FLORIDA MANATEE MANAGEMENT PLAN

Trichechus manatus latirostris

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FLORIDA FISH AND WILDLIFE CONSERVATION COMMISSION
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EXECUTIVE SUMMARY

Manatees (*Trichechus manatus latirostris*) were first added to Florida's imperiled species list as a threatened species in 1974 and later changed to endangered status in 1979. At that time, the state's listing process was qualitative and did not have the quantitative measures that are part of the current listing process. However, listing the manatee as endangered on the state list was consistent with the U.S. Fish and Wildlife Service (USFWS) which in 1967 listed the manatee as endangered.

In response to the designation as an endangered species, tremendous resources from local, state, and federal government agencies and the private sector have been directed towards research, protection, and conservation of manatees. While little was known about manatees when they were first listed, they are now considered one of the most researched and well studied of all marine mammals. The manatee conservation effort has become a case study in endangered species public policy and is chronicled in books, periodicals, and virtually all types of media. Manatees have become a Florida icon and engender an international level of public support.

This management plan provides an overview of the myriad programs, initiatives, and strategies implemented to protect and conserve manatees. While a number of the conservation actions have benefited manatees, many of these actions have had economic and social impacts as well. Public debate on how to balance manatee conservation with other social values has resulted in one of the nation's most contentious and polarized environmental issues.

In 1999, the Florida Fish and Wildlife Conservation Commission (FWC) adopted new rules to standardize how species are evaluated for possible inclusion on the state imperiled species list. In 2001, the FWC received a petition to reclassify the manatee. Final action on that petition was delayed until April 2005 while the listing process received additional review and revisions in response to public input. In 2005, using the revised listing rules, a biological review panel (BRP) consisting of biologists from the FWC, the USFWS, the U.S. Geological Survey (USGS), academia, and the private sector examined the best available scientific information regarding the potential risk of manatee extinction. Based on the criteria established by the FWC rule (68A-27.0012, F.A.C.), the biological review panel concluded the manatee meets two of five criteria for designation as a threatened species. "Threatened" is defined in the state rule as "having a very high risk of extinction."

The biological review panel used the core biological model (CBM) to predict the probability of future declines over three generations or approximately 60 years. The models showed that there is virtually no chance of an 80% decline (the threshold for endangered) but there is slightly more than a 12% chance of the manatee population declining by as much as 50% in the next 60 years (the threshold for threatened). The review panel concluded that a 12% chance was significant enough to merit meeting Criterion A and being listed as threatened under the state rule. In addition, the panel concluded there are less than 2,500 mature adults in the population and that, coupled with an estimated chance of at least

a 20% decline in the next two generations (40 years), also met Criterion C which additionally qualifies the manatee for threatened status.

The FWC Commissioners accepted the findings of the biological review panel in June 2006. This completed phase one of the listing process. Phase two requires development and Commissioner approval of a management plan before the manatee can be reclassified. FWC chartered a team to draft the management plan. Public input and ultimately public acceptance are essential to the success of FWC management plans; accordingly, a number of steps were taken to ensure public participation. There was a 45-day comment period to solicit written comments during the development of the initial draft. The Manatee Forum, a group of 22 stakeholder organizations, provided suggestions on topics to include in the plan. In addition, FWC staff met individually with specific stakeholders to discuss their vision of the management plan prior to development of the first draft. The first draft was made available to the public and was presented to the Manatee Forum in November 2006. During the public comment period on the first draft, FWC staff received and reviewed over 900 public comments. Changes were made and a second draft was released for additional public comment, presented to the Manatee Forum in April 2007, and presented to the FWC Commission at their June 2007 meeting. Over 3,600 comments were received on the second draft. This final plan has incorporated many of the suggestions and recommendations provided through the public comment process and has greatly benefited from extensive public participation.

The Florida Manatee Management Plan provides the framework for conserving and managing manatees in Florida. It is a planning document; not a rule or a regulation. Upon approval, the only rule change will be removing the manatee from 68A-27.003, the list of endangered species, and adding it to 68A-27.004, the list of threatened species. The plan addresses the key tasks outlined in the federal Florida Manatee Recovery Plan (2001) and is complementary with that plan. The goal of all federal recovery plans is to remove the species from the list of federally endangered and threatened species. In addition to this stated goal, federal recovery plans identify management actions and criteria that must be met in order for the species to be reclassified and removed from the list. Like the federal recovery plan, this plan is intended to reduce the threat of extinction to a level where the manatee can be removed from the list of imperiled species. However, this management plan differs from the federal recovery plan because it will be used to guide management efforts to conserve the population even after the species is de-listed. Therefore, once the threat of extinction is removed, the manatee will be actively managed by the FWC and will be protected under federal and state laws.

Humans have radically altered the manatee's habitat in many ways: the dredging of canals, inlets, and bays; damming of rivers; the introduction of non-native plants; destruction of seagrasses; and the proliferation of artificial warm-water discharges. All of these human actions have likely had some effect on the distribution and seasonal abundance of manatees. However, historical records indicate that, before these alterations, manatees ranged throughout Florida and into other southern states. Accordingly, this management plan calls for the management and conservation of manatees throughout Florida, from Nassau County to Monroe County on the Atlantic coast; Monroe County through the Florida

Panhandle on the Gulf coast; and the numerous rivers in interior Florida including the St. Johns and Suwannee river systems and the Okeechobee waterway. While the state listing criteria considers the statewide population, it is helpful to consider the progress of management actions on a regional basis. To ensure manatees thrive in all parts of Florida, the plan divides the state into four management units: the Atlantic coast, the Southwest coast, the Northwest coast, and the upper St. Johns River. These four management units are the areas referred to as sub-populations in the Federal Recovery Plan of 2001.

Implementation of the many tasks described in this plan will require the cooperation of many state agencies, the federal government, local governments, and the private sector. The FWC will not be the lead agency on some critical tasks, such as setting minimum flows and levels of springs, which is a state responsibility that will depend upon implementation by the respective water management districts. Inclusion of tasks in this plan for which the FWC is not the lead agency constitutes a commitment that the FWC will work to influence and assist the responsible agencies to accomplish the targeted tasks.

To reduce or eliminate the threat of extinction for manatees, the FWC and its partners must implement the many tasks described in this plan. Adequate funding will be necessary to achieve success. Present projections indicate the Save the Manatee Trust Fund will be inadequate to support the existing level of management and research within the next few years. Additional commitments of funds, from state, federal, or private sector sources, will be needed to continue the existing manatee program and to accomplish new tasks called for in this plan.

The conservation goal of this plan is to remove the manatee from the state imperiled species list and effectively manage the population in perpetuity throughout Florida by securing habitat and minimizing threats. The plan identifies six primary objectives to accomplish this goal.

Objectives:

(1) Within three years, implement peer-reviewed and statistically sound methods to estimate the manatee population and monitor trends.

(2) Reduce human-caused annual manatee mortality rate by minimizing human-related threats, including those attributed to watercraft, water-control structures, entanglement and entrapment.

(3) Within five years, in full cooperation with electric utilities, develop and implement plans to prevent significant future manatee mortality caused by potential changes in power plant operation.

(4) Within five years, in cooperation with the water management districts, establish minimum flows at Florida springs that protect the warm-water habitat requirements of manatees.

(5) Within five years, enhance management practices, such as a statewide monitoring program, that help ensure sufficient abundance and distribution of seagrasses and freshwater vegetation to support the manatee population in perpetuity.

(6) Use measurable biological goals (MBGs) in an ongoing fashion to measure progress toward recovery and to assist in the evaluation of the need for future research, regulatory, and management actions. The MBGs focus on adult survival rates, availability of habitat, and the number of mature individuals in the population.

Radical changes to existing conservation measures already established to manage manatees are not necessary to accomplish the conservation goal and objectives of this plan. The latest population models indicate that the manatee population is growing in three out of four management units with the population in southwest Florida likely declining. However, population growth alone will not necessarily move the manatee to a lower risk category under the state listing system. In order for that to happen, we will need to eliminate or reduce existing and future threats to acceptable levels so that the chances of significant future declines are very small. The primary focus of management efforts over the past 35 years has been to control, and to eliminate where possible, human-caused manatee mortality. The best available science indicates that increasing adult survival rates (reducing death rate) have a profound impact on manatee population growth. The emphasis on human-caused sources of mortality as opposed to natural mortality, such as disease, has been largely pragmatic. The responsibility for human-caused mortality is ours, and there is more opportunity for controlling and mitigating these factors. Therefore, efforts to reduce risks from watercraft collisions, structure-related deaths, and other human-caused mortality factors will continue. In addition to human-caused mortality, the FWC is also concerned with manatee mortality from causes such as red tide. However, red tide has broad ecological, economic, and human health implications and is addressed and studied from a broader perspective. The impacts of red tide on manatees are discussed in this plan, but a thorough discussion of red tide is beyond the scope of this manatee management plan.

The plan recognizes the need to address the public policy implications of long-term manatee reliance on warm water produced by power plants. A predicted decline in the manatee population resulting from the potential loss of warm-water sources is a key factor contributing to listing the manatee as threatened. If steps are taken to reduce the likelihood of a major population reduction, manatee status could be reevaluated and perhaps reclassified. Accordingly, the plan calls for an increased emphasis on warm-water issues and will develop contingency plans and management plans to reduce the potential loss of life in the event of a change in power plant operation.

Floridians can be proud of past efforts to protect and conserve manatees and it is encouraging that manatee numbers are growing in most areas of the state. However, there is still much to be done. The listing of manatees as threatened under the state system means the species still has a very high risk of extinction. Florida's predicted human population growth will make achieving the conservation goal very challenging. Human population growth and associated development will compete for available fresh water, alter coastal habitats and submerged aquatic resources, and make efforts to control human-caused mortality increasingly difficult. Nevertheless, provided appropriate state and federal resources are dedicated to accomplishing the many tasks outlined in this plan, we are optimistic the status of manatees will improve, their long-term survival will be secured, and they will remain a unique and treasured part of Florida.

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AIP: area of inadequate protection
APA: Administrative Procedures Act (Chapter 120, Florida Statutes)
ARC: Acquisition and Restoration Council
ASR: aquifer storage and recovery
BAC: Florida's Boating Advisory Council
BACI: before-after/control-impact sampling
BFSP: Boat Facility Siting Plan
BPSM: Bureau of Protected Species Management, FWC
BRP: biological review panel
BSR: biological status review
BWS: Boating and Waterways Section, LE, FWC
CBM: core biological model
CCSG: Carrying Capacity Subgroup
CERP: Comprehensive Everglades Restoration Plan
CFFW: Citizens for Florida's Waterways
cfs: cubic feet per second
CI: Confidence interval
CMR: capture-mark-recapture
CWD: chronic wasting disease
DCA: Florida Department of Community Affairs
DEP: Florida Department of Environmental Protection
DER: Florida Department of Environmental Regulation (now DEP)
DERM: Dade County's Department of Environmental Resource Management
DLE: Division of Law Enforcement, FWC
DNR: Florida Department of Natural Resources (now DEP)
DOAH: Florida Department of Administrative Hearings
DRI: developments of regional impact
ERP: environmental resource permit
ESA: federal Endangered Species Act
EWG: Entanglement Working Group
F.A.C.: *Florida Administrative Code*
F.A.W.: *Florida Administrative Weekly*
FIU: Florida International University
Florida Legislature; the Legislature
Florida Manatee Sanctuary Act (implemented by rule Chapter 68C-22)
FMRI: Florida Marine Research Institute (now FWRI)
FPL: Florida Power and Light
FTE: full-time equivalency position or employee
FWC: Florida Fish and Wildlife Conservation Commission
FWRI: Fish and Wildlife Research Institute, FWC (formerly FMRI)
GFC: Game and Fresh Water Fish Commission (now FWC)
GIS: geographic information system
HBOI: Harbor Branch Oceanographic Institution
HWG: federal Habitat Working Group
IACP: International Association of Chiefs of Police
ISM: Imperiled Species Management Section, Division of Habitat and Species Conservation, FWC
ITFWCS: Interagency Task Force for Water-Control Structures
IUCN: International Union for Conservation of Nature
JAPC: Joint Administrative Procedures Committee
KOEBCC: Kissimmee, Okeechobee, Everglades, and Big Cypress Committee
LRRC: local rule review committee
MAA: mutual aid agreement
MBGs: measurable biological goals
MEWG: Florida Manatee Entanglement Working Group
MFC: Marine Fisheries Commission
MFL: minimum flows and levels
MHWG: Manatee Habitat Working Group
MIPS: Manatee Individual Photo-identification System
MMC: Marine Mammal Commission
MML: Mote Marine Laboratory
MMP: Manatee Management Plan, Florida

MMPA: federal Marine Mammal Protection Act
MMPL: Marine Mammal Pathobiology Laboratory
MOU: memorandum of understanding
MPP: Manatee Protection Plan
MPSWG: Manatee Population Status Working Group
MPWG: Manatee Protection Working Group
MRCTF: Marine Resources Conservation Trust Fund
NEPA: National Environmental Policy Act
NGVD: National Geodetic Vertical Datum
NMFS: National Marine Fisheries Service, NOAA
NOAA: National Oceanic and Atmospheric Administration
NOC: Notice of Change
NORD: Notice of Rule Development
NPDES: National Pollution Discharge Elimination System
NTSB: National Transportation Safety Board
OPS: other personal services
PCA: Project Cooperative Agreement
PCC: Policy Coordinating Committee
PSD: pressure sensitive device
Reliant Corp. (formerly OUC)
SAV: submerged aquatic vegetation
SERC: Statement of Estimated Regulatory Costs
SFWMD: South Florida Water Management District
SJRWMD: St. Johns River Water Management District
SOP: standard operating procedure
STMTF: Save the Manatee Trust Fund
SWFWMD: Southwest Florida Water Management District
SWIM program: Surface Water Improvement
TECO: Tampa Electric Company's Big Bend power plant
UBC: state uniform boating citation
UME: unusual mortality event
USACOE: U.S. Army Corps of Engineers
USCG: U.S. Coast Guard
USFWS: U.S. Fish and Wildlife Service
USGS: U.S. Geological Survey
USJ: Upper St. Johns River
WHOI: Woods Hole Oceanographic Institution
WMD: water management district
WWTF Warm-Water Task Force

CHAPTER 1: BIOLOGICAL BACKGROUND

This section provides a brief synopsis of information on selected aspects of the biology and life history of Florida manatees. For more detailed reviews and information on the biology and conservation of this subspecies, we point the reader to the Final Biological Status Review of the Florida Manatee (Haubold *et al.* 2006), the Florida Manatee Recovery Plan 3rd revision (USFWS 2001), the primary literature cited below, and general texts on manatees (Reynolds and Odell 1991; Reynolds 1999; Glaser and Reynolds 2003; Reep and Bonde 2006).

Taxonomic Classification

The Florida manatee (*Trichechus manatus latirostris*) is a member of the Class Mammalia, Order Sirenia, and Family Trichechidae. It is one of two subspecies of the West Indian manatee (*T. manatus,* Linnaeus 1758) and is native to Florida. The other subspecies is the Antillean manatee (*T. manatus manatus*), native to the greater Caribbean (Reynolds and Odell 1991). These subspecies are morphologically and genetically distinct from one another (Domning and Hayek 1986; Garcia-Rodriguez *et al.,* 1998).

Life History Overview

Like many large mammals, manatees have a long expected life span (~ 60 years), are relatively old at maturity (four to seven years), have a low reproductive rate (one calf every three years, 11-13 month gestation), and high parental investment (two-year calf dependency). (See O'Shea and Hartley 1995; Marmontel 1995; Odell *et al.* 1995; Rathbun *et al.* 1995; Reid *et al.* 1995; Marmontel *et al.* 1996.) In order to persist, species with this life-history strategy must have high and stable adult survival rates. Long-term photo-identification studies show that adult manatees have an annual survival rate of about 96% in regions of the state that also have relatively low levels of human-related mortality (Langtimm *et al.* 2004). Accordingly, manatee populations are vulnerable to elevated mortality rates. Florida manatees have a low level of genetic diversity compared to other manatee populations, possibly resulting from a founder effect or a population bottleneck (Garcia-Rodriguez *et al.* 1998) that can result if the population was started by only a few individuals, or if there was a time when the population decreased to only a few individuals. This means that individual Florida manatees are genetically very similar to one another. Lack of genetic diversity within a population can result in inbreeding and a decrease in reproductive fitness.

Habitat and Ecology

Florida manatees live in a variety of environments, from canal systems in densely populated urban settings to nearly pristine areas dominated by mangroves or salt-marsh habitats. They can tolerate a range of salinities, including freshwater rivers, estuarine bays, and marine coastlines. Manatees in estuarine or marine environments regularly seek freshwater sources to drink, such as creeks or industrial outfalls (Lefebvre *et al.* 2001). Manatees are generalist herbivores that feed on a variety of marine and freshwater vegetation (Smith 1993). In addition to benthic foraging, manatees also feed on floating, emergent, and bank vegetation. Manatees frequently feed over shallow grassbeds in close proximity to deeper water to which they flee when startled by approaching watercraft or other disturbances (Nowacek *et al.* 2004).

The manatee's unusual physiology, including an extremely low metabolic rate and a high thermal conductance, limits its ability to thermoregulate in cold waters and makes it susceptible to cold-related stress and death (Irvine 1983). Manatees are unable to tolerate prolonged exposure to temperatures below about 16°C (61ºF) and typically seek warm-water sites when temperatures drop below 20°C (68ºF). The creation of warm-water outfalls from electric power generating plants and other industrial facilities over the past 50 years has probably contributed to manatee population growth by providing access to more habitat during winter and by reducing the extent of cold-related mortality.

Senses

Manatees often inhabit areas with turbid and noisy conditions. Compared to other marine mammals, little is known about manatee sensory systems. Studies of manatee behavior and carcasses provide a growing body of information regarding manatee sensory systems. The manatee's hearing ability is of particular interest because of its role in the animal's ability to detect and localize boats. In addition to the anatomical research done on manatee carcasses to explore how well manatees hear and localize sounds (Ketten 1992), behavioral studies have been conducted both in captivity and in the wild (Bullock *et al.* 1980, 1982, Popov and Supin 1990, Gerstein *et al.* 1999, Nowacek *et al.* 2004, Mann *et al.* 2005, and Mann 2007). Research in this area is ongoing. Some research has indicated that manatees may not be able to hear boats well (Gerstein *et al.* 1999). Gerstein (2002) further posited that manatees are less able to hear slow-moving boats than ones traveling faster. However, field observations have provided contradictory results which demonstrate that manatees can hear and respond to approaching boats of various speeds (Nowacek *et al.* 2004). In addition, through research on captive manatees, Mann *et al.* (2007) found evidence that suggests manatees can localize sounds under water, including the direction of oncoming boats.

Anatomical studies indicate that manatee eyes lack visual acuity, having been adapted to low-light conditions (Walls 1963, Piggins *et al.* 1983, West *et al.* 1991) and probably possess color vision (Cohen *et al.* 1982; Ahnelt & Bauer, unpublished, reported in Ahnelt & Kolb, 2000). Behavioral research on visual acuity supports the findings of anatomical studies in demonstrating that manatees have good brightness discrimination (Griebel & Schmidt 1997), possess some color discrimination (Griebel & Schmidt 1996), and have poor visual acuity (Bauer *et al.* 2003). Manatees do, however, have an extremely well developed sense of touch. Several behavioral studies have shown that the manatee's sense of touch is acute and probably plays a large sensory role for the species (Marshall *et al.* 1998 and 2003, Bauer *et al.* 2005).

Geographic Range and Distribution

Florida manatees are found only in the United States, although vagrants have been known to reach the Bahamas (Lefebvre *et al.* 2001). Their year-round distribution is generally restricted to peninsular Florida because they need warm water to survive the winter. During winter (December to February), manatees seek shelter from the cold at a limited number of warm-water sites or areas in the southern two-thirds of Florida (Reynolds and Wilcox 1994; USFWS 2001; Laist and Reynolds 2005a,b). These aggregation sites, frequented by a large proportion of the manatees counted during synoptic surveys, include eight principal power plant thermal outfalls

(five on the Atlantic coast, three on the Gulf coast) and four major artesian springs (Blue Spring, Crystal River, Homosassa Springs, and Warm Mineral Springs). Some winter aggregations can number in the hundreds (Reynolds and Wilcox 1994). Other industrial outfalls, smaller springs, and passive thermal basins that retain heat longer than ambient waters provide additional secondary warm-water habitat for manatees.

Telemetry studies have demonstrated that Florida manatees are highly mobile, migrating seasonally over extensive geographic areas (Weigle *et al.* 2001; Deutsch *et al.* 2003). The most important environmental factor influencing long-distance movements is seasonal fluctuation in water temperature, but breeding behavior and temporal-spatial variation in forage are also factors. Seasonal movement patterns are varied; some are year-round residents in a local area, while others are migrants that travel over several hundred kilometers of coastline annually (Weigle *et al.* 2001; Deutsch *et al.* 2003). Their movement patterns are structured by strong philopatry (tendency to return to the same area) to the same seasonal ranges year after year; this includes winter aggregation sites and warm-season home ranges (Reid *et al.* 1991; Koelsch 1997; Deutsch *et al.* 2003). Individual manatees typically occupy a few, relatively small core areas that are connected by lengthy travel corridors (Deutsch *et al.* 2003).

During the warm season when water temperatures exceed 20°C (March/April through October/November), manatees disperse throughout the coastal waters, estuaries, and major rivers of Florida. Some migrate to neighboring states, particularly southeastern Georgia (Lefebvre *et al.* 2001). Individuals have traveled as far north as Massachusetts and west to Texas (Powell and Rathbun 1984; Deutsch *et al.* 2003; Fertl *et al.* 2005).

For both management and research purposes, manatees in Florida have been subdivided into four relatively distinct regional management units (see Figure 1), originally termed subpopulations in the Florida Manatee Recovery Plan (USFWS 2001). It is known from photo-identification and telemetry studies that manatees travel between these regions, particularly within coasts, to a limited extent (Bengtson 1981; Rathbun *et al.* 1990; Reid *et al.* 1991; Weigle *et al.* 2001; Deutsch *et al.* 2003; FWC, Mote Marine Laboratory, and USGS, unpublished data). These regions are defined geographically as Northwest, Southwest, Atlantic, and Upper St. Johns River. Manatees in Florida perhaps fit the term metapopulation; that is, a group of spatially separated populations of the same species that interact at some level. Each region of the Florida manatee metapopulation is composed of individuals that tend to return to the same network of warm-water refuges each winter and have similar nonwinter distribution patterns.

Figure 1. Management units of the manatee in Florida (USFWS 2001).

Population Status

There are no statistical estimates of abundance for the either statewide or regional Florida manatee populations. Minimum counts have been obtained from rangewide synoptic surveys conducted nearly every winter since 1991. The surveys are timed to coincide with periods of extreme cold weather when manatees are known to aggregate at a limited number of warm-water sites. The highest count obtained during these surveys was 3,300 manatees in January 2001 (http://research.myfwc.com); this is presumed to be a minimum count, but the fraction detected is unknown. Because detection probability varies greatly with environmental conditions and across sites, population experts have consistently cautioned against using these data for population trend analyses.

What follows is a summary of our understanding of manatee population growth rates and brief statements on the status of each management unit. Population growth rates cited below were estimated by Runge *et al.* (2007a) using a stage-based model that integrated mark-recapture estimates of survival (Langtimm *et al.* 2004) and reproduction (Kendall *et al.* 2004). The estimates of vital rates were made possible through a long-term, multi-agency effort to distinguish individual manatees based on unique patterns of scars and mutilations using photo-identification techniques (Beck and Reid 1995).

Table 1. Annual growth rates for each management unit calculated using a stage-based model (Runge *et al.* 2004, 2007a).

Management Unit	Years	Annual Growth Rate	95% CI
Atlantic	1986-2000	3.7%	1.1 to 6.0%
Upper St. Johns River	1990-1999	6.2%	3.7 to 8.1%
Northwest	1986-2000	4.0%	2.0 to 5.9%
Southwest	1994-2001	-1.1%	-5.4 to +2.4%

Atlantic Region

Two methods have been used to estimate the annual growth rate of manatees in the Atlantic region. One method relies on the stage-based model described above (Runge *et al.* 2007a) while the other uses Bayesian models of aerial survey counts (Craig and Reynolds 2004). Recently updated adult survival rates have been incorporated into the stage-based model, which estimates an annual growth rate of 3.7% per year (95% CI 1.1 to 6.0%) between 1986 and 2000 (Runge *et al.* 2007a).

