems that are home to manatees and other marine species, the quality of life that attracts so many people to Florida’s coast also will be preserved.

The United States Fish and Wildlife Service (USFWS) is given authority to manage and protect manatees through the Endangered Species Act of 1973, as amended (16 U.S.C. 1531) and the Marine Mammal Protection Act of 1972 (16 U.S.C. 1361-1407). In 1978, the state passed the Florida Manatee Sanctuary Act (370.12 F.S.) and established Florida as a refuge and sanctuary for manatees and provided the authority for the initiation of protective measures, carried out since that time through Chapter 68C-22, F.A.C.

B. Purpose

The purpose of this plan is to provide county-wide protection for the Florida manatee and its habitat. To effectively accomplish this purpose, this plan contains recommendations for vessel speed zones, marina/boat facilities development, shoreline/submerged land development, habitat protection, law enforcement, educational programs, human-manatee interaction, and inter-governmental coordination.

The objectives of this plan are drawn from relative objectives set forth in the Florida Manatee Recovery Plan of 1996 (revised 1/96). This plan was developed for the USFWS by the Florida Manatee Recovery Team, which was composed of various governmental agencies and interest groups who set a long range recovery goal as required by the Endangered Species Act of 1972. The goals of this act were to maintain the health and stability of the marine ecosystem and to determine and maintain Florida manatee numbers at optimum sustainable population levels in the southeastern United States. One of the objectives of this act is to downlist the species from endangered to threatened, with the ultimate goal being delisting of the species. To achieve this objective, it will be necessary to maintain a viable, self-sustaining population of manatees on both the Atlantic and Gulf coasts. The most effective way to reach this goal is to reduce mortality and injury, minimize harassment, ensure the continued existence of suitable habitat, and monitor the status of manatee populations and their habitats. Downlisting will be considered when the population is growing or stable, mortality factors are controlled at acceptable levels or are decreasing, and habitats are secure and threats controlled or decreasing.

C. Goals and Objectives

The goal of county manatee protection plans is to ensure the long-range protection of manatees and their habitat. Objectives for Volusia County's Manatee Protection Plan (MPP) include: reducing the number of boat-related manatee mortalities, achieving an optimal sustainable manatee population, protecting manatee habitat, promoting boating safety, and developing public education keyed to the need to protect manatees and their environment (Florida DNR, 1989). While attempting to accomplish these objectives the plan also will take into consideration the rights of the citizens to use the waters of Volusia County for recreational and commercial purposes.

II. INVENTORY AND ANALYSIS

A. MANATEE/HUMAN INTERACTION

Human activities in and around manatee habitats in Florida have dramatically increased in recent years. Widespread development in coastal areas for housing, commercial, and agricultural activities has severely altered the estuarine and river environments where manatees have traditionally inhabited. Activities such as dredge and fill operations, canalization of rivers, streams, and estuaries, and other alterations of the natural environment contribute to the decline of significant manatee habitat. This has been compounded by the growth of boating on Florida's waterways, which are shared with manatees, resulting in watercraft-related manatee deaths. Other types of manatee/human interaction problems include feeding and watering manatees, and chasing them. These actions and others that alter a manatee's natural behavior are harassment and are illegal.

Interactions between manatees and humans take place throughout Volusia County on both the ICW and the SJR systems. The ICW has been identified by researchers as an area that manatees primarily use to travel through during the warm weather months. In the winter months (December through February) manatees generally leave the area and travel to warmer waters out of the County, although use of the ICW during winter has been documented. Mortality and aerial survey data and research conducted by the United States Geological Service (USGS), Sirenia Project, document this winter use. There are several areas on the ICW where manatees are known to congregate, including the Tomoka River, Manatee Cove located just north of Canaveral National Seashore (CNS) on the eastern shore of Mosquito Lagoon, the sewage outfall by the New Smyrna Beach city library at the end of canal street, the sewage outfall by the Seabreeze Bridge on the west side of the ICW, and the canal by English Jim's Marina. Aerial surveys on the Tomoka River, and the ICW have been performed in Volusia County.

There is additional data from USGS, Sirenia Project, documenting manatee use of the Tomoka River and other portions of Volusia County.

On the SJR, manatees congregate at Blue Spring during the winter months and travel throughout the river system during the warmer months. Manatees are present on the SJR year-round. According to USFWS, Blue Spring manatees make up about half of the warm season population (personal communications, Jim Valade, USFWS). Based on Bengston's (1981) study and mortality data, Blue Spring manatees migrate north into Putnam County and even further after the winter. After this initial dispersal, most Blue Spring manatees slowly return south. The best available data suggests that a majority of this population remains in the upper St. Johns River throughout the year.

Because manatees are present throughout the waterways of Volusia County, opportunities arise whereby manatees can be harassed, injured, or killed by human activities. These activities include recreational and commercial boating, recreational and commercial netting, improper disposal of monofilament fishing line, and poaching. Drowning in nets and ingestion of monofilament line have resulted in five deaths in Volusia County since 1974. Crab trap lines, monofilament, fishing tackle, etc. are known to kill, maim, and injure manatees. Commercial fishing and sport fishing make up a significant percentage of the boating activity in Volusia County waters and may contribute heavily to this problem. (Robert Turner, USFWS, 1996). The Florida Fish and Wildlife Conservation Commission (FWC) is also concerned with manatee deaths and injuries resulting from netting and fishing line impacts. As mentioned previously, since 1992, five manatees have been rescued because of entanglement in monofilament line in Volusia County.

1. Manatee Protection Programs

1.A. International Protection

Manatee protection regulation outside the U.S. is minimal, even though most of the countries where manatees exist have laws protecting them. They are now rare or in danger of becoming extinct in many areas. This is happening mainly through the exploitation of the species for their meat and other products and the degradation of their environment. Many of the governments within the manatee's range are experiencing social, economic, and political problems, making manatee protection efforts impractical, especially enforcement of existing regulations.

1.B. Federal Protection

In the U.S., manatees are protected under the Marine Mammal Protection Act of 1972 and the Endangered Species Act of 1973. These laws prohibit the harassment, hunting, capture, or killing of these animals, and are administered by the National Marine Fisheries Service of the Department of Commerce and the USFWS of the Department of the Interior, respectively.

The Marine Mammal Protection Act establishes policies regarding the maintenance of the health and stability of marine ecosystems, as well as obtaining and maintaining optimum sustainable populations of marine mammals. The act also requires the development of conservation plans for the purpose of identifying actions needed to restore species to optimum sustainable populations.

The Endangered Species Act has two segments that affect the protection of manatees in Volusia County. The first is the establishment of sanctuaries and refuges. Sanctuaries are areas where human activities are prohibited, while refuges are areas where human presence is allowed, but activities deemed to cause disturbance and harassment to manatees are restricted. The second segment of the act requires the

USFWS to develop and implement recovery plans for listed species and populations. Included in these plans are: (1) a description of site-specific management actions necessary to conserve the species or populations, (2) objective measurable criteria which, when met, will allow the species or populations to be removed from the list, and (3) estimates of the time and funding required to achieve the plan's goals and intermediate steps. In this regard the USFWS, with the aid of the Florida Manatee Recovery Team, developed an initial recovery plan for manatees in 1980, which was subsequently revised in 1989 and 1996. This plan will serve as the foundation to Volusia County's Manatee Protection Plan.

1.C. State Protection

The Florida manatee has been protected in the State of Florida since 1893, and since 1907 there has been a fine established for killing or molesting the animals. In 1978, the Florida Manatee Sanctuary Act was passed which established the state as a refuge and sanctuary for the manatees, and made the manatee the official Florida State Marine Mammal. This act also allowed for the enforcement of boat speed regulations in designated areas. Amendments were made to the Florida Manatee Sanctuary Act to provide for increased habitat protection, to increase protection for manatees from harmful activities throughout Florida's waterways, and to authorize local governments to protect manatees through local ordinances. Responsibility for manatee protection falls under the jurisdiction of the Florida Fish and Wildlife Conservation Commission (FWC), and to a lesser extent, the Florida Department of Environmental Protection (FDEP).

In October, 1989, the Governor and Cabinet instructed thirteen key counties to develop interim county-wide manatee protection regulations, which included the development of boat speed zones and limited the construction of more than five new power boat slips to one powerboat slip for every 100 feet of linear shoreline. The power boat slip limitation can be altered once an FDEP approved MPP is developed. The Governor and Cabinet also directed FDEP to present recommendations for priority acquisition of critical manatee use areas under the Conservation and Recreational Lands (CARL) program and to ensure the long-term protection of grassbeds within Florida's Aquatic Preserves.

Following the October, 1989, actions taken by the Governor and Cabinet, Volusia County worked with the FDNR (now FWC) to implement manatee protection speed zones. Speed zones were established in 1991 for the SJR and ICW systems under rule 68C-22.012, F.A.C. The majority of the waters of the SJR and ICW systems are now regulated. These boat speeds range from 35 MPH to idle speed/no wake. Several of these zones incorporate existing idle speed boater safety zones. In addition, several of the zones were established as "seasonal", reflecting the level of manatee use and protection necessary at different times of the year.

1.D. County Protection

Volusia County's Comprehensive Plan (Comp Plan) has several chapters that deal either directly or indirectly with manatee protection. Chapter 11, Coastal Management Element, addresses the estuarine area from the Tomoka River to Mosquito Lagoon, including Spruce Creek. The overall objective of this element is to preserve, protect, and manage the county's coastal resources. Section 11.1.1.18 specifies that the County will develop a manatee protection plan that will, at a minimum:

- A. Assess the occurrence of manatee activity.
- B. Document the number of manatee accidents and deaths.
- C. Identify manatee habitats.
- D. Determine the potential for adverse impacts to the manatee population from various activities and identify the level of protection necessary to ensure least possible interference.

E. Recommend local mitigative actions to be undertaken.

In addition, this element establishes policies for the expansion and siting of marinas, with specific criteria given. Section 11.2.3.3.I. specifically states that “marinas should not be permitted in areas which have been determined by FDEP and USFWS to be critical to the survival of the endangered manatee. These areas may include, but are not limited to, manatee sanctuaries, feeding areas, or areas which have been identified in manatee recovery plans.” Appendix C illustrates the pertinent sections of Section 11 of the Comprehensive Plan.

Chapter 12 of the Comprehensive Plan, the Conservation Element, also addresses manatee protection. This chapter deals with the protection of habitat, especially critical habitat, and the protection of water quality. Section 12.2.4.8 addresses the establishment of programs to reduce or eliminate pollution activities which endanger the species. Section 12.2.4.10 specifically states that “the County shall protect manatees by, at a minimum: regulating and enforcing boat speeds, safety and water sport activities; utilizing the most current FDEP boat facilities permitting standards relating to manatee protection; monitor and maintain extensive signage denoting manatee habitat and associated boat speed zones; and provide and disseminate educational materials about manatees and their protection at boat launch and marina facilities.”

The implementation strategy for achieving the goals of Section 12.2.4.10 states: “The Environmental Management and Growth Management Departments shall collect existing data, or fill in data gaps with appropriate research projects, relating to manatees and their habitats. This information should be used to propose manatee sanctuaries, particularly in the St. Johns River and Lake Beresford. The County Manager’s Office should assist the Environmental Management Department in establishing and distributing educational materials about manatees and their protection. Additionally, the County Sheriff’s Department should actively enforce boat speed zones and speed limits where designated.” Appendix D illustrates the pertinent excerpts of Section 12 of the Comprehensive Plan.

1.E. City Protection

In 1988, at the request of the City of Ormond Beach, the Legislature added the Tomoka River (from U.S.1 to the Halifax River), Thompson’s Creek, Strickland Creek, and Dodson Creek to the Florida Manatee Sanctuary Act. This was subsequently incorporated into the city’s 2010 Comprehensive Plan (as amended) and is officially known as the Tomoka River Manatee Sanctuary. Specific actions in the Comprehensive Plan include: establishing slow speed zones in Thompson, Strickland, and Dodson creeks and seasonal and year-round slow and idle zones in the Tomoka River; the prohibition of personal watercraft and air boats on these waters; the prohibition of new marina development in the sanctuary; and specific guidelines on the construction of private boat houses and slips. The number of boat slips per parcel of land is limited to one, regardless of the number of housing units located on the property. In addition, the Conservation Element of the city’s Comprehensive Plan calls for the establishment of management plans for specific endangered species, including the manatee. Appendix E illustrates the important aspects of Ormond Beach’s Comprehensive Plan as it relates to manatee protection.

Several other factors which are unique to Ormond Beach provide protection for the manatee: the Tomoka River has been identified by the state as being an Outstanding Florida Waterway (OFW), Tomoka State Park’s boundaries are within the city, and portions of the Tomoka River are incorporated in the Tomoka Marsh Aquatic Preserve. Finally, the Tomoka River Manatee Sanctuary lies within the city’s established Wildlife Corridor, which preserves not only the waterways, but the surrounding wetlands and buffer zones, establishing a 120-foot shoreline setback and a 50-foot upland buffer.

1.F. Enforcement

The existing boat speed zones established for manatee protection are enforced by several agencies. On the St. Johns River, the Florida Fish and Wildlife Conservation Commission (FFWCC) and the Volusia County Sheriff's Department enforce these zones. In addition, Lake Woodruff National Wildlife Refuge and Blue Spring State Park officers patrol the waters within their respective jurisdictions, and the Florida Marine Patrol assists the Florida Park Service when requested. Presently, FFWCC has six water duty officers who spend 90% of their time on the water in Volusia County from March through September. During the October through February time frame, they concentrate more on land-based activities, such as hunting management. There can be as many as four FFWCC boats on the SJR waters of Volusia County at any one time. This number can increase to 8-10 boats on the water if officers from other regions are in the area. FFWCC works in conjunction with the Sheriff's Department, as well as the enforcement agencies in Lake and Marion counties, to patrol the entire SJR system.

The Sheriff Department's Marine Unit has a total of six boats; three are active and on the water year-round with 4-5 active during the summer months, the peak boating months in Volusia County. Their enforcement efforts are more diverse than FFWCC because in addition to patrolling the SJR, they are responsible for the ICW and the ocean out to three miles.

Other enforcement agencies responsible for enforcing the boat speed zones on the ICW are the Florida Marine Patrol (FMP) and Canaveral National Seashore (CNS). In addition, the City of Daytona Beach has a marine division with two boats that assist the FMP when needed. The city has 6 officers who are trained for on-water duty.

The FMP has 6 officers assigned to the Volusia County area, with 4 of them being on-water enforcement officers. The FMP has divided the ICW in the County into two zones for patrol purposes. There can be as many as two officers on the water at any one time but there is generally only one. They run two overlapping shifts and are on the water from 8:00 am to 10:00 pm. They patrol all waters of the ICW system. Canaveral National Seashore has two boats and they are frequently patrolling the waters within the park's boundaries. Canaveral National Seashore is the primary law enforcement agency within the Seashore's boundaries and they coordinate with FMP and the Volusia County Sheriff's Department.

2. Manatee Distribution

Manatees are found in Volusia County year-round, with distinct summer and winter distribution patterns on the SJR and ICW systems. In summer, manatees can be found throughout both of these systems. During the winter months (generally assumed to be from December through February), SJR animals are found in or near Blue Spring, the only natural warm water refuge in the County. Very few animals use the ICW in the winter, with use being temperature dependent. Manatees that use the ICW generally move south into Brevard County where there are two power plants that discharge warm water and attract several hundred manatees during cold weather, or continue on to South Florida. Some animals are thought to travel north to Jacksonville to the warm water outfalls of the power and paper plants located there. In short, the ICW, with the exception of the Tomoka River system and portions of the backwaters of Mosquito Lagoon, is used primarily as a travel corridor (Hartman, 1974; Kinnard, 1983).

Information on manatee distribution in Volusia County was obtained from several sources. These include FDEP's aerial surveys which were conducted from 12/3/85 to 1/13/87 and from 3/11/91 to 7/1/93 and mortality databases; observations/studies from Blue Spring State Park, Canaveral National Seashore, Tomoka State Park; John Bengston's doctoral dissertation; and the Population Biology of the Florida

Manatee, Information and Technology Report , by the U.S. Department of the Interior, National Biological Survey. Manatee distribution is discussed further by waterbody.