Craig and Reynolds (2004) used a Bayesian approach to model growth in aerial counts of manatees at several major aggregation sites along the Atlantic coast (primarily power plants). This model took into account manatee movement between surveys and variation in detection rates with ambient temperature. The Bayesian approach estimated trends in counts that suggested the population of animals using Atlantic coast power plants increased at a rate of 5–7% per year from 1982–1989, leveled off (growth rate 0–4%/yr) between 1990 and 1993, and then increased at about 4–6% per year from 1994 to 2001.

Upper St. Johns River (USJ) Region

The management unit occupying the Upper St. Johns River has shown strong growth between 1990 and 1999, increasing at an annual rate of 6.2% (95% CI: 3.7-8.1%) (Runge *et al.* 2004). This growth rate is supported by high survival and reproductive rates (Langtimm *et al.* 2004, Runge *et al.* 2004). This is the smallest of the four management units, contributing less than 5% to the maximum synoptic count, but the Upper St. Johns is the fastest growing management unit.

Northwest Region

This management unit has grown at an annual rate of 4.0% (95% CI: 2.0–5.9%) between 1986 and 2000 (Runge *et al.* 2007a). This is the second smallest management unit, accounting

for about 11% of the highest synoptic count. Its dynamics are similar to those of the USJ management unit, with a high adult survival rate, except that the reproduction seems to be lower.

Southwest Region

Population trends in this management unit are less certain than the other three. The model indicates a decline at an estimated rate of –1.1% per year (95% CI: –5.4 to +2.4%) over the eight-year period between 1994 and 2001 (Runge *et al.* 2004). However, the relatively wide confidence interval shows that that the population could be declining by as much as 5.4% annually, or could actually be increasing by as much as 2.4% annually. The wide confidence interval reflects greater uncertainty about survival and reproductive rates in this region, in part due to a shorter time series of sight-resight data. The geographic extent of sampling may also be a factor. Manatees in the Southwest management unit are found in a broad diversity of habitats, from the more developed Tampa Bay to the more pristine reaches of Everglades National Park; demographic data are lacking for individuals in the southernmost parts of the region. While the population trend in this management unit cannot be predicted with certainty at this time, it should be noted that "most (71%) of the simulated values for the growth rate indicated a decreasing population" (Runge *et al.* 2004, p. 378). Although no statistical contrasts have been performed among regions, evidence suggests that estimates of adult survival in this unit (Langtimm *et al.* 2004) are lower than those of all other management units, probably due to the combined effects of chronic human-related (watercraft) mortality and episodic mortality events caused by red tide.

Population Status Summary

Although manatee numbers appear to have increased in the past few decades, many anthropogenic threats to the Florida manatee population persist and may affect the survival of the species. Also, most natural catastrophes, defined as events that occur infrequently but have the potential to cause significant declines in the population (*e.g.*, hurricanes), are expected to continue to occur in the future. Some, such as red tide mortality events, appear to be occurring at greater frequencies than in the past. A decline in survival over the next half century is plausible, given the expected reduction or loss of warm-water discharges and reduced spring flows, the projected increase in Florida's human population in coastal areas, and the continued threat from increases in the number of motorized vessels in Florida waters.

CHAPTER 2: THREAT ASSESSMENT

Reason for Listing/De-listing

The 2005–2006 FWC Florida Manatee Biological Review Panel (BRP) recommended that the Florida manatee be listed as threatened under 68A-27.004, F.A.C., according to Criteria A and C. According to state listing requirements, the manatee met criteria for listing as threatened due to the size of the current population (< 2,500 mature individuals with possible population decline (Criterion C) and the possibility of at least a 50% future reduction in population size (Criterion A). To be reclassified to the less imperiled "species of special concern," the status of the manatee population would have to improve such that it no longer qualifies as "threatened" under either criterion; to be completely de-listed, it must not qualify under any criterion at any level of threat. (See "Measurable Biological Goals" in Chapter 4, "Conservation Goal and Objectives," for additional information).

The state's guidelines provided the Biological Review Panel (BRP) with the option of raising or lowering the listing status by one category from that determined by application of the listing criteria. The panel unanimously agreed that the data for the Florida manatee did not warrant listing the species under the State of Florida's Endangered Species category (one category more imperiled than threatened), nor did the data warrant reclassifying to the State of Florida's Species of Special Concern category (one category less imperiled than threatened). (See Haubold *et al.* 2006.)

Present and Anticipated Threats

Threats to the Florida manatee encompass anthropogenic factors and catastrophic, natural events that could cause declines in reproductive and survival rates or loss and degradation of habitat. The largest known cause of human-related manatee mortality in Florida is watercraft collision. Watercraft strikes result in numerous injuries and deaths each year. The future of the Florida manatee is also jeopardized by the predicted loss and deterioration of warm-water habitat, caused by retirement of or changes in the operations of aging power plants and reductions in natural spring flows. Threats that can be determined through necropsy of manatee carcasses over the past 10 years are depicted in Figure 2.

A recent assessment of threats to the Florida manatee indicated that watercraft-related mortality had the greatest impact on manatee population growth and resilience and that, particularly in the long term, loss of warm water was also a substantial threat (Runge *et al.* 2007b).

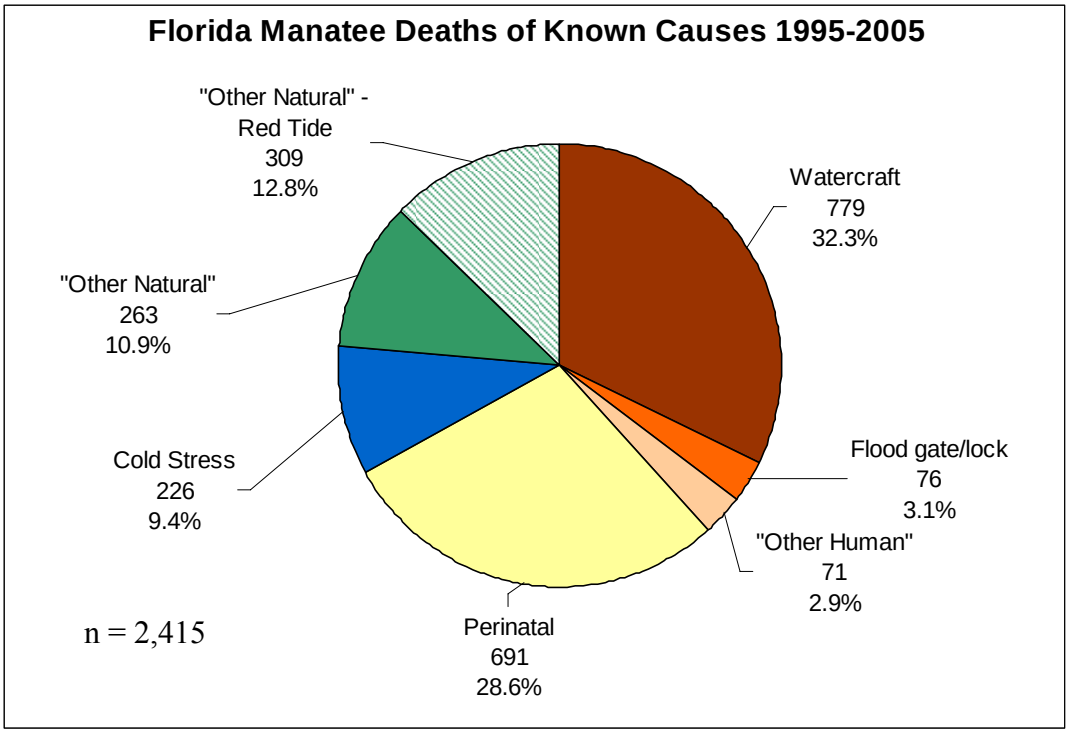


Figure 2. Proportions of known causes of death for Florida manatees between 1995 and 2005. Not depicted are 898 manatee carcasses where cause of death was undetermined.

Anthropogenic Threats

Human activities play an important role in depressing manatee population growth. Approximately half of adult manatee mortality rangewide is attributable to human-related causes, primarily watercraft collisions (MPSWG 2005). This is significant because the manatee population growth rate is highly sensitive to changes in the adult survival rate (Eberhardt and O'Shea 1995; Marmontel *et al.* 1997; Runge *et al.* 2004). Other human-related threats include entrapment, entanglement, crushing, harassment, and loss of warm-water habitat.

Watercraft collisions

Watercraft collisions account for approximately 25% of all documented manatee deaths since 1976 (and 35% of documented deaths of known cause), and are the single greatest known cause of mortality (Ackerman *et al.* 1995; Wright *et al.* 1995; Deutsch *et al.* 2002; MPSWG 2005; FWC-FWRI unpublished data). In the absence of vessel traffic data, numbers of registered vessels in an area provide the only information on potential volume of vessel traffic. The number of registered vessels in Florida has increased by an average of 2.9% per year over the past 25 years, doubling since 1980 (FWC unpublished data). In 2005, there were over one million registered vessels in Florida (FHSMV, http://casey.hsmv.state.fl.us/Intranet/dmv/TaxCollDocs/vesselstats2005.pdf). Many more out-of-state boaters visit Florida annually. There are other factors that may act synergistically to increase the risk of collisions between manatees and watercraft as well as adversely affect habitat. For example, modifications to the design of vessel hulls and engines allow boats to travel at higher speeds in shallower waters, thus potentially increasing watercraft interactions

with manatees and scarring seagrass beds (Wright *et al.* 1995). Research is also needed to evaluate the effects of modified boat designs on manatees. Staff at the Fish and Wildlife Research Institute (FWRI) are refining and expanding diagnostic tools and forensics to improve their ability to determine cause of death and characterize watercraft from vessel-induced wounds on manatees (for additional information, see Chapters 9 and 10, titled "Monitoring Activities" and "Ongoing and Future Research," respectively).

There are also sub-lethal effects of increased vessel traffic. Most adult manatee carcasses bear scars from previous boat strikes and the healed, skeletal fractures of some indicate that they had survived previous traumatic impacts (Wright *et al.* 1995; Lightsey *et al.* 2006). Based on manatees documented in the photo-identification database through 2000, more than 1,000 individuals have been scarred from boat collisions, and 97% of that sample had scar patterns from multiple boat strikes (Beck and Reid 1995; O'Shea *et al.* 2001). Approximately one-third of these individuals were severely mutilated, especially on the tail and the dorsum. At least two carcasses examined at necropsy each had evidence of more than 50 past collisions with watercraft. Non-lethal injuries may reduce the breeding success of wounded females and may permanently remove some animals from the breeding population (O'Shea 1995; Reynolds 1999). Vessel traffic and recreational activities that disturb manatees may cause them to leave preferred habitats and may alter biologically important behaviors such as feeding, suckling, or resting (Powell 1981; Buckingham 1990; O'Shea 1995). In Crystal River, Buckingham (1990), Buckingham *et al.* (1999), and King and Heinan (2004) documented increased manatee use of sanctuaries at times of increased boat traffic. King and Heinan (2004) also reported behavioral changes of manatees in response to the presence of human swimmers. These changes included decreased resting and suckling and increased swimming.

Loss of warm-water habitat

Expected changes in the network of warm-water refuges over the next several decades present one of the most serious long-term threats to manatees in Florida. As noted in the federal Florida Manatee Recovery Plan, "one of the greatest threats to the continued existence of the Florida manatee is the stability and longevity of warm-water refuges" (USFWS 2001, p. 28). Ultimately, the discharges from power plants will provide unreliable warm-water habitat when viewed over the long term (*i.e.*, over the next 20-100 years). The existing power plants that provide large warm-water refuges are being replaced by more efficient and environmentally friendly plants due to new technologies and more stringent water quality standards that do not permit thermal discharges into natural water bodies. Additionally, short-term threats to the network of warm-water sites also loom on the immediate horizon. High fuel costs, increasing competition, and new environmental regulations are additional economic pressures that may affect the feasibility of maintaining aging power plants or cause a change in their operations. These changes will eliminate thermal discharges or reduce the reliability of warm-water effluents upon which large numbers of manatees depend for survival (USFWS 2000). Temporary disruptions in heated effluents during winter have caused changes in local manatee distribution (Packard *et al.* 1989) and have been implicated in elevated numbers of deaths from cold stress (Campbell and Irvine 1981, Ackerman *et al.* 1995). The complete elimination of a secondary warm-water refuge in northeastern Florida through diffusion of the heated effluent resulted in a shift in manatee distribution within the area and in substantial mortality of manatees that remained in the region (Deutsch *et al.* 2000; Laist and Reynolds 2005a). Loss of certain key

warm-water sites could result in catastrophic mortality and would likely reduce the environmental carrying capacity for manatees in Florida.

Between 2000 and 2005, Florida's human population increased by 11%, more than twice the national average, to almost 18 million (U.S. Census Bureau 2007). Projections suggest the population of Florida will increase by another 10 million people over the next 25 years. The long-term reliability of artesian springs that provide natural warm-water refuges for manatees is vulnerable because human demands for groundwater and loss of recharge areas through development have already resulted in diminished spring flows and declining water quality (Reynolds 2000, Laist and Reynolds 2005a). Blue Spring—a first-order spring that provides essential winter habitat for manatees in the upper St. Johns River region—has experienced declines in spring flow (Sucsy *et al.* 1998). The new rule for minimum flows and levels at Blue Spring provides for drawing down the flow, but then incrementally increasing it to historic annual mean levels by 2024. It is likely that spring flows and water quality will continue to decline as a result of increased human demands for water unless other water sources and water conservation strategies are developed. Continued declines of springs will shrink available natural warm-water habitat for manatees. This problem will be compounded because natural habitat will become even more important in the future as existing industrial sites disappear. Changing the availability of manatee warm-water refuges will have a major impact on manatee distribution patterns and habitat use.

Other direct threats to manatees from human activities

Other human-related causes of manatee death and injury are entrapment in water-culvert pipes, crushing (in flood-control structures, in canal locks, or between large ships and wharfs), entanglement in fishing gear or debris, and incidental ingestion of debris (Beck and Barros 1991; Ackerman *et al.* 1995). Together, these other human-related causes accounted for approximately 6% of all documented manatee deaths over the past two decades. Considerable effort and funding have been invested in modifications to flood-control structures and navigation locks to prevent manatee entrapment and drowning or crushing (USFWS 2001). These efforts have been successful in reducing this source of mortality and should be continued. To reduce entrapment in culverts and pipes, FWC staff asks that permitting agencies require the installation of gratings across the accessible ends of these structures for projects located in manatee habitat. Although entanglement does not result in many deaths each year (Ackerman *et al.* 1995), entanglement can result in disfiguring injuries that may hamper an animal's ability to survive and reproduce in the wild (Beck and Barros 1991). Over the past decade, there have been between five and 16 rescues per year to disentangle manatees and, for many of those years, most entanglements were due to crab-trap lines (FWC unpublished data). New laws surrounding the blue crab fishery have recently been implemented. These changes are designed to decrease the amount of debris from this fishery and decrease impacts to manatees. Concerted efforts to remove derelict traps remain of significant importance in reducing this threat to manatees. Entanglement in monofilament fishing line also occurs and is a cause of rescue for up to several manatees annually. Statewide efforts are under way to educate the public about the hazards of monofilament line to wildlife and to promote a statewide monofilament recycling program. Entanglement will likely continue to be a hazard for manatees for the foreseeable future. Manatees ingest a variety of debris incidental to feeding, especially monofilament line, but also plastic bags, fishhooks, string, and

other items (Beck and Barros 1991; FWC unpublished data). Sometimes ingestion of foreign objects causes illness or death due to blockage or perforation of the digestive tract.

Human effects on manatee forage plants

Human population growth in coastal Florida over the past half century has resulted in drastic losses of coastal wetland habitats. Seagrass distribution and abundance in many estuaries have declined as the result of direct human impacts (*e.g.*, dredge-and-fill activities, propeller scarring) and indirect effects of development (declining water quality and nutrient loading). Within Tampa Bay, for example, an estimated 80% of the seagrass present in the early 1900s was lost by 1980 (Kurz *et al.* 2000). This decline in seagrass coverage is slowly being reversed through actions to reduce nitrogen loading in the regional watershed such as those that have improved water clarity in much of Tampa Bay (Johansson and Greening 2000; Kurz *et al.* 2000). Non-point-source runoff is difficult to control, however, and causes water clarity to decline in years of above-average precipitation. Reductions in optical water clarity result in declines in the health and abundance of submerged aquatic vegetation (Stevenson *et al.* 1993). Indirect effects from increasing vessel traffic include increased water turbidity from wake action and scarring of seagrass beds by propellers (Sargent *et al.* 1995). It will be particularly important to protect, restore, and maintain aquatic vegetation communities in the vicinity of warm-water aggregation sites. Without conservation measures to secure these winter habitats, manatees would have to travel greater distances, concentrate into smaller areas, and forage in sub-optimal environments. For additional information, see Chapter 14, "Ecological Impacts."

Natural Threats

Naturally occurring catastrophic threats to manatees include prolonged periods of very cold temperatures, hurricanes, harmful algal blooms (*i.e.*, "red tide"), and the potential for a disease epizootic. The threat from extended periods of cold weather relates to the availability and quality of warm-water habitat, which has already been discussed above.

Manatees on Florida's Gulf coast are frequently exposed to brevetoxin, a potent neurotoxin produced by the dinoflagellate *Karenia brevis* during red tide events. In 1996, 151 manatees were confirmed or suspected to have died in southwestern Florida from brevetoxicosis (Landsberg and Steidinger 1998, Bossart *et al.*, 1998). This epizootic was particularly detrimental to the manatee population because more adults were killed than any other age class. Other epizootics in 1982, 2002, 2003, and 2005 resulted in the confirmed red tide-related deaths of 37, 33, 86, and 68 manatees, respectively, with an additional 38 animals suspected to have died from red tide during those years (O'Shea *et al.* 1991; FWC unpublished data). The proportion of confirmed deaths due to red tide between 1995 and 2005 are depicted in Figure 2. Recent studies have determined that brevetoxin can exist outside of the algal cells (*e.g.*, on seagrass) for extended periods of time (Flewelling *et al.* 2005). This can result in a lag-time between red tide blooms and manatee deaths, and suggests that manatees do not have to come into direct contact with the brevetoxin in the water column or air, but can also be exposed through ingestion of seagrasses and their epibiota that have bio-accumulated the brevetoxin. Red tide represents a major natural source of mortality for manatees in the southwest region. Experts have not reached consensus on red tide trends including the frequency of occurrence over time and factors that influence red tide in the Gulf of Mexico, but certainly the impact on the manatee

population has increased over the past two decades. The role of nutrient loading to coastal systems relative to the intensity and duration of inshore red tides is an active area of research for the FWRI harmful algal blooms group. Scientists at FWRI and their research partners continually strive to learn more about factors affecting the growth and intensity of *K. brevis* blooms. Although the biology of the organism and the role that red tides play in the dynamics of the Gulf of Mexico ecosystem are still not fully understood, predictive two- and three-dimensional models are being developed and tested. Data generated through traditional environmental sampling and monitoring, in combination with data generated through newer approaches such as remote sensing and modeling, may give us the ability to forecast red tide events and mitigate, or even eliminate, their effects. For additional information about FWRI's red tide research program, see http://research.myfwc.com/.

In addition to red tide, manatees could potentially be exposed to pathogens. Spread of such pathogens could be particularly rapid during winter when manatees are concentrated in warm-water refuges. Large-scale mortality events caused by disease or toxins have decimated other populations of marine mammals, including seals and dolphins, removing 50% or more of the individuals in some events (Harwood and Hall 1990). Manatees have robust immune systems that have, through the present time, provided disease resistance. Since 1997, papilloma virus has been found in captive Florida manatees and there is some evidence that it may also be present in the wild population in northwestern Florida (Bossart *et al.* 2002a; Woodruff *et al.* 2005). While the consensus is that this virus probably does not present a serious threat to wild manatees at this time, managers are proceeding cautiously (*e.g.*, by establishing a quarantine on exposed captives). Surveillance for papilloma lesions in wild manatees and research on the pathology and epidemiology of the papilloma virus continues.

Hurricanes are another type of phenomenon that can potentially impact manatee populations. In the Northwest region, Langtimm and Beck (2003) found that adult survival rate were depressed in years with severe storms or hurricanes. The mechanisms underlying the lower survival probabilities are unknown as there has not been a corresponding elevation in the number of reported carcasses. Such events could also result in large-scale emigration out of the affected region. In eastern Australia, for example, the simultaneous occurrence of flooding and a cyclone, combined with poor watershed management practices, resulted in the loss of 1,000 km^2 of seagrass beds and in the mass movement and mortality of dugongs (*Dugong dugon*), a sirenian relative of the manatee (Preen and Marsh 1995). Given the notice from meteorologists that we have entered a new 25- to 50-year cycle of greater hurricane activity and intensity (Landsea *et al.* 1996), as well as possible longer-term climate changes associated with global warming (McCarthy *et al.* 2001), storm activity may have a greater impact on manatee populations in the future.

CHAPTER 3: LEGAL FRAMEWORK

The Florida Fish and Wildlife Conservation Commission (FWC) was created in 1999 by a Florida constitutional amendment that passed in November 1998. Article IV, Section 9, states in pertinent part:

> The commission shall exercise the regulatory and executive powers of the state with respect to wild animal life, fresh water aquatic life, and shall also exercise regulatory and executive powers of the state with regard to marine life, except that all license fees for taking wild animal life, fresh water aquatic life, and marine life and penalties for violating regulations of the commission shall be prescribed by general law.

In 2003, the Florida Supreme Court interpreted Chapter 99-245, Laws of Florida, which implemented the Fish and Wildlife Conservation Commission. The Supreme Court upheld Chapter 99-245, Laws of Florida, and concluded that the FWC has constitutional authority over the wild animal life, freshwater aquatic life (originally regulated and managed by GFC), and marine fish (originally regulated by the MFC), but the FWC is subject to statutory authority when regulating endangered or threatened marine life, specifically manatees, sea turtles, and whales. *See, Caribbean Conservation Corporation v. FWC, 838 So.2d 492 (Fla. 2003).*

In public comments regarding the proposed management plan, several stakeholders have suggested a constitutional amendment to expand FWC's constitutional authority to include manatees, sea turtles, and whales in order to provide FWC with more autonomy to regulate and manage these marine species. While this management plan takes no position as to the propriety of such an amendment, it is unclear whether such an amendment would significantly expand FWC's existing authority. Some stakeholders feel that, because the Legislature has the power to change the protections afforded to manatees in statute, bringing the species under constitutional authority would add stability to the protections afforded to them and provide more uniformity in the way wildlife is protected by the FWC. However, the constitution currently does not provide the FWC with authority to regulate boats and waterways. Unless a constitutional amendment authorized FWC not only to regulate manatees but also to regulate boating and waterways, the amendment would not significantly expand the authority now provided by the statute.

Florida Manatee Sanctuary Act

FWC's power to regulate manatees, their habitat, and the operation and speed of motorboat traffic in order to protect manatees from harmful collisions and harassment, is derived from a specific grant of power from the Florida Legislature, found in Section 370.12(2) of the Florida Statutes (F.S.). This statute, known as the Florida Manatee Sanctuary Act, was enacted in 1978. The Act declares the entire State of Florida to be a manatee "refuge and sanctuary." The protections afforded under the Act are not contingent upon the manatees' status as either a state or a federally listed species. The Act authorizes the FWC to grant or deny permits for the possession of manatees for scientific or propagational purposes after the U.S. Department of Interior concurs in the decision.

See, §370.12(2)(c), F.S.; *The Cooperative Agreement between the U.S. Department of Interior, Fish and Wildlife Service and FWC for the Conservation of Endangered and Threatened Fish and Wildlife, July 2001.* This makes it unlawful for any person by any means, without a permit, to intentionally or negligently "annoy, molest, harass, or disturb or attempt to molest, harass, or disturb any manatee." This prohibition includes any attempt to hurt, pursue, capture or possess any manatee or even any part of any manatee. § 370.12(2)(d), F.S. This prohibition is enforceable as a criminal offense punishable as a second-degree misdemeanor.

These protections should not change as a result of this re-listing process. As is evident in the "Proposed Regulations" portion of this plan, the suggested language for listing the Florida manatee as threatened adopts the language of Section 370.12(2)(d) of the statute, thereby keeping the protections against annoyance, molestation, harassment, disturbance, and possession the same. While the statute does not define "harass," FWC Rule 68C-22.002(17), F.A.C., defines harassment as "any intentional or negligent act or omission which creates the likelihood of causing an injury to a manatee by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, breeding, feeding or sheltering." Intentionally feeding manatees not in captivity is considered harassment under this definition unless authorized by a valid federal or state permit. The Act actually allows for the seizure of any item, including boats or aircraft, used in an attempt of any of the violations previously mentioned, provided the party owning the equipment or vessel is not an innocent party.

The Act authorizes FWC to regulate the operation and speed of motorboat traffic "only where manatee sightings are frequent" and where the best available scientific and other relevant information, including observations, "supports the conclusions that manatees inhabit these areas on a regular basis." The Act specifies a number of different areas where FWC is authorized to regulate the operation and speed of motorboats, but it also authorizes FWC to designate other areas of the state waters as being subject to regulation, using the same criteria mentioned above. §370.12(2)(n), F.S. This includes the regulation of areas where a new power plant is constructed or where other sources of warm-water discharge are discovered that attract manatees. Additionally, the Act authorizes FWC to create limited areas as safe havens for manatees where they can be undisturbed by human activity, allowing them to feed and reproduce, among other things. §370.12(2)(o), F.S. The Act is not limited to the protection of the mammals themselves; it also authorizes FWC to adopt rules that protect manatee habitat from destruction by boats and other human activity. §370.12(2)(n), F.S. This specifically includes seagrass beds, but does not include noxious aquatic plants that are controlled by Chapter 369.20, F.S. It is not the intent of the Manatee Sanctuary Act to "post and regulate boat speeds generally throughout the waters of the state, thereby unduly interfering with the rights of fishers, boaters, and water skiers using the areas for recreational and commercial purposes." §370.12(2)(k), F.S. This means that zones can only be established in areas where the best available information supports the conclusion that manatees inhabit the area on at least a periodic basis. The FWC will not establish general speed limits that cover broad areas unless the best available information supports zones in an entire area. The Act further provides that FWC "may identify and designate limited lanes or corridors providing for reasonable

motorboat speeds within waters of the state whenever such lanes and corridors are consistent with manatee protection." §370.12(2)(k), F.S.

The Act specifies penalties. Any violation of a manatee speed zone is a civil infraction and is charged as a uniform boating citation. §327.73(1)(k)3, F.S. Any violation of the restrictions governing "no-entry" or "motorboats-prohibited" zones are punishable comparable to a second-degree misdemeanor for a first offense and comparable to a first-degree misdemeanor for a subsequent offense. §370.12(2)(s)2, F.S. If a violation constitutes such willful or wanton action so as to be harassment, it is also punishable as comparable to a second-degree misdemeanor for a first offense and comparable to a first-degree misdemeanor for a second offense. §370.12(2)(s)2, F.S.

In the October 1989 Policy Directive, the Governor and Cabinet directed 13 counties, considered to be substantial-risk counties for manatees, to implement manatee protection plans (MPPs). These counties were Dade, Duval, Collier, Citrus, Brevard, Broward, Martin, Lee, Indian River, Palm Beach, St. Lucie, Sarasota, and Volusia. In 2002, this policy directive was codified in statute at §370.12(2)(t) and requires that the 13 counties submit their MPPs to FWC. The statute also directs FWC to designate those counties of substantial risk that must complete an MPP by July 1, 2006. As of October 1, 2006, 11 of the 13 "key" counties had approved MPPs in place. The statute requires that each MPP include elements regarding boater education, an assessment of the need for new or revised speed-zone protection, local law enforcement, and a siting plan for boat facilities that is incorporated into each county's comprehensive plan and includes issues regarding the expansion and development of marinas, ramps, and other multi-slip boating facilities. For more details on MPPs, please see Appendix I, "Historic and Ongoing Manatee Conservation in Florida."

FWC Rule Promulgation

All FWC-proposed rules related to manatees are subject to the Administrative Procedures Act (APA), Chapter 120 of the Florida Statutes. This means that the rules promulgated under the Act must conform to the procedural requirements of the APA. This also means that any substantially interested person wishing to challenge a proposed or existing rule promulgated pursuant to the Act may file a petition for an administrative review under Chapter 120, F.S.

When a proposed rule deals with the regulation of the speed or operation of motorboats for manatee protection, the Act also requires that FWC notify the local county or counties affected. After notification, the county or counties shall form a local rule review committee (LRRC) to discuss and review the proposed rule. The Act is specific as to the organization of these committees, requiring membership from a variety of stakeholder groups representing boaters, water skiers, waterways users, and manatee and environmental advocates. The rule review committees are given 60 days in which to submit a written report of their review to the FWC. The FWC Commissioners are required to consider the LRRC reports, as well as written FWC staff responses to the reports, prior to authorizing staff to proceed with proposed rule-making, and again prior to the adoption of a final rule. While the LRRC is advisory, they provide the views of local stakeholders and are a very important component of the rule-making process.

The Florida Manatee Sanctuary Act is implemented by rule Chapter 68C-22 of the Florida Administrative Code. Section 68C-22.001 lays out the standards used for determining whether or not restrictions are needed in an area to protect manatees or manatee habitat. These standards include such factors as boating activity, manatee-use patterns, the area's known manatee mortality trends, the existence of features essential to the survival of manatees in the area, whether the absence of adequate restrictions in the area will likely result in manatee habitat destruction or manatee harassment, injury, or death, and "[w]hether the Commission's measurable biological goals that define manatee recovery are being achieved in the region that is being considered." Rule 68C-22.001, F.A.C. The statute also recognizes that the term "region" refers to the different subpopulations, defining it as one of the four geographic areas identified by the USFWS in the third revision of the Florida Manatee Recovery Plan of October 2001. §370.12(u)(2), F.S. When amending or adopting rules, the Act indicates that FWC shall give "great weight" to existing rules in areas where the measurable biological goals (MBGs) are being achieved; however, amendments and adoptions may still be made to address risks in those areas. §370.12(2)(u)1, F.S.

Rule Chapter 68C-22 specifies boating speed regulations by county zones, with each rule addressing regulations in a specific county and sometimes including regulations in portions of geographically close counties. The following counties currently contain at least some regulated zones, and are listed in the order in which they appear in the chapter: Lee, Brevard, Indian River, St. Lucie, Palm Beach, Broward, Citrus (including portions of Levy and Hernando), Volusia (including portions of Putnam, Lake, Seminole, and Flagler), Hillsborough, Manatee, Charlotte (including a portion of DeSoto), Pinellas, Collier, Martin, Dade, Sarasota, and Duval (including portions of Clay and St. Johns). Chapter 68C-22 also includes guidelines and application procedures for obtaining a permit that allows an exception to FWC manatee protection rules. Permits are granted after a finding that the activities will not "pose a serious threat to manatees and that such activities are justified." 68C-22.003(1). The criteria used to determine whether an activity is justified vary based on the type of permit being requested. A "justified" activity differs depending on the category and, in many cases, a showing of hardship is required. "Justification" and "hardship" are defined differently in each of the rule sections dedicated to different possible permits. For example, a permit may be granted to a commercial fisherman or professional guide upon a justification of significant curtailment of fishing or guiding practices; whereas, for a boating manufacturer seeking to test vessels in manatee protection areas, there must be a specific showing of substantial economic hardship. The rule provides guidelines for granting permits based on other types of need, including resident access to limited entry or speed controlled areas, boat races, and even general activities. For emergency situations, Rule 68C-22.003(3) states:

> (3) Emergency Situations: Any person may engage in water-borne activities otherwise prohibited by Chapter 68C-22, F.A.C., if such activity is reasonably necessary to prevent the loss of life or property due to emergency circumstances, or to render emergency assistance.

While these different types of permits and exceptions allow some boaters an exception to FWC's rules regulating speed or entry restrictions; they do not allow boaters to harass, injure, or kill a manatee. There is also a separate process under Chapter 120, F.S., to allow any person to apply for a waiver or variance of a rule. A waiver or variance of a rule shall be granted when the

person subject to the rule demonstrates that (1) the purpose of the underlying statute will be achieved by other means; and (2) the application of the rule would create a substantial hardship or would violate principles of fairness. §120.542(2), F.S. Persons seeking an exception to a manatee protection rule need not use the Chapter 120 process unless they do not fit the exception categories in the FWC rule.

Other Regulatory Law

In addition to the Florida Manatee Sanctuary Act, the federal Marine Mammal Protection Act (16 U.S.C. §§1361-1421), the federal Endangered Species Act (16 U.S.C. §§1531-1544) and the Florida Endangered and Threatened Species Act (§372.072, F.S.) also play important roles in the protection of the Florida manatee.

The Marine Mammal Protection Act (MMPA) was enacted by Congress in 1972 as a reaction to the concern that certain marine mammals may be in danger of extinction or depletion as a result of man's activities. The MMPA is primarily implemented by the U.S. Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS). The combined authority of these two federal agencies includes the protection of the following marine mammals and any products made from them: walruses; polar bears; sea otters; dugongs; marine otters; West Indian, Amazonian, and West African manatees; whales; porpoises; seals; and sea lions. Subject to regulations, the MMPA allows for the incidental take of marine mammals in the course of commercial fishing operations in situations with or without a permit depending on the regulations. However, if the mammal is listed as endangered or threatened, as is the manatee, the MMPA requires a number of protections, including a determination that the impact of the incidental injury or mortality will be negligible, that an Endangered Species Act recovery plan is being developed for that mammal, and that a monitoring program is in place prior to the permit issuance. Incidental take rules relating to the Florida manatee have not yet been promulgated under the MMPA. This issue is described in more detail in the Case Summaries section (Appendix II) under the description of the settlement agreement in *Save the Manatee Club, Inc., et al., v. Ballard, et al.*, *Civil No. 1:00CV00076 EGS/JMF, (U.S. Dist. Col. 2001)*; *See also*, *Final Environmental Impact Study of MMPA Incidental Take Regulations, Florida Manatee (USFWS, 2003).*

The federal Endangered Species Act (ESA) was enacted by Congress in 1973. It provides that, unless specified, no provision of the ESA shall take precedence over any more restrictive conflicting provisions of the MMPA. State laws may not allow, in general or by exemption, any act prohibited by the ESA, but a state may create more restrictive regulations relating to federally endangered or threatened species. 16 U.S.C. §1535. In addition to the FWC manatee protection speed zones discussed above, the federal government has established areas where "certain waterborne activities will be restricted or prohibited for the purpose of preventing the taking of manatees." 50 CFR §17.100. These may include areas "without waters under the jurisdiction of the United States." *Id.* There are a number of designated manatee protection areas, known as sanctuaries and refuges, where federal speed zones have been created in Florida waters. These speed zones can be enforced by both federal and FWC law enforcement officers. The state can also enter into agreements with the federal government which, in turn, can allocate funds and other assistance to aid the state in its efforts to protect endangered and threatened species. *See, Cooperative Agreement between FWC and USFWS for Conservation of*

Endangered and Threatened Fish and Wildlife; Mutual Aid Agreement for Cooperative Law Enforcement (2003). In 2000, the Save the Manatee Club and other organizations filed a lawsuit against FWC in the United States District Court, Northern District of Florida, alleging that FWC had violated the ESA by harmful and inadequate regulation of vessels, thereby causing the taking of manatees. The parties agreed to mediate and a settlement agreement was reached in 2001. FWC agreed to look at certain areas designated in the agreement to see if additional regulations were necessary, agreed to study other areas of the state as to the adequacy of existing regulations, and agreed to continue to improve law enforcement and education. There was no finding by the court that FWC violated the ESA and no attorneys' fees or costs were awarded. FWC has completed all obligations of the settlement agreement. *See, Save the Manatee Club et al. v. Egbert, Case No. 4:OOCV17/RV, U.S. District Court, N.D. Fla.; Settlement Agreement adopted as a Consent Decree, November 7, 2001*. A more detailed discussion of the settlement can be found in the judicial case history provided in Appendix I, "Historic and Ongoing Manatee Conservation in Florida."

The FWC, in conjunction with the USFWS, must develop "measurable biological goals" to be used when evaluating manatee protection rules, existing and proposed, and for use in evaluating any achievement made towards manatee recovery. §372.072, F.S. This act requires that FWC develop rules no later then July 1, 2005, to define the ways in which these measurable biological goals will be used. These rules have been adopted in Rule 68C-22.001, F.A.C. The manatee management plan will provide measurable biological goals that define manatee recovery in compliance with the Florida Statutes. For more detailed discussion, see subsection entitled "Measurable Biological Goals" in Chapter 4, "Conservation Goal and Objectives."

FWC is also required to comment as a part of the process of state and federal permitting of water and boating access facilities, including marinas, docks, and boat storage facilities. In doing so, FWC must comply with sections 20.331(9), F.S., and 120.60(7), F.S., which require that FWC act within its jurisdiction and base its comments upon credible and factual scientific data.

Under Phase 1 of FWC's imperiled species classification process (Rules 68A-27.0012, F.A.C.), the Florida manatee qualifies to be classified as a threatened species. Under Phase 2 of this process, a manatee management plan must be developed. The manatee management plan is a plan setting forth goals and recommendations, and is not a rule.

Appendices I and II contain additional information relating to the Legal Framework of the manatee management plan—a legislative history relating to the Florida manatee and an administrative and judicial case history relating to the Florida manatee.

CHAPTER 4: CONSERVATION GOAL AND OBJECTIVES

Conservation Goal:

To remove the manatee from the state imperiled species list and effectively manage the population in perpetuity throughout Florida by securing habitat and minimizing threats.

The conservation goal is a broad statement of a condition or accomplishment to be achieved in the future. Goals provide direction and inspiration and are the principle basis from which objectives are developed. The goal can be easily stated, but actually has three important components. The goal seeks to eliminate any significant risk of extinction; it strives to maintain manatees throughout their range; and it recognizes our long-term responsibility to manage manatees, even once they are no longer a listed species.

Florida's imperiled species classification system is a way to measure the relative risk of extinction. Florida recognizes three categories of imperilment: the most highly imperiled category is termed "endangered" and is defined in the rule as a species in imminent risk of extinction. The second category is termed "threatened" and is defined as a species having a very high risk of extinction. The last category is termed "species of special concern" and is defined as a species having a moderate risk of extinction.

The first phase of this plan is to take the necessary steps to reduce the risk of extinction for manatees so it is no longer considered to have even a moderate risk of extinction. The U.S. Fish and Wildlife Service (USFWS) uses the term *"recovery"* when a species' status has improved to a point where it no longer qualifies for listing as endangered or threatened under the provisions of the Endangered Species Act (ESA). In these cases, a species has been recovered from the threat of extinction. While this plan sets forth removal from the state list as a positive first step, it does not represent the complete management goal. Unlike the federal recovery plan, this state management plan will continue to be implemented after the manatee is removed from the state's imperiled species list.

The plan aspires to manage manatees in perpetuity **throughout** Florida. Under the state listing system, a species could theoretically be extirpated from one region of the state while growing enough in other regions of the state to qualify for reclassification to a lower state of risk. However, this outcome is not acceptable under this plan. The intention of this plan is to provide the framework for comprehensive manatee population management throughout Florida, so that manatees will continue to be a valued part of our diverse native fauna in all parts of the state. If manatees in a particular region of the state experience an increased threat, then the FWC will take management actions in that area to mitigate that threat. These actions will be taken regardless of the overall statewide imperilment status. The latest population models indicate that the manatee population is growing in three regions with the population in southwest Florida likely declining. However, population growth alone will not necessarily result in removal of the manatee from the state imperiled species list. In order for that to happen, we will need to eliminate or reduce future threats to acceptable levels so that the chances of significant future declines are very small.

Finally the goal recognizes that manatees will need to be managed **in perpetuity.** The need for wise management of this species will not disappear even if the risk of extinction is eliminated. Manatees will remain a protected species under state and federal law and will continue to be managed and protected.

Conservation Objectives

The plan identifies six primary objectives upon which individual tasks are based.

Objectives:

(1) Within three years, implement peer-reviewed and statistically sound methods to estimate the manatee population and monitor trends.

(2) Reduce human-caused annual manatee mortality rate by minimizing human related threats, including those attributed to watercraft, water-control structures, entanglement and entrapment.

(3) Within five years, in full cooperation with electric utilities, develop and implement plans to prevent significant future manatee mortality caused by potential changes in power plant operation.

(4) Within five years, in cooperation with the water management districts, establish minimum flows at Florida springs that protect the warm-water habitat requirements of manatees.

(5) Within five years, enhance management practices, such as a statewide monitoring program, to help ensure sufficient abundance and distribution of seagrasses and freshwater vegetation to support the manatee population in perpetuity.

(6) Use measurable biological goals (MBGs) in an ongoing fashion to measure progress toward recovery and to assist in the evaluation of the need for future research, regulatory, and management actions. The MBGs focus on adult survival rates, availability of habitat, and the number of mature individuals in the population.

The planning timeframe for this management plan is five years. This does not suggest that all necessary tasks to accomplish the goal of this plan will be completed within five years. Within the next five years, the FWC will revise the plan and create new timeframes for other objectives and tasks.

Measurable Biological Goals for Florida Manatee Recovery

Rationale

In 2004, the Florida Legislature required the FWC to develop measurable biological goals (MBGs) that "define manatee recovery" and assist in the development of management plans for the species, and in the evaluation of existing and proposed manatee protection rules [§372.072(6)]. Subsequently, in April 2005, Florida adopted the International Union for Conservation of Nature (World Conservation Union; IUCN) red list criteria as the basis for its

imperiled species classification process. These established unambiguous criteria for species listing and, hence, for recovery (since a de-listed species implies recovery). Therefore, in principle, there already exist biological goals that can be measured or estimated to assess recovery. However, there is ambiguity in the language of the 2004 statute. In particular, the legislation dictates that the MBGs be used for "determining progress in achieving manatee recovery." Thus, rather than defining recovery *per se*, this implies that MBGs are to act as indicators of progress toward recovery. This endows greater utility to these measures because, rather than simply being redundant criteria in the presence of the state listing criteria, they can be used to gauge recovery efforts.

In defining appropriate MBGs, it is important to consider the listing criteria that presently determine the species' status. In the recent biological status review (BSR) for the Florida manatee (Haubold *et al.* 2006) conducted by the FWC, the biological review panel recommended the population be re-classified as "threatened" (previously "endangered"), based on its performance in two of the five listing criteria:

Criterion A: Population Reduction

The core biological model predicted a 46% chance of a 30% population decline and a 12.1% chance of a 50% population decline statewide within three generations. Based on these models, the biological review panel (which conducted the BSR for FWC) concluded that there was sufficient risk of a 50% decline to merit classification as threatened under this criterion.

Criterion C: Population Size and Trends

At least 2,181 mature individuals are known to be in the population (Haubold *et al.* 2006); therefore, the manatee qualifies as threatened under this criterion. Additionally, there is a 77.1% chance of a 10% reduction in the manatee population over the next two generations, and a 55.5% chance of a 20% reduction, thereby satisfying the required sub-criteria.

Therefore, according to state listing criteria, the manatee should be classified as threatened due to the size of the current population and to the likelihood of a future reduction in population size. To be re-classified to "species of special concern," the manatee population would have to improve in a future status review such that it no longer qualifies as "threatened" in either criteria; to be completely de-listed, it must not qualify under any criterion at any level of threat. Of course, this also assumes that the population's performance under the remaining criteria does not substantially worsen. In order to be relevant for indicating movement toward recovery, MBGs should relate directly to the above factors; it would be confusing and counter-productive to develop independent MBGs if they did not lead to recovery as defined by the state listing criteria. Rather, these measures should be quantities that, if sufficiently improved over time, would eventually lead to down- or de-listing in a future status review.

However, some difficulties are immediately apparent when looking to derive measurable biological goals directly from the state criteria. Criterion A evaluates species according to some reduction in population size that is "observed, estimated, inferred or suspected," with the minimum severity of the reduction varying according to the listing category (§68A-1.004). This decline can either have taken place in the past or been anticipated to occur in the future. For the

manatee, classification under this criterion is based on a *projected* decline. This is problematic when trying to establish measurable milestones to monitor recovery—how does one measure changes in an anticipated decline? This can only be predicted by models based on current information and assumptions about future population trajectories. Similarly, Criterion C classifies the manatee as threatened based on a projected population decline, as a sub-criterion of the population size threshold.

One approach for deriving measurable goals from listing criteria that are informed by model-based projections is to examine the associated model itself. From this, it may be possible to identify elements (*i.e.,* parameters) that strongly influence population projections. If these quantities can be measured, they may serve as a means for monitoring recovery progress and, hence, suitable measurable biological goals.

Analysis of Manatee Core Biological Model

The manatee core biological model (CBM), developed by Runge *et al.* (2007a), represents the accumulation of the best current information regarding the biology of the Florida manatee. The model describes the life history of the species, and forecasts population changes in each of four regions (Atlantic, Upper St. Johns, Northwest, and Southwest). Parameter estimates are taken from reports and peer-reviewed publications where available (Runge 2003; Runge *et al.* 2004; Kendall *et al.* 2004; Langtimm *et al.* 2004), and from expert consensus otherwise. The model parameter set currently includes age-dependent survival and reproductive rates, probabilities of catastrophes (emergent disease and red tide), cold-stress mortality, and parameters related to the effects of density dependence and carrying capacity. In addition, survival and reproduction are modeled with temporal variability, and all parameters are specified with associated ranges of uncertainty (either empirical or based on expert consensus). The model integrates this information to provide population projections via simulation, allowing researchers to evaluate the relative influence of a range of factors on population dynamics. Output from CBM simulations was used to conduct the 2006 biological status review (BSR) for the State of Florida (Haubold *et al.* 2006).

Several CBM parameters have been identified as having large relative effects on population growth and projected population size, based on sensitivity and elasticity analyses (Runge *et al.* 2007a). **Sensitivity analysis** examines how model predictions vary when model inputs (parameters) are changed. Thus, this method is useful for assessing the relative influence of model components. For the CBM, the sensitivity of two outputs (first-year growth rate and the final population size after 100-year simulations) to a set of model inputs may be relevant for developing MBGs. First-year growth is a useful measure of short-term dynamics, while 100-year population size is an appropriate metric for long-term dynamics. The results showed the first-year growth rate to be most sensitive to adult survival rate in all regions. Secondarily, there was sensitivity to:

1. the temporal variability in adult survival (in all regions except Upper St. Johns),
2. the probability of emergent disease, and
3. sub-adult survival.

The hundred-year population size showed a very similar pattern of sensitivity, with some additional sensitivity to long-term carrying capacity in the Upper St. Johns region. **Elasticity analysis** is simply an examination of *proportional* sensitivity (*i.e.*, scale-independent). Adult survival was clearly the most elastic parameter for both first-year growth and 100-year population size. The elasticities of the remaining survival rates were an order of magnitude smaller, and current and long-term carrying capacity parameters showed some elasticity in the Upper St. Johns region only.

Based on current information about manatee population dynamics as expressed in the CBM, it is clear that changes in adult survival rate have important consequences for both population growth and population size; sub-adult survival is of secondary importance. For this reason, any set of MBGs should contain goals for adult survival such that the thresholds for population decline under the state listing criteria are not exceeded. In addition, MBGs based on adult survival are attractive because there exists relatively reliable information for estimation (*i.e.*, it is measurable) via the photo-identification monitoring program. In contrast, components such as the probability of emergent disease, while shown to be important from sensitivity analysis, are not measurable entities. Rather, it is an anticipated future threat that is quantified in the CBM based largely on expert consensus. The use of survival rates as a basis for MBGs is also appealing because it allows for flexibility in the recovery program. Survival can be broken down by cause of death, including watercraft collisions, red tide, cold stress, and others. Thus, recovery might be achieved by addressing whichever causes might most readily be influenced by management.

Habitat is also a key factor influencing manatee population dynamics, and therefore warrants consideration as an MBG. In particular, important concerns regarding the viability of the manatee population are related to changes in warm-water carrying capacity in winter. The importance of carrying capacity is not reflected in the sensitivity (elasticity) analyses because of the structure of the CBM. The anticipated reduction in warm-water carrying capacity is fixed in the model, with the values related to current and long-term carrying capacity, as well as the effects of approaching or exceeding carrying capacity, bounded by estimates of associated uncertainty. The sensitivity (elasticity) analyses simply explore the effects of changing the values of these parameters, but do not change the structure of the density-dependent model itself. It is clear, however, that simulated population trajectories are strongly influenced by the specified carrying capacities by acting as an upper bound to population growth. While there is currently no established quantitative metric for precisely determining warm-water carrying capacity, setting minimum thresholds of predicted carrying capacity is possible. Because the availability of warm water during winter is a critical component of the species' viability; its omission from the set of measurable biological goals would be unsatisfactory. Manatees could surpass established population benchmarks and achieve sufficiently high adult survival rates, yet unless sufficient long-term warm-water carrying capacity is secured, their classification would not likely improve following a new biological status review. Thus, in the absence of a warm-water habitat goal, the MBGs are not a robust measure of the manatee's progress toward recovery. Future re-listing decisions should only be made considering both population parameters and habitat components.