Intracoastal Waterway (ICW) System Manatee Distribution

2.A. Florida Department of Environmental Protection (FDEP) aerial sighting data for Volusia County Coastal Waters

Aerial surveys to determine manatee distribution were flown from 12/3/85 to 1/13/87 and 3/11/91 to 7/1/93. Results show that manatees use the ICW system throughout the year, with the number of animals declining significantly from December through February. Manatees primarily use the ICW channel, with considerable manatee use also in the Tomoka River system and Government Cut in Mosquito Lagoon. Manatees have been documented during the aerial flights in the backwaters of Mosquito Lagoon, south of Ponce Inlet in the ICW area, and in the Atlantic Ocean off Ormond Beach and Canaveral National Seashore. Groups of eight to 14 manatees were recorded primarily south of Ponce Inlet in the ICW area and the backwaters of Mosquito Lagoon. Two groups of three manatees were documented in the Atlantic Ocean, one off of Ormond Beach and one off of Canaveral National Seashore. Most manatee sightings were of groups of 1- 3 animals.

2.B. FDEP Manatee Mortality Data for Volusia County

Manatee mortality data reflect manatee presence throughout ICW system in all months. Perinatal and watercraft-related manatee deaths are the two most frequently identified types of manatee deaths. Concentrations of perinatal deaths are in the Tomoka River, the Daytona Beach area, and the backwaters of Ponce Inlet between Spruce Creek and North Causeway. Watercraft-related deaths are dispersed throughout the county, with a high number of 7 in the Oak Hill area.

2.C. Observation Data from Tomoka Basin Geo-Park/Tomoka Marsh Aquatic Preserve

The rangers at Tomoka Basin Geo-Park and the manager of Tomoka Marsh Aquatic Preserve have informally studied manatees in this area. The aquatic preserves do not have any manatee research programs (personal communication, Deborah Shelley, 1996), nor does the Tomoka Basin Geo-Park, but discussions with rangers and managers indicated that the area is a prime location for resting, feeding, mating and birthing. There are several known small groups of animals that inhabit Strickland and Thompson creeks and the tributary off the Tomoka River at the Tomoka Estates subdivision. The animals use the Tomoka River from its confluence with the Halifax River westward to the I-95 overpass.

2.D. Observation Data from Canaveral National Seashore (CNS)

During the summer of 1994, the rangers at CNS conducted a survey and identified a resident summer manatee population of 4-8 animals that inhabit a small cove known locally as “Manatee Cove” (personal communication, Brent McGinn, 1996). Volusia County Environmental Management staff have also witnessed manatees in Manatee Cove on several occasions (2-3 animals).

The CNS rangers indicated that there is no resident winter population in the Park and this is supported by aerial survey data. As the weather cools, the manatees move south to Brevard and other Counties. The belief is that the animals use the old ICW channel through Government Cut to Castle Windy, since this area is deep enough to support the animals (4-12 feet deep). A great deal of the remainder of the park is made up of flats that are too shallow to accommodate the animals.

2.E. Other Congregation Areas

Discussions held with personnel from the USFWS in Jacksonville indicated several other areas along the ICW where manatees congregate: (1) sewage outfall by the New Smyrna Beach city library at the end of Canal Street; (2) sewage outfall point by the Seabreeze Bridge on the west side of the ICW; and (3) the canal by English Jim's Marina (personal communication, Bob Turner, 1996; personal communication, Jim Valade, 1996). The manager of English Jim's Marina also noted manatee use in the marina canal, with mating and calving likely.

Hartman (1974) described manatee activity in coastal Volusia County as being concentrated in the vicinity of the Tomoka River and Spruce Creek. He described such use as "regular." Manatees have been known to swim up the Tomoka River to the Little Tomoka River and Groover Branch, and 14 kilometers up Spruce Creek, past the Moody Bridge.

St. Johns River (SJR) System Manatee Distribution

The manatee data are limited for the St. Johns River system in comparison to the coastal waters. Aerial surveys were not flown due to the overhanging vegetation and dark waters, which obscure visibility. Animals have been documented throughout the waterways, with the amount of use south of Lake Monroe less known. One animal was rescued as far south as Lake Washington in Brevard County (FMRI, 1995), which is the furthest south a manatee has been documented in the St. Johns River system. Bengtson (1981) provides documentation of manatee ecology and behavior for 15 manatees radio-tracked with very high frequency (VHF) radio transmitters.

2.F. VHF Radio-tracking Efforts on the SJR System

Radio tracking studies of manatees on the SJR have been done by several individuals (John Bengston, James P. Reid, Robert K. Bonde, and Thomas J. O'Shea). The results of these studies indicate that manatees use the SJR extensively from the confluence of Lake George and the SJR to the confluence of the SJR and Lake Monroe. These data reveal the movements and activities of individual manatees fitted with transmitters, as well as any manatees which may have been associated with them. Multiple location points were documented for each animal (Bengston, 1981).

Bengtson's (1981) radio-tracking efforts revealed that during the winter months manatee activity essentially revolved around being in or out of Blue Spring. Manatees must leave Blue Spring to feed, with animals leaving at different times. Exit times, as a general rule, were just after the daily air temperature peaked. The animals fed for the remainder of the afternoon and evening as air and water temperature fell. Popular feeding areas were Lake Beresford and the Hontoon Dead River, with individuals ranging up to 12 kilometers from Blue Spring. During the summer months manatees were tracked throughout the St. Johns River and its tributaries and lakes.

2.G. Blue Spring Manatees

The major research on manatees on the SJR system has occurred at Blue Spring State Park. This is the only natural warm water refuge in the area and was purchased by the state as a sanctuary for manatees. There were two man-made warm water refuges in the County, but they are no longer available to manatees: the Florida Power Corporation plant on the east side of Lake Monroe has shut down and the

FPL plant at Lake Monroe and I-4 now discharges its warm water into Lake Konomac, which is not connected to the SJR and not accessible to manatees.

Manatee data has been collected at Blue Spring for the past 18 years, with an emphasis on studying reproduction and life history. Utilizing a catalogue of scar pattern photographs, Wayne Hartley, Park Ranger, has documented repeated sightings of individual animals. In addition, a major study was conducted on Blue Spring manatees by Bengtson (1981).

Manatees congregate in the spring run when the water temperature drops below 68 degrees Fahrenheit. There has been an increase in the number of manatees that inhabit the run since record keeping began, from 11 in 1974 to 111 in the 1997-98 winter season. Wayne Hartley indicated that the animals leave the run during the warm part of the day to feed in the river, and use Lake Beresford, Shell Creek, Mud Lake, and the Hontoon Dead River for this activity. He also indicated that the numbers of animals inhabiting the spring can fluctuate (personal communication, Wayne Hartley, 1996).

Although Blue Spring provides a warm-water refuge during the winter months, there is no food source; the animals must leave to feed in the river. Conversations with the rangers at the park indicate that they do not have a concern with a lack of food in the spring (personal communication, Wayne Hartley, and personal communication, Paul Allen, 1996). Experiences at Crystal River on the west coast have shown that if food becomes scarce the animals will feed at other locations.

2.H. Other Congregation Areas

Bengtson's (1981) data show that manatees travel along the shoreline area of Lake Woodruff, particularly along the southwest shore. Hartman (1974) references sightings in Lake Woodruff and other areas of the SJR system. However, some of the lake may be too shallow (<3 feet) for regular manatee use (personal communication, Leon Rhodes, 1996).

Silver Glen Springs on the west shore of Lake George has also been used by manatees during cold snaps. This is also a natural warm-water artesian spring, similar to Blue Spring. Manatees will move into the this spring after a cold front, then move down to Blue Spring once the weather warms up slightly. They are not known to inhabit the spring for prolonged periods of time due to human activity (personal communication, Wayne Hartley, 1996).

DeLeon Spring is another warm water artesian spring located on the SJR in Volusia County. This spring discharges 16 million gallons of constant-temperature water a day. Sighting data suggest that manatees occasionally use this spring, but not as much as Blue Spring (personal communication, Wayne Hartley, 1996; personal communication, Henry Sansing, 1998). One possible explanation for this is that the animals have to traverse Lake Woodruff to get to DeLeon Spring.

3. Manatee Mortality

3.A. Mortality in Florida

The manatee carcass salvage program to document manatee mortalities was begun in 1974. Manatee mortality has been on a steady increase, with peaks and valleys through the years (Figure 3). Table 1

illustrates the causes of mortality in the state from 1974 to 1998. The leading identified cause of manatee mortality is watercraft, with 23.6% of the total manatee deaths. Death was either caused by impact, propeller, or a combination of the two. The other two categories of human-related manatee deaths are flood gate/canal lock and other human (drowning in nets, entanglement in monofilament line, etc.), with 4.1% and 2.6%, respectively. Perinatal manatee deaths are the second leading identified category of manatee mortality, with 21.2%, while other natural deaths account for 16.6%. The cause of death for 31.8% of the mortalities was undetermined.

3.B. Mortality in Volusia County

Volusia County has also seen a steady increase in manatee mortality from 1974 through 1998, with peaks and valleys from 1983 to 1998 (Figure 4), although some of this increase may be attributed to an improvement in the carcass recovery program (Ackerman, et al., 1995). A total of 143 deaths were recorded in Volusia County during the 1974-1998 period. Table 2 illustrates the causes of mortality over the time period, while Figure 5 graphically represents this data. As was true with the state figures, watercraft mortality in Volusia County accounted for approximately one quarter of the total deaths (25.9%). Figure 6 illustrates Volusia County total and watercraft-related manatee mortality by year from 1974 to 1998.

The two categories where Volusia County differs from the state statistics are perinatal mortality and undetermined mortality. Perinatal mortality in the County accounts for 44.1% of all deaths, compared to 21.2% throughout the state. In addition, undetermined mortality accounts for only 21.7% of the total deaths in the County, compared to 31.8% throughout the state. With such a high portion of deaths in Volusia County, perinatal mortality is of special concern. Figure 7 illustrates perinatal mortality as it compares to total mortality.

As Volusia County has two distinct water bodies, the remaining mortality analysis will be broken down by water body.

3.C. ICW System Mortality

From 1974 through 1998, there have been 116 manatee mortalities on the ICW in Volusia County, with 57 of these being perinatal, followed by watercraft (25), undetermined (21), other human (4), cold stress (4), verified-not recovered (3), and other natural (2) (Table 3). The majority of mortality takes place between the months of March through October, with 87% of the total mortality, 91% of the perinatal, and 92% of the watercraft mortality (Table 3 and Figure 8). Regarding the 57 perinatal mortalities, the monthly deaths generally follow a “bell curve” starting in March and ending in December, with the majority occurring in the month of July (14). There were no perinatal deaths recorded in the months of January or February (Figure 9).

Regarding the 25 recorded watercraft mortalities, the highest months were July, with eight, September, with five, and May and June, with four apiece. There were no watercraft mortalities recorded during the months of April, October, November, and December (Figure 10). Watercraft deaths on the ICW in Volusia County appear to have increased dramatically in recent years, primarily due to the occurrence of 5 watercraft-related deaths documented in July, 1998.

There are four areas along the ICW where concentrations of mortalities have been recorded; the Tomoka River/Basin area, Daytona Beach from the Seabreeze Bridge to the Memorial Bridge, the Ponce Inlet area, and the Oak Hill area. The Ponce Inlet area also includes Spruce Creek and Turnbull Bay, as well as the tributaries off Ponce DeLeon Cut. In the Tomoka River/Basin area, there were 19 recorded

perinatal, 3 watercraft mortalities, and 2 other human-related, and 2 verified-not recovered, from 1974 to 1998. The high amount of perinatal deaths in the Tomoka River reflect the importance of this area to manatees for calving. The other human-related deaths are attributed to drowning in a fishing net and ingestion of a fish hook and monofilament line.

In the Daytona Beach area, 10 perinatal, 2 watercraft, 2 undetermined and 1 cold stress were recorded. Most of these deaths were centered around the City Island Complex. In the Ponce Inlet area, the death categories were 9 perinatal, 4 watercraft, 2 undetermined, and 1 verified-not recovered, and 1 other natural. In the Oak Hill area, there were 7 watercraft, 2 other human, 4 perinatal, and 4 undetermined mortalities. The two other human-related deaths were caused by drowning in fishing nets.

3.D. SJR System Mortality

The center of the St. Johns River is the boundary between Volusia and Lake and Seminole counties, and, as such, the manatee mortality analyses for Volusia County include deaths from these counties. From 1974 through 1998, there have been 27 manatee mortalities recorded for Volusia County, 10 for Lake County, and 5 for Seminole County. Sixteen of these are watercraft-related deaths. The remaining manatee deaths are 13 perinatal, 8 undetermined, 2 other human, 1 other natural, and 2 verified-not recovered. Unlike the ICW, there have been no recorded deaths on the SJR from cold stress.

Thirty-eight of the 42 total manatee deaths were documented (Table 4 and Figure 11) between March and November. May, August, April, and July were the highest months for mortality, with 7, 5, and 5, and 5, respectively. 94% of watercraft-mortalities, the leading category of mortality at 50% of the documented causes of death, were recovered during this period. March, and May were the months for which the highest number of watercraft-related deaths were recorded with 3, each. In addition, September, October, and November each had two deaths followed by January, June, July and August with one watercraft-related death each. No watercraft deaths were recorded in the months of February, April, or December (Figure 12). Regarding recovery locations, manatees have been recovered throughout the SJR system, with eight watercraft-related deaths documented within a radius of approximately 3 miles from Blue Spring.

3.E. Mortality vs. Vessel Registrations

From 1985 to 1998 there have been a total of 28 recorded watercraft-related manatee deaths in the ICW and SJR systems of Volusia County and 3 watercraft-related deaths in the Lake County portion of the SJR system. This is approximately 2.2 per year. During this same time period, there has been a net increase of 5,181 watercraft, or 30%, registered in the County. Volusia County (using 1984-85 through 1997-98 vessel registration statistics). Volusia County has seen several periods where the number of registered vessels actually decreased (Table 5).

From 1985 through 1987, mortality and boat registrations followed an upward trend. In 1988, boat registrations increased by 5.7%. There was one watercraft-related manatee mortality that year. In 1989, the number of registered vessels decreased by 4.0%; there were two watercraft-related mortalities. From 1989 to 1991, boat registration remained relatively stable and watercraft-related manatee mortalities increased to two in 1989 and to four in both 1990 and in 1991. Manatee protection speed zones were adopted for Volusia County in 1991. From 1992 to 1993 the County experienced the largest single year increase in registered vessels at 13.7% (a total of 21,472 registered boats in 1993). There was one watercraft-related death in 1992, and, in 1993, there were no recorded manatee deaths attributable to watercraft.

In 1994 and 1995, the number of registered vessels decreased by 4.3% and 7.9%, respectively, over 1993's numbers, while the number of watercraft mortality was constant at one per year. There was an average increase of 1,200 registered vessels from 1995-1997. Watercraft-related mortalities ranged between one and two during these years.

Between 1986 and 1997, there was a 24.2% increase in registered vessels. During the six year period prior to the 1991 adoption of the manatee protection zones, there was a 6.0% increase in registered vessels and a total of 16 watercraft-related mortalities. From 1992-1997, although there was an increase in registered vessels by 14.8%, there was a decrease in watercraft-related mortalities to six. However, watercraft-related manatee mortality in 1998 was higher than in any other year with 8 deaths attributed to boat collisions.

For Volusia County, there does not appear to be a direct correlation between manatee mortality and registered vessels.

There are two important aspects of the watercraft in Volusia County that affect the number of boaters in the County. The first is the fact that the County adds a 50% surcharge to all boats registered in the County. This may have caused some boat owners who live in the County to register their boats in surrounding counties in order to avoid this additional fee, thus explaining the decrease in the number of registered boats in Volusia County in the years mentioned above. The percentage of boaters who fall into this category is unknown. The second factor concerns the number of non-Volusia County residents who boat on the county's waters. This will be discussed in the following section.

4. Volusia County Boating Activity Study

A boating activity study of the St. Johns River (SJR) and the Intracoastal Waterway (ICW) of Volusia County and selected bordering counties was conducted from July, 1994, to May, 1995. Data was collected during this time frame and depict the summer and winter boating patterns of the County.

The purpose of this study was to collect data that describes and quantifies the boating activities, patterns, and composition of boat types taking place on Volusia County's two main waterways. The data was collected using several methodologies: ramp intercept interviews, aerial surveys, boat ramp trailer census, shoreline dock survey, marina survey, and a mail survey to 2,050 registered Volusia County boaters.

The results of this study revealed that the main use of the two water bodies was for recreational purposes, with traveling and fishing being the two major boating activities, accounting for 86% of all activities. All areas of the County were used for these activities, with three main areas of concentration: Silver Glen Springs on the SJR system, and Ponce Inlet and Mosquito Lagoon on the ICW system.

A temporal pattern of activity was observed via boat ramp surveys and aerial surveys on five summer weekends and five winter weekends. The data revealed that there were 50% more boats on the water during the summer than the winter. The data also revealed that although there were less total boats on the SJR in the winter, there was a marked increase in the number of recreational fishermen during this time period than there was in the summer months.

The primary boats on the waterways were outboard engine power boats, with an average of 100 horsepower. The size class most observed was the Class 1 boat (16 feet - 25 feet), followed by the Class A boat (less than 16 feet). These two class sizes accounted for 88% of the boats observed.

Regarding marine facilities in the Volusia County area, there are 100 boat ramps, 77 marinas with 5,346 slips, and 4,100 shoreline docks, both single and multi-family residences. Based upon the number of registered boats and the population of the County, there is one boat for every 20.2 people. In addition, there are 46 commercial fishing boats registered with the Ponce DeLeon Port Authority operating out of the ICW. These are large commercial fishing vessels and deep-sea party boats whose main destination is the Atlantic Ocean via Ponce DeLeon Inlet.

Regarding the residency of the boaters using the county's waters, 51% were Volusia County residents, while 46% resided in other Florida counties. Out-of-state boaters did not make up a significant percentage of boaters using these waters (3%), and the majority of these boaters used the SJR during the winter months.

The majority of boaters stored their boats at home on a trailer. For those who stored their boats at marinas in wet slips, the primary type of boat was a Class 2 power boat (26 feet - 39 feet), while boats in dry storage were Class 1 power boats (16 feet - 25 feet).

The greatest boater concerns expressed during the ramp interviews and the mail survey centered around speed zones and boater education/boater licensing. Second to these issues were concerns regarding the adequacy and/or conditions of existing facilities.

4.A. Boating Use Areas

Data generated from the Volusia County Boating Activity Study yielded areas of concentrations of boats that may have an impact on manatees in the County, and are described below. The data that generated this information came from several survey methodologies: aerial surveys, ramp intercept interviews, ramp trailer census, shoreline dock census, and the mail survey. Map 1 illustrates the locations of all public and private marine facilities in Volusia County. For ease of discussion, the areas of concentration will be broken down between the ICW and SJR systems.

4.A.1. ICW System Boat Use Areas

4.A.1.A. Mosquito Lagoon

Mosquito Lagoon was the most popular destination on the ICW. The majority of the boats in this area are power boats less than 22 feet in length and are engaged in recreational fishing. Mosquito Lagoon is characterized by a large expanse of shallow water with sand bars and seagrass beds. In fact, the only seagrass beds of significance on the ICW are located in this water body. There are only two deep channels in this system; the present ICW channel, which is maintained to a depth of 12 feet, and the "old" ICW channel, which traverses through the east side of the lagoon through Canaveral National Seashore. This channel is not as deep as the ICW, averaging four feet. Once out of the channels, the water depth becomes shallow very quickly. Many parts of the lagoon are only accessible to boaters who have shallow draft "flats boats" and are familiar with the waters. Canaveral National Seashore is located within this geographic area.

The ICW channel, which connects Mosquito Lagoon to the North Indian River in New Smyrna Beach and the Indian River in Brevard County, is used as a travel corridor for boats traveling north and south through Volusia County. Many of these boats are the larger, Class 3 boats (40 foot and greater), that migrate south during the early winter, and return north during the spring. These boats are confined to the ICW channel.

The aerial survey data showed that many boats use the area outside the ICW channel, but that boating is not congested due to the vast expanse of the water body. There are several public boat ramps that service Mosquito Lagoon, from the Kennedy Park ramp in Edgewater, to the Turtle Mound ramp in CNS, to the Haulover Canal ramp, located in Brevard County just south of the Volusia/Brevard County line. Also, there is a public ramp at Riverbreeze Park, located between Edgewater and Oak Hill, that opened in January, 1996. In addition to the public boat ramps, there are several fish camps and a marina in the area that allow public access to the lagoon.

The natural back waters of CNS and the lagoon and the associated upland habitats are ecologically important systems which harbor an abundance of wildlife, including many commercially valuable and protected species. Mosquito Lagoon also had a large commercial fishing industry, due to the abundance of commercially valuable finfish and shellfish. The commercial finfish industry is in decline, due to the ban on nets that was passed by the voters in 1994. However, the other side of this issue is the belief among many that the recreational fishing will increase in the lagoon, as depleted fish stocks make a comeback. In addition, the ecotourism industry is believed to be increasing, because of the natural beauty of the Mosquito Lagoon. The boat traffic in this area is expected to increase.

4.A.1.B. Ponce DeLeon Inlet Area

The second most popular destination on the ICW is the Ponce DeLeon Inlet area. This area has several unique features that are important to boaters. First, it is the only access to the Atlantic Ocean in Volusia County; in fact, it is the only access to the ocean for more than 60 miles north or south. All types of craft, with the exception of the smallest craft, utilize the inlet to access the ocean for commercial and recreational fishing, as well as offshore sailing. The inlet area has a concentration of large, commercial fishing boats (Class 3) that engage in commercial fishing, as well as fishing charters for recreational fishermen.

The second feature of the area is Disappearing Island, a large sandbar that is exposed at low tide. Boaters use the island for recreational land activities (picnicking, sunbathing, etc.). This is a popular destination for boating families. This sandbar is dependent upon the tides, which fluctuate greatly at the inlet. At high tide, the sandbar is underwater; therefore, overnight camping is not usually observed. This sandbar gets quite crowded; during the afternoon on a summer weekend, up to 100 boats have been observed at the island. Disappearing Island also shows a distinct seasonality; during the winter months, the number of boats observed during aerial surveys was significantly less than during the summer months.

The third unique feature of the inlet area is Smyrna Dunes Park, a County park located on the south side of the inlet. This is a popular boating spot for land activities, very similar to Disappearing Island. The park runs from the ICW to the ocean, giving boaters access to the beach. One of the main differences between the park and Disappearing Island is that the park is not dependent upon the tides; therefore, at high tide, boaters who were going to Disappearing Island can travel several hundred yards and access the park.

The main sphere of influence for the inlet area is from the Port Orange Causeway boat ramp in the city of Port Orange, to the North Causeway Boat Ramp in the city of New Smyrna Beach. In addition to these public boat ramps, which are large, regional facilities, there are seven commercial and private marinas, six large residential marinas (condominiums with more than 20 wet slips each), and six commercial fishing facilities and boat yards.

4.A.1.C. The Greater Daytona Beach Area

The Halifax River runs through the Greater Daytona Beach Area and is characterized by the deep ICW channel, surrounded by very shallow water outside the channel, and a relatively narrow bank-to-bank width. This is a travel corridor, and it experiences a considerable amount of boat traffic. Unlike other parts of the ICW system through Volusia County, this area does not get a lot of fishing activity, unless the shrimp are running. Halifax Harbor Marina (HHM), with more than 500 wet slips, is located in this area. It is the second largest continuous marina on the east coast of the United States. HHM has a large regional public boat ramp with eight lanes.

In addition to HHM, there is a private marina and four commercial marina/boat yards and one large recreational marina with more than 40 wet slips, although the occupancy rate at this facility is very low. There are three public boat ramps in the area, Seabreeze Bridge, City Island, and Bethune Point Park, with a total of eight lanes. Survey data indicated that the Seabreeze Bridge and City Island ramps do not get as much boat traffic as other ramps in the area. The Bethune Point Park ramp also experiences rather light boat traffic, except when the shrimp are present in the Halifax River.

The Greater Daytona Beach Area also has a recreational zone, located on the west side of the ICW just south of the Seabreeze Bridge. This recreational zone is used extensively by personal watercraft. In fact, there is a personal watercraft rental facility located across from the zone on the west side of the ICW, and several more located in the general vicinity of the Seabreeze Bridge.

4.A.1.D. Tomoka River/Tomoka Basin

From the boating activity study, it was found that the third most popular boating destination is the Tomoka River/Tomoka Basin area. The Tomoka Basin, a large, flat, shallow water body, is used primarily for recreational fishing and commercial crabbing. The Tomoka River, an Outstanding Florida Waterway (OFW), is used for a variety of activities, such as fishing, cruising, and water skiing. In addition, Tomoka Geo-Park, a state park, is located on the Tomoka River and is used by boaters for picnicking and accessing the park's other features. The primary types of boats that frequent this area are powerboats and pontoon boats less than 26 feet in length.

The City of Ormond Beach, in which this area falls, designated this water body a manatee sanctuary, and has prohibited any commercial marina development. There is one small private marina, the Tomoka Boat Club, that is located on the river and was grandfathered in by the city. In addition, personal watercraft and air boats are also prohibited, although this is a city ordinance and has not gone through the formal rule making process: there are no signs posted indicating that these vessels are prohibited. There are three public boat ramps, one private homeowners' association boat ramp, and a ramp in the Geo-Park, that are the primary access points to this area.

In addition to the city's manatee sanctuary designation and the existence of the Tomoka Geo-Park, the waters of the basin and the lower Tomoka River are part of the Tomoka Marsh Aquatic Preserve (TMAP). TMAP is one of 42 aquatic marshes throughout the state that was established by the state to preserve the biological resources of the state's estuarine systems.

Because of the above factors, marina development will most likely not occur in this area, and boat dock densities are strictly controlled. Boating activity in this area may increase with the improvement to the ramp at Tomoka Geo-Park, but the boating study data indicated that boaters do not use the park as a launching site. Therefore, an increase in boating traffic remains to be seen.

4.A.2. SJR System Boat Use Areas

4.A.2.A. Silver Glen Springs to Astor Area

Silver Glen Springs, commonly referred to as “The Glen,” was the most common destination for boaters on the SJR, especially in the summer months. Over 100 boats have been observed in this area at one time during aerial surveys. During the ramp intercept interview surveys of the boating activity study, 36% of the boaters interviewed named this area as their destination. The types of boats that access this area include all categories, including sailboats and 40 foot houseboats. This was the only area in Volusia County where overnight trips were common; many of the boats at The Glen launch on Friday evening and stay until Sunday afternoon.

The primary sphere of influence for The Glen is as far south as the Ed Stone Park boat ramp in DeLand. Boaters have indicated that prior to the advent of the speed zones, boaters from as far away as Lake Monroe would travel to The Glen for a day of picnicking. The speed zones now make the trip too time-consuming to enable some boaters to enjoy a daily outing to the spring. The boat study did not go far enough into Putnam County to determine how far north the sphere of influence went, although the aerial surveys revealed most of the boats going to and from The Glen were coming from the south.

The two public boat ramps in Astor (Lake County), Butler Street and Pearl Street (at Midway Marine), are the primary launch points for boaters going to The Glen. On a summer weekend, a queue of up to six boats were observed at the Butler Street ramp waiting to launch their boats and go to The Glen. In addition to these ramps, there are several remote ramps that serve the area, but the survey data did not reveal these ramps to contribute any significant amount of boat traffic to this location.

The area is also served by several fish camps in the Astor area in Volusia County and several in the Georgetown area of Putnam County (on the east shore of Lake George). Again, the data did not indicate that these ramps had any significant impact on the boats going to The Glen. In fact, the data indicated that these fish camps cater more to the winter recreational fisherman who were interested in fishing Lake George and Lakes Dexter and Woodruff.

Due to the popularity of The Glen and the access points in Astor, the SJR, from the mouth of Lake George to the SR 40 Bridge in Astor, attracts tremendous boating activity. The data indicated that the majority of the boats on the water were traveling from Astor to The Glen and vice-versa. This led to boating safety concerns and the establishment of boating safety zones in this part of the river.

4.A.2.B. Lake Dexter/Lake Woodruff/Norris Dead River

The boating activity study indicated that Lakes Dexter and Woodruff were popular fishing lakes, especially during the winter, when the area experiences an influx of out-of-state visitors who come for fishing. The Norris Dead River is also a popular boating area as this is one of the primary access rivers to these two lakes. The Norris Dead River is also known as a prime fishing area.

During aerial surveys conducted during January and February, over 100 boats were counted in this area on the 8:00 am flights. The majority of the boats observed were powerboats and pontoon boats less than 20 feet in length. Due to the shallow depth of the two lakes, no boats over 26 feet in length were observed during either the summer or winter surveys. This was also true of the Norris Dead River, since the river is narrow and winding in certain areas.

The sphere of influence for this area stretches from Georgetown on Lake George to Ed Stone Park in DeLand. There are five fish camps in Putnam County, eight in Volusia County, and six in Lake County that provide direct access to this area. These fish camps have wet storage for boaters storing their boats on a year-round or seasonal basis, as well as boat ramps that are open to the general boating public. In addition, there are five boat ramps, three commercial marinas, and one recreational marina servicing this area.

4.A.2.C. Hontoon Island/Lake Beresford

Hontoon Island State Park is a popular boating destination for boaters wanting to spend the day in the park picnicking. The park has approximately 40 slips for boaters to use to access the park. There are also two commercial marinas, Holly Bluff Marina and Hontoon Landing Marina, that have a large houseboat rental business. All three of these facilities sit on a winding portion of the river, which causes congestion.

Just to the east of Hontoon Island is Lake Beresford. This is a popular area for water sports such as water skiing and riding personal watercraft. In addition, Lake Beresford is a popular fishing location, especially in the winter when the fish are bedding. There are three private ramps on the lake, two of which allow public access. In addition, there is a private yacht club located on the west shore of the lake. This facility has a boat ramp but does not allow public access.

Just south of Lake Beresford is Blue Spring State Park, which is a popular boating destination for picnicking and swimming in the summer and for observing manatees in the winter. There is an unimproved ramp just to the north of the park, but survey data indicated that this ramp does not attract much boat launching usage, but it does attract swimmers and overflow from the beach at the park.

4.A.2.D. Lake Monroe Area

Lake Monroe is the only area on the SJR system in Volusia County where sailing is an important activity. Many sailboat regattas are staged on the lake year round. Three of the largest marinas in the area, with 572 wet slips, are located on the Seminole County side of the Lake Monroe area, all of which have a substantial sailboat occupancy rate. They also have a significant percentage of Class 3 boats, but interviews with the harbor masters indicated that these boats rarely leave their slips.

Lake Monroe can be characterized by having a large, unobstructed water surface, sufficient depths in the center for large boats, and large grass flats on the north and east shores. In addition to the marinas listed above, the area is serviced by four public boat ramps and two private ramps, with a total of 14 boat launching lanes.

Recreational fishing is a popular activity on Lake Monroe, especially in the winter. The majority of the fishing takes place on the north and east shores, where the grass beds are located. In addition, fishing is popular south of Lake Monroe in the Osteen area. South of Osteen, the boating activity can be described as highly seasonal with almost twice as many boats observed during the winter surveys than the summer. The activities of the boaters are also quite different. In the winter, the most popular activity is fishing; in the summer, the most popular activities are cruising, skiing, and riding personal watercraft.

4.B. Projected Future Boat Ramp Needs

The Volusia County Boating Activity Study conducted an extensive inventory of existing boat ramps and lanes, applied a population-based level of service that the County established in its Comprehensive Plan,

and projected the need for additional ramps through the year 2010. Appendix F is the Projected Boat Ramp Needs, in its entirety, from this study.