Models of warm-water carrying capacity, currently informed by expert opinion, are integrated into the CBM, and may be used for initial predictions of changes to warm-water

availability. Ongoing investigations into the appropriate metrics and dynamics of carrying capacity by FWC and its partners may be used to update these models in the future. In the interim, it may be possible to better quantify anticipated changes in warm water by estimating the number of warm-water sites that are protected and guaranteed to operate or exist into the future. Management activities can then be targeted either to securing additional existing sites or to augmenting current warm-water availability by restoring springs or establishing new artificial sites. The inclusion of warm-water carrying capacity as an MBG is a direct and important research challenge that aims to improve our understanding of this important aspect of manatee ecology.

Another candidate metric for deriving an MBG is population size. This is natural because Criterion C, which was used to reclassify the Florida manatee, is partly based on the population's size. With a minimum population estimated to be just over 2,100 mature individuals, the manatee fell just within the "threatened" category's threshold of 2,500. Thus, with sufficient positive growth, the population could conceivably exceed this value in the near future and be reclassified to "species of special concern" (SSC) for this criterion. The threshold for SSC listing is 10,000 mature individuals, in conjunction with one of two sub-criteria:

1. an estimated continuing decline of at least 10% within ten years or three generations, whichever is longer (up to a maximum of 100 years in the future); or
2. a continuing decline (observed, projected, or inferred) in numbers of mature individuals and at least one of the following:
   (a) population structure in the form of either (i) no subpopulations estimated to contain more than 1,000 mature individuals, or (ii) all mature individuals are in one subpopulation;
   (b) extreme fluctuations in number of mature individuals.

While reaching a population size of 10,000 mature manatees may be unlikely, the manatee could be de-listed by satisfying both of the sub-criteria. These sub-criteria are both related to population declines, similar to that for Criterion A.

Measurable Biological Goals

Given the rationale described above, we propose the following set of measurable biological goals for further consideration:

Mature population size

Mature population size exceeding 2,500 mature individuals statewide: This is the threshold value for "threatened" under Criterion C. The state listing criteria define mature population size as the number of individuals known, estimated, or inferred to be capable of reproduction.

Adult survival rate

*Sufficient **regional adult survival rates** to support a stable or increasing manatee population:* This will be achieved by ensuring **a less than 1% probability of population decline of greater than 30% over the next three generations** (~ 60 years), given available warm-water resources. This is the threshold for de-listing under Criterion A of the state listing criteria. Current predicted values of adult survival required to satisfy these thresholds are shown graphically, with associated levels of warm-water carrying capacity for each region, in Figures 3-6. The maximum 1% threshold probability for a 30% or greater decline reflects both the recovery objective as specified in the listing criteria and a desire to avoid declines of any magnitude in any of the four management units (see Figure 1). For example, it would be unlikely for more moderate declines (say 10-20%) to be probable while still keeping declines of 30% or more below 1% probability over the same time period. Moreover, to achieve the first goal (corresponding to Criterion C), the population cannot be allowed to decline. The 1% risk tolerance threshold has some precedent in marine mammal conservation, having been used in the context of extinction risk (Angliss *et al*. 2002; NMFS 2005).

Warm-water carrying capacity

*Sufficient **regional warm-water carrying capacity** to support a stable or increasing manatee population, given the prevailing rate of adult survival:* Here, carrying capacity is defined as the number of independent manatees that can be supported by available warm water such that death due to exposure to cold is avoided. These include both natural and artificial warm-water sources. Current predicted values of carrying capacity required to satisfy aforementioned thresholds (less than 1% probability of population decline of greater than 30% over the next three generations) are shown graphically with associated levels of adult survival for each region in Figures 3-6.

Note the explicit linkage between the adult survival rate and warm-water carrying capacity goals. This is because the threshold value that satisfies one goal varies with the value of the other (see Figures 3-6). Outputs from the CBM suggest that adult survival and carrying capacity interact differently across regions with respect to their influence on population size. In the Atlantic (Figure 3), recovery thresholds for population change appear to occur at about 93-94% survival for carrying capacity (K) above approximately 1,000 animals. At lower carrying capacities, the required survival rate increases dramatically to about 98% for K=600. In the Upper St. Johns (Figure 4), adult survival rate thresholds for de-listing are much lower (approximately 88-89%) and relatively independent of carrying capacity across the simulated range. Similarly, in the Northwest (Figure 5), the recovery thresholds are generally independent of carrying capacity above 500 animals, and occur in the 91-93% survival range. The Southwest shows the strongest relationship between the two factors and generally the highest threshold values (Figure 6). Differences in survival rates among regions reflect the conditional dependence on available carrying capacity, as well as sensitivity to other model parameters, such as the temporal variation in survival rates. For example, there is greater variation in survival within the Northwest region than in the Upper St. Johns, which perhaps accounts for the difference in estimated minimum survival.

The maximum 1% threshold probability for a 30% or greater decline was derived from existing marine mammal conservation documents related to risk of extinction (Angliss *et al.* 2002; NMFS 2005). By selecting this very low probability of a 30% decline, the chance of less dramatic declines are also very low and the chance of the population increasing are great. For example, it would be highly unlikely for more moderate declines (say 10-20%) to be probable while still keeping declines of 30% or more below 1% probability over the same time period. This is shown in Figures 3-6; the grey-shaded regions identify combinations of adult survivorship and warm-water carrying capacity such that the probability of a 30% or worse decline is 1% or less. Note that in these regions, the vast majority of model runs resulted in a growing population (*i.e.*, no decline), as depicted by blue sections of the corresponding charts.

Summary

In developing measurable biological goals to guide manatee recovery, managers and scientists are faced with the difficult task of identifying metrics that can be monitored but, at the same time, are related to recovery criteria that are based on predicted system states and dynamics. In light of this, we chose to analyze the manatee core biological model (Runge *et al.*, 2007) to derive a set of MBGs. This is an appropriate path, since the CBM was used to recommend re-classification during Florida's 2006 biological status review of the species, and some form of the model will likely be used to inform future reviews. Therefore, selecting metrics that are related to the dynamics of the manatee population as described by the CBM will likely be most useful in monitoring recovery efforts. Sensitivity and elasticity analyses were used to identify parameters to which short- and long-term dynamics (first-year growth and 100-year simulated population size, respectively) were sensitive. Adult survival rates appeared to have a disproportionately large influence over model dynamics relative to other CBM parameters. From a range of candidate parameters, three MBGs were selected: (1) **mature population size** exceeding 2,500 individuals statewide; (2) sufficient **regional adult survival rates** to ensure a less than 1% probability of population declines greater than 30% (~ 60 years), given available warm-water resources; and (3) sufficient **regional warm-water carrying capacity** to ensure a less than 1% probability of population declines greater than 30% over the next three generations, given estimates of adult survival.

While MBGs should provide guidance for the development of a management plan and for recovery efforts, they should not be considered replacement or alternative criteria to the state listing criteria. In addition, population projections used to derive the MBGs were based on a stochastic model (the CBM); that is, a model which incorporates both uncertainty in the estimates of parameters (*e.g.*, survival rates) and natural environmental variation. This model will certainly change as we learn more about the manatee population, and as parameter values are refined and updated. Therefore, we recommend that readers not be preoccupied with the precise threshold values for these goals. Rather, the state space diagrams in Figures 3-6 are useful in identifying *regions* that are indicative of recovery, based on the best current information. Since the MBGs themselves will not be the basis for reclassification, they are best viewed as a means of monitoring the contribution of management toward recovery by measuring improvements in survival rates, available warm water, and population size. For example, strong movement into the regions of the threshold values may be cause for a new biological status review.

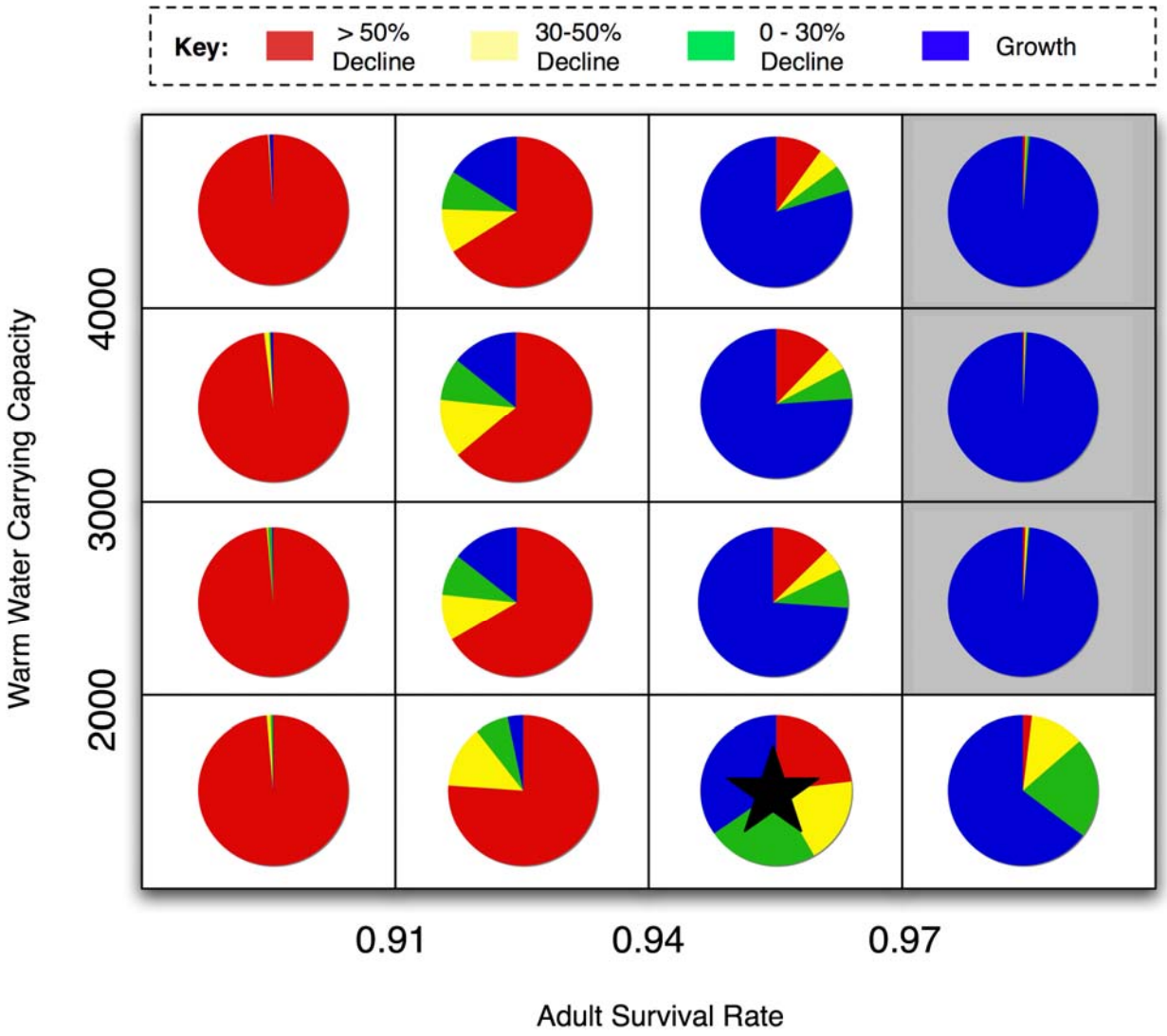


Figure 3: Summary of predicted population change over three generations for ranges of adult survival rate and long-term warm-water carrying capacity for the **Atlantic region**, based on 10,000 simulations of the core biological model (CBM). Red pie chart areas are the proportion of simulations within each range of adult survival and warm-water carrying capacity that resulted in declines of greater than 50% (Threatened); yellow, declines of 30-50% (Species of Special Concern); green, declines of less than 30%; and blue, population growth. Gray-shaded regions indicate 1% or less probability of declines exceeding 30% (*i.e.*, states that satisfy the MBGs). The approximate region of the current estimated trajectory of the population is indicated by a star.

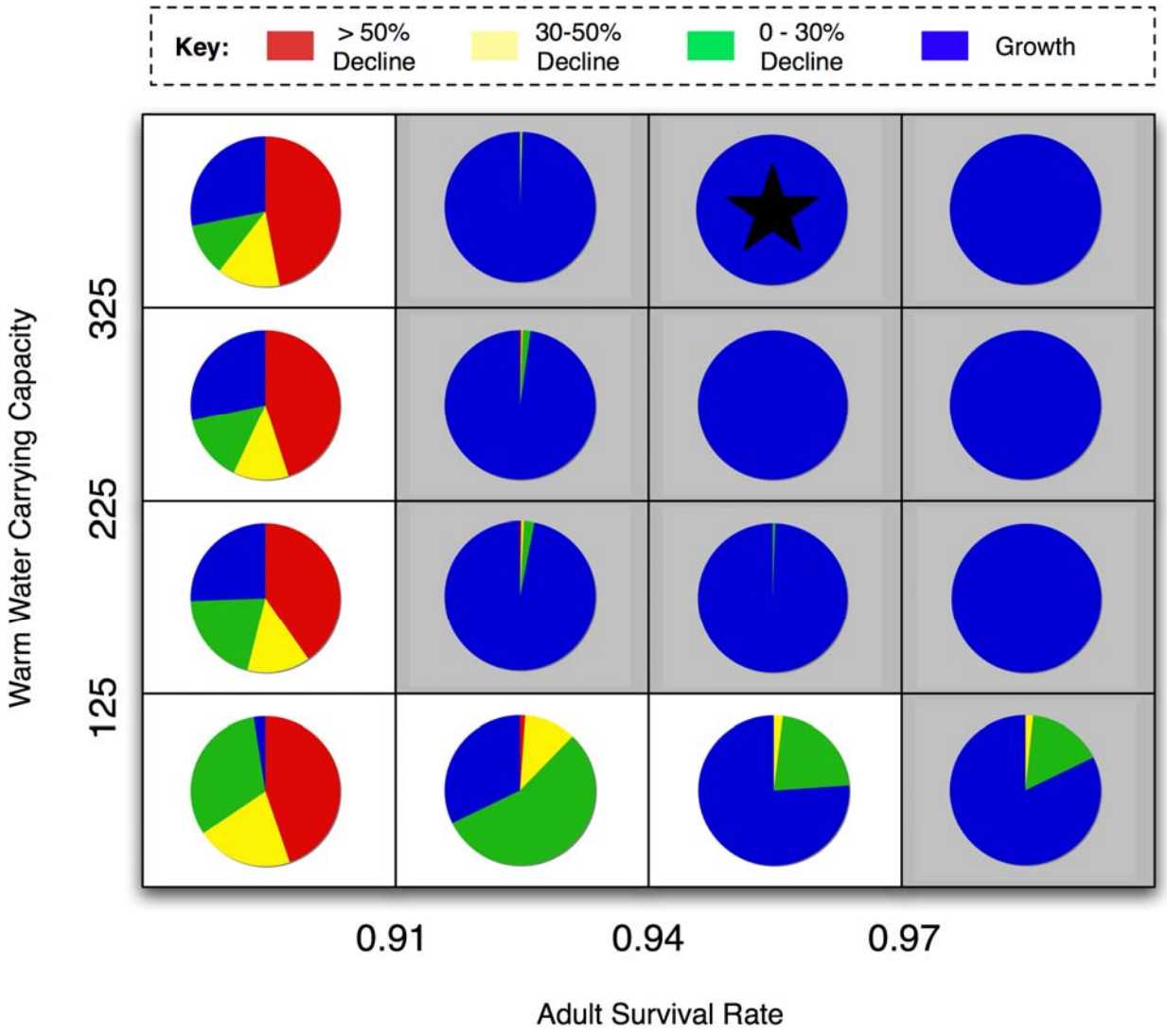


Figure 4: Summary of predicted population change over three generations for ranges of adult survival rate and long-term warm-water carrying capacity for the **Upper St. Johns region**, based on 10,000 simulations of the core biological model (CBM). Red pie chart areas are the proportion of simulations within each range of adult survival and warm-water carrying capacity that resulted in declines of greater than 50%; yellow, declines of 30-50%; green, declines of less than 30%; and blue, population growth. Shaded regions indicate 1% or less probability of declines exceeding 30% (*i.e.*, states that satisfy the MBGs). The approximate region of the current estimated trajectory of the population is indicated by a star.

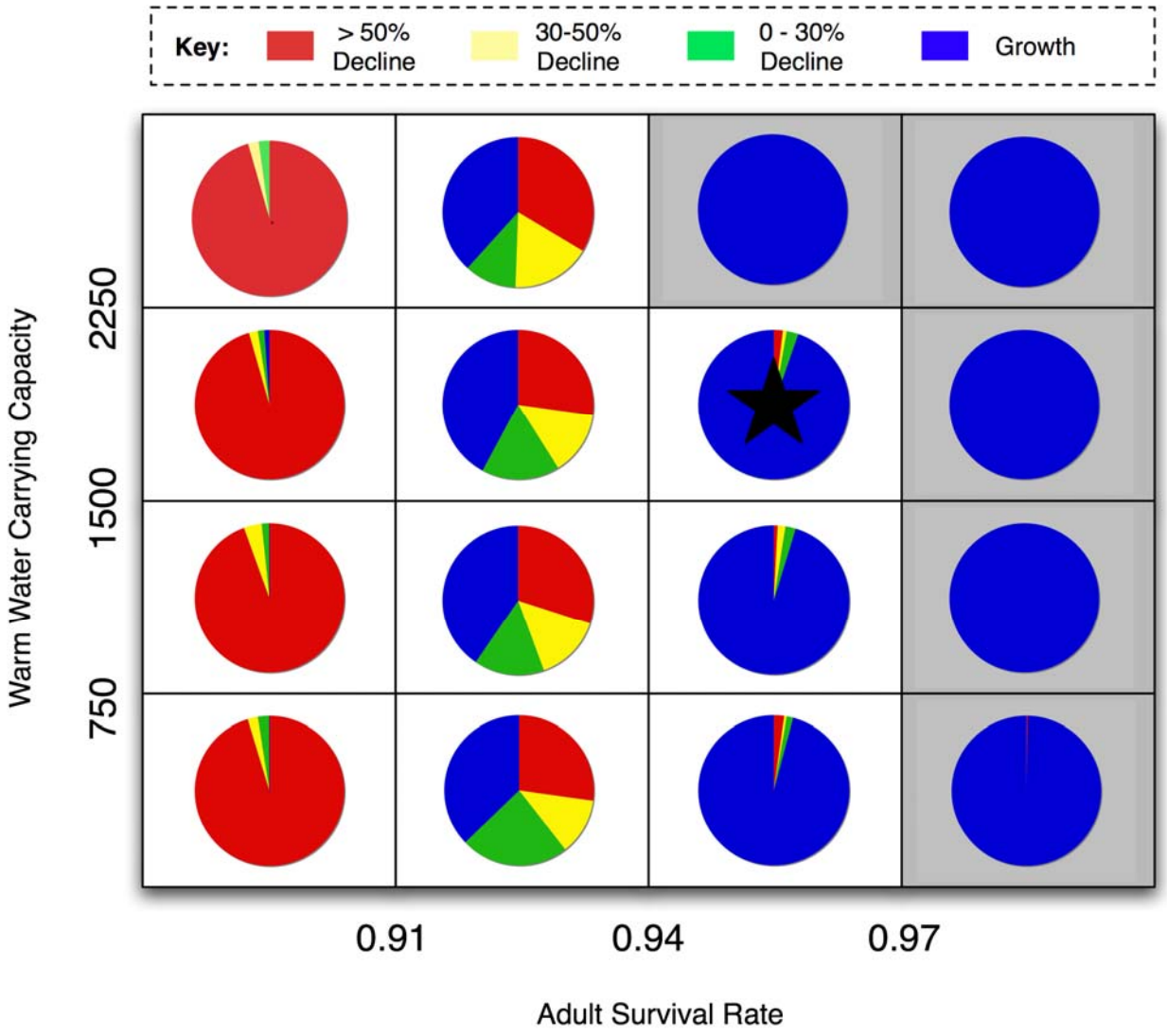


Figure 5: Summary of predicted population change over three generations for ranges of adult survival rate and long-term warm-water carrying capacity for the **Northwest region**, based on 10,000 simulations of the core biological model (CBM). Red pie chart areas are the proportion of simulations within each range of adult survival and warm-water carrying capacity that resulted in declines of greater than 50%; yellow, declines of 30-50%; green, declines of less than 30%; and blue, population growth. Shaded regions indicate 1% or less probability of declines exceeding 30% (*i.e.*, states that satisfy the MBGs). The approximate region of the current estimated trajectory of the population is indicated by a star.

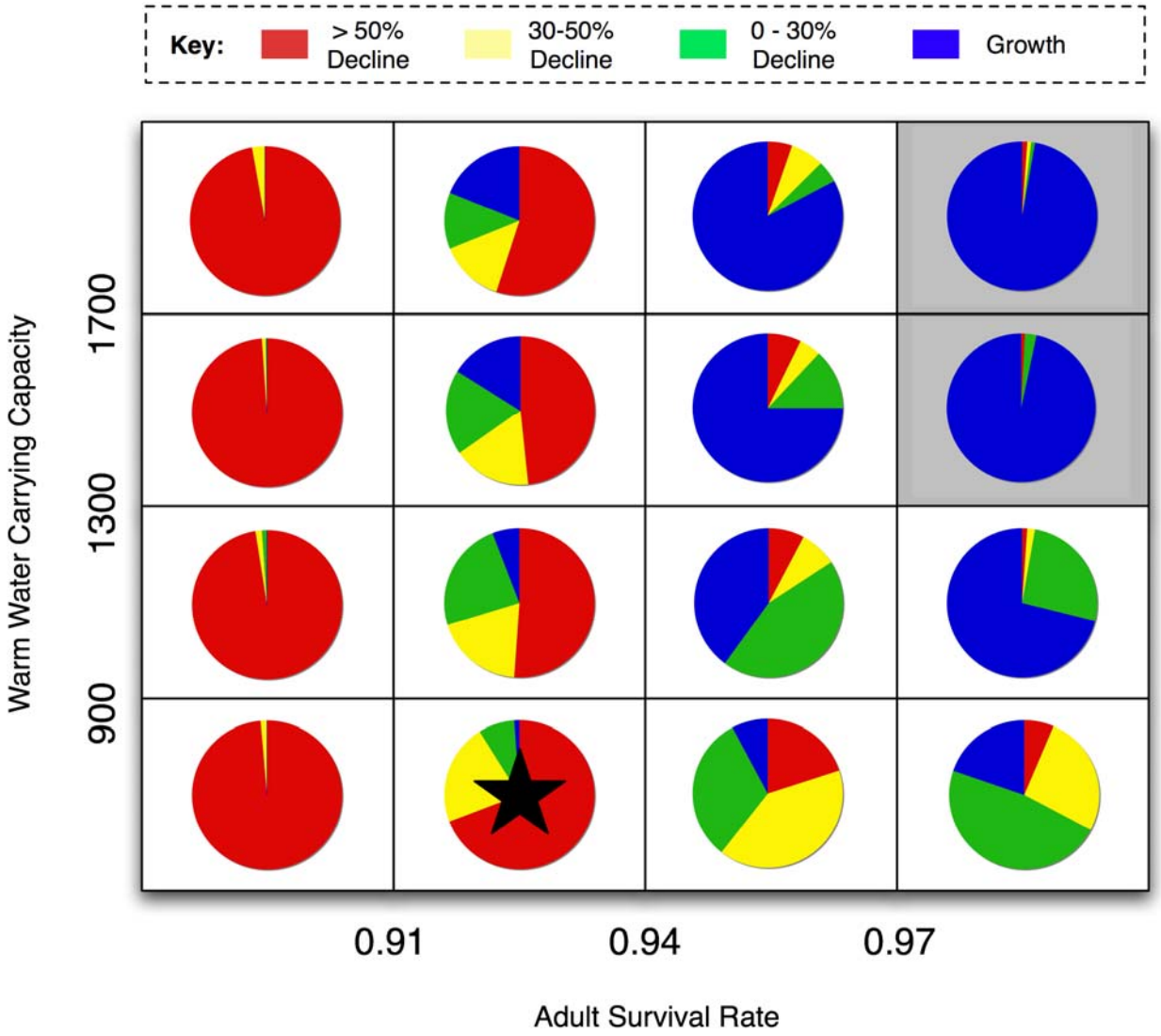


Figure 6: Summary of predicted population change over three generations for ranges of adult survival rate and long-term warm-water carrying capacity for the **Southwest region,** based on 10,000 simulations of the core biological model (CBM). Red pie chart areas are the proportion of simulations within each range of adult survival and warm-water carrying capacity that resulted in declines of greater than 50%; yellow, declines of 30-50%; and green, declines of less than 30% (including increases). Shaded regions indicate 1% or less probability of declines exceeding 30% (*i.e.*, states that satisfy the MBGs). The approximate region of the current estimated trajectory of the population is indicated by a star.