The conclusions drawn from the above study indicated that there were sufficient boat ramps overall in the Volusia County study area to meet the boating needs through the year 2010. This was done utilizing the most conservative published figures for levels of service. However, this changes when the demand is analyzed by water body. Although the SJR system boat ramp/lane supply exceeds demand through the year 2010, the supply on the ICW system meets demand in the year 2005, and there is a shortage of five boat lanes by the year 2010.

4.B.1. ICW System Boat Ramp Analysis

Based upon an analysis of boat ramp overflow trailer parking and comments received from the boating public during the ramp interviews and the mail survey, the areas where additional ramps and/or lanes were needed on the ICW system are being at least partially addressed. In the Edgewater/Oak Hill area, a four lane County boat ramp opened in January, 1996, at the Riverbreeze Park. In Port Orange, an additional ramp with two lanes has been constructed at the Port Orange Causeway boat ramp facility, which has brought the number of boat lanes at this site to six. In Ormond Beach, the Tomoka Geo-Park is completing a \$221,000 restoration of its waterfront area, including a \$98,000 retrofit of its boat ramp. According to Park personnel, boat traffic may increase (personal communication, Benny Woodham, 1996; Charles DuToit, 1996). The ramp opened May 1, 1996. Finally, the boat ramp at Lighthouse Point at Ponce Inlet has been improved, including the parking facilities.

4.B.2. SJR System Boat Ramp Analysis

As mentioned previously, the data indicates that boat ramp supply exceeds demand on the SJR for the near-term. The one ramp where queuing was observed on a regular basis was the Astor @ Butler Street ramp. As this ramp is in Lake County, Volusia County has limited influence over this situation.

Currently, there are no additional ramps planned in Volusia County on the SJR. There are also no plans to improve the French Avenue boat ramp. This ramp received numerous comments from the boating public as needing improvement. However, as this ramp is located directly north of Blue Spring State Park, a critical manatee habitat, securing the permits for increasing boat traffic in this area appears unlikely at this time.

Constructing new boat ramps on the SJR will prove difficult for several reasons. The first is that much of the land is in public ownership in the form of national forest and wildlife refuge, and there has not been any demand from the managers of these lands for boat ramps. The second reason is that much of the remaining land along the river is wetlands, and is not suitable or economically viable for the construction of ramps and the accompanying facilities such as parking.

4.C. Existing Marina Usage

As with the boat ramp projections, the Volusia County Boating Activity Study analyzed the current supply of wet and dry marina slips, and projected out the needs for additional slips through the year 2010. Appendix G is the complete marina projections analysis.

For projecting marina slip demand, there are 44 public access facilities in Volusia County, 26 on the ICW and 18 on the SJR. These facilities had a total of 2,450 wet slips and 808 dry slips, which is further broken down by 1,480 wet and 633 dry slips on the ICW and 970 wet and 175 dry slips on the SJR. Unlike boat ramps, marina facilities located outside Volusia County were not included in the total count

of slip supply, as there was not enough data available to determine the likelihood of a Volusia County boater storing their vessel in a marina located in another county.

4.C.1. Marina Slip Occupancy

The boating study revealed an overall occupancy rate of 76% on the ICW and 65% on the SJR, suggesting that supply exceeds demand. This was especially true on the SJR where interviews with marina operators indicated that slip demand was down. In 1996, Holmar Fish Camp, in Lake County, submitted an application to FDEP to add 216 wet slips. On the ICW, three marina operators indicated that demand exceeded supply; two of these facilities, Causeway Marina and Smyrna Yacht Club in New Smyrna Beach, have applications pending to increase the number of wet slips by 39 and 16, respectively. In addition, Smyrna Yacht Club, a private marina, indicated that they have a waiting list, but it is believed that this is a function of the facility. The Halifax Yacht Club has the same situation.

4.C.2. Marina Slip Projections

Based upon the analysis performed during the boat study, marina demand in Volusia County is 11.5% of the registered boats (see Appendix G). Using this figure, the current supply of slips, and the projected number of registered boats in the County, there is an excess of supply until the year 2005. By the year 2010, it is estimated that 568 additional slips will be required.

Breaking this down by water body, on the ICW, 37 additional slips will be required by the year 2005, and 451 slips by the year 2010. On the SJR, 118 additional slips will be required by the year 2010.

5. Land Development

Properly controlled land development, including submerged lands, is critical to manatee protection. For the purposes of this Plan, only shoreline and submerged land development is addressed. Development activities occurring in a watershed or along shorelines ultimately affects the water body, thus affecting species survival in the aquatic environment. Shoreline and submerged land development activities which need to be carefully managed include the construction of artificial canal systems, dredging and filling, the construction of structures that can possibly eliminate beneficial aquatic vegetation, such as docks and bulkheads, and the installation of structures which can trap or crush manatees. The construction of facilities which could increase the number of boats in areas utilized by manatees, such as boat ramps and marinas, must be thoroughly analyzed, so that the potential of watercraft strikes of manatees are minimized to the greatest extent practical.

5.A. Marinas/Boat Ramp Criteria

Marina and boat ramp criteria are covered in Phase II of the MPP, under Boat Facility Siting.

B. HABITAT INVENTORY

1. Water Quality

Degradation of water quality has negative impacts on manatees and the other inhabitants and users of the waterways. Development activities and poor agricultural practices can contribute to the pollution of water bodies by increasing the levels of turbidity and pollutants, as well as decreasing the amount of

dissolved oxygen in the water. Stormwater runoff can also increase the pollutant loads of pesticides, herbicides, petroleum products, and heavy metals.

Volusia County, through the Environmental Management Service Center, has a water quality monitoring program on both the ICW and SJR, which is designed to pinpoint such water quality problems. This program was implemented in late 1989. Both water bodies have been sampled monthly for over eight years and are now being sampled quarterly. The data that are collected are sent to the St. Johns River Water Management District (SJRWMD), and eventually uploaded to the USEPA's STORET computer system. Although no overall definitive analysis reporting has been done, the water quality in the County appears to be good, with no major pollution point sources (personal communication, Michael Gately, 2000).

In addition, as part of the Surface Water Improvement Management (SWIM) program, the County directed all waste water treatment plants (WWTP) to cease discharging into the ICW and SJR by 1995. A new WWTP for New Smyrna Beach is being constructed. This plant will replace the existing one and will be located inland from the North Indian River. The WWTP in Edgewater discharges into the North Indian River, but this is an Advanced Wastewater Treatment (AWT) plant with excellent treatment capabilities (biological nutrient removal, chemical feed, tertiary filtration, high level disinfection, dechlorination and post aeration facilities), and only discharges on major rain events.

The Mosquito Lagoon section of the ICW in Volusia County, from Edgewater to the county line, is a Conditionally Approved Shellfish area. This designation, given by FDEP, allows for the cultivation and harvesting of shellfish during periods of acceptable water quality. The area is closed to these activities when there is a major rainfall event, or any other activity that causes a degradation to the water quality. There is a substantial commercial shellfish industry in the Oak Hill area and aquaculture industry is in the initial stages of development (personal communication, Herky Huffman, 1996).

2. Stormwater Control

Runoff from stormwater has been identified by several entities as having a major impact on habitat quality in Volusia County. Along the Tomoka River and its tributaries, the Tomoka Geo-Park and Tomoka Marsh Aquatic Preserve staff indicated that this is the biggest habitat concern. Several subdivisions drain directly into Strickland, Thompson, and Dodson creeks with no treatment. In addition, the north peninsula has become an area of concern as the homes along the Halifax River are on septic systems which are becoming old, and the roads in this area that run east and west drain directly into the river with no treatment.

Volusia County contracted with several consulting firms to conduct comprehensive stormwater studies for the County. Eleven studies were conducted on various areas of the County and detailed plans for managing stormwater runoff were developed. These plans developed recommendations for projects totaling over \$98 Million in capital expenditures and \$4 Million in annual Operations & Maintenance expenses.

These reports indicated that in Volusia County, non-point surface water runoff was a major problem, which is also more difficult to deal with, due to the fact that there is not a single source for this pollution; it comes from all the land (residential, commercial, agricultural, public works, etc.) surrounding the water bodies. In some water bodies, it is estimated that up to 80% of the pollution comes from non-point sources (Indian River Lagoon National Estuary Program, 1996). In addition, localized flooding problems and the control of new development were areas of concern. The use of Best Management Practices (BMP's), and the retrofitting of these systems, were discussed in all the reports.

In addition to the contractors reports mentioned above, the Indian River Lagoon National Estuary Program (IRLNEP), has been working over the last five years on the development of a Comprehensive Conservation and Management Plan (CCMP), which was approved by Governor Chiles and Carol Browner, the EPA Administrator on November 15, 1996. This plan received earlier endorsement from the Volusia County Council. The CCMP has developed action items for the restoration of the Indian River Lagoon, which encompasses Volusia County from the Brevard/Volusia County line to Ponce Inlet, and addresses numerous habitat quality issues, stormwater control being one of them.

3. Aquatic Vegetation

The aquatic vegetation in Volusia County consists of two distinct communities - a fresh water-based community on the SJR system and the upper reaches of the Tomoka River and Spruce Creek, and a saline-based community for the remainder of the ICW system. The SJR system is characterized as having submerged aquatic, floating and emergent vegetation, while the ICW system is characterized as having primarily submerged and emergent aquatic vegetation. There is sufficient aquatic vegetation available for manatees in Volusia County (personal communication, Wayne Hartley, 1996). The following is a description of the major plant communities on each of the water bodies.

A. ICW System Aquatic Vegetation

On the ICW, seagrass beds are located throughout Mosquito Lagoon, from the Brevard County line to Edgewater, with scattered beds up to Ponce Inlet (Map 2). The grasses in this region are mostly Cuban Shoal Grass and Manatee Grass. In Mosquito Lagoon, seagrasses are abundant along the edge of the ICW channel and through the old channel that runs to the west of the barrier island through Canaveral National Seashore (CNS), including the Turtle Mound and Eldora area. Prop scarring of the beds to the east and west of the channel is an identified problem.

In addition to the seagrasses, this area is also characterized with low marsh and high marsh vegetation. The low marsh vegetation is primarily Smooth Cordgrass, while Salt Grass and Glassworts are typical of the high marsh. This area is also the northern boundary of mangrove communities, including both red and black mangroves.

North of Ponce Inlet the waters become dark with the tannin that flows from the Tomoka basin area and the surrounding upland areas. This impedes light penetration, thus restricting the growth of seagrasses. The predominant type of SAV in the Halifax River/Tomoka Basin is marine algae, including red and green algae (Department of Natural Resources, 1992).

The waters of the Tomoka River and its tributaries are very dark, due to the high concentrations of tannin in the water. There are no seagrasses in this area. Manatees in this area feed on the smooth cordgrass in the low marsh community. When accessible to them, manatees may also feed on high-marsh vegetation, by partially pulling themselves out of the water (personal communication, Benny Woodham, 1996). Protection of marsh grasses in close-proximity to manatee-accessible waters is therefore important. The vegetation inhabiting this area includes Saltgrass, Glasswort, and Saltwort. In addition, Smooth Cordgrass is found on the low marsh areas.

On the ICW system, Brazilian Pepper and Elephant Ear are the exotic or nuisance vegetation of concern. On the Tomoka River there are Brazilian Pepper plants, while Elephant Ear plants are starting to grow on Strickland Creek. In addition, these plants are found on the spoil islands of the ICW (personal communication, Benny Woodham, 1996).

B. SJR System Aquatic Vegetation

The SJR system is characterized as having a diverse set of plant communities, with both submerged, emergent, and floating vegetation. The river is also characterized by having problems with exotic vegetation that, in some cases, has choked off certain areas leading into the river.

Table 6 illustrates the major plant types by their classification. Eelgrass is a preferred food for manatees and grows within Lake Beresford on a cyclical basis. Eelgrass beds within Lake Beresford wax and wane depending upon environmental conditions that vary annually, although specific causes of this variability are not understood (personal communication, Wayne Hartley, 1996; personal communication, Deborah Shelley, 1996). It was suggested that there is a need to map the submerged grasses to determine how the food sources are doing.

Bengtson (1981) conducted feeding studies on manatees and determined that they do have a preference for the types of vegetation they eat. The plants most often eaten by the animals were Water Hyacinth, Pickerelweed, Alligatorweed, Paragrass, Giant Reed, and Cattail. They avoided woody, terrestrial plants and those plants that appear to have a bitter taste to them. In some instances, it appeared the manatees were tasting the plants for chemical evaluation. No information has been found that would indicate that a similar study has been done for animals on the ICW.

As mentioned previously, control of aquatic plants is a problem on the SJR, with the exception of Blue Spring. The Army Corps of Engineers (ACOE) is responsible for maintaining the navigable portions of the river, as well as keeping public areas such as boat ramps clear of overgrowth. Keeping the tributaries, dead rivers, and lakes off the river clear of vegetation is also done by the ACOE if the funds are available and there is sufficient public request for an area to be cleared. Some of the canals and creeks were originally built for the timber industry and were maintained by the industry; however, the timber industry no longer exists and these water bodies are not being maintained on a regular basis. Blue Spring does not have a problem since the water coming out of the boil is low in oxygen and the flow from the boil (16 million gallons per day) is too strong to allow floating vegetation to travel up the run.

ACOE has maintenance programs for two aquatic plants: water hyacinths and water lettuce. This maintenance program is designed to keep the navigable channels open, with the other areas of the SJR system addressed when there are funds available and sufficient citizen concern over an area. They also spray for hydrilla, but only on a "spot application" basis. Hydrilla is not as much of a problem as the other two plants since the tannic acid in the waters of the SJR blocks sunlight from penetrating the water column, which retards growth. The ACOE does not have the technology to eradicate nuisance plants; they perform maintenance only. If there is a plant bloom in the navigable channel of the river they will address this problem and most likely postpone any maintenance work being done in the lakes off the river.

ACOE alters aquatic plant control operations according to manatee use. No herbicide spraying takes place over manatees. In the Blue Spring area, ACOE does not apply herbicides between Channel Marker "85" and Lake Beresford (personal communication, Eddie Knight, 1996). Regarding the rest of the SJR system, ACOE won't spray herbicides if manatees are in the area. They rely on timely information provided as to where the animals are; sometimes the information is dated. There needs to be a mechanism developed to provide ACOE with timely information (personal communication, Dean Barber, 1996).

Water hyacinths, the plant of most concern on the SJR, can double its mass in 6-14 days under appropriate conditions. This plant is not cold tolerant and die-backs occur during periods of severe cold. These events do not kill all the plants and seeds, so control efforts must be maintained.

A private citizen can control the vegetation on their property by applying herbicides, but they must obtain a permit from both Volusia County and FDEP. There are eight herbicides approved by FDEP for use in the state, none of which are restricted in their use. Therefore, the private homeowner can apply the herbicide without the use of a professional applicator. There are currently less than 20 permits issued to private citizens in the Volusia County area (personal communication, Dean Barber, 1996).

Periods of high water bring problems to the river by bringing plants that were farther up in the swamps/wetlands out into the river. Volusia County experiences frequent periods of high water.

Herbicides are the preferred method of dealing with nuisance plants. Mechanical harvesting has been used in the past, but this method is expensive and inefficient, especially the smaller machines that are used for the lakes and tributaries off the main part of the river. The smaller harvesters cannot keep up with the growth. Harvesting in areas with high numbers of manatees, however, may be viewed as the only option to control growth without affecting manatees.

C. HABITAT PROTECTION

C.1. Volusia County Comprehensive Plan

Volusia County recognizes the need for protection of its natural resources as the area experiences future growth, and has responded to the challenge by addressing these issues in its Comprehensive Plan, specifically, Chapter 11, the Coastal Management Element, and Chapter 12, the Conservation Element (Appendices C and D). In addition, the ten municipalities within Volusia County also address these issues in their individual Comprehensive Plans.

The purpose of the Coastal Management Element of Volusia County's Comprehensive Plan is to "plan for and, where appropriate, restrict development activities where such activities would damage or destroy coastal resources, and protect human life and limit public expenditures in areas that are subject to destruction by natural disaster." This Element solely addresses the coastal area, which includes all areas seaward of the St. Johns River Basin. The Element not only addresses the protection of coastal resources, it also addresses other related issues of land use, traffic circulation, public access, and public services, facilities and infrastructure.

The specific watersheds/water bodies that are addressed in this Element include:

1. Tomoka River North
2. Tomoka River South
3. Halifax River
4. Mosquito Lagoon/Indian River North
5. Indian River South
6. Spruce Creek

The Conservation Element provides the framework for intertwining protection, preservation, and enhancement of the county's natural resources with growth and corresponding development. It also provides for the identification and preservation of ecologically irreplaceable resources.

This Element divides the goals, objectives, and policies relating to natural resources into four broad categories: water resources, natural communities and wildlife, air quality, and mineral resources. It is also directed toward the elimination of any further degradation of the County's lakes, rivers, and estuaries.

Protection of upland and wetland ecological resources is provided for in a number of ways. Large relatively uninterrupted expanses of natural communities will be managed in a more systematic manner than areas of the County targeted for urban growth. Protection of the natural environment in the undeveloped areas is given a high priority, recognizing that these areas contain the highest ecological diversity and functional value. Direction of urban growth away from these areas is a by-product of protecting the natural system. Protection of wetland is another high priority. Wildlife protection is accomplished primarily by preserving habitat critical to the survival of wildlife species.

C.2. Surface Water Monitoring Program

The County also maintains a county-wide surface water monitoring program. The water sampling is done quarterly on the SJR, the North Indian River Lagoon, the Halifax River, and monthly in the Mosquito Lagoon. The County monitors physical, chemical, and bacteriological parameters in its sampling. The physical parameters include cloud cover, water clarity, air temperature, wind direction and speed, turbidity, and total depth. The chemical parameters are pH, salinity, dissolved oxygen, nitrite and nitrates, chlorophyll, total Kjeldahl nitrogen (TKN), total suspended solids, dissolved phosphorus, and total phosphorus. The bacteriological parameters include fecal coliform and total coliform. The results of the sampling are entered into the U.S. Environmental Protection Agency (USEPA) STORET computer system. Through this program, the County is able to monitor the quality of surface water and ensure its safety for the residents of the County.

C.3. Public Lands

Volusia County has thousands of acres of environmentally sensitive lands under public ownership (Map 3 and Table 7).

The total acreage of upland public lands adjacent to the SJR and the ICW systems is important to manatee protection because there will be very little, if any, development on the land in the future. In addition, industrial and urban pollutants should be kept to a minimum. For the Aquatic Preserves, the adjacent uplands are largely used for residential, preservation, or recreational purposes. The total public lands available in the Volusia County area is 573,293 acres.

C.4. Land Acquisition

In addition to the management techniques recommended in this Element, the County has protected significant natural resource areas through its Land Acquisition Program. The Program has been coordinated with State and Federal agencies in order to maximize joint land acquisition efforts. Map 3 illustrates the conservation lands in the County while Table 7 provides information on the various conservation lands owned by federal, state and county governments. In the table, each area is broken down by the number of acres and by water body. On the SJR, there are a total of 453,323 acres of protected land. On the ICW, there are a total of 119,970 acres of conservation area. This gives a total of 573,293 acres of acquired public lands in Volusia County.

In addition to the already acquired lands, the County is looking to purchase several other tracts. The Bellmeade property, Spruce Creek lands, and the Lake Woodruff corridor are some of the lands under current consideration for purchase. Acquisition of these lands would benefit manatee habitat by providing wetland and upland buffers, allowing continued protection of water quality.

C.5. Waterway Protection

Several waterbodies that are important to manatees within Volusia County and its surrounding counties are classified by the State of Florida as Outstanding Florida Waters (OFW). These include:

- * Lake Woodruff National Wildlife Refuge
- * Merritt Island National Wildlife Refuge
- * Blue Spring State Park
- * Bulow Creek State Park
- * DeLeon Springs State Recreation Area
- * Tomoka State Park
- * Canaveral National Seashore
- * Spruce Creek and several unnamed tributaries
- * Mosquito Lagoon
- * Tomoka Marsh
- * Murray Creek (including Rose Bay)
- * Tomoka River and the following tributaries:
 - * Little Tomoka River
 - * Groover Branch
 - * Priest Branch
 - * Misner's Branch
 - * Thompson Creek and Strickland Creek

In addition to the waterways mentioned above, Volusia County has also designated several water bodies as part of the Florida Scenic and Wild River Program. These water bodies include Bulow Creek, Spruce Creek, the Tomoka River on the ICW, and Spring Garden Run on the SJR. Spruce Creek and the Tomoka River are already designated as Outstanding Florida Waters. With these areas so protected, Volusia County is focusing on planning for the potential development of surrounding areas.

C.6. Other Protection Initiatives

Another program the County participates in is called "Florida Yards and Neighborhoods." This program was developed by the Indian River Lagoon National Estuary Program (IRLNEP) and is supported in Volusia County by the Agriculture and Cooperative Extension Service. The purpose of this program is to inform riverfront property owners of how to protect the health of the river by using proven, environmentally sound landscaping and watering practices. During the spring of 1996, the Halifax/Indian River Task Force mailed informative materials to all waterfront property owners on the Intracoastal Waterway in an attempt to inform them of some of these techniques.

Finally, the State protects County natural resources by the designation of its waters as Outstanding Florida Waterways (OFW). This program helps maintain the quality of the water from any future degradation.

D. EDUCATION AND AWARENESS

Volusia County has several existing education and awareness programs for manatee protection. The most comprehensive program exists at Blue Spring State Park. Since the park is a warm water refuge for numerous animals in the winter, the park is able to offer interactive programs to educate the public. Each winter, the park has a K-12 VCR presentation that is shown four times a day. Over 400 children go through this program each day. Part of this program includes field observation classes. The children

are able to view the behavior of the manatee due to the number of animals that utilize the park as a winter home. Furthermore, Blue Spring holds weekend and holiday adult programs and a summer camper program for manatee education. Finally, Blue Spring supplies several informational brochures on manatee habitat and behavior to the visitors of the park.

Canaveral National Seashore has education programs that also include manatee protection segments. The rangers of the park participate in various presentations which educate the public on the wildlife within the park, which includes the manatee. The program they sponsor for children is called “Environmental Education Program For Kids.” This program is full through 1997, so Canaveral National Seashore is currently educating thousands of children on local environmental issues. The park also provides various informational brochures to its visitors.

Volusia County participates in the annual Manatee Festival which is hosted by the Orange City Blue Spring Manatee Festival, a not-for-profit corporation. The festival includes educational displays, arts, crafts, children’s games, entertainment, and volunteer opportunities focused on raising awareness for local environmental concerns. State and local environmental agencies and various non-for-profit environmental groups, such as VCEMS and Save the Manatee Club, are represented. They provide booklets, posters, and pamphlets on varied topics such as boating safety, endangered species (including manatees), and various recycling efforts.

As part of their boat testing speed zone exemption (#98-07-64-001), the Boston Whaler boat manufacturing company in Edgewater has an existing education program geared toward manatee awareness for its test drivers. Any personnel entering the exemption zone must be informed of the possible presence of manatees and the characteristics used to identify the presence of manatees, and must be familiar with the conditions of the exemption. Test areas must also be toured prior to testing activities to ensure that no manatees are in the area.

The Volusia County Soil and Water Conservation District has a marine outreach program that protects the County’s habitat by removing unusable fuel oils. They remove heating oil, marine and diesel fuels, and used motor oils on an emergency basis, with no cost to the marinas. They also provide a list of qualified contractors for the removal of other hazardous wastes such as gas, acetone, paint thinners, etc. They are actively contacting all the marine facilities in the County to educate them to the fact that this program exists.

The Indian River Lagoon National Estuary Program developed the “Boater’s Guide to the Indian River Lagoon”, which can be found at <http://sjr.state.fl.us/info/IRL.html>, provides extensive information on how to boat safely in the Indian River. Volusia County contains the northern-most end of the Lagoon, beginning at Ponce Inlet. This publication contains information on natural resources, boating regulations, boating violations and penalties, safety and environmental concerns, navigation rules, and maps broken down by county. The Boater’s Guide provides educational material on most aspects relevant to recreational boating. These guides are available to the public for a cost of \$3.25 each.

Save the Manatee Club (SMC) is active in Volusia County. SMC provides teacher in-service programs which instruct teachers on how to educate students on manatee biology, behavior, habitat and protection. SMC provides a teacher’s guide which contains manatee information and activities geared for various age levels. Coloring books, brochures, posters, and videos are also available for educational purposes. Teachers can request master copies of the materials and then reproduce copies for their classes. SMC provides volunteer speakers for school and community events. SMC participates in various festivals and fairs with manatee educational displays. Manatee signage is an important part of SMC’s programs. SMC provides “Please Watch for Manatees: Operate with Care” signs for private residents at no cost

through FMP district offices. VCEM distributes these signs for the SMC, as well, as a service to Volusia County residents. SMC also supplies informational signs and brochures on the dangers of feeding and watering manatees. These signs are placed at high-interaction areas, such as marinas and boat ramps, as well as waterfront parks and tourist areas.

Florida Power and Light hosts various workshops and presentations on manatee awareness throughout the state, including Volusia County. These workshops use slides, video, and visuals to educate the public on manatees. The workshops, presented by FPL's senior environmental specialists, are announced in local newspapers and are open to all interested parties. FPL also produces an in-depth manatee information booklet called "The West Indian Manatee in Florida." This booklet provides information on manatee behavior, physiology, mortality, and protection/conservation efforts.

The Florida Inland Navigation District assists with the manatee protection effort in Volusia County by providing detailed speed zone maps of the SJR and ICW at no cost to boaters. These maps break the waterways into sections and provide detailed speed zone and signage information.

The Florida Fish and Wildlife Commission (FWC) has valuable manatee information available to Volusia County residents. FWC provides slide shows/videos, pamphlets, brochures, curriculum, newsletters, and posters which are focused on manatee awareness. They developed the manatee information signs that are posted at marinas and boat ramps.

Sea World also provides information on wildlife, including the manatee. Their exhibit, "Manatees, The Last Generation?", features recovering and rehabilitated manatees. A presentation and lecture accompanies the live manatee exhibit. Sea World also hosts workshops to provide information on manatee biology, behavior, habitat, and recovery.

Volusia County Environmental Management has produced, through grant funding from the FWC, a special EnviroNet Manatee Education Newsletter for distribution to marine related businesses, civic groups, environmental organizations, educational institutions as well as to residents and visitors. VCEM is also distributing boat console decals with manatee education information on them and floatable keychains imprinted with the FMP rescue number, 1-800-DIAL-FMP (the new number is 1-888-404-FWCC). Manatee educational talks to school groups and other organizations are being conducted by VCEM staff. These are all part of an ongoing VCEM manatee education program.

E. GOVERNMENT COORDINATION

E.1. Permit Procedures and Development Review

Permit and development review procedures for marine facilities, docks, and general structures located on the shoreline or submerged lands that affect manatees may be conducted by many agencies. Facilities which will ultimately affect the manatee may be reviewed by the municipality (if any), Volusia County, FDEP, St. Johns River Water Management District (SJRWMD), U.S. Army Corps of Engineers (ACOE), Florida Fish and Wildlife Commission (FWC), and the U.S. Fish and Wildlife Service (USFWS).

The ACOE and FDEP have a joint application for dredge and fill projects which include boat docking facilities. The ACOE issues permits under Section 10 of the Rivers and Harbors Act of 1899 for projects located in navigable waters and structures that would alter or modify the condition, capacity, or channel of any navigable water. In addition, the ACOE issues permits under Section 404 of the Federal Water Pollution Control Act Amendments, which prohibits the discharge of dredge or fill material into navigable waters without a permit. The ACOE is required to consult the USFWS when an "individual"

permit application is received, to insure that its actions are not likely to result in the destruction or adverse modification of designated critical habitat or jeopardize the continued existence of any endangered or threatened species. The ACOE issues “general” permits for small projects (including docks and bulkheads for single family residences). If these projects do not meet the conditions for a “general” permit, an “individual” permit will be required.

Pursuant to Chapters 253, 258, 403, 373 F.S., the state Environmental Resource Permit (ERP) program regulates the construction, alteration, maintenance, removal, modification, and operation of all activities in uplands, wetlands, and other surface waters (whether publicly or privately owned) that will alter, divert, impede, or otherwise change the flow of surface waters. This program is designed to ensure that such activities do not degrade water quality by discharging untreated stormwater runoff or cause flooding by changing off-site runoff characteristics. In addition, the ERP program regulates dredge and fill activities such as the dredging of navigation channels, filling of wetlands, and the construction of docks and seawalls. This will ensure that water quality is not degraded, and that these wetlands and other surface waters continue to provide healthy levels of wildlife habitat (including those of threatened and endangered species) and aquatic productivity. The ERP program streamlines the permitting process by allocating the processing of ERP applications to one agency, either a water management district or the FDEP. The Department of Community Affairs and the Regional Planning Council are responsive to manatee issues through their state and regional review procedures.

Volusia County also participates in the permitting process for single family docks. The Building Code and the Environmental Management Service Centers handle the permitting of docks if the dock is not located in a city that has its own ordinance for dock construction. The guidelines used by Volusia County Environmental Management for permitting are found in the Volusia County Comprehensive Plan. Section 11.2.3.2 of the Comprehensive Plan deals with the criteria for marina siting or expansion as part of land development regulations. The criteria, which gives priority to the expansion of existing marinas, can be found in the Boat Facility Siting criteria, Phase II of the MPP.

The provisions for the Tomoka Marsh Aquatic Preserve, the Mosquito Lagoon Aquatic Preserve, and the Wekiva River Aquatic Preserve that relate to construction practices can also be found in the Boat Facility Siting criteria..

E.2. Programs and Projects

Volusia County has several programs and projects in place that involve various government organizations and deal specifically with protecting water quality, acquiring lands, and protecting natural resources. The various programs are outlined below.

The Environmentally Endangered Lands (EEL) Program has been established in Volusia County with the cooperation of the St. Johns River Water Management District (SJRWMD). The EEL program includes the acquisition, preservation, enhancement, restoration, conservation, and maintenance of environmentally endangered lands. Environmental land is evaluated for biological value and integrity, vulnerability to damage or destruction, and the cost and feasibility of managing the natural resource over the long term. Buffer land is evaluated on the basis of its vulnerability to development and the biological value of the environmental land which it buffers. The lands that have previously been acquired can be found in Table 7 under the Habitat Protection section.

Several programs exist in Volusia County that deal with water quality monitoring. One of SJRWMD’s projects in Volusia County involves monitoring water quality in the Mosquito Lagoon. SJRWMD also participates in an annual cleanup of the entire St. Johns River, including portions in Volusia County.

This cleanup began in 1996 and utilizes various volunteers and agencies within Volusia County. The SJRWMD also funds the Surface Water Improvement and Management (SWIM) program in Volusia County. One of the projects using SWIM funds is the “baffle-box” project, which involves the control of pollutant loadings in Mosquito Lagoon from stormwater runoff.

As mentioned previously, Volusia County participates in a water quality monitoring program that monitors physical, chemical, and bacteriological parameters of the St. Johns River. This program is explained in more detail in the Habitat Protection section of this report. In addition, Volusia County has an on-going partnership with Daytona Beach for maintaining and monitoring the water quality of the ICW up to the Volusia/Flagler County line.

The Halifax Indian River Task Force also assists in maintaining the quality of Volusia’s waterways by hosting an annual clean-up of the Halifax and North Indian River. This clean-up utilizes volunteers and various local organizations in the County.

Other things Volusia County Environmental Management attempts to do include the following:

1. Promote wise use of water-dependent and water-related projects and activities along shorelines in order to protect the natural resources.
2. Protect manatee habitat.
3. Promote greater cooperation between law enforcement agencies.
4. Promote public education and awareness programs.
5. Evaluate the regulations and regulated areas for waterborne activities.
6. Identify areas of public use conflict and evaluate ways to reduce the conflict.
7. Design regulatory measures to improve surface water quality, reduce chemical spraying, and promote the development of solutions to surface runoff problems.