CHAPTER 5: PROPOSED REGULATIONS

This plan proposes changing existing regulations to reclassify the Florida manatee as a threatened species, and establishing prohibitions and protections to facilitate manatee conservation, management, and recovery. The FWC, through the formal rule-making process, considers these specific actions concurrent with their review of this management plan. Any future rule changes needed to support this plan will be submitted and reviewed through the formal rule-making process.

Listing

The FWC Manatee Biological Review Panel recommended reclassifying the manatee from endangered to threatened, and the Commission decided this was warranted. The recommendation can be implemented by modifying Rule 68A-27.003, F.A.C., to remove the Florida manatee from the rule, and modifying Rule 68A-27.004 to include a new item that lists the manatee as a threatened species and includes recommended prohibitions and protections.

Prohibitions and Protections

While manatee status may have improved over the last 20 years, the species still faces a very high risk of extinction and strong protections are still necessary. The proposed regulation incorporates all previous protections afforded the manatee in §370.12(2), F.S., namely prohibitions on annoying, molesting, harassing, disturbing, injuring, harming, capturing, collecting, pursuing, hunting, wounding, killing, possessing, or selling manatees or manatee parts, or attempting any of the listed prohibitions.

Following is draft language for the proposed listing of the Florida manatee as threatened under Rule 68A-27.004, F.A.C.:

> "The Florida manatee (*Trichechus manatus latirostris*) is hereby declared to be threatened and shall be afforded the protective provisions specified in this paragraph. It is unlawful for any person at any time, by any means, or in any manner intentionally or negligently to annoy, molest, harass, or disturb or attempt to molest, harass, or disturb any manatee; injure or harm or attempt to injure or harm any manatee; capture or collect or attempt to capture or collect any manatee; pursue, hunt, wound, or kill or attempt to pursue, hunt, wound, or kill any manatee; or possess, literally or constructively, any manatee or any part of any manatee. Permits to possess manatees for scientific or enhancement purposes may be issued by the U. S. Department of the Interior.

Other Regulations

The primary existing regulations related to manatee protection are rules that regulate boat speed and access. There are no new proposed speed-zone regulations in this plan, but a task of reviewing existing speed zones for possible changes is part of the plan (see the Manatee Protection Zones section of Chapter 7, "Management Actions").

CHAPTER 6: PERMITTING FRAMEWORK

Florida Statues 370.12(c) states, "Whenever the Fish and Wildlife Conservation Commission is satisfied that the interest of science will be subserved, and that the application for a permit to possess a manatee or sea cow (*Trichechus manatus*) is for a scientific or propagational purpose and should be granted, and after concurrence with the United States Department of Interior, the commission may grant to any person making such application a special permit to possess a manatee or sea cow, which permit shall specify the exact number which shall be maintained in captivity." However, under agreement with the USFWS, the FWC does not provide state permits to possess manatees. Permits to possess manatees for scientific or enhancement purposes may be issued by USFWS.

Permits Issued to Allow Exceptions from Manatee Protection Rules

The FWC is authorized to issue permits that allow certain persons to perform activities or operate at higher speeds than are otherwise allowed by the FWC manatee protection speed zone rules. The permit process and criteria are set forth in Rule 68C-22.003, F.A.C., and apply only to FWC manatee protection rules. The exceptions and permits allowed by rule do not authorize the taking or harming of manatees in any way. For more details on these permits and exceptions see the "Legal Framework" portion of this plan in Chapter 3, and Appendix I, "Historic and Ongoing Manatee Conservation in Florida." Of the various types of permits issued by FWC, we propose amending the rules to eliminate the permits for commercial guiding and fishing, except for net-setting, that are currently allowed under Rule 68C-22.003, F.A.C.

This general permit type has been used to allow qualified commercial fishers or professional fishing guides to operate at speeds up to 20 MPH while engaging in commercial fishing or guiding. These permits can only be issued for activities and zones identified as eligible in the rule for the specific manatee protection zones. As of August 2006, permits were available for these activities in portions of the following counties: Brevard, Citrus, Collier, Indian River, Lee, Manatee, Martin, St. Lucie, Sarasota, and Volusia. These permits cannot be issued for activities within limited-entry zones (*i.e.*, no-entry or motorboats-prohibited zones). In recent rule actions (Manatee County in 2004 and Lee County in 2005), the FWC has narrowed the permit for commercial fishers to allow only commercial fishing net-setting activities, but not any other commercial fishing activity or any guiding activities.

The elimination of permits for commercial fishers and guides, except for net-setting, would improve enforcement capabilities, enhance overall compliance, and eliminate a source of confusion and contention. State, federal, and local law enforcement have been consistently opposed to these permits in general and to the guiding permits in particular. Enforcement of manatee zones is more difficult when certain vessels can proceed on plane while most others must maintain slow speed. Officers have indicated that other boaters are less likely to comply with posted regulations when they see permitted vessels traveling faster through slow-speed zones. In many cases, the boaters with permits cannot be visibly distinguished from other boaters in the area. This is especially true for guiding since the vessels used by guides are often identical to recreational vessels that are being operated in the same areas for the exact same purpose. The USFWS does not support these permits and federal manatee regulations do not allow similar authorizations. Therefore, no permits can be used in locations that include both

state and federal manatee protection zones, such as Lee County. The elimination of commercial fishing and guiding permits is supported by some stakeholders. The basis of the agreement appears to be mostly an issue of fairness (*i.e.*, if zones are warranted, then they should apply equally to all boaters). Even some professional guides who benefit from these permits have spoken publicly against the issuance of these permits.

In order to eliminate this type of permit, Rule 68C-22.003, F.A.C., would need to be amended. Approval of the manatee management plan does not bind the Commission to repeal the permit exception for commercial fishers and professional fishing guides. FWC staff would file a notice of proposed rulemaking only upon approval of the Commission. Any revisions to these rules would be done by the usual rule-making process that would include multiple opportunities for public input through workshops and then a public hearing before the Commission. The county-specific rules that reference the availability of guiding or commercial fisher permits also would need to be amended; however, these rule amendments could be made over time as the affected rules are reviewed and amended in accordance with the normal cycle of rule review.

CHAPTER 7: MANAGEMENT ACTIONS

Introduction

Successful implementation of this plan will require improvement of long-term existing programs and strategies, as well as the adoption of additional conservation actions and new approaches. Future actions will be modified as needed based on the results of ongoing research efforts, including the evaluation of the effectiveness of previous management actions. Typically management efforts have focused on the reduction of threats to manatees and their habitat from anthropogenic causes. Recently published analyses (Runge *et al.* 2007b) indicate the two most prominent future threats to manatees are from watercraft-caused deaths and loss of warm-water refuges (artificial and natural). Therefore, the agency will continue to pursue measures to address these impacts with the tools we have available. Additional information relevant to this chapter can be found in the appendices (particularly Appendix I, "Historic and Ongoing Manatee Conservation in Florida," and Chapter 3, "Legal Framework.")

Many of the conservation actions and tasks identified in the following pages are consistent with efforts recommended in the federal Florida Manatee Recovery Plan as important for manatee recovery. For many years, FWC staff has participated as members of the federal manatee recovery team responsible for helping update and implement the federal Manatee Recovery Plan. The federal plan is updated approximately every five years. Prior to developing this state management plan, the state program's initiatives and guidance were generally based on tasks identified in the federal Manatee Recovery Plan. The most recent federal recovery team was the largest ever formed and included many working groups with sizeable and diverse memberships in each group. In many cases, the FWC had representation on these working groups from management, research, and law enforcement. In September of 2007, the recovery team was disbanded and will be replaced with a much smaller group that will develop the next revision of the federal recovery plan. While there are some small differences in the specific tasks described in this state plan, the general approaches are very similar to the federal plan.

We will continue to use the previously identified subpopulation regions identified in the USFWS Recovery Plan. These four regions (Atlantic, Southwest, Northwest, and St. Johns River) are referred to as management units in this plan. Dividing the state into management units allows the FWC to implement different actions to address the differing threats in these regions. For example, ensuring the continuation of minimum spring flows is very important for both the Northwest and St. Johns management units. Contingency plans for the future loss of warm-water sites at power plants are vital for the Atlantic and Southwest management units.

Cooperation and coordination with counties will continue to be an essential part of our approach to manatee conservation. The successful development and implementation of manatee protection zones and manatee protection plans has depended on working cooperatively with county governments. Many counties have their own environmental monitoring programs, inventories of boat facilities, law enforcement staff that help enforce speed zones, staff who review applications for boat facilities, and staff and programs that assist with information and education for the public about manatees. Counties often fund or assist in the collection of data important for many state-proposed evaluations of existing speed zones and county manatee

protection plans. For example, both Dade and Duval counties conduct ongoing manatee distribution aerial surveys (Dade since 1989 and Duval since 1994). Sarasota (2006), Collier (currently under way), and Dade counties (1991) have funded boat studies.

Similar to our coordination with counties is our extensive effort to coordinate all our management actions with the USFWS. Most recently in November 2003, the FWC and the USFWS developed a coordination strategy that provides a consistent approach to manatee protection at both the state and federal levels. The strategy outlines several initiatives for manatee protection, including how to address impacts from construction projects receiving regulatory authorizations. This strategy re-emphasizes the need for countywide MPPs as guidance during the permit review process, and directs federal and state wildlife agencies to develop a process for evaluating watercraft access projects. The process applies to all areas where manatees are present, with particular focus on the 13 "key" counties that were required to produce MPPs. The resulting interim strategy was developed and implemented in July 2005 (and subsequently revised in August 2006), and is referred to as "Interim II." It was also incorporated into the federal "manatee key" ("The Corps of Engineers, Jacksonville District, and the State of Florida Effect Determination Key for the Manatee in Florida," July 2005, version 1.1) used by the U.S. Army Corps of Engineers (USACOE) to identify projects with manatee impacts that require review by the USFWS. The use of Interim II typically reduces the time required to evaluate permit applications without reducing protection for manatees. This serves to reduce processing time and expense in the permitting of watercraft access facilities.

The FWC coordinates with the USFWS on many other aspects of manatee recovery such as the development of county manatee protection plans, manatee protection zones, and data acquisition needed to undertake all these efforts.

Manatee Protection Zones

The purpose of protection zones is to reduce risks to manatees and their habitat by limiting boat speeds or boat/human access in specific geographic areas. The first state-designated manatee protection zones were adopted in 1979. Most of these zones were established in close proximity to natural or industrial warm-water sites (*e.g.*, springs, power plants, or other industrial sources) where manatees gathered in large numbers during winter. Since that time, additional direction from the Governor and Cabinet resulted in identifying 13 "key" counties where countywide protection was needed. A settlement agreement in 2001 identified additional areas to evaluate for new or amended manatee protection zones, with zones subsequently adopted in many of the evaluated areas. Manatee protection zones are now established in all 13 "key" counties (including portions of some adjacent counties as part of these rules) and in four additional counties. The FWC has implemented zones to reduce risks to manatees from boat collisions and from harassment, with habitat protection as a secondary benefit of many of the zones (see Chapter 14, "Ecological Impacts").

In the future, protection zone efforts will focus on several tasks. One task will be to study the effectiveness of current zones and to refine the zone development process based on the outcome of that analysis. Other tasks will include the review of existing zones based on new, updated manatee and boating data to determine if refinements are needed. Also, in an effort to be proactive, we plan to monitor other areas that currently have little or no regulation in order to

evaluate whether these areas may warrant protection zones. While coordination with the FWC Division of Law Enforcement (DLE) already occurs during rule development and other mutual tasks, this effort will be enhanced to ensure that zones result in the best and most enforceable designs. More focused outreach materials will also be developed to inform the public about zones and improve compliance. For more information on the basic process that is used to develop manatee protection zones, see Appendix V, "Manatee Protection Rule Development Process, September 2006." Also, Appendix III, "Florida Manatee Sanctuary Act Summary of Significant Changes 1978-2006" provides a history of changes made to the Florida Manatee Sanctuary Act which provides statutory authority for manatee protection zone rules.

Table 2 shows areas regulated by the state and federal governments for manatee protection in Florida.

Table 2: Summary of FWC and USFWS Manatee Protection Regulations in Florida.

Summary of FWC and USFWS Manatee Protection Regulations in Florida (2006)

6/27/06

COUNTY	Regulated by FWC (acres)	Regulated by FWC at or below Slow Speed (acres)	Regulated by USFWS (acres) [with no overlap with FWC zones] [1]	Total Inshore Waters (acres) [2]	% Regulated by FWC (Total)	% Regulated by FWC at or below Slow Speed	% Regulated by FWC and/or USFWS (Total)
BREVARD	53,204	53,019	22	160,400	33.2%	33.1%	33.2%
BROWARD	2,677	2,677	0	5,678	47.1%	47.1%	47.1%
CHARLOTTE	10,063	7,193	1,546	76,533	13.1%	9.4%	15.2%
CITRUS	28,679	3,064	0	28,766	99.7%	10.7%	99.7%
CLAY [3]	1,340	1,340	1,043	16,188	8.3%	8.3%	14.7%
COLLIER	32,792	12,408	0	48,600	67.5%	25.5%	67.5%
DESOTO	596	194	0	1,384	43.1%	14.0%	43.1%
DUVAL [3]	5,946	5,946	3,997	50,168	11.9%	11.9%	19.8%
FLAGLER	38	27	0	9,791	0.4%	0.3%	0.4%
HERNANDO	390	52	0	8,496	4.6%	0.6%	4.6%
HILLSBOROUGH	5,520	3,329	100	122,117	4.5%	2.7%	4.6%
INDIAN RIVER	10,946	10,302	0	16,839	65.0%	61.2%	65.0%
LAKE	2,860	2,347	0	2,950	96.9%	79.6%	96.9%
LEE	47,531	45,403	6,765	155,694	30.5%	29.2%	34.9%
LEVY	504	154	0	27,678	1.8%	0.6%	1.8%
MANATEE	13,623	12,564	0	57,373	23.7%	21.9%	23.7%
MARION	812	812	0	9,196	8.8%	8.8%	8.8%
MARTIN	10,016	8,726	0	78,883	12.7%	11.1%	12.7%
MIAMI-DADE	19,922	19,519	0	167,223	11.9%	11.7%	11.9%
PALM BEACH	7,417	6,786	0	158,588	4.7%	4.3%	4.7%
PINELLAS	1,670	1,670	30	114,562	1.5%	1.5%	1.5%
PUTNAM	451	451	0	45,236	1.0%	1.0%	1.0%
SARASOTA	9,775	9,178	529	20,350	48.0%	45.1%	50.6%
SEMINOLE	359	359	0	16,167	2.2%	2.2%	2.2%
ST JOHNS [3]	195	195	117	40,225	0.5%	0.5%	0.8%
ST LUCIE	11,887	11,490	0	25,011	47.5%	45.9%	47.5%
VOLUSIA	39,676	17,719	0	86,395	45.9%	20.5%	45.9%
Total (Regulated Counties)	318,888	236,922	14,150	1,550,492	20.6%	15.3%	21.5%
Total (Florida)	318,888	236,922	14,150	2,292,681	13.9%	10.3%	14.5%

[1] USFWS zones that overlap FWC zones are not included; however, in some locations overlapping USFWS zones are more restrictive than the FWC zones that they overlap

[2] Inshore waters are defined as those waters within estuaries and/or inside of barrier islands. This generally excludes waters of the Atlantic Ocean and Gulf of Mexico; however, in counties where manatee regulations include waters farther out (i.e., Citrus, Levy, Hernando), the "inshore waters" include waters described by a 1000-foot buffer into the Gulf of Mexico. Total value for Florida does not include estimates for the Pasco Co. thru Taylor Co. area, or Monroe Co.

[3] Calculation of area for USFWS zones assumes maximum width of USFWS zones (1000 ft) and minimum width of FWC zones (500 ft)

Other routine activities carried out by rule staff include the review of requests for variances from protection rules, typically for movie productions or special events involving the desire to exceed the speed zones in a certain area for a limited period of time. Some rules allow for permits to be issued under certain circumstances to authorize access to limited-entry zones or faster speeds than otherwise allowed for the following activities: commercial fishing and professional guiding, boat races, testing motors or vessels by manufacturers, resident access through speed-controlled areas or limited-entry areas, and general activities (usually used for

access to limited entry zones). More information on these types of activities is provided in Appendix I, "Historic and Ongoing Manatee Conservation in Florida."

Other requests handled by rule staff include the review of local manatee protection ordinances and petitions to create new or amend existing FWC zones. For example, the FWC received an informal petition in late 2005 from Citizens for Florida's Waterways (CFFW) requesting the addition of several higher speed corridors and water sports areas in the central portion of the county. Although the FWC determined there was not a basis to consider rule changes at the time, the FWC committed to gather additional boating data and to use the petition in our efforts to develop a methodology for evaluating the effectiveness of zones.

Effectiveness of zones

Cooperative efforts are currently under way between FWC, USFWS, and others to develop methods to better evaluate effectiveness of zones through the use of mortality analysis, risk analysis, a boat-pattern simulator, and boat planing-speed analysis. A more detailed explanation of these research efforts can be found in Chapter 10, "Ongoing and Future Research." In particular, a study is under way in Brevard County to evaluate potential rule changes recommended by CFFW. Part of the study involves collecting boating-use data by mail surveys and boat-distribution data by aerial surveys to use in the development of a risk assessment methodology. If the methodology is deemed useful and reliable, it could then be used to evaluate existing and proposed manatee protection zones in other areas.

Review of Existing Zones

FWC will review and evaluate existing protection zones to determine if modifications are warranted. Any changes to manatee protection rules will require the typical steps for rule promulgation described in more detail in Appendix V, "Manatee Protection Rule Development Process, September 2006." Eventually, all existing rules will be reviewed in this way, although the completion of this task will extend well beyond the five-year planning horizon of this plan. From one perspective, it would be logical to prioritize the review based on which rules have been in place the longest; however, other important factors may outweigh that general consideration so several factors will be evaluated to prioritize counties for review. For example, it will be important in this evaluation that newer data be available to conduct the reviews. The data needed in particular will be manatee- and boat-distribution data collected from aerial surveys. The manatee data will provide information that can be used to evaluate whether manatees have altered their use or distribution patterns within a county since the original rule was promulgated, while the boat data will provide information that can be used to assess levels of risk seasonally throughout the county. A list of the available manatee-distribution data is provided in Chapter 9, "Monitoring Activities," under the subheading "Aerial Surveys." Other types of reliable boating data will be considered from outside sources when available (such as information from counties and local authorities or other published studies relevant to boating); however, boat-distribution data from aerial surveys is often more cost-effective than other data collection methods.

Prioritizing the review of county rules will also include considering whether or not a specific manatee risk or boating safety issue (that was created by the placement of manatee protection zones) has been identified that needs to be addressed. Other considerations for setting

priorities are listed below and can be used in the process of selecting counties to review. For example, Broward and Sarasota counties have recent data for manatees and boats. Collier County will also have updated data by the fall of 2008. Manatee-distribution data were recently collected for Indian River and coastal Volusia counties but these counties lack boat-distribution data; however, these areas could be prioritized for review based on data availability. Conversely, the FWC Boating and Waterways Section is collecting boating data for Martin and Palm Beach counties; however, that manatee aerial survey data is over 13 years old and would need to be updated before these counties could be evaluated. Shown below in Table 3 is a listing of the 13 "key" counties identified in 1989 and those counties with zones completed in response to the 2001 settlement agreement. The year in which a countywide assessment of manatee protection zone needs was last made for each county is provided for the 13 "key" counties, with the counties listed in order of the length of time since a countywide review has been performed. In the case of non-key counties, the date represents review of a specific area of the county, not a review of the entire county. A history of rule promulgation for each county is provided in Appendix VI, "Manatee Protection Rule-making by County."

Table 3: List of county dates for existing manatee protection rules.

County	**Last Review**
Martin	1990 (Dec)
Palm Beach	1990 (Dec)
Volusia	1991 (July)
Miami-Dade	1991 (Dec)
Citrus	1992 (Jan)
Sarasota	1992 (Jan)
Indian River	1992 (July)
Broward	1993 (May)
St. Lucie	1994 (July)
Collier	1997 (June)
Duval	2000 (July)
Brevard	2002 (June)
Charlotte	2002 (Nov)
Hillsborough	2004 (Dec)
Manatee	2004 (Dec)
Pinellas	2004 (Dec)
Lee	2005 (Aug)

It should be noted that the review of existing rules may not result in a finding that changes are needed. If changes are deemed to be warranted for a particular rule, the timeline for modifying the rule would need to be coordinated with the FWC schedule for rule-making before it could begin. As required by statute, a Local Rule Review Committee (LRRC) would be requested from the affected county before formal rule-making could begin. This step is required regardless of the size or scope of the proposed rule change.

Prioritizing the **review of existing zones** will include, but not be limited to, the following considerations:

Considerations for Prioritizing the Review of Existing Rules:

- There is an identified manatee risk from watercraft impacts that requires immediate attention.
- The existing zones have been in place a long time and could benefit from a review, including minor modifications or simplification that would benefit boater understanding and ease of sign posting while not reducing manatee protection.
- A boating safety problem caused by a manatee protection zone has been identified.
- Manatee and boating data have been collected recently (at least newer than the data used to promulgate the existing zones).
- The Boating and Waterways Section (BWS) is reviewing the posting and adequacy of regulatory markers, or is considering the need for boating safety zones in a county. In these cases, consideration of possible changes to the manatee zones at the same time could minimize posting effort and costs.
- A county requests a review of the zones within its jurisdiction and provides a detailed rationale and discussion supporting its request.
- Some other type of information becomes available that suggests a need to review the existing rule(s).

Development of New Zones

New protection zones may be warranted in areas that do not currently have zones or that have only limited zones. Based on new information about manatee distribution and abundance throughout the state and the development of new areas of risk, an evaluation of some unregulated areas should be conducted. In some cases, the new or increased risks may be identified by noting an accumulation of approved permits for marine facilities in a focal area. If FWC determines protection zones are the appropriate strategy for safeguarding manatees in these circumstances, anticipating the need for the same manatee and boating data mentioned previously will be essential. Anticipating the need to evaluate new areas will provide an opportunity to collect the "before" data that is not available when evaluating the older rules. If new zones are warranted, boat traffic and manatee use should be evaluated after implementation to further the investigation of the effects of zones. The following areas have been identified as possible candidates for the evaluation for protection zones: Flagler, coastal St. Johns and coastal Duval (data available mid-2008), western Pinellas (Pass-a-Grille to Clearwater Pass–data dependent), and Upper Keys (Monroe County, north of Marathon–data dependent).

The Wildlife Trust is currently conducting a review of springs that are or could be used by manatees. This report should be complete in 2008. At that time, we can evaluate whether safe havens should be designated proactively to secure a series of sanctuaries along manatee migration routes to offset anticipated loss of artificial warm water.

Prioritizing the need for **review of areas for new zones** will include, but not be limited to, the following considerations:

Considerations for Prioritizing Assessments for New Rules

- There is an identified manatee risk from watercraft impacts that requires immediate attention.
- There are no zones or only limited zones in place and the area could benefit from a review to ensure protection of manatees and their habitat.
- Manatee and boating data have been collected recently and are available to use in the analysis.
- The Boating and Waterways Section (BWS) is considering the need for boating safety zones in a county. In these cases, planning for potential manatee zones (where appropriate) at the same time could result in increased agency efficiencies.
- A county requests new manatee zones and provides a detailed rationale and discussion supporting its request. For example, counties may request zone reviews to facilitate coastal development permits that add boat traffic to an area.
- Some other type of information becomes available that suggests a need to review an area.