III. MANATEE PROTECTION PLAN RECOMMENDATIONS

A. BOATING CONSIDERATIONS

1. Speed Zones

One of the main issues of any manatee protection plan is the regulation of watercraft through speed zones. This has proven to be one of the most contentious issues revolving around the protection of manatees. In 1989, the Governor and Cabinet directed FDEP to institute speed zones in Volusia County. The County created a speed zone task force in an effort to address this issue. After much deliberation between the task force and the state, speed zones were instituted in Volusia County in 1991. These zones have been in place since this time, although there have been several legal challenges to these zones and to the definitions of “slow speed.”

In a letter dated June 21, 1999 the Bureau of Protected Species Management now under the Florida Fish and Wildlife Conservation Commission stated that it was their preference that development or modification of speed zones in Volusia County be handled during the State’s rule-making process. For this reason this document does not address any revision to Volusia County’s speed zones.

A.1. Confusion over Signage

The data obtained from the Boating Activity Study (1996) surveyed 954 boaters. Data has indicated problems with the existing system. From the Boating Activity Study, 22% of all surveyed boaters when asked the question, “Do speed zones affect boating behavior?”, indicated that the signs were “not necessary/not in correct areas and/or need to be less restrictive” and 6% of all surveyed boaters indicated that the signs were “too confusing/needs additional enforcement and more consistent enforcement.” Thirty-two percent of all surveyed boaters indicated that they have “slowed down/were more cautious and/or obeyed” the speed zones. Part of this confusion stems from the problem that the County’s waters are a mosaic of short zones with varying speeds, during different seasons, and the fact that there are many tributaries leading from the water bodies, especially on the SJR. This last issue causes confusion over the exact area of regulation. Volusia County currently is divided up into 26 different speed zones with 11 different zone classifications on the SJR, and 29 different zones with 10 different zone classifications on the ICW. In addition, the 11 different zone classifications on the SJR are not the same as the 10 on the ICW. These zones include idle, slow, 25 mph, 30 mph, 35 mph, seasonal idle and slow zones, shoreline buffer zones, and slower speeds at night. Table 8 illustrates the different zone classifications by water body. Due to these varying zone classifications, many boaters have voiced a concern that these signs contain too much information, and the information varies from sign to sign. The problems associated with reading the detailed information on the signs may cause many boaters to be unaware of the exact regulation of the waterways they use, which may ultimately leads to non-compliance.

The confusion over signage may be a problem for both residents of the County, who frequently use the waters, and for non-residents who use Volusia County on a short term basis or as a travel corridor. From the Volusia County Boating Activity Study (1996), it was found that 31% of boaters on the ICW are non-Volusia County residents, while 59% of the boaters on the SJR are non-Volusia County residents. The non-Volusia County residents were predominantly from counties adjacent to Volusia County. In addition, 2.4% of the ICW boaters are from out of state, while 6.2% of boaters on the SJR are from out of state. This data came from the boat ramp census. Boaters traveling the ICW through Volusia County as well as the winter tourists on the SJR who store their boats in marine facilities were not included in this count. The aerial survey data showed a marked increase during the winter of recreational fishing boats on the SJR which, according to interviews with fish camp operators, were winter out-of-state residents.

A.2. Enforcement Issues

Currently, enforcement in Volusia County is difficult and less than optimally effective because of manpower constraints. Therefore, if officers on patrol spend more time in slow speed zones it affects their ability to cover other areas of the County. All law enforcement agencies adhere to vessel speed restrictions unless an emergency is in progress. Some of these areas include the Norris Dead River on the SJR, and the Tomoka River and Spruce Creek on the ICW. Finally, because of manpower constraints, there are no scheduled night patrols; therefore, no night enforcement. Enforcement is a crucial element for boating safety and natural resource protection, and the County needs to concentrate its efforts on strengthening its enforcement capabilities.

In addition, a particular enforcement problem may occur in the five mile slow zone from Edgewater to Oak Hill in which a boat manufacturer has an exemption to this zone for testing purposes. The presence of exempted vessels may create a built-in defense for non-exempted vessels and may reduce the level of voluntary compliance.

A.3. Manatee Data

Watercraft related manatee mortality has been collected on both the ICW and SJR in Volusia County from 1974 through 1998. During this time, a total of 37 manatees were killed as a direct result of watercraft, 25 on the ICW and 16 on the SJR. In 1991, the speed zones were in full effect in Volusia County. The data from Figures 13, 14, and 15 indicates yearly total watercraft-related manatee mortality for Volusia County, the ICW and the St. John's River of Volusia County, respectively. There were a total of 15 mortalities during the nine years prior to the adoption of the speed zones and a total of 22 watercraft mortalities in the nine years after the speed zones went into effect. Data collected by the scientific community indicates that Volusia County is a travel corridor for manatees, with no known major congregation areas except for Blue Spring State Park during the winter. This lack of congregation areas, suggests that current location-specific speed zones may not be effective, and need to be re-assessed.

B. BOAT FACILITY SITING

The siting of marine facilities is addressed in Phase II of the MPP, Boat Facility Siting.

C. ENFORCEMENT

Purpose Statement

The purpose of this section is to describe the roles of enforcement agencies and make recommendations for their coordination in order to avoid duplication and provide better coverage of the waterways.

Background Information C1:

The Volusia County Sheriff's Marine Unit is the primary enforcement agency involved in manatee speed zone enforcement within the county. The Florida Marine Patrol, now part of the FWC's Division of Law Enforcement in the Bureau of Field Operations, also provides enforcement services in Volusia County as does the Florida Park Patrol and the U.S. Coast Guard (USCG). It is recognized by all that additional on-water officers are needed to effectively manage the County's waterways.

The Florida Park Patrol (part of FDEP) has four officers located in Volusia County: two at Blue Spring State Park and two whose geographic area of responsibility includes Tomoka Basin GeoPark. Their responsibilities include enforcement of the Manatee Sanctuary Act. Currently there is one vacant, unfunded, position for Hontoon Island State Park. The officers at Blue Spring State Park have a vessel and conduct routine patrols, the officers at Tomoka Basin GeoPark also have a vessel, and this allows them to do on-water patrols as well.

The FWC's Division of Law Enforcement is an important enforcement agency on Volusia County's waters. Currently, there are vacancies within the squads in many areas throughout the state including Volusia County. At one time FMP recommended that to properly enforce the waterways, three additional officers and equipment would be needed. This would require \$105K to fund the officers (personal communication, FMP Officer Mitch Needelman, 1996). At this point in time there are approximately four vacancies within the three squads which cover Volusia County waters.

Recommendation C1:

Additional funding for three additional on-water officers through the FWC is recommended in order to increase enforcement capabilities in Volusia and its surrounding counties. This is in addition to filling the currently approved vacant positions. As the marine officers are a division of FWC, this should be funded by FWC. Volusia County will lobby the FWC to seek three additional officers.

Background Information C2:

The responsibility of enforcing the waterway laws throughout Volusia County presently is handled by several agencies. Many of their duties overlap, for example, the FWC and the Volusia County Sheriff's Department both have a focus on boating safety and boating-related violations of law. The Sheriff's Department has been the primary agency targeting manatee speed zone violations, allowing the Florida Fish and Wildlife Conservation Commission to focus more on resource violations and promoting ecosystem management, which includes resource protection. With the understanding that there is a finite resource with these groups, coordination of efforts becomes crucial in order to effectively protect the manatee and its habitat, and to promote boater safety.

Recommendation C2:

An annual group meeting that would establish a working relationship between enforcement agencies shall be developed. The goal of this annual meeting would be to ensure full and efficient monitoring of areas with vessel speed regulations, proper handling of manatee-related incidents, and coordinated planning of the participating agencies' enforcement activities for the coming year. This organization of officers would afford better communication, more effective enforcement coverage, and prioritized areas of enforcement. This meeting would include at least one officer from each of the main enforcement agencies for Volusia County: FWC's Division of Law Enforcement, Volusia County Sheriff's Department Marine Unit, Canaveral National Seashore, Florida Park Service, USCG and USFWS. Each of these representatives should be designated as the "manatee specialist" for their agency, and would be notified of any manatee related proposals with which law enforcement agencies may be involved. Participating agencies should consider incorporating the use of aerial surveys and compliance surveys to better coordinate enforcement.

Background Information C.3

Data developed during the boating activity study for Volusia County indicated problems over the signage throughout the river systems. Conversations with the Sheriff's Marine Unit confirmed that some of the signs were confusing, had too much information on them, and were located in less than ideal locations.

Recommendation C.3

The County will actively explore ways to clarify and consolidate signage relating to boating regulations.

Background Information C.4

The Ad-Hoc Manatee Protection Plan Advisory Committee agreed that it was important to get manatee and habitat information out to the boating public and waterfront property owners so that they could assist in reporting violations to the proper authorities.

Recommendation C.4

The County will include the 1-888-404-FWCC phone number with information for reporting dead or injured manatees and any violations related to manatee protection and habitat degradation with all boater education and waterfront property owner information materials.

Recommendation C.4.1.

The County will attempt to inform all registered boaters, possibly through a mass mailing, of any regulatory changes that would impact them.

D. HABITAT PROTECTION

The purpose of the Habitat section is to define favorable habitat for manatees in Volusia County, identify areas in the County where favorable habitat for manatees exists, establish baseline information as necessary for evaluating trends toward improvement or degradation, and to identify and evaluate both threats and actions needed to restore, enhance, or protect habitat. No recommendations in this section are meant to duplicate existing efforts.

D.1. Indian River Lagoon Comprehensive Conservation & Management Plan

Background Information D.1:

Volusia County has assisted and supported the efforts of the Indian River Lagoon National Estuary Program (IRLNEP) in defining objectives on maintaining the quality of the Indian River through collaborating with them on water quality monitoring programs and providing technical support and review during the development of their management plan. IRLNEP has existed for five years and has done extensive research in regards to the preservation and conservation of the Lagoon. IRLNEP has produced the final draft of the Comprehensive Conservation and Management Plan (IRLCCMP) that outlines various objectives for habitat protection in the Lagoon. Volusia County EMS is one of the reviewers of this document, and has been involved in the development process from the beginning. The final draft of the IRLCCMP has been approved by Governor Chiles and Carol Browner, the EPA Administrator, and has been endorsed by the Volusia County Council. The Volusia County Council supports the habitat recommendations for the North Indian River, that area of the river from Ponce Inlet south to the Brevard/Volusia County line. In addition, some of the CCMP action plans, such as the management of septic tanks, can be applied to all waters of the County and should be analyzed for inclusion to all water bodies. The IRLCCMP includes Action Plans which address the following issues:

A. Water and Sediment Quality

- Point Source Discharges-Objective: To ensure compliance with the Indian River Lagoon Act and to reduce or eliminate, where possible, industrial wastewater discharges to the IRL.
- On-Site Sewage Disposal-Objective: Determine the impacts of on-site sewage disposal on the resources of the Indian River Lagoon, and to develop and implement strategies to address these impacts.
- Fresh & Stormwater Discharges-Objective: To develop and implement strategies to address the impacts of freshwater and storm-water discharges on the resources of the Indian River Lagoon.
- Marina & Boat Impacts-Objective: To engage the boating public and marine industry as active participants in the protection and restoration of the resources of the Indian River Lagoon.

B. Biodiversity Preservation & Restoration

- Biodiversity Research & Management-Objective: Develop and implement a coordinated research and management strategy to preserve, protect, and restore biodiversity in the Indian River Lagoon.
- Seagrass Restoration-Objective: To protect and restore seagrass integrity and function in the Indian River Lagoon by attaining and maintaining water quality capable of supporting a healthy submerged aquatic vegetation community to a depth of 1.7 meters
- Wetlands-Objective: Preserve, protect, restore and enhance the wetland resources of the Indian River Lagoon Region.
- Impounded Marsh Restoration & Management-Objective: Restore the functions of marshes impounded for mosquito control purposes.
- Land Acquisition-Objective: Develop and implement a coordinated strategy to protect environmentally endangered habitats within the Indian River basin through acquisitions.
- Endangered & Threatened Species-Objective: Protect endangered and threatened mammals, birds, fish, reptiles, amphibians, and invertebrates of the Indian River Lagoon.
- Fisheries-Objective: Conserve and protect fin and shell fisheries of the Indian River Lagoon.

C. Public and Government Support and Involvement

- Public Governmental Support & Involvement-Objective: Facilitate implementation of the Indian River Lagoon CCMP through public involvement and education.
- Future IRLCCMP Implementation-Objective: Establish a modified management structure that will oversee the implementation of the Indian River Lagoon Comprehensive Conservation Management Plan and provide for an organization to support the activities of the modified management conference.
- Data & Information Management Strategy-Objective: Develop and implement a strategy to coordinate the management and dissemination of data and information concerning the Indian River Lagoon.
- Monitoring-Objective: To develop and maintain a monitoring network which will provide adequate and reliable data and information on water quality, sediment quality, and the biological resources of the Indian River Lagoon on which management decisions may be based.

Recommendation D.1:

Volusia County, primarily through the Environmental Management Service Center (VCEMSC), the Volusia County Port Authority, and the Halifax/Indian River Task Force (HIRTF), will actively support the Action Items outlined above from the IRLNEP CCMP, and work in concert with the various agencies involved, to ensure that the goals and objectives of this plan are met. Part of this support will entail planning for the necessary resources that the action plans will require.

Recommendation D1.1:

The County will review the IRLNEP CCMP and related regulations, and determine how best to achieve a similar result in the Halifax River.

D.2. Water quality

Background Information D.2:

As mentioned in the Inventory and Analysis Section of this plan, Volusia County has had a water monitoring program in place for the ICW and SJR systems since 1990, the goal of which is to maintain good water quality. This program has proved to be valuable in protecting the quality of Volusia's water by developing the baseline data needed for trend analysis, and the identification of any "hot spots", indicating poor water quality. Both water bodies are sampled on a quarterly basis, with 30 sampling stations on the SJR system, from Lake Monroe to Lake Harney, and 30 sampling stations on the ICW system, from the Flagler/Volusia County line to the city of Oak Hill in Mosquito Lagoon. The sampling that is done on the ICW system is also done via a partnership with the City of Daytona Beach.

During the research for this aspect of the MPP, one area where a sampling program needs to be started is Strickland Creek, a tributary of the Tomoka River. Currently, there has been no formal sampling conducted on this water body. This tributary has been identified as having consistent manatee use, with the exception of the colder months, and has also been designated as an Outstanding Florida Waterway (OFW). In order to effectively manage an OFW, a baseline set of water quality data must be established. Once this baseline data is established, pollution reduction goals can be set.

Another water quality issue that surfaced during the research concerned on-sight disposal (septic tanks) systems. Several areas were identified as having systems that were at or nearing the end of their life cycle. These included the Tomoka River area, the north peninsular in Ormond Beach, and the City of Oak Hill. Due to the large number of residences on these systems, discussions have been held regarding moving entire areas onto sewer systems. The County has had several discussions with the City of Oak Hill regarding this issue.

Recommendation D.2.1:

VCEMS will continue its water sampling program. To accomplish this, VCEMS will continue its partnership with the St. Johns River Water Management District (SJRWMD) to deal with such issues as funding, data reporting, and data collecting in relation to water quality monitoring. This type of partnership will increase the effectiveness of the water quality monitoring program in Volusia County. As data for this program has been collected for eight years or more, which is above the standard length of time required to establish baseline data, the County will work with SJRWMD to do analysis and to identify trends.

Recommendation D.2.2:

VCEMS shall establish a water quality monitoring sampling program on Strickland Creek, establishing several sampling sites that will be monitored on a monthly basis. This program will require 3-5 years of data before baseline water quality parameters can be established.

Recommendation D.2.3:

VCEMS will continue to work with the County and the coastal areas to explore ways in which to move some of the waterfront properties from septic tanks to direct sewer connection. VCEMS will also assist the County and the cities as they plan for the movement of homes from septic to sewer systems.

D.3. Florida Yards and Neighborhoods Program

Background Information D.3:

As mentioned in the Inventory and Analysis Section, Volusia County has instituted a Florida Yards and Neighborhoods Program for all of the Indian River Lagoon and is anticipated to be implemented countywide. This program is designed to educate waterfront property owners on the proper methods of maintaining their yards to minimize adverse impacts to the water bodies.

Recommendation D.3:

Volusia County will extend this program to property owners along the SJR system. Property owners on this water body will be surveyed to determine how their yards are being maintained, and this information will be added to the database of ICW property owners. VCEMS will follow up with an informational mailing on tips to properly maintain waterfront property using proven, environmentally sound landscaping and watering techniques.

D.4. Aquatic Plant Control

Background Information D.4:

As mentioned earlier in this document, the control of aquatic plants is a problem on the SJR and occurs mostly in the warmer months. Water hyacinths, the plant of most concern, are not cold tolerant and die-backs occur during periods of severe cold. These events do not kill all the plants and seeds, so control efforts must be maintained. Water lettuce and hydrilla are the other two plants of concern. ACOE is responsible for controlling these plants through the spraying of herbicides.

Aquatic plant removal should be done by licensed applicators, using FDEP approved herbicides only. The use of copper-based herbicides, which have been found in high concentrations in manatees, is prohibited by FDEP in the natural waters of the state. Herbicides containing ehdothal l and fluridone are most acceptable. The spraying of herbicides directly onto manatees is prohibited (62C-20, F.A.C.). Biological controls can also be used to control invasive vegetation. These controls include the use of insects, fish, and diseases which have evolved in concert with the target species and are able to naturally suppress aquatic weeds.

As mentioned previously, residents may apply for permits for the removal of nuisance plants on their properties. Along the SJR there are many finger canals that become choked off with these plants. It is also important that citizens understand that it is illegal to apply aquatic herbicides without a permit.

There needs to be a balance between aquatic plant control and maintaining manatee habitat.

Recommendation D.4:

VCEMS will coordinate with FDEP on identifying those areas along the SJR system where manatee habitat must be balanced with aquatic plant control. These areas will be identified and a plan, with timetables, developed for addressing these areas. VCEMS will also coordinate with ACOE to identify those finger canals that have become clogged with vegetation and work with the homeowners along the canal to have the whole canal treated at once, thereby minimizing the amount of herbicide that must be applied. At the same time the County will educate the homeowners on the proper methods and legal aspects of aquatic plant control. VCEMS will meet with ACOE on the issue of how much spraying, if

any, is needed to control nuisance vegetation. The results of this meeting will be disseminated to the public and managers of the ecosystems.

Recommendation D.4.1:

The County will explore how, where, and on what schedule re-vegetation of the St. Johns River (with native submerged and emergent vegetation, especially eel-grass) might be undertaken. This will be done in coordination with FFWCC. The IRLNEP CCMP recommendations in this area may serve as a model. Re-vegetation efforts in Lake Monroe may also provide information for this undertaking.

D.5. Stormwater Issues

Background Information D.5:

Volusia County's Public Works Department is responsible for stormwater issues in the County. They have reviewed the contractors' reports mentioned earlier in this document and are prioritizing the action plans. As previously mentioned, there are over \$98 Million in capital projects in these reports. Some of these projects require water quality monitoring on both an on-going and "rain event" needs basis.

Recommendation D.5:

VCEMS will support the County's Public Works Department by providing water quality monitoring to stormwater projects. VCEMS has the capability, through its Enviro-Net program of trained water quality sampling volunteers, to develop the programs needed in this effort, and is prepared to do so. VCEMS will also provide input to the Public Works Department on areas that they feel need attention, such as Strickland, Thompson, and Dodson creeks. Presently, no water quality monitoring is being conducted in this area, and direct stormwater runoff is occurring from the surrounding subdivisions. These creeks are designated as an Outstanding Florida Waterway (OFW), and manatee usage of this area is high.

Recommendation D.5.1:

The County should develop a comprehensive strategy for stormwater management. This strategy should coordinate with and make use of existing efforts, expanding these efforts to include current retrofitting standards, and to focus on the importance of stormwater management in the protection of aquatic habitat and manatees.

D.6. Habitat Acquisition

Background Information D.6:

Volusia County has an active lands acquisition program and is currently looking to purchase additional tracts of land. Tomoka State Geo-Park is considering two pieces of property, which would add to the boundaries of the park. One piece is called the Rivers property and is owned by the Bellemeade Development Company. This property borders the Tomoka River, which would add to the preservation of the waterway. The purchase of this piece of property via bonds was approved by the voters of the City of Ormond Beach in November of 1997. The other piece of property under consideration is found at the confluence of Strickland Creek, Thompson Creek, and Dodson Creek. The acquisition of this location would help protect the known population of manatees that frequent the area in the summer.

Also on the ICW is the proposed 1995-96 CARL sites acquisition in the Spruce Creek area. These properties are important for their archeological features and for the location as a gateway to the other public lands already in County ownership. In addition, the county is coordinating the purchase of additional lands on the ICW through the Indian River Lagoon Blueway Program, another CARL project.

On the SJR, there is a piece of property on Lake Woodruff that will possibly be acquired by the County. This piece of property would complete the corridor that exists from Lake Woodruff to the DeLand city limits along the SJR.

Recommendation D.6:

Volusia County will continue to actively pursue the purchase of the Spruce Creek CARL property, the Lake Woodruff corridor property, and other properties or the development rights to those properties identified in the Indian River Lagoon Blueway project. In addition, the County will work with Tomoka Geo-Park to pursue their purchase of the Strickland, Thompson, and Dodson creeks confluence property.

Recommendation D.6.1:

An inventory of irreplaceable resources should be developed. This should begin with any existing inventories, and should include developed areas, any areas important to manatees including any feeding, calving, nursing, cavorting, resting, and freshwater areas, and any manatee migratory routes.

Recommendation D.6.2:

The County recognizes that additional degradation of water quality affects aquatic habitat and manatees. The County should work towards elimination of additional degradation in the integrated basins. The County should review and refine existing regulations with the goal of minimizing additional degradation of water quality and addressing the cumulative effects of development.

Recommendation D.6.3

VCEMS will work with SJRWMD, FDEP, and EPA, if appropriate, on the feasibility of using computer models for pollution load reduction and development impacts. VCEMS will research the legal implications and the costs associated with setting up such a system.

D.7. Dredging

1. All dredged material shall be contained on an upland site. (FDEP Policy Dredge and Fill Requirements)
2. New and maintenance dredging projects on the Intracoastal Waterway should be performed during the period of November 15 through March 15, when feasible, to minimize potential impacts to manatees (would require a new policy).
3. Dredging in areas of abundant seagrasses will be prohibited. (would require a new County policy or Countywide Minimum Standards).

E. EDUCATION AND AWARENESS

Purpose Statement

The purpose of the Education and Awareness section is to make the citizens of Volusia County and visitors to the County aware of the vulnerability of the manatee to threats of all kinds, from habitat degradation to direct human intervention, and to make people care enough to modify their behavior to protect the manatee and its habitat.

Background Information E.1:

Volusia County has several programs in place that deal with manatee education and awareness (see section II.E. for existing programs). However, education is a vital element in manatee protection so the following education initiatives were developed to raise the level of awareness for manatee protection in Volusia County. The initiatives are labeled according to their projected time of implementation. Short term initiatives are those that can be completed in less than a year. Near term initiatives are those completed in a 1-3 year period. Finally, long term initiatives are those which will take longer than three years to complete. Completion of these initiatives is the responsibility of the County unless otherwise specified and is contingent upon available funding. The suggested education programs are as follows:

E.1. Manatee Education Coordination (Short Term)

The on-going support of the education initiatives will be coordinated through VCEM's assigned staff. Currently, there is not a designated position for a manatee specialist. Due to the importance of manatee education initiatives, governmental coordination and implementation of all MPP components it is recommended that a position be created and funded. There is an active internship program with Stetson University, the University of Central Florida, and Daytona Beach Community College. Interns, with close guidance of assigned staff, will be responsible for helping with the execution of the education portion of the plan. In addition, volunteers are available through VCEM's Enviro-Net program, who can be utilized for projects if and when they are needed. The County will submit any educational materials to a group of interested parties for review.

E.2. Manatee Information and Maps Distributed with New Boat Registrations (Near Term)

- A. Manatee education brochures will be developed and distributed with all new boat registrations. Information on the brochures would include, but not be limited to: waterproof manatee protection and boater safety speed zone maps, how to identify a manatee in the water and how to take efforts to avoid striking one, how to minimize impacts on the waterways (including water quality, seagrasses and marine debris, such as monofilament line), and the steps taken to report a dead, injured, orphaned, or harassed manatee..

Target Audience: Boat owners and operators

Potential Funding: Florida Fish and Wildlife Conservation Commission (FWC), Save the Manatee Club (SMC) , Florida Inland Navigation District (FIND), U. S. Fish and Wildlife Service (FWS), U.S. Coast Guard (USCG) and other public and private sources of funding.

- B. Floatable manatee-shaped key chains to be distributed with all new boat registrations. These key chains would show the 1-888-404-FWCC phone number that should be called if a dead, injured, orphaned or harassed manatee is observed.

Target Audience: Boat owners and operators

Potential Funding: SMC, FWC, FDEP, FIND, FWC, USCG, FWS and other public and private sources of funding.

- C. Manatee informational stickers, like those developed by Citrus County, should be created and distributed to all rental vessels. A manatee briefing checklist should be developed, which would be signed by both the rental operator and the renter before a vessel is allowed to be operated.

Target Audience: Boat and personal watercraft rental businesses

Potential Funding: SMC, FDEP, FWC, USCG, FWS and other public and private sources of funding.

- D. Environmental Management will contact Seminole and Lake counties and offer to supply an original of the manatee information distributed to boater registrations in Volusia County, so that copies can be included with their boat registrations.

Target Audience: Boat owners and operators

Potential Funding: None required

E.3. Manatee Educational Brochures to be Distributed to Residents (Short Term)

Manatee educational brochures should be developed and distributed to residents. These brochures could possibly be enclosed with city utility bills. These brochures would provide information on the migration patterns of the animals, as well as general manatee information, habitat protection issues, marine debris, and manatee interaction guidelines. They would also include information for shoreline property owners on how to report a dead, injured, orphaned or harassed manatee, and on the law against disturbing manatees. Another possibility is the distribution of manatee information in newsletters that are already produced by municipalities. Cities such as Port Orange and Daytona Beach Shores have expressed a willingness to include such information in their quarterly newsletters.

Target Audience: All Volusia County Residents.

Potential Funding: SMC, FDEP, VCEM, FWC, USCG, FWS and other public and private sources of funding.

E.4. Manatee Education Segments for Boating Safety Courses (USCG Auxiliary and the US Power Squadron) (Near Term)

Currently, boating safety courses offered in Volusia County do not provide any significant amount of information on manatees. Segments for these courses should be developed and include the following information: how to identify manatees in the water, manatee habitat areas, how to reduce the impact of boating on the environment, marine debris, the law against disturbing manatees, and how to report a dead, injured, orphaned or harassed manatee. A video or slide show along with an educator's guide would be used to convey this information. The informational brochures developed above for registered boaters could also be provided to participants. In addition, speed zone maps from FIND could be provided.

Target Audience: Registered boat owners and operators.

Potential Funding: SMC (curriculum assistance), VCEM, FDEP, FWC, USCG, FWS and other public and private sources of funding.

E.5. Public Service Announcements (Short Term)

A series of public service announcements on manatee education have already been developed by the Save the Manatee Club, FDEP, and Duval County, and could be utilized by Volusia County to educate the public. The PSAs would include information on manatee education and boating safety. In addition to airing these on public television, they could also be shown on the County's television and radio programs, the County's Internet Web site, and hotel/motel cable programming.

A series of slides for movie theater previews would be another outlet for conveying manatee and safe boating information. Many theaters in Florida have provided this service free of charge for other education initiatives.

Target Audience: Volusia County residents

Potential Funding: Use established PSAs from SMC, Duval County, FDEP, FWC, USCG, FWS and other public and private sources of funding.

E.6. Manatee Information Kiosk Displays for High Use Ramps (Long Term)

At high use ramps and/or key manatee areas visited by the public (areas with high manatee presence), a covered kiosk with a graphic illustration of manatee awareness information will be established. This information could include habitat, behavior, interaction regulations, location of speed zones, and what to do if a manatee is seen killed, injured, orphaned or harassed. The kiosk could be created with slots that would hold speed zone maps and other informational brochures. The displays and maintenance of the kiosk could be done by school or service groups.

Brevard County developed plans for the design of these kiosks and their related costs. Groups such as the Boy Scouts, Girl Scouts, school, and service groups could assist in the funding and construction of these kiosks. The development and maintenance of these displays could be coordinated as "Adopt a Ramp" or "Adopt a Kiosk" programs. The sponsorship by these groups and possible private sponsors would require regular visits to the ramp or kiosk to ensure its maintenance and good condition.

Target Audience: Boating public

Potential Funding: FIND has already committed to funding this program, Volusia County Port Authority, FWC, FWS and other public and private sources of funding.

Maintenance of kiosks: Service groups, Enviro-Net volunteers

E.7. Manatee Information to Fishing Tournaments (Short Term)

Fishing tournaments are popular on both the ICW and SJR. The County will coordinate with the organizers of these events to provide the participants with information regarding manatees (including speed zone maps), with an emphasis on the existing speed zones, how to spot manatees in the water, how to take efforts to avoid them, and how to report a dead, injured, orphaned or harassed manatee.

Target Audience: Fishing Tournament Boaters

Potential Funding: SMC, VCEM

E.8. Improve Manatee Zone Signs at Boat Ramps (Near Term)

A. Signs will be developed, with the assistance of Volusia County's GIS department, that contain a map illustrating a particular ramp's location in relation to relative speed zones. The map will include a five mile sphere of influence for each ramp. The signs will be visible from boat ramp lanes. These signs will allow boaters to be aware of zones they may be entering as they launch their boat from a particular ramp. FDEP and FIND have done some work on this project. (Near Term)

Target Audience: Boat Operators

Potential Funding: FIND, FDEP, FWS, USCG, FWS

B. Information obtained from the 1996 Boating Activity Study found that 80% of marinas and 69% of ramps in the County do not display any type of manatee signs or information. These signs, such as the Caution Manatee Area and Manatee Basics for Boaters, are available from private vendors. Better distribution of these signs is needed at boat ramps and marinas, especially those that receive high use. Volusia County will identify those ramps and marinas that do not display education materials and coordinate the effort to have the signs posted. (Short Term)

Target Audience: Boat Operators, Marina Operators and Patrons

Potential Funding: FIND, FDEP, FWS, FWC

E.9. Incentive Program to Increase Manatee Information Displays at Marinas (Short Term)

Incentives should be established to encourage marinas to display manatee brochures and information. Special displays should be designed to specifically promote manatee information. One incentive may be to develop a "Manatee Friendly Marina" designation for marinas that meet certain criteria.

Target Audience: Marina Patrons

Potential Funding: FDEP, SMC, FWC, FWS

E.10. Manatee Awareness Alert to be included on NOAA Weather Radio Broadcasts (Short Term)

A Traveler's Information Manatee Alert (30 second broadcast) will be developed and included in radio weather advisories for boaters. This should provide basic information for non-resident boaters to alert them that manatees are in the area, to watch for marked manatee protection boat speed zones, and what to do if a manatee is seen injured, harassed, or killed. This would be a way to target transient boaters who travel through Volusia County in late fall and early spring. Brevard County has contacted NOAA and received a favorable response to this initiative. Volusia County will coordinate with Brevard County.

Target Audience: All boaters in state waters

Potential Funding: No local funding needed, FDEP is currently funding this initiative.