A proposed timeline for implementing the review of areas and other rule-related activities described above is shown below in Table 4. The hatched lines represent when staff anticipates performing the tasks, with the years starting after the management plan is approved.

Table 4: Proposed timeline for manatee protection rule-related actions.

FWC Rule-Related Conservation Actions	Year One	Year Two	Year Three	Year Four	Year Five
A. Review of Existing Protection Zones					
1. Review zones in Sarasota County					
2. Review zones in Broward County					
3. Review zones in Collier County					
4. Review zones in Indian River and Volusia counties [1]					
B. Review of New Areas for Protection Zones					
1. Review Flagler County, and coastal St. Johns and Duval counties					
2. Review springs for possible safe havens (mostly St. Johns River)					
3. Review western Pinellas County (Pass-a-Grille to Clearwater Pass) [1], [2]					
4. Review Monroe County (Upper Keys) [1], [2]					
C. Other Rule Activities					
1. Review of existing fishing guide and commercial fishing permits for elimination, except for net-setting.					
2. Re-evaluation of the informal petition for rule amendments in Brevard County submitted by CFFW.					

Notes:

[1] Action dependent on collection of boating data

[2] Action dependent on collection of new or additional manatee data

Coordination Activities with Law Enforcement

During the review and development of any manatee protection zones, the Imperiled Species Management Section (ISM) will consult with the Division of Law Enforcement's (DLE) Boating and Waterways Section (BWS) for input from the enforcement, boating safety, and posting perspectives. This close coordination is needed because manatee regulations can affect

overall waterway management. This will ensure that any proposed manatee regulations will not have the unintended consequence of creating boating safety issues by their placement or be difficult to post due to their configuration. While this coordination has always taken place, it could benefit by being initiated at an earlier phase in the process.

ISM staff will work with the BWS to identify priority counties for collecting boating data. The funding for this data collection may be provided by BWS because this information can be used for a variety of waterway management purposes in addition to the consideration of manatee protection zones. Funding from BWS to collect boating data will allow more funds from the Save the Manatee Trust Fund to become available for collection of manatee data.

Manatee program staff within ISM and FWRI will participate in an annual manatee workshop for federal, state, and local law enforcement staff. Topics to be discussed include basic manatee biology, assistance from officers during rescues and carcass recovery, the use of data to develop manatee protection zones, sign posting issues, and increasing the effectiveness of enforcement efforts. The first of these workshops was held in October 2006. One of the expected outcomes is to develop a cooperative framework within the related sections of FWC as well as with the USFWS and local government enforcement entities. There is a desire to foster communication among all participants to improve enforcement efforts. It is important to provide "lessons learned" from the field to headquarters and *vice versa*. Open communication for improvements is the main goal of this annual workshop.

In an effort to keep DLE informed of the location and number of recent watercraft-related manatee deaths, ISM will provide DLE and the USFWS with a summary of the most recent six months of mortality data in August and January of each year. This will entail providing maps showing the locations of the most recent data, with a write up of any emerging hot spots, problem locations, or developing trends. This information can then be used by DLE field staff to assist them in designing and planning their patrols for protection zone enforcement. Other more frequent updates may be provided if warranted.

ISM will work with DLE to investigate the concept of the development of innovative boat hull designs and propulsion systems that may pose less risk to manatees. Some small, shallow-draft vessels and prop-less propulsion systems may be less dangerous than other types of more powerful, deeper-draft vessels. FWC has initiated dialogue with representatives from selected boat manufacturing companies to explore this design concept. If research demonstrated that certain hull design and propulsion combinations were significantly safer for manatees, management may be able to utilize incentives to increase public selection of these types of vessels. This idea is in the conceptual stage, and requires additional staff development as well as requiring consideration of many related issues beyond boat design. A proposed timeline for activities coordinated with DLE is provided (Table 5).

Table 5: Proposed timeline for activities coordinated with DLE.

ISM Coordination with DLE	Year One	Year Two	Year Three	Year Four	Year Five
Disseminate manatee education materials to regional law enforcement offices in targeted counties.					
Provide updated, county-specific manatee mortality, distribution, and abundance data (if available) for consideration during future law enforcement details.					
Provide updated poster-size maps of manatee mortality on a county-specific (or regional) basis.					
Alert law enforcement to areas that are "hot spots" for manatees, either because of unusual aggregations or areas with higher than usual manatee deaths, for consideration during law enforcement details.					
Provide training on manatee biology, ecology, and conservation to the FWC Law Enforcement Academy.					
Investigate innovative vessel designs					

Permit Reviews for Impacts to Manatees

In summer 1984, the Marine Mammal Section (of the manatee program) in the Department of Natural Resources (DNR) began reviewing and providing comments on applications for proposed boat facility projects that could affect manatees. Responsibilities at that time included providing comments to the Division of State Lands for sovereign submerged land leases and selected Developments of Regional Impact (DRIs). Concurrently, the manatee program also provided comments and recommendations to the Department of Environmental Regulation (DER), when requested, on pending dredge-and-fill permit applications (which included dry-storage facilities as well as facilities on privately owned submerged lands). The Governor and Cabinet's 1989 Directive to DNR included recommendations to review coastal development projects for impacts to manatees and their habitat. The manatee program has provided reviews and comments for approximately 6,300 projects in its 22-year history (summer 1984 through June 2007). The number of projects submitted to the manatee program has tripled between 1996 and 2007. More information about the history of this part of the manatee program can be found in Appendix I, "Historic and Ongoing Manatee Conservation in Florida."

In general, the FWC's process for reviewing permit applications includes screening applications to determine which ones to consider for review and comment. In order to complete the review, often additional information and clarification about the proposed project is needed. The FWC requests this information of the applicant through the responsible permitting agency, either DEP or one of the water management districts. Once all information is provided, the FWC provides final recommendations to the permitting agency.

In general, the types of information needed by the FWC to finalize our review include specific information about the project design, size, type, and location. Also needed is information about the natural conditions at the site such as existing water depths and a survey of submerged aquatic vegetation (SAV) present in the project footprint. It is often relevant to know if the proposal is a new project or an expansion of an existing project and if any previously received permits for the project are relevant for the review. A list of general, regularly asked questions are provided at the end of Appendix X. This is not an exhaustive list because each project can be unique and sometimes requires specialized questions.

The actions described below seek to address issues related to permit reviews. Some efforts may be achievable in a predictable amount of time, while others may need additional time to see if they can be done based on relevant rules and responsibilities of FWC and other agencies involved. A detailed description of how each task may be undertaken is not possible at this time. Once the manatee management plan is approved by the FWC Commissioners, staff will begin to develop some of the new concepts described in this section. Staff will consult with other agencies, counties, stakeholders, and others when developing concepts and processes that affect, or are of interest to, those entities. We will continue to review individual permits in coordination with the USFWS and other reviewers. Furthermore, we will explore developing a general approach to address certain types of small projects with similar and minimal impacts that would also provide appropriate protection.

Development of Permit Review Improvements

Coastal and wetland development projects require authorizations from state and federal regulatory agencies, such as the Florida Department of Environmental Protection (DEP) or the state water management districts (WMDs), and the U.S. Army Corps of Engineers (USACOE). More specifically, in-water work associated with marinas, boat ramps, boat slips, and channel dredging require state and federal permits. These developments, when located along Florida waterways, may also need permission to use state-owned submerged lands, which requires an additional authorization from the state. The FWC provides comments and recommendations to the state permitting agencies on environmental resource permits and sovereign submerged lands leases regarding project-related impacts to listed species and fish and wildlife, including secondary and cumulative impacts. These types of proposed activities can result in adverse impacts to manatees and their habitat. Direct impacts can include harassment or injuries to manatees from in-water work. Secondary and cumulative impacts to manatees include loss of habitat and potential injuries or harassment that may occur as a result of subsequent activities associated with the permitted project. To offset and minimize any expected adverse impacts from these activities, the FWC has recommended, on a project-by-project basis, permit conditions to regulatory agencies. More information about the FWC authority to review and provide recommendations for development projects can be found in Appendix X, "Authority References for FWC Marine Species Impact Reviews." The USFWS has a similar mission in response to federal permits and potential impacts to manatees.

An example of a secondary or cumulative impact would be an increase or change in boat traffic as a result of a new or expanded marina. Changes in boat activity patterns and changes in the volume of boat traffic may increase the risk of boat and manatee interactions. When assessing the effects of a particular permit, the cumulative effects of all past, present, and future

similar permits need to be considered to adequately address manatee-related impacts. Other types of permitted activities that result in impacts to manatees include dredging, blasting, locks and water-control structures, boat ramps, drainage culverts, and in-water filming activities.

The number of development projects that have the potential to adversely affect manatees continues to increase every year. FWC has limited staff to dedicate to project-by-project reviews for impacts to manatees. In an effort to improve the efficiency of the process, yet retain the level of protection provided by individual reviews, FWC intends to develop a consultation guideline that will address the projects outlined in the Interim II Strategy (2005) (see web link at http://www.fws.gov/northflorida/Manatee/Documents/Interim-II-version-1-1-August-2006.pdf) that was developed in cooperation with the USFWS. While the Interim II Strategy outlined types of projects that can move forward with a shortened timeframe for review, it still requires project review by the wildlife agencies.

As a natural progression of the intent of the Interim II concept, specific conservation measures for certain types of projects in certain locations will be identified in this consultation guideline. This document will allow the regulatory agencies to incorporate adequate conservation measures without having to consult with the wildlife agencies for some types of projects. For these projects in certain locations, the consultation guidance will provide the conditions that should be included in the permit to offset potential impacts to manatees. In those cases, the guidance will represent FWC's expert opinion for the permitting agency. This may significantly streamline the permitting process for many projects while not diminishing protection. In addition, measures may be provided for many small projects not currently reviewed by the FWC due to workload constraints. These projects would then receive a level of review and recommendations for manatee impacts that previously were not addressed. This would increase the agency's ability to provide more input on projects than is currently possible. None of this is intended to reduce protection for manatees. In most cases, the resulting recommendations for the types of projects captured by this proposed streamlining would be the same as if the project had received an independent review by our staff. The FWC will coordinate this effort with the USFWS so the same approach can be used for federal and state permits. It is likely that the USFWS's process would require developing a Programmatic Biological Opinion for the USACOE to accomplish this at the federal level.

The consultation guideline will also identify projects that will require individual reviews by the FWC because they pose a significant risk to manatees or their habitat. Reviews in areas with county manatee protection plans (MPPs) will continue as well. Interpreting the provisions of the MPPs requires coordination with the USFWS and the county to ensure consistent application of the plans. However, because the provisions of the MPPs help determine the outcomes of project reviews, these reviews usually take less time. The most time-consuming reviews are those in counties without plans where there are limited or no protective measures in place to offset the anticipated impacts of proposed projects.

The FWC will work with the state permitting agencies (DEP and WMDs), the USFWS, and the USACOE to develop new approaches and additional efficiencies to the permitting process when possible and only if resource and manatee protection are not diminished. The extent to which this can be accomplished has not yet been evaluated, but staff expects that some process efficiencies can be found without diminishing protections for manatees and their

habitats. Also under development are standard protocols to protect marine species, including manatees, from in-water blasting requested for some projects. Underwater demolitions can impact manatees and other marine species. This is being coordinated with the USFWS, the National Marine Fisheries Service (NMFS), and the Marine Mammal Commission (MMC).

Seagrass Protection

Direct and indirect impacts to seagrass habitat are addressed during the permit review process by recommending modifications to proposed projects to eliminate and avoid direct and indirect impacts. In some cases, mitigation to offset direct losses of seagrass is evaluated for adequacy and recommendations are made to improve proposed mitigation plans. In cases where impacts are too great and mitigation is inadequate, recommendations to deny projects are made. We will develop a proactive approach with the permitting and resource agencies to minimize the negative impacts on submerged resources of over-water structures. The FWC manatee program staff works closely with seagrass experts in FWC and other agencies to provide appropriate evaluations and recommendations on projects with proposed seagrass impacts. More details of seagrass protection and enhancement efforts are discussed in the "Habitat Protection" portion of this chapter.

Data Collection for Permit Related Cumulative Analysis

Florida's shoreline continues to be altered by individually permitted projects and, at this time, there is no method for assessing the cumulative impacts of these changes on manatees. Developing an appropriate approach for evaluating potential cumulative impacts to manatees has been challenging. So far, no widely accepted and tested method has been developed that will allow staff to assess cumulative impacts while they evaluate an individual project. Concern for developing such an approach is heightened by the fact that the annual rate of applications for proposed projects has significantly increased in recent years. One step toward developing a method of evaluating the aggregate effects of collectively located projects is to begin to create a GIS database of the location and size of existing boat facilities in areas of Florida used by manatees.

Part of this process includes mapping projects as they are reviewed so a database can be built from this point forward. Once this information is available in a GIS layer(s), staff evaluating projects will be able to review not only manatee data in the vicinity of a project, but also the presence of existing facilities in the vicinity of the project. In addition to manatee data, staff already include consideration of relevant natural resource information such as water depth and forage resources, and boating data such as speed zones in the area and existing boat traffic information. This effort will only begin the process of considering cumulative impacts from projects, but it will assist in future development of cumulative impacts assessments once methods are developed. This data layer will be developed with assistance from the USFWS.

Table 6 below provides an estimated timetable for completion of permit-related tasks described above. The timetable is based on staff estimates of how long each effort will take to accomplish and do not necessarily reflect the priority of the tasks. Because multiple staff will work on the various tasks, some can be developed concurrently.

Table 6. Proposed timeline for permit-related actions.

FWC permit review-related conservation actions	Year One	Year Two	Year Three	Year Four	Year Five
A. Manatee Impact Reviews					
1. Review and comment on potential state permitting actions to DEP and water management districts (ongoing)					
2. Refine and improve efficiencies in coordination with FWS, DEP, WMDs, and USACOE (ongoing)					
3. Develop consultation guideline to streamline permitting process in cooperation with agency partners					
B. Development of Protocols					
1. Develop and improve protocols for in-water blasting with USFWS, NMFS, & MMC (in progress)					
2. Develop and improve protocols for seagrass protection with partners					
C. Data Collection for Permit Related Cumulative Analysis					
1. Create GIS layer of existing boat facility inventories for consideration in permit review process (ongoing)					
2. Modify and update permit database to include Lat/Longs of projects to create a GIS layer (ongoing)					

Manatee Protection Plans

A manatee protection plan (MPP) is a comprehensive planning document that addresses the long-term protection of the Florida manatee through law enforcement, education, boat facility siting, and habitat protection initiatives. Although the MPPs are primarily developed by the counties, the plans are the product of extensive coordination and cooperation between the local governments, the FWC, the USFWS, and other interested parties.

The impetus for developing MPPs came from the federal Florida Manatee Recovery Plan and the state's l989 directive from the Governor and Cabinet, described in more detail in Appendix I, "Historic and Ongoing Manatee Conservation in Florida." In the state 1989 directive, 13 "key" counties needing to develop MPPs were identified and guidance was provided for what should be included in a plan as described in Attachment K, provided in Appendix VII. More recently, the 2002 Legislature amended §370.12(2), F.S., the Florida Manatee Sanctuary Act, to codify the 1989 report recommendations for the development of county MPPs in the specified counties. This statute provided deadlines for MPP development,

established criteria for approval, and required adoption of the boat facility element into county comprehensive plans. Currently, 11 of the 13 "key" counties have state-approved MPPs. A summary of county MPP development is provided in Appendix IX.

In general, the plans are to include all relevant manatee data, information on boating (boat traffic studies and marina inventories), manatee habitat, law enforcement, port facilities, and education and outreach. This information is analyzed to develop measures to protect manatees and their habitat from expected risks. The plans must include a boat facility siting element, seagrass protection measures, springs protection and other warm-water refuge protection, law enforcement strategies, plan for outreach efforts to the public, monitoring initiatives, and an implementation schedule to ensure that the identified listed activities will be addressed. More details regarding the development of boat facility siting plans are provided in Appendix VIII.

Thirteen "Key" County MPPs

Counties that have approved MPPs include Brevard, Citrus, Collier, Duval, Indian River, Lee, Martin, Miami-Dade, St. Lucie, Sarasota, and Volusia. Clay and Levy counties also have approved MPPs that they proactively developed even though they were not identified as one of the 13 "key" counties. Currently, two of the 13 counties that are required to develop MPPs remain without them: Broward and Palm Beach counties. Palm Beach and Broward counties both submitted completed plans approved by their county commissions and transmitted them to the FWC for review. Both plans were found to be inadequate in providing appropriate protections for manatees and this state finding received concurrence from the USFWS. Staff continues to work with these counties to develop MPPs that can gain state and federal approval. All proposed new plans and revisions to existing plans are evaluated using "Attachment K of the Governor and Cabinet 1989 Policy Directive" (Appendix VII) which was added to the statute in 2002.

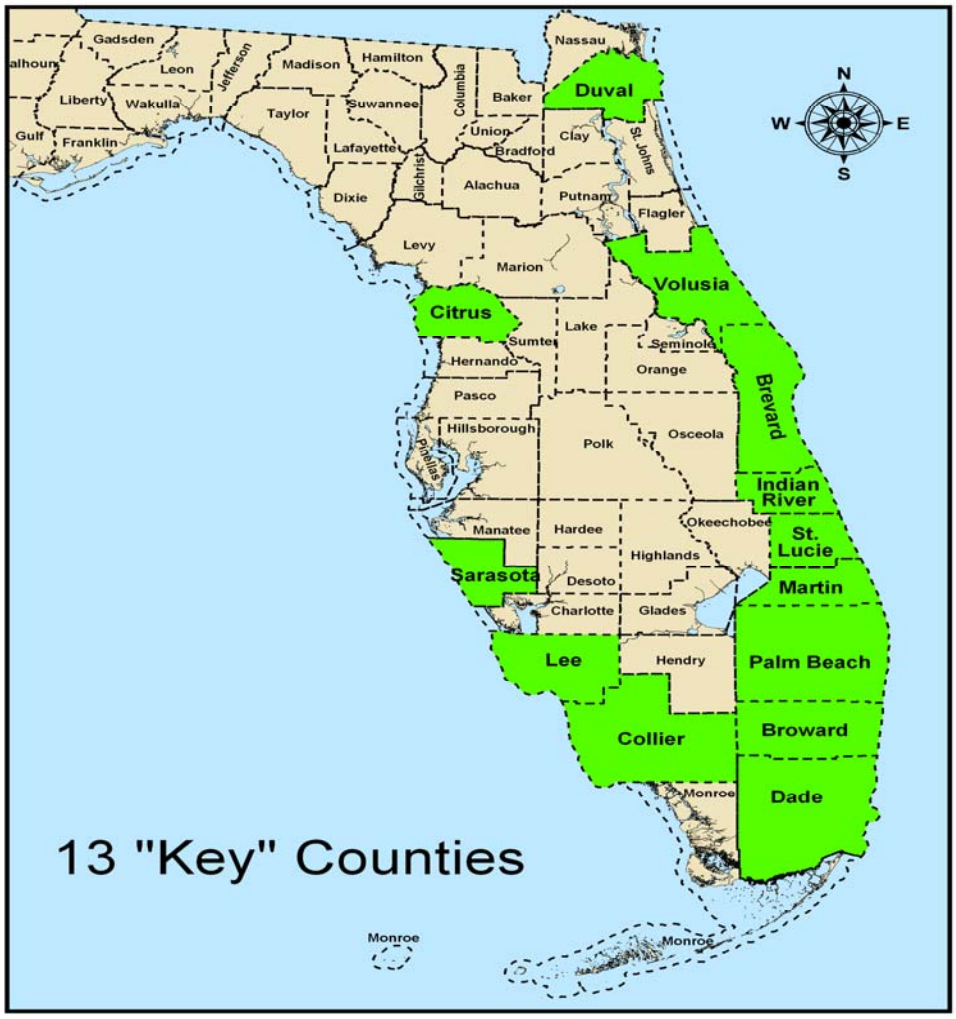


Figure 7: 13 “Key” Counties.

Updates of Existing MPPs

The FWC will review all existing MPPs to assess whether or not revisions are needed. These reviews will evaluate all relevant data collected since the last approval of the plan. In advance of this review, there are certain data or inventories that may need to be collected before the plans can be fully re-evaluated. In general, the following types of information will need to be updated: boat facility inventories including boat ramps, boat traffic and distribution studies, manatee distribution aerial surveys, and other sources of information (habitat assessments, etc.). Currently, a few counties with approved MPPs are collecting this information. Therefore, these counties may be appropriate to be re-evaluated first and could include Duval and Collier counties. Other counties will need to be identified, based on the anticipated schedule of data availability and other considerations; however, all existing county MPPs will eventually be evaluated. The reviews of county plans will be done in consultation with the counties and the USFWS. Some factors to be considered when setting the priority schedule for review are as follows:

- Status of available data for the review. Manatee and boating data, and boat facility inventories, must be more recent than when the MPP was developed or last reviewed.
- Length of time since the last review of the MPP.
- Identification of a particular manatee-related issue or concern that could be addressed by the MPP.
- A need to clarify language in the plan that makes implementation difficult or results in mixed interpretation.

A summary of county manatee protection plan development is provided in Appendix IX. Table 7, included below, shows dates for county speed zone posting and MPP approvals, and whether MPPs have been incorporated into county comprehensive plans.

Table 7. Approval dates for the 13 "key" counties for speed zones, MPPs, and comp. plan amendments.

County	State Countywide Speed Zones with Signs Posted	MPP Approved by the State of Florida	Comprehensive Plan Amendment Status
Brevard	Jul 1991 Feb 2003	2003	Approved
Broward	Oct 1994	Draft 2007	NA
Citrus	Dec 1992	1991	Adopted
Collier	Feb 1991 Oct 1998	1995	Approved
Miami-Dade	Apr 1993	1995	Adopted
Duval	Sept 1993	1999	Approved
Lee	Caloosahatchee River: Sept 1993 Countywide: Dec 2000 and 2005	2004	Approved
Indian River	Jul 1993	2000	Adopted
Martin	Jul 1991	2002	Adopted
Palm Beach	Nov 1991	Draft 2007	NA
Sarasota	June 1993	2004	Approved
St. Lucie	Sept 1995	2002	Approved
Volusia	Jan 1992	2005	Approved

Approved = reviewed and approved by FWC; Adopted = approved and adopted by DCA

Volunteer Counties for MPP Development

Counties that are not currently required to develop MPPs may choose to do so for the benefits they provide to the permitting process and to natural resource and manatee protection. If a county chooses to voluntarily develop an MPP, the state will assist the county in that effort. As stated previously, MPPs can ease the permitting process for the applicant by providing predictability and assuring a consistent response from federal and state wildlife agencies. This enhancement of the permitting process could provide an incentive for non-key counties to be proactive in developing county MPPs. In addition, some counties have found that developing the boat facility siting portion of the plan has required them to comprehensively consider their long-term needs for providing public access to the water. The plans also help protect submerged

aquatic resources that are not only important to manatees but important to many other species in the county, including those that contribute to recreational and commercial fishing activities.

To assist counties that may choose to develop MPPs, the FWC will develop a general template for these new MPPs. The templates will present the various required sections and provide examples of the information generally needed in each section of the MPPs. Each county will still need to customize the sections of the plan based on the data and information available for their county. The templates are a starting framework for plan development and are not expected to produce identical plans for all the counties. Because each county is different and has issues that are county-specific, it is expected that the plans will vary from each other as is appropriate for the conditions present in that county. The templates could also be used by counties revising their existing plans, if appropriate. Eventually, the template could help standardize the organization of county MPPs. This could make them easier for developers, consultants, and the public to use.

New MPP Guidance for New Substantial-Risk Counties and Approval Criteria

FWC staff proposes developing new guidance documents to assist with evaluation of counties for potential designation as new substantial-risk counties and MPP approval criteria. The guidance documents will evaluate all counties with manatee use and identify the relative risks of those counties for manatees. The documents will describe what data sources will be used and how the data will be analyzed and evaluated in making the risk assessment. The documents will also provide explanations of how the criteria of Attachment K are used to consider approvals of county manatee protection plans and other guidance for the development of county MPPs. Currently, the criteria for approval are contained in Attachment K, approved by the Governor and Cabinet in 1989, and, in 2002, included by the Legislature in Chapter 370.12 (2)(t). All the existing approved MPPs were evaluated for approval under Attachment K.

The FWC is authorized (but not mandated) in Section 370.12 (2)(t) to develop rules for identifying substantial risk counties and establishing MPP approval criteria. At this time, FWC staff favors development of guidance documents rather than rule promulgation. The guidance documents may provide greater flexibility for the agency to consider innovative approaches for manatee protection plans and allow adjustments to plans based on evolving needs. Once the guidance documents are drafted, input from counties, the USFWS, and stakeholders will be requested to assist the FWC in finalizing these documents. If this approach is not satisfactory, rulemaking is still an option. The agency favors a more flexible, less regulatory approach and believes that more counties will volunteer to develop MPPs due to the benefits of such plans to long-term resources and manatee protection, and predictability for the regulated community.

Review of Comprehensive Plans

Under Section 370.12 (2)(t)3, F.S., a county required to adopt an MPP must adopt the boat facility siting plan into its comprehensive plan. It is important to coordinate with the Department of Community Affairs (DCA) to ensure appropriate review of these amendments. In addition, the Evaluation and Appraisal Report, conducted every seven years for county comprehensive plans, should be reviewed in counties with manatee use for issues relevant to

manatee conservation. When possible, with the assistance of DCA, city comprehensive plans in the 13 "key" counties should also be reviewed.

Evaluation and Monitoring of Effectiveness of Management Actions

The FWC will evaluate the effectiveness of permit reviews and the implementation of county MPPs for the recovery of manatees in Florida. One part of this evaluation will include an assessment of all the counties with manatee use statewide, based on manatee and other relevant data, to determine if adverse impacts are being addressed through these actions. The methodology has not been developed at this time but will be a future effort of the agency.

The proposed timeline for implementing the MPP activities described above is provided in Table 8 (including new tasks). The hatched lines represent when the tasks will be performed, with the years starting after management plan approval.

Table 8. Proposed timeline for manatee protection plan actions.

FWC MPP-related Conservation Actions	Year One	Year Two	Year Three	Year Four	Year Five
A. Develop MPPs in the 13 "Key" Counties					
1. Assist Broward County in developing an approved MPP with FWS (in progress)	▒				
2. Assist Palm Beach County in developing an approved MPP with FWS (in progress)	▒				
3. Review comprehensive plan amendments related to MPPs for DCA (ongoing)	▒	▒	▒	▒	▒
B. Review Existing MPPs in the 13 "Key" Counties for Possible Revisions					
1. Review MPP for Duval County with FWS		▒	▒		
2. Review MPP for Collier County with FWS		▒	▒		
3. Review minor revisions to existing plans with FWS (ongoing)	▒	▒	▒	▒	▒
4. Determine schedule for review and revisions of all existing MPPs[1] with FWS			▒	▒	
C. MPPs in the "Non-Key" Counties					
1. Develop a MPP template for use by existing 13 counties for MPP revisions and for new counties developing MPPs, with FWS coordination.	▒	▒			
2. Conduct analysis of counties with manatee use to evaluate relative risk for manatees with FWS coordination.	▒	▒			
3. Develop guidance document explaining MPP approval requirements with FWS cooperation.	▒	▒			
D. Evaluation and Monitoring of Effectiveness					
1. Develop method and assess implementation of permit reviews and MPPs with FWS			▒	▒	
2. Develop method and assess, statewide and over time, whether adverse impacts to manatees are being addressed by permit review and MPPs with FWS					▒

Notes: [1] Action dependent on collection of new or updated manatee and boating data

Habitat Protection

The habitat requirements of the Florida manatee will not change in the future. Over time, however, the availability and quality of these habitats will be affected by various factors. Our ability to preserve, protect, and enhance these habitats will, in large part, determine the future status of the Florida manatee. The challenge today is to manage and conserve the manatee

population and its habitat in an already altered state. This habitat continues to change as the surrounding land is increasingly urbanized by Florida's growing human population. FWC has focused on issues such as seagrass protection, freshwater aquatic plant management, protection of natural springs, reduction of risks to manatees from water-control structures and navigational locks, and responses to long-term changes to manatee warm-water habitat (industrial and natural).

FWC's focus on manatee habitats will not change significantly. Although the manatee's habitat requirements will not change, FWC's priorities will. FWC's ongoing tasks will continue until accomplished and new objectives have been and will continue to be identified. Provided below is a summary of the habitat topics and the ongoing and newly identified habitat tasks, with estimated timelines for completion.

Warm-Water Habitat

Adequate warm-water habitat is essential for manatee survival during the winter and maintaining regional warm-water networks may be the single most important habitat issue to face the Florida manatee population in the future. Warm-water resources, along with foraging resources in proximity to these focal areas are viewed as the least common denominator determining carrying capacity. The creation of warm-water outfalls from electric power generating plants and other industrial facilities over the past 60 years has contributed to manatee population growth by providing access to more habitat during winter and by reducing the extent of cold-related mortality. However, the full extent of the impacts of power plants on manatee abundance and distribution is speculative, as there is little historical information regarding manatee abundance and distribution prior to the proliferation of these warm-water sources. It seems clear, however, that power plants have altered manatee winter distribution, allowing manatees to over-winter as far north as southeast Georgia and northeast Florida. Closures of

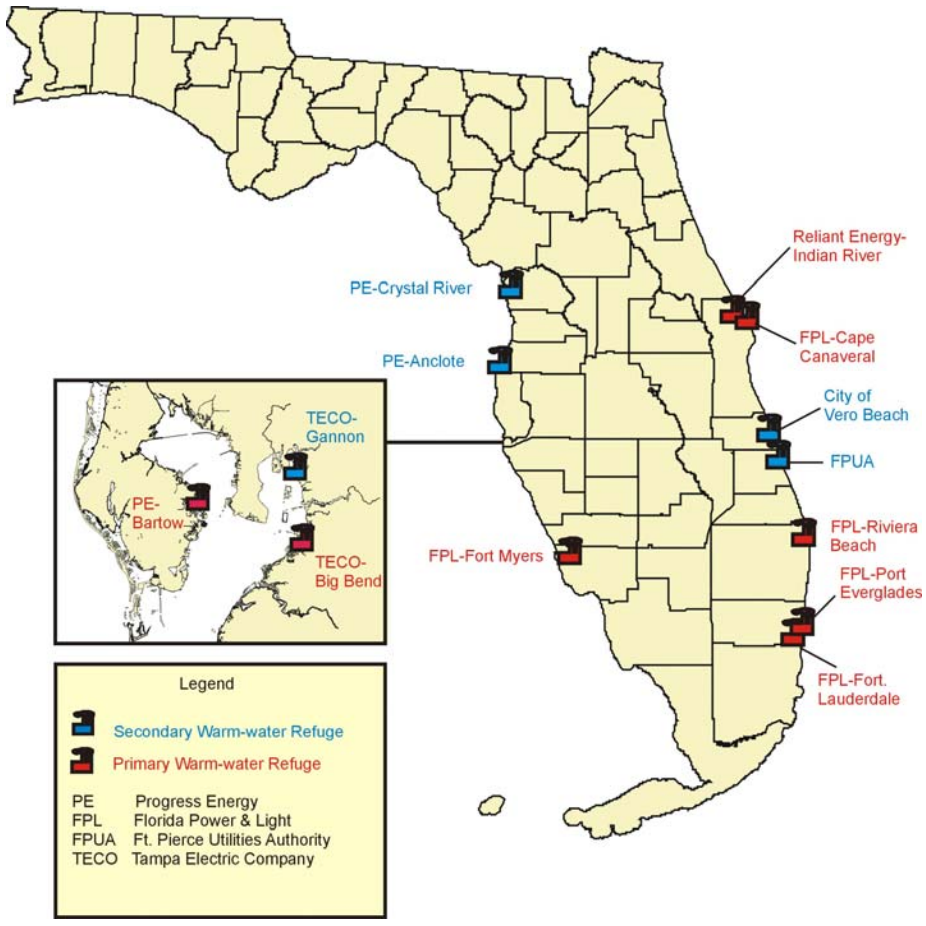


Figure 8: Primary and secondary industrial warm-water habitat.

power plants in Duval County and alterations of industrial outfalls in Georgia have significantly reduced winter manatee presence in extreme northeastern Florida. However, over 600 manatees have been counted at power plants in central Florida (Brevard County) during the winter (FWC unpublished data). Currently, approximately 60% of the manatees counted during synoptic surveys are known to use the thermal discharges created by coastal power plants (Figure 8). It is possible that the altered winter distribution also affects year-round distribution. Telemetry studies show that some of the manatees that range into north Florida and coastal Georgia during the warm months return to the power plants in Brevard County in the winter.

The habituation of manatees to industrial warm-water discharges may have increased the risk of cold-related deaths due to manatee dependence on these warm-water sites and their potential lack of knowledge of alternate warm-water habitats. These potential impacts of power plants are not just a factor for manatees in northern Florida. In south Florida, manatees gather in large numbers at power plants in Palm Beach and Broward counties on the east coast and in Lee County on the west coast; the level of dependency on these warm-water sources is not entirely understood. While it is clear that manatees are attracted to these warm waters, it is not certain if they are essential for manatee survival in southeast Florida or simply a manatee preference. During severe cold conditions, even manatees in extreme southern Florida (*e.g.*, Collier County) are vulnerable to cold-stress-induced mortality. It is reasonable to assume then that, without the southern power plants, more manatees would die in south Florida during particularly cold winters.

A number of stakeholders have suggested that the management plan should include provisions to maintain manatees in a more "natural" habitat condition, and take steps to "wean" manatees from dependence on power plants. Some stakeholders have suggested that carrying capacity for manatees in Florida should be based on the habitat's carrying capacity without warm water from power plants. However, the potential future reduction or loss of power plants is one of the very factors contributing to the manatee being listed as threatened. Based on the best available data and expert opinion, the elimination of power plants could result in significant loss of manatee life and in the manatee remaining at the threatened level or, depending on the number of manatees lost, could result in the manatee meeting the endangered criteria.

This situation creates interesting potential public policy decisions regarding the long-term reliance on man-made warm-water sources. Our models suggest that one way of moving manatees toward recovery is to ensure that there are no predicted significant population declines. If warm-water sources are maintained and protected, the probabilities of population declines are greatly reduced and manatee recovery (at least using the state criteria) could be achieved. Whether the public is willing to achieve recovery of this species if it means long-term reliance on artificial warm-water sources (either power plants or other means of heating water) is not known. Another possible scenario is that manatees could adapt to the changing availability of warm water by increasing their southward migration in the winter, thereby avoiding significant loss of life. While this possibility is not given much support by the manatee experts consulted, even if the manatee population did shift, it raises the question of the carrying capacity of extreme south Florida during the winter. It is not currently known if a huge influx of manatees can be supported during the winter months by the existing warm-water habitats. Additionally, what possible management changes, such as boat speed regulations and safe havens, might be needed if those manatees presently wintering in central Florida began wintering in south Florida?

This management plan does not propose a solution for these complex public policy issues. We do propose to take a number of steps that will help us obtain additional information so that policy-makers can deal with these issues in an informed and reasoned manner. Over the next five years, FWC plans to conduct an analysis of the legal aspects of the potential changes to existing warm-water habitat as well as conducting a query of public attitudes regarding the warm-water habitat issue. The knowledge gained from these two tasks will provide important information that will help guide the agency's future actions. In addition, existing natural and passive warm-water sites will be assessed for suitability and adequate protection. Another important consideration is the development of a detailed contingency plan in the event of temporary or permanent loss of warm-water habitat. FWC is currently working out the coordination details of this plan.

If we are to achieve further downlisting of the Florida manatee or at least ensure that the risk of extinction does not increase and thus merit listing as endangered, it will be necessary to maintain regional networks of warm-water habitats that will continue to support the four currently recognized Florida manatee management units and the Florida population as a whole. New warm-water habitat also needs to be identified prior to the loss of existing industrial warm-water sites to ensure that there is enough warm-water habitat to sustain the current regional populations and allow for future growth. Over the long term, warm-water habitat that replaces existing industrial warm water should be based as minimally as possible on technology, so a similar dilemma does not recur. The physical replacement of warm-water habitat is only part of the solution that must be considered in warm-water habitat planning. Behavioral adjustments by manatees are also necessary. Many manatees will have to overcome a demonstrated strong site-fidelity to their former warm-water habitat and adapt to new warm-water habitat, something that may take years to achieve. Another important consideration is the development of a detailed contingency plan in the event of temporary or permanent loss of warm-water habitat. FWC is currently developing a detailed coordination plan to address such contingencies. FWC will not be able to accomplish all these tasks independently, and will require assistance from other agencies, the WWTF, and our many stakeholders, including the power-generating industries.

Table 9. Proposed timeline for implementing warm-water habitat actions.

Future Conservation Measures – Warm-Water Habitat (see also Chapter 10, "Ongoing and Future Research.")	**Year One**	**Year Two**	**Year Three**	**Year Four**	**Year Five**
Develop comprehensive interim and long-term plans for the management of manatee warm-water habitat.	■				
Warm-water habitat plan - Complete a thorough analysis of endangered species case law related to issues associated with changes to industrial warm-water habitat.	■				
Identify components of regional warm-water habitat networks and establish protection measures for sites that require this action.	■	■	■	■	
Conduct an analysis of public attitudes and expectations regarding warm-water options and their potential consequences.	■				
Assess management response alternatives for the loss of industrial warm-water habitat including weaning, maintaining warm-water sites and monitor/rescue. (See "Ongoing and Future Research" chapter for further information).				■	■
Identify funding sources that will assist in the implementation of warm-water research and management activities.	■	■			
Assess carrying capacity of warm-water habitat in Florida. (See "Ongoing and Future Research" chapter for further information)					■
FWC Contingency Plan - Complete an interagency contingency plan for responding to a temporary or permanent shutdown of all industrial warm-water sites. (See "Ongoing and Future Research" chapter for further information)	■				
Industrial warm-water sites - Coordinate with power companies to identify timelines, methods, and procedures for reducing the risk to manatees in the event of a change in plant operations that affect existing warm-water habitat.	■	■	■		
Update and modify existing NPDES Manatee Power Plant Protection Plans.			■		
Passive warm-water habitats - Identify, assess, protect, and enhance existing and potential passive warm-water habitat (*e.g.*, thermal basins, groundwater seeps, canals).			■	■	■
Alternative warm-water sites - Evaluate technological methods that may be employed to create small warm-water sites (*e.g.*, solar, thermal blankets, donkey boilers).			■	■	■

Springs

Natural spring flows continue to decline as human demands for groundwater increase (Florida Springs Task Force 2000). The loss or alteration of these warm-water sites will directly affect the animals that now depend upon them, as well as the overall carrying capacity for the manatee population. The protection and enhancement of natural sites and how we address the loss of industrial sites will set the course for the manatee's future. Springs provide extremely important habitat for manatees. During the spring and summer, spring-fed river systems provide food and fresh water; during the winter; springs also provide critical warm-water habitat (Figure 9). Establishing minimum flows and levels (MFL) to ensure the continuing availability of existing warm-water habitat is critical for manatee conservation and recovery. Table 10 provides a list of completed MFLs for important manatee warm-water habitat while Table 11 lists proposed timelines for completion of some of the important natural spring warm-water sites.

Figure 9: Important natural spring habitat currently used by manatees as warm-water habitat.

Table 10: Completed MFLs at important manatee warm-water habitat.

Water Management District	Water Body	Date Approved
St. Johns River WMD	Blue Spring	2006
Suwannee River WMD	Lower Suwannee River	2006
Suwannee River WMD	Fanning Spring	2006
Suwannee River WMD	Manatee Spring	2006

Table 11: Proposed dates for MFL completion for important natural warm-water habitat.

Water Management District	Water Body	Proposed Date
Southwest Florida WMD	Weeki Wachee River System	2007
Southwest Florida WMD	Weeki Wachee Springs	2007
St. Johns River WMD	DeLeon Springs	2007
Northwest Florida WMD	Wakulla Springs	2008
St. Johns River WMD	Silver River	2008
St. Johns River WMD	Silver Springs	2008
Southwest Florida WMD	Homosassa Spring	2009
Southwest Florida WMD	Homosassa River	2009
Southwest Florida WMD	Crystal River System	2010
Southwest Florida WMD	Kings Bay Spring	2010

There are also a number of Florida springs that have historically provided manatee habitat (*e.g.*, Rainbow Spring, Silver Spring and the springs of the Oklawaha River) that no longer do as a result of man-made changes to these sites (Beeler and O'Shea 1988 and Laist and Reynolds 2005). Warm-water habitat created by these spring systems and others will be needed to replace warm-water habitat that will be lost when the eventual changes to the industrial warm-water habitat occur. Springs that provide potential warm-water habitat will be identified and assessed for manatee accessibility and seasonal protection status. In addition, MFLs at springs and other water bodies like Biscayne Bay and Florida Bay must also be developed to maintain their current levels so potential winter habitat may be preserved.

Table 12. Proposed timeline for implementing natural springs habitat actions.

Future Conservation Measures – Springs/Riverine Habitat	Year One	Year Two	Year Three	Year Four	Year Five
Identify and assess Florida springs that may provide warm-water habitat for future use.	■	■			
Review all Florida natural springs that provide warm-water habitat for manatee protection and establish seasonal protection where needed.			■	■	
Establish minimum flows and levels on a priority basis at all Florida springs that provide primary or secondary manatee warm-water habitat.	■	■	■		
Establish minimum flows and levels on all riverine and estuarine systems that provide manatee habitat.	■	■	■		
Review and assess manatee accessibility to all Florida natural springs that provide potential warm-water habitat and prepare recommended management actions as needed to ensure accessibility.	■	■			
Promote restoration of potential natural Florida spring warm-water habitat that is currently inaccessible to manatees.			■	■	■
Continue to actively pursue springs protection through the state's Florida Springs Task Force.	■	■	■	■	■

Estuarine Submerged Aquatic Vegetation (Seagrass)

FWC will develop strategies for maintaining existing seagrass resources and restoring seagrass habitat where conditions are amenable for seagrass growth. Seagrass resources are the primary food source for manatees and provide habitat that serves a multitude of other species, including many that are important for recreational and commercial pursuits. As impacts to seagrass resources escalate, better strategies are needed for seagrass protection. Over-water structures, dredging, shoreline armoring, and non-point pollution all can result in direct and indirect adverse effects to seagrass. The effects of these activities in any given region of the state are cumulative and, even when the impact from individual projects is small, the sheer number of projects in some areas is creating a scenario of irreversible resource loss. The state often accepts out-of-kind mitigation for damages to seagrasses; however, mitigation techniques such as reef balls, mangrove planting, channel marking, and conservation easements do not address existing seagrass loss, the loss of foraging habitat for manatees, or the loss of habitat for a myriad of estuarine and marine species. Even in-kind mitigation by seagrass restoration and seagrass habitat creation has had mixed results and is not assured of success. Consequently, avoidance of adverse effects to seagrass should be a priority on all sovereign submerged lands.

To assist in addressing these and other seagrass issues, the FWC will work with our partners and other state and federal agencies to evaluate individual areas relative to their particular seagrass preservation needs and develop, as much as possible, coherent cross-agency strategies for seagrass protection. Coordination among DEP, the water management districts,

USFWS, NMFS, and FWC can be used, with minimal time input, to develop proactive, effective strategies for seagrass protection. The strategies should address cumulative effects of construction projects in particular areas of the state and reduce overall seagrass effects from the increasing Florida human population. To address these issues, FWC has taken steps to implement the statewide seagrass management plan, create an interagency statewide seagrass monitoring plan, and evaluate the feasibility of a rule for the protection of the state's seagrass resources, following the timeline suggested in Table 13.

Table 13. Proposed timeline for implementing submerged aquatic vegetation actions.

Future Conservation Measures – Submerged Aquatic Vegetation	**Year One**	**Year Two**	**Year Three**	**Year Four**	**Year Five**
Implement statewide Seagrass Management Plan.					
Organize a statewide interagency seagrass monitoring program.					
Develop and implement statewide legislation that deters seagrass scarring by vessels. Use fines collected under this statute for restoration of vessel-damaged seagrass.					
Evaluate the feasibility of a statewide comprehensive seagrass protection rule.					
Complete HWG assessment of manatee carrying capacity relative to food resources and warm-water habitat needs at selected regional sites. (See "Ongoing and Future Research" chapter for further information.)					
Assess the efficacy of seagrass mitigation projects.					
Assess the effectiveness of new over-water structure design techniques for seagrass protection.					
Develop permit guidelines for the construction of over-water structures that will further promote seagrass protection.					

Water Control Structures and Navigational Locks

Retrofitting of most water-control structures and navigational locks is expected to be completed by 2010. Providing manatee protection at these structures has been completed through a project cooperative agreement between the USACOE and the South Florida Water Management District (SFWMD). At this point, 28 structures have been retrofitted and six remain to be retrofitted under this agreement (Table 14).

Table 14: Water-control structure and navigational lock retrofitting status–2007.

Structures	County	# of Manatee Deaths 1975-2006	Date Retrofitted
Navigational Locks			
Inglis Lock	Levy	3	Closed
S-193	Okeechobee	7	1994
St. Lucie Lock and Dam	Martin	16	1998
Port Canaveral Lock and Dam	Brevard	14	2000
Buckman Lock	Putnam	4	2001
Ortona Lock and Dam	Glades	20	2007
Moore Haven Lock and Dam	Glades	13	
Port Mayaca Lock and Dam	Martin	8	
Franklin Lock and Dam	Lee	2	
Vertical Navigational Locks			
S-131	Glades	2	2000
S-135	Martin	4	2000
G-36	Okeechobee	5	2001
S-127	Glades	0	2004
S-310	Hendry	0	
Water Control Structures			
S-26	Dade	4	1996
S-29	Dade	12	1997
S-25B	Dade	7	1998
S-27	Dade	18	1998
Rodman Dam	Putnam	7	2002
S-21	Dade	5	2002
S-22	Dade	6	2002
S-28	Dade	6	2002
G-93	Dade	0	2002
S-20F	Dade	9	2003
S-20G	Dade	2	2003
S-21A	Dade	3	2003
S-13	Broward	4	2004
S-123	Dade	0	2004
S-25	Dade	0	2006
S-33	Broward	2	2006
S-352	Palm Beach	1	
S-36	Broward	1	
Rocky Creek – A & G	Hillsborough	2	

The SFWMD continues to look for techniques that enhance manatee protection devices and provide improved performance, extended longevity, and flexibility in the operations of water-control structures and navigational locks. FWC will continue to review new structure designs and monitor retrofitted structures and test their efficacy.

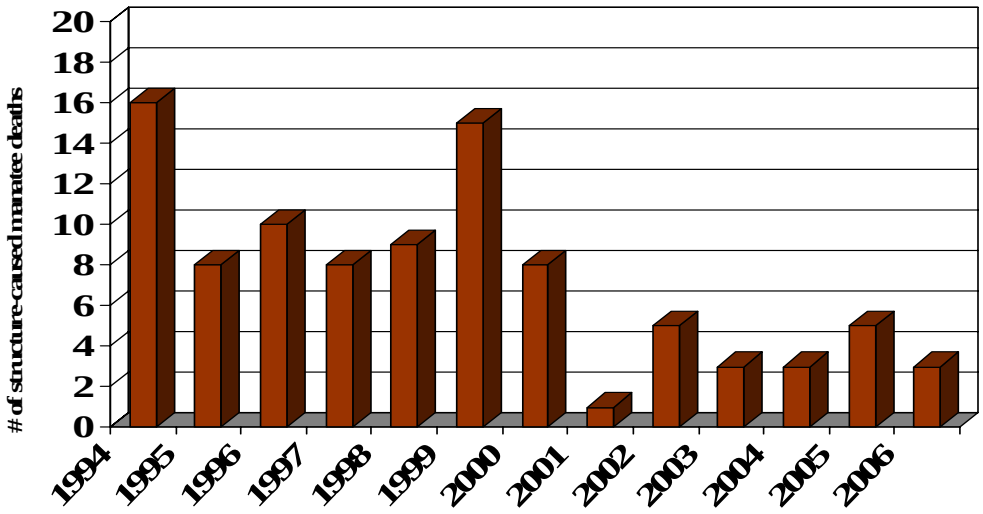


Figure 10. Number of structure-caused manatee deaths from 1994-2005.