E.11. Interactive Manatee Education Computer Program (Long Term)

An interactive manatee educational computer program should be developed for various age levels and distributed to schools. This program would include information on manatee habitat and biology, and the rules about not disturbing manatees. Furthermore, this program would provide information on how to get further involved in manatee volunteer efforts. SMC is working on coordinating this project. Volusia County will support the effort of SMC on this initiative and solicit additional input from all interested groups.

Target Audience: School children, general public

Potential Funding: SMC, FWC, FWS, and other public and private sources of funding.

E.12. Manatee Education and Information Segment on Volusia County Website (Short Term)

Volusia County has an established Internet home page, which includes Environmental Management's home page. Manatee information which can be accessed by the public will be added to these systems. Information would include, but not be limited to: manatee habitat, manatee speed zones, manatee migratory patterns, special events, lectures, current manatee information (Blue Spring counts, etc.), sources of additional manatee information and brochures, and prop guard information (in coordination with FWC and USFWS) which stresses that: (1) information is available, (2) studies are being conducted to determine the effects, if any, of prop guards on manatee protection, and (3) this prop guard technology is available to meet other needs (seagrass protection, property protection, etc.). The Internet page would provide links to other sites containing manatee information, such as Save the Manatee Club's site at: <http://www.savethemanatee.org>, the FWC site at: <http://www.floridaconservation.org> and the Florida Marine Research Institute at: <http://floridamarine.org/>

Target Audience: Volusia County residents and general public

Potential Funding: VCEMS (staff time)

E.13. Monofilament Line Recycling Program (Near Term)

The Monofilament Line Law states that it is illegal for any person to dispose of monofilament line in any waterbody. The recycling of monofilament is already in place at various marine and tackle facilities throughout the County. This effort is coordinated and supported by the fishing line manufacturers. To create incentives for increased clean-up and recycling of monofilament, receptacles should be placed at high-use boat ramps. Berkeley, a fishing line manufacturer, will supply the receptacles free of charge. In addition, they will pay for postage for the recycled line to be returned via UPS. Partnerships with service groups could be utilized to maintain receptacles, collect the line, and return it to the line manufacturers.

Save the Manatee Club has already established pilot programs for this project in Dade, Broward, and Palm Beach Counties. They have expressed a willingness to develop a partnership for this project with Volusia County.

Target Audience: Boating public, fishermen, visitors

Potential Funding: Monofilament line companies, waste disposal companies, service groups, SMC, FWC, FWS and other private sources of funding.

E.14. No Feeding/Watering Signs for Boat Ramps and Problem Interaction Areas (Short Term)

SMC has developed an educational sign that warns against the dangers of feeding and watering manatees and explains the legality of such actions. SMC has provided signs to Volusia County to be placed at high interaction areas. This sign was initially placed at Manatee Cove due to the frequency of manatee and human interaction. The effectiveness of the sign has been positive.

Target Audience: Volusia County residents

Potential Funding: Signs provided by SMC, Volusia County responsible for distributing the signs, FWC

E.15. Manatee Educational Curriculum (Short Term)

Manatee educational curriculum should be made available to compulsory schools (K-12) and adult education programs (such as DBCC). The information and materials for these curricula is available through SMC, FPL, FWC and Sea World. Appropriate videos and educators guides are already developed for the various age levels. Volusia County will be responsible for providing balanced packets of information which describe all threats to the manatee. This packet may include that fact sheet to be developed by the County, as well as information from other interested groups. Master copies of information would be provided that could be copied by an educator. Younger students would receive manatee coloring books that supply manatee information on habitat, biology, and protection. Older students would receive manatee brochures and speed zone maps. School Boards would be informed of the available information and who to contact if educators are interested in teaching manatee curriculum. The FWC also has manatee educational curriculum materials available including a student activity workbook for middle and high school students.

Target Audience: Volusia County students

Potential Funding: SMC, FPL, Sea World to provide materials, VCEM to distribute materials, Volusia County School Board, FWC, FWS and other public and private sources of funding.

E.16. Mandatory Education for Boat Operators (Near Term)

It is recommended that the State of Florida develop enhancements to the existing mandatory education programs for boat operators under 16 years of age and for boating regulation violators. These enhancements should include manatee and habitat information, safe boat operation, rules of the road, basic navigation, and the effects of such boating operations as prop scarring and fuel discharges. These education programs would be provided through the existing programs provided by the U.S. Power Squadron and the U.S. Coast Guard Auxiliary. Also, Boater ED, Center for Environmental Education and Research, Inc. has good information. Volusia County, through County Council approval, will support legislation to boater education.

Target Audience: Boat Operators

Potential Funding: FDEP, FWC, USCG, FWS and other public and private sources of funding. Boat Registration Fees

E.17. Abandoned Nets and Crab Traps Program (Near Term)

One cause of manatee deaths is attributable to entanglements in abandoned fish nets and crab traps. A collection of abandoned hoop nets in May of 1996 by the Florida Game and Fresh Water Fish

Commission (now under the FWC)) yielded 18 nets from one section of Lake George on the SJR. Volusia County should establish a bi-annual effort for cleaning up abandoned traps and nets on both the SJR and ICW. This program would require coordination from the FWC, Volusia County Sheriff's Office, Volusia County Environmental Management, and the Enviro-Net program. Volunteers should be recruited to participate in this effort. This effort could also be coordinated with the Center for Marine Conservation's annual coastal clean-up.

Potential Funding: VCEM, SJRWMD, FDEP, SMC, FWC, USCG, FWS

E.18. Caution Manatee Signs for Private Docks (Short Term)

"Please Watch for Manatees" signs are provided free of charge by SMC. Volusia County Environmental Management will bring a supply of the signs, when available from SMC, to the County for distribution. This service would be provided as a courtesy to private residents. If a resident desires to acquire a sign, they will be informed of the supply available at the County offices.

Target Audience: Waterfront property owners

Potential Funding: None necessary, signs supplied by SMC and distributed by Volusia County.

E. 19. Aquatic Plant Control

Volusia County should disseminate information to all waterfront property owners in existing County database regarding the following:

1. The dangers and risks of spraying yards.
2. The dangers and risks of spraying for exotic plants.
3. The potential for using mechanical means to control aquatic plants.
4. The value of replanting with native species.

Target Audience: Waterfront property owners

Potential Funding: Volusia County, SJRWMD, IFAS and other public and private sources of funding.

E.20. Marine Cleaning Agents Information

Volusia County should disseminate information to marina owners on the proper use of cleaning agents and other chemicals used by the boating industry. FDEP's Clean Marina program is a good source of information.

Target Audience: Marina operators

Potential Funding: Volusia County, FDEP and other public and private funding.

E.21. Boat Speed Definitions

The following definitions of idle and slow speed appear in Florida FWC Rule 68C-22.002. The County will include and disseminate these definitions with all appropriate boater education materials.

"Idle speed means the minimum speed that will maintain the steerage way of a motorboat."

“Slow speed: A vessel completely off plane and which has fully settled into the water and is proceeding without wake or with minimum wake is proceeding at slow speed. A vessel that is operating on a plane, in the process of coming off plane and settling into the water, or coming up onto plane, is not proceeding at slow speed.”

Target Audience: Boat owners and operators

Potential Funding: None required.

E.22 Volusia County Manatee Fact-Sheet

Volusia County will develop a manatee fact-sheet. It should discuss and place in context all threats to manatees and be widely disseminated to the public.

Target Audience: Boat owners and operators

Potential Funding: FFWCC, SMC, FDEP, Volusia County

E.23. Boater Handbooks

Boater handbooks, analogous to the Florida Driver's Handbook and containing state and local boating regulation (including those related to manatee protection) are available from the Florida Inland Navigation District. The County will disseminate these to boaters with boat registrations.

Target Audience: Boat owners and operators

Potential Funding: FIND

As a way to track and evaluate the implementation of recommendations in this section, a matrix will be developed indicating the date educational material was disseminated, who it went to, and how many copies were sent or how many people it went to.

F. RESEARCH

Purpose Statement

The purpose of the Research section is to identify, collect, assimilate, and analyze data among all of the agencies/organizations collecting data on manatees, in order to make informed management decisions regarding manatee protection within Volusia County. This involves identifying areas where data is missing, and developing programs to obtain this data.

F.1. Perinatal Mortality and Water Quality

Background Information F.1:

Volusia County leads all counties in the proportion of perinatal deaths to total deaths. Countywide, 69% of all perinatal deaths have occurred in the Halifax and Tomoka Rivers. Data suggest that the Tomoka/Halifax River region is a highly-used birthing and calving area for manatees. Concentrations of perinatal deaths are in the Tomoka River, downtown Daytona Beach area, and the backwaters of Ponce Inlet. Wild marine animals are most vulnerable to death as newborns, and there

is a typically high natural mortality rate among newborn marine mammals. Statewide, 40% of the recovered manatee calves died from diseases or still birth. The following are other sources of perinatal mortality: disorientation of the calf at birth, making it susceptible to predators; abandonment by first-time mothers; separation of the calf and mother due to breeding activities or human-related interference; cold weather; and the inability of the mother to adequately nurse the calf due to injuries or partial functioning of the mammary glands (Scott Wright, 1994). Degraded water quality in the Tomoka River area is another possible cause raised during the development of this plan, although the quality of the Halifax River/North Indian River portion of Volusia County appears to be good (personal communication, Michael Gately, Chemist, Volusia County Environmental Health Lab).

Recommendation F.1.1:

While research by FFWCC/FMRI into the causes of high perinatal mortality among manatees is ongoing, Volusia County recommends that these efforts be increased. Additional research by FDEP should also address hormone disrupting chemicals and their origins.

Recommendation F.1.2:

VCEMS will coordinate with the SJRWMD to develop a comprehensive water quality data analysis and reporting program. This will assist not only in the protection of manatees, but will assist managers in making informed decisions regarding the ICW and SJR systems, from an ecosystem standpoint, by identifying trends and changes in water quality.

F.2. Manatee Use Patterns in Volusia County

Background Information F.2:

As mentioned in the Inventory and Analysis Section, manatee use data has been collected in Volusia County for many years utilizing aerial surveys, telemetry studies, and research with people with local knowledge. Continued research on manatee use patterns and abundance would assist with the development of a more comprehensive MPP. However, continued research such as this is subject to available funding.

Recommendation F.2:

Additional research by the Florida Fish and Wildlife Conservation Commission on manatee use patterns in Volusia County should be conducted. VCEMS will coordinate with U.S.G.S. on this research and will provide resources (staff, volunteers, boats, etc.) to assist in this endeavor. This research would assist with the development of a more comprehensive MPP.

F.3. Boating Activity Study

Background Information F.3:

The boating activity study that was conducted during 1994 - 1995 provided valuable data on the boating usage and patterns in Volusia County. This study was conducted using several data gathering techniques: aerial surveys, ramp interviews, boat ramp trailer census, marina surveys, shoreline surveys, and a mail survey. The data was collected over a yearly cycle to analyze the differences in boat activity during summer and winter. In addition to providing baseline information regarding manatee protection, this data will also be used for marina and economic development.

Recommendation F.3:

The boating activity study completed for this report should be repeated every five years on a smaller scale. The information could be updated by flying two aerial survey flights in the summer and two flights in the winter, with one being a holiday and the other a normal weekend day; completing the marina inventory in the summer (could be done over the telephone); and the boat ramp census in the summer and winter (one weekend day and one weekday). This type of study would be valuable to the future implementation of the Manatee Protection Plan, as well as for the planning for future marine facilities demand.

Recommendation F.4:

Volusia County will coordinate with FFWCC and other interested parties in designing and implementing a speed zone compliance study to determine the effectiveness of current speed zones. The group eventually identified to conduct this study will be agreed upon by all parties.

Recommendation F.5:

If funding becomes available, research should be conducted by involved agencies on the economic impact of manatee protection.

Recommendation F.6:

In order to better understand the range of threats to manatees, the scientific community should continue to collect data on environmental stressors which may affect manatee health.

G. GOVERNMENTAL COORDINATION

The purpose of the Governmental Coordination section is to coordinate all of the agencies and organizations collecting data and managing programs on manatees, at the Federal and state levels, as well as at the County level, to open lines of communication, and to engage in meaningful dialogue, in order to make informed management decisions regarding manatee protection in Volusia County.

Background Information:

There are several agencies that are involved in manatee research and policy issues and decisions, such as FFWCC/ FMRI and BPSM, USFWS, National Biological Survey Sirenia Project, and Volusia County. Each one of these organizations has pertinent manatee data regarding Volusia County. In order to put together a comprehensive Manatee Protection Plan, the following recommendations are given regarding governmental coordination. Issues relating to the waters of the county also have an effect on the municipalities; these effects need to be taken into consideration.

Recommendation G.1:

Volusia County shall establish a reporting mechanism whereby FMRI will send the County mortality summaries and rescue reports for each quarter beginning in 1998.

Recommendation G.2:

Volusia County shall establish a reporting mechanism with the rangers at Blue Spring State Park to provide the County with Blue Spring manatee counts on a monthly basis. This shall take place during the months when manatees are congregating at the Spring, beginning in ____? ____.

Recommendation G.3:

Volusia County shall request additional data and input from USFWS, FFWCC/FMRI and BPSM as necessary. Coordination with these agencies on Volusia County manatee issues is expected to result in increased awareness of additional data/policy sources. In addition, Volusia County will request that VCEMS be notified whenever any one of the above agencies are planning on conducting any manatee research in the County. This will allow VCEMS to provide additional manpower, if available, to assist in the research efforts.

Recommendation G4:

The final draft of the MPP shall be reviewed to ensure that it is consistent with Volusia County's Comprehensive Plan and vice-versa in order to ensure full implementation.

Recommendation G.5:

Program Coordination: Annually, Volusia County will convene a meeting with the appropriate programs to share information and concerns and develop action items for the coming year. Preliminary groups include: VCEMS, FFWCC/FMRI and BPSM, USFWS, and the Sirenia Project. All interested groups will receive invitations and the meeting will be noticed as a public meeting. The information can also be put on the County's Web page.

Recommendation G.6:

Volusia County shall establish a formal communication link with Tomoka Geo-Park to exchange data of manatee use in the Park as well as the Tomoka River. The exact form of this communication link will be developed by the County and the Park rangers.

Recommendation G.7:

Volusia County will contact each municipality to request that an individual be assigned to the position of liaison for manatee-related issues. In addition, the County will periodically request time on commission agendas to update the municipalities about the status of manatee protection measures in Volusia County and around the state.

Recommendation G.8:

Volusia County will work together with the waterfront cities on water quality issues, including sharing of data gathered from the County's water sampling program.

Recommendation G.9:

VCEMS will contact the Volusia County School Board to discuss the feasibility of a public school manatee information coordinator to assist with distribution of educational materials. District science education coordinators and environmental education regional service project representatives may be another good contact.

Recommendation G.10:

Incorporate USGS telemetry data which the County has formally requested from the Sirenia Project into the Manatee Protection Plan.

H. IMPLEMENTATION

A Manatee Program should be developed in Volusia County. The program will require that a full time County Manatee Program Coordinator position be created and funded.

Short-term

The short term is defined as less than one year after FWC approval of the MPP. The following elements of this plan shall be completed within this one year period:

1. Initiate ongoing manatee education initiatives
2. Conduct initial water quality analysis on existing data.
3. Formulate initial plans and cooperating partners for research, beyond the research already being done at Blue Spring.

Near-term

The near term is defined as 1-3 years after FWC approval of the MPP. The following elements of this plan shall be completed within a three year period:

1. Implement ongoing manatee education initiatives
2. Complete the water quality analysis.
3. Establish mechanisms for increasing enforcement within the County.
4. Develop criteria for determining the effectiveness of the MPP.

Long-term

The long term is defined as greater than three years after FWC approval of the MPP. The following elements of the plan shall be completed in this period:

1. Implement ongoing manatee education initiatives.
2. Update the Boating Activity Study within five years of FWC approval of MPP
3. Update and modify the MPP as needed.

Annual Report

Volusia County shall prepare an annual report on the status of the implementation of the Volusia County Manatee Protection Plan. Volusia County shall request yearly receipt of the FWC Save the Manatee Trust Fund Annual Report beginning in 2001.