In addition to the originally identified 34 structures and locks being addressed in the Project Cooperative Agreement (PCA), six other structures, three operated by the USACOE at the southern end of Lake Okeechobee, two by the SWFWMD, and one privately operated lock have been identified as causing either a manatee death or entrapment. Plans for retrofitting these structures are in varying degrees of completion, and FWC will continue to monitor the resolution of these structures. FWC will also continue to address manatee concerns that occur through activities related to the Comprehensive Everglades Restoration Plan (CERP), primarily through FWC's Kissimmee, Okeechobee, Everglades, and Big Cypress Committee (KOEBCC) and cooperative efforts with the USFWS, USACOE, and the SFWMD.

Table 15. Proposed timeline for implementing water-control structures and navigational lock actions.

Future Conservation Measures–Water Control Structures and Navigational Locks	Year One	Year Two	Year Three	Year Four	Year Five
Complete all PCA Phase I manatee protection retrofitting at water-control structures and spillways.	■				
Complete all PCA Phase II manatee protection retrofitting of navigational locks and spillways.	■	■	■		
Complete manatee protection retrofitting of SWFWMD structures.		■	■		
Review new technology for the protection of manatees at water-control structures, spillways, and navigational locks to enhance manatee protection and provide water managers with additional flexibility.	■	■	■	■	■
Identify any other water-control structures, spillways, or navigational locks that may require manatee protection devices.				■	■
Continue to participate in the Comprehensive Everglades Restoration Plan through review and comment on specific projects and teams (KOEBCC and the CERP Manatee Task Force).	■	■	■	■	■

Aquatic Plant Management

Aquatic plant management is an issue that will continue to garner FWC's attention through ongoing efforts with established working groups. Freshwater vegetation, both native and non-native, provides important manatee forage. Our efforts are aimed at controlling non-native and invasive species and encouraging the growth of native vegetation while ensuring that adequate manatee forage will be present during the winter months. A current objective is to assess and map freshwater vegetation near warm-water habitat so these resources can be monitored through future winters, ensuring an early warning should these resources should begin to recede. FWC will continue to work closely with DEP's Bureau of Invasive Plant Management and the Division of State Parks, USFWS, USACOE, and the respective county governments in our efforts to safely control exotic vegetation and promote the re-establishment of native submerged aquatic vegetation.

Table 16. Proposed timeline for implementing aquatic plant management actions.

Future Conservation Measures–Aquatic Plant Management	Year One	Year Two	Year Three	Year Four	Year Five
Continue to represent manatee interests on the Blue Spring Aquatic Plant Management Working Group.					
Continue to represent manatee interests at the annual Crystal River Aquatic Plant Management Working Group meeting.					
Continue interagency coordination on the conservation and restoration of submerged aquatic vegetation in Kings Bay.					
Assess and map freshwater aquatic plant resources near manatee warm-water habitat.					

Outreach and Education Efforts

Past and Current Activities

Public interest in Florida's manatees has grown steadily since the earliest efforts to provide information on them in the late 1970s. At one time, the manatee program regularly received manatee information requests from thousands of individuals all over the world each year. To meet their needs, informational brochures and posters were developed, printed, and mailed on a regular basis. In 1996, basic manatee information was posted online through the internet to provide information directly from the web. In 1999, access to information about management and research activities was added to the agency website. (FWC web pages on manatees include http://myfwc.com/manatee/ and http://research.myfwc.com/.) The web pages are updated regularly with new information; however, individual questions continue to be addressed via e-mail and written correspondence.

The FWC's primary public information, education, and outreach initiatives are designed to inform and educate the public about the manatee, its place in Florida's environment and ecosystems, and the threats it faces. These outreach efforts aim to minimize negative human effects on manatees by promoting a sense of stewardship about our use of aquatic and marine environments. FWC targets Florida's citizens and visitors to increase their awareness of manatees. The FWC develops press releases, public service announcements, publications and products for targeted groups, signs for boat ramps and marinas, and informational displays for public educational purposes. FWC staff assists county governments in developing the educational component of their manatee protection plans, and provides publications to a statewide network of oceanaria, parks (federal, state, county, and city), visitor centers, and environmental education facilities. More details of past and current efforts regarding manatee outreach and education are provided in Appendix I, "Historic and Ongoing Manatee Conservation in Florida."

Future Efforts

An evaluation of existing educational materials was completed and will be used to refine existing materials to increase effectiveness, and guide the development of future efforts. Future efforts will focus on clarifying public misconceptions about manatees, providing focus materials for particular interest groups, increasing public awareness of how to behave around manatees, and working to reduce manatee harassment. Staff in ISM, FWRI, and Community Relations will work together to develop an agency strategy for improving the dispersal of accurate information about manatees to the public. The agency will engage interested stakeholders when developing this strategy to ensure a well developed approach.

The following are future efforts for outreach and education:

- develop additional multi-lingual materials about manatees,
- work with the U.S. Coast Guard Auxiliaries to enhance the manatee information presented during boating safety classes,
- work with our law enforcement and USFWS staff to develop manatee approach guidelines and communicate a clear understanding of what constitutes harassment,
- develop materials to explain what "slow speed" means,
- provide materials for marina education programs, and
- develop large vessel docking guidelines for port facilities

Effectiveness of Education and Outreach

Little is known about how effective outreach and education efforts can be in conveying important conservation messages. The FWC and other agencies have attempted to inform the public about manatee issues using a variety of typical methods; however, we have limited information about which ones work best and why. The use of printed information was shown to have little positive impact on desired behavioral outcomes on a military base (Jacobson and Marynowski 1998). The purpose of much of the information provided to the public seeks to encourage specific behaviors in certain situations. Research has shown that communications that appeal to personal values can lead to behavioral change (Kelman, 1958; Osbaldiston and Sheldon, 2003). However, environmental problems are complex and require more to affect an individual's motivations. For example, perceived risk, accepted behaviors, and economics are additional elements that influence behavioral change. Studies have shown that for norms to influence behavior they have to be prominent (Caldini 2003), but effectiveness here can be dampened by distraction from the message (Kallgren *et al.* 2000). These studies have significant implications for how the state conducts effective manatee outreach and education. Messages need to be relevant and clear. An understanding of how the target audience acquires and perceives messages needs to be well understood. Finally, communications not traditionally considered outreach should be evaluated for their capacity to convey important conservation messages.

To improve our education and outreach approach, we plan to monitor public opinion concerning manatees and manatee protection, including attitudes of the public toward protection

efforts, willingness to take actions to protect manatees, responses to specific actions, and influences of stakeholder groups. This includes evaluating on a regular basis how effective the agency is at communicating to the public risks of extinction, cumulative impacts, collisions between vessels and manatees, and harassment. We will also evaluate what methods are best at communicating manatee conservation messages.

Table 17 describes the proposed action items for outreach and education efforts.

Table 17. Outreach and information activities.

Action Item Outreach and information activities	**Year One**	**Year Two**	**Year Three**	**Year Four**	**Year Five**
Implement recommendations from the survey of manatee education materials for revisions to current materials and development of new products and evaluate effectiveness (ongoing)					
Maintain distribution of outreach materials around state (ongoing)					
Develop new permit-related education materials and programs for marinas					
Develop new docking guidelines for large vessels					
Develop new materials to improve compliance with slow-speed zones in cooperation with law enforcement staff					
Work with federal and state partners to develop guidelines for manatee harassment issues					
ISM, FWRI, and Community Relations will work together to develop an agency strategy for improving the dispersal of accurate information about manatees to the public					

Geographic Information System Data Management

Geographic Information System (GIS) data and related computer support is provided by ISM staff for management efforts, including data support and maintenance for all existing GIS data and metadata, spreadsheets, and databases. Currently, efforts are focused on data analysis for MPP development, project reviews, and protection zones. In addition, staff creates manatee data maps requested by the Governor and Cabinet for projects on their agenda that have manatee impacts. They assist DLE with the development of sign plans for the posting of manatee protection zones. Graphical support for manatee educational endeavors is also provided and is used in presentations, brochures, Web site pages, posters, and the manatee decal. GIS staff also helps maintain the ISM website to provide information to the public.

Future Tasks

Future tasks include creation of maps that will depict watercraft-related deaths for the 13 "key" counties for posting on the web. These maps will aid law enforcement and our partners in assessing risk, and will be updated when a new full year of data is available. The web page will include a link to FWRI's online mapping tool: http://ocean.floridamarine.org/mrgis/viewer.htm.

Another task is to establish and maintain a process for periodically converting GIS coordinates in the permit application tracking database of docking facility permit applications into a shapefile. This shapefile will be used for reviewing permits to consider the cumulative effects of proposed projects. The information can also be used for MPP development and be made available to other partners.

- Compile existing boating facility inventories into a GIS cover for use in permit review and by MPP staff and their partners in their data analysis.
- Assist with data analysis that is required as part of the consultation guideline for permit review, the reassessments of protection zones, and the development and review of MPPs.
- Contribute to the data analysis needed to evaluate effectiveness of management actions.

Note that the GIS tasks are included in Table 6, "Proposed timeline for permit-related actions," of the section dealing with permit reviews in this chapter.

Manatee Forums

The FWC and the USFWS have been working to address the existing controversy surrounding manatee issues. Beginning in the summer of 2004, we have held a series of Manatee Forums with representatives of 22 selected stakeholder organizations. The goal of the Forums is to provide a process to improve communication and understanding among key stakeholder groups and participating agencies. Through this continuing process, we hope to establish areas of common ground, identify problems or conflicts, and develop potential solutions. The Executive Director of the FWC and the Director of Southeast Region of the USFWS have been instrumental in the development of this idea and its implementation.

From July 2004 through June 2007, the Forum met ten times; the meetings lasted anywhere from one to three days. Initial meetings served to define the group's mission and operating guidelines. The next several meetings focused on presentations of the latest available information regarding manatees and their habitat. The next two meetings concentrated more directly on conflict resolution and the goal of finding common ground. The last three meetings centered on explaining and discussing the various drafts of this state manatee management plan.

While the effort has taken some time to progress, both agencies believe our work together has been worthwhile in moving the manatee discourse forward, as well as reducing the intensity of the conflict among the stakeholders. The agencies plan to continue the Forum meetings into the future as long as they continue to be productive and are valued by the stakeholder participants. The Manatee Forum members have provided input on the content of the manatee management plan early in the process of its development. We will continue to solicit the input of the members of the Forum as the plan is developed, approved, and implemented.

Cooperation Within FWC

There are many opportunities within FWC for the divisions and offices to work together to assist in the recovery of the manatee and other imperiled species. Listed below are some areas within the agency where we will work to improve those efforts not already mentioned in previous sections:

- Provide input into Florida Forever land purchases, putting the focus on lands important to listed species' recovery.
- As a member of the Acquisition and Restoration Council, contribute to the development of good land management plans that will help protect, maintain, and recover species, particularly listed ones.
- Develop an agency approach to environmental commenting that integrates consideration of all wildlife, especially listed species.
- Work with Legislative Affairs to propose proactive legislation to ensure recovery of the manatee. Provide review of relevant proposed bills during the legislative session to ensure manatee protection is maintained. Meet with Legislative Affairs staff after each session to determine and understand the final outcome and intent of any manatee-related legislation.

Other Management Efforts

Propeller Guards

Since before 1993, the state's manatee program has responded to citizen and industry requests to institute the broad-scale use of propeller guards as a solution to the manatee-watercraft interaction problem. FWC staff has worked with inventors, citizens, marine outboard manufacturers, engineers, and the Boating Advisory Council to address this issue. FWC staff compiled information on various propeller-guard designs and performance tests in an effort to evaluate whether or not propeller guards could reduce manatee propeller wounds and death, not endanger people, and allow safe operation of watercraft equipped with these devices. Unfortunately, clear benefits to the operation of watercraft and protection of people are not

apparent with most designs. Research sponsored by the state manatee management program (a $100,000 contract with ocean engineers at Florida International University [FIU] and the University of Tennessee in 1998) showed that propeller guards are effective at stopping extensive cutting damage caused by propellers at low speeds. At high speeds, however, the resulting blunt trauma force appears to cancel out the benefits of the guards.

Based on the best available science, the FWC maintains that propeller guards do not provide significant protection to manatees from collisions with fast moving vessels. At slow speeds, propeller guards or some propulsion mechanism other than the open propeller systems may reduce the risks to manatees by reducing the potential for cuts. These may be beneficial in areas of very high manatee use such as aggregations in springs. However, propeller guards should not be considered a substitute for manatee protection zones that regulate boat access and speed.

Red Tide Concerns

Red tide research is an FWC priority. The impact of red tide on manatees is significant, and is a contributing factor to the low adult survival rate in the southwest region. In addition to research focused on red tide itself, there has been a considerable investment of resources into learning more about how it affects manatees and what can be done to reduce its impacts. Thus far, there are very limited management options, and no known ways to prevent manatees from being affected by severe occurrences of red tide. However, if manatees that are suffering from the effects of red tide are captured and brought to a treatment facility, they can often be successfully treated and released back into the wild. As we learn more about the biology and ecology of red tide, additional management options may become viable. More discussion of red tide is provided in Chapter 2, "Threat Assessment."

Manatee Avoidance Technology

FWRI administers a grants program for proposals that attempt to develop manatee avoidance technology to reduce risks to manatees. While some of this research may hold promise, presently there are no known devices or specific kinds of technology that are available to boaters that will reduce the risk of a collision with manatees. As the results of ongoing research are made available, the FWC will explore possible management applications of any promising technology. FWC maintains that, if avoidance technology devices were to be used to prevent manatee injury, they would augment existing manatee protection mechanisms already in place, but would not be a substitute for manatee protection zones that regulate boat access and speed. More discussion of the grants program and the funded projects can be found in Chapter 10, "Ongoing and Future Research."

CHAPTER 8: LAW ENFORCEMENT

Manatee Regulatory Zone Enforcement

The FWC's Division of Law Enforcement (DLE), in conjunction with our federal, state, and local law enforcement partners, has initiated a number of programs and tasks to enhance the safety of manatees and help ensure their survival. These efforts include the following: patrol goals for enforcing state and federal boating regulations, enhanced posting of the manatee protection zones, improved boater understanding of the regulations, reduced manatee harassment, reciprocal law enforcement training programs, and better coordination among all enforcement entities to improve zone coverage.

Manatee regulatory speed zones and protection areas are created by local, state, and federal agencies. The state develops manatee protection zones that include both speed regulations and several types of limited-entry areas; the federal government implements sanctuaries and refuges to protect manatees. Refuges are generally areas with speed regulations, and sanctuaries are areas where access is limited. Local governments can and do implement local manatee protection zones. The difficulty in developing an enforcement strategy is that only the state can enforce all types of regulatory zones. FWC is working with local and federal law enforcement agencies to address cross-training and appropriate interagency agreements to allow all law enforcement agencies to enforce all manatee speed zones. Cross-training and coordination between all agencies is required for consistent enforcement. The primary day-to-day responsibility of patrol and enforcement of these various manatee protection areas rests with the FWC. The FWC remains committed to patrolling these important local, state, and federal refuges put in place to protect manatees and their habitat. This is accomplished while balancing other enforcement responsibilities, both on land and water, to preserve our state's unique natural resources and protect its citizens.

In addition to routine patrols, FWC's DLE is called upon to respond to injured manatees, recover carcasses, and coordinate several statewide initiatives such as "Operation Sea Cow" and "Operation Slow Speed." The consistent presence of law enforcement patrols, combined with an effective education component that includes clearly understood signage, results in increased compliance with manatee speed zones and thereby affords the manatee greater protection.

These enforcement initiatives go hand-in-hand with other initiatives, such as fisheries protection and boater safety. Officers often multi-task while on patrol. It is common for an officer to be in a manatee zone, stop a boat to conduct a fisheries inspection and a boating safety inspection, and deal with any manatee-zone issues simultaneously.

Fines and Penalties

The state fine for a manatee speed zone violation, as with any boating infraction, is $50 plus court costs up to an additional $30. This fine amount was implemented for non-criminal boating violations in 1986 and later amended to include manatee speed zone violations. Adjustments to the fine structure may be overdue. FWC will consider the merits of increasing

these fine amounts and determine whether or not to bring the issue to the Florida Legislature for consideration.

Enforcement Tasks

Prior to 2004, FWC could not provide accurate data on the total hours spent on manatee patrol. In 2004, FWC committed to conducting 35,000 hours of manatee patrols. We exceeded the first year goal by over 10,000 hours. In 2005, the goal was raised to 50,000 hours of patrols and we have exceeded that goal in 2005 and 2006 by over 800 hours. To ensure consistent and effective manatee protection patrols throughout the state, FWC is now including these hours as a task in our DLE work plan. The yearly statewide manatee protection task is 50,000 hours of patrol directed toward manatee protection. Time that officers spend in manatee zones is considered to be much higher, which increases compliance, but officers generally do not claim manatee patrol hours unless they are concentrating on manatee enforcement.

To more effectively react to manatee issues, each FWC region will develop strategic manatee enforcement operational plans. These plans will include patrol techniques, improved signage, increased coordination with researchers and community relations to improve awareness of manatee movements or aggregations, and partnerships with local, state, and federal agencies.

Staffing

FWC currently has 724 sworn Law Enforcement positions that provide a variety of law enforcement services. A staffing study, completed by the International Association of Chiefs of Police (IACP) in June 2006, recommended that the FWC Division of Law Enforcement have a minimum of 1,005 sworn FTEs to meet increasing responsibilities and demands for law enforcement services. This recommendation would increase the division's current complement of sworn FTEs by 281. The IACP study stated that this recommendation was conservative and that resource threats, population trends, fieldwork, and qualitative measures such as stakeholder interviews and officer questionnaires corroborate the need for far more officers than was projected by the staffing study. These qualitative measures suggested that, to fully protect Florida's people, land, and waters, sworn staffing levels should be in the 1,500-2,000 range. FWC will consider this recommendation combined with available funding to determine what direction to take.

Law Enforcement Funding

In order to provide greater manatee protection and respond to this plan, the Division of Law Enforcement will spend approximately $4,000,000 per year on manatee initiatives that include enforcement and signage. All of this funding is derived from State General Revenue or the Marine Resources Conservation Trust Fund (Vessel Fuel Tax). This is stated to inform the reader that law enforcement is not dependent on the Save the Manatee Trust Fund to continue its mission of protecting manatees but is, as any other government program, dependent on the legislative budget process to continue this dedicated funding. DLE has also received grant funding from USFWS for manatee speed zone signage.

Training and Coordination of Protection Efforts

The FWC and the USFWS promulgate vessel regulatory zones to protect manatees. The enforcement of state manatee protection zones falls within the jurisdiction of federal, state, and local law enforcement agencies, which include municipal and county agencies. The primary law enforcement agency tasked with enforcing the protection zones is the FWC's DLE. Until April 2003, federal manatee protection zones created by the USFWS were enforced solely by agents of the USFWS Office of Law Enforcement.

The FWC and the USFWS entered into a Mutual Aid Agreement (MAA). The MAA establishes FWC's authority to enforce federal fish and wildlife regulations. This MAA provides an avenue for joint enforcement efforts in the state. Specifically, the FWC and USFWS plan and conduct joint enforcement efforts with regard to manatee protection.

One benefit of the MAA, with regard to manatee protection, is to provide USFWS agents with the authority to issue state citations for manatee protection zone violations and FWC Wildlife Officers with the authority to issue citations for violations of federal manatee protection zones. These shared authorities provide for a mutually consistent enforcement strategy by USFWS and FWC, and an avenue for the better coordination of enforcement efforts. The MAA operations plan includes tasks and strategy to increase compliance with state and federal manatee protection zones. The MAA provides specific information regarding joint law enforcement operations as follows:

Operation Details

1. The FWC and the USFWS will jointly conduct at least five targeted enforcement operations annually. The number of joint targeted enforcement details is lower than previous years due to budget cuts within the USFWS. The areas to be targeted will be in counties that meet some or all of the following criteria:
   - High or increased number of watercraft-related deaths in the previous year.
   - Areas of high or increased numbers of watercraft-related complaints received by law enforcement or the public and/or a general lack of compliance within manatee speed zones.
   - Areas which historically have high boater activity and/or lack of compliance during holidays, weekends, or special events.
   - Properly posted signs allowing for effective enforcement.
   - Concurrent/overlapping state and federal zones.
2. There will be USFWS Special Agents and USFWS Manatee Refuge Officers working with FWC Wildlife Officers during each enforcement operation. Where and when possible, the following protocols will be followed:
   - Prior to each detail, a coordination meeting will be held in close proximity to the manatee zones encompassing the detail area. Representatives from both agencies will be present as well as most of the personnel who will be conducting enforcement operations.

- Specific zone assignments will be coordinated during the coordination meeting to ensure the most effective coverage.
- FWC Wildlife Officers, USFWS Special Agents, and USFWS Manatee Refuge Officers are encouraged to work together and are authorized to ride on each agency's patrol vessels. FWC Wildlife Officers, USFWS Special Agents, and USFWS Manatee Refuge Officers should utilize the most efficient and effective means to conduct patrols.

Enforcement Coordination with USFWS

The enforcement strategy and explanation of the MAA was provided to USFWS agents in Florida during a training session for issuing state Uniform Boating Citations (UBCs) in January 2004 and again in November 2005. This information, along with training for issuing citations for federal manatee protection zone violations, was also provided to FWC Wildlife Officers in several different sessions: in southwestern and northeastern Florida and in FWC's south region.

Directly related to the implementation of the MAA, USFWS and FWC initiated an effort to better coordinate marine law enforcement with all agencies providing marine law enforcement services. This initiative was launched in Lee County in July 2003 with the creation of the Lee County Marine Law Enforcement Task Force. Though the task force was used to provide more efficient law enforcement in manatee protection zones, it was crafted with a broad foundation to be proactive in addressing all marine enforcement issues. This group includes all of the municipal, local, and federal agencies conducting law enforcement activities in Lee County.

Using the Lee County Marine Law Enforcement Task Force as a model, the Marine Law Enforcement Task Force of Northeast Florida was created in October 2003, and includes representatives from Alachua, Clay, Flagler, and St. Johns counties, the Jacksonville Sheriff's Office, and the USCG. In May 2006, the Bay County Marine Law Enforcement Task Force was established to target marine law enforcement issues in the northwest area of the state.

A manatee protection law enforcement forum began in 2006 and will continue annually with the purpose of providing the latest in manatee enforcement training and strategies along with the sharing of ideas between local, state, and federal agencies. This venue has been used to attempt to expand the use of the marine law enforcement task force, which has become a goal of FWC.

FWC Enforcement Strategy

Enforcement efforts in newly established zones will begin with an education process coordinated with the FWC's Community Relations office and Imperiled Species Management section. In well established areas, violators will generally receive written warnings or state uniform boating citations (UBCs), depending on the severity of the violation as observed by the officer. Wildlife Officers check the FWC arrest database for repeat offenders and flagrant violators may receive a criminal or federal citation. This arrest database is now available on the statewide Criminal Justice Network so all state and local law enforcement agencies have access to this information. In addition, FWC has provided (at the expense of USFWS) USFWS law

enforcement agents with FWC radios and direct access to all FWC databases so they can determine if a person has been a past violator of any type of resource or boating offense.

Manatee Regulatory Zone Sign Posting

DLE is responsible for posting and maintaining waterway markers statewide and must also ensure that these markers adhere to all state and federal requirements. In addition to the numerous markers currently under our ownership within the central and southwestern portions of the state (Citrus to Collier counties), FWC has recently accepted maintenance responsibility for the manatee protection regulatory markers from Nassau County south to Dade County.

The FWC's development of waterway marker designs to post manatee protection zones involves coordination within and outside FWC. It is important to identify navigational issues and the presence of existing regulations (whether established by the local, state, or federal government) to alleviate confusion and duplication, and to ensure markers do not become hazards to navigation. For this reason, the FWC, in consultation with the USFWS Protection Working Group, has produced a white paper report on standards for waterway marking as a reference for all levels of government involved in posting regulatory makers. This report can be found on the FWC website by going to http://myfwc.com/boating/ and clicking on the document name. The report lays the foundation for a uniform standards manual, and will be modified as new technology and techniques are introduced in consultation with the U.S. Coast Guard (USCG) uniform marking system.

Numerous site evaluations are conducted to identify boating safety concerns, presence of existing pilings, channel markers, and aids to navigation. Consideration is also given to bathymetry, geographic configuration, and boat facilities such as ramps, marinas, and canal systems. Maps and supporting documents are created with the regulatory boundaries and proposed marker locations.

Using these preliminary plans, FWC coordinates meetings with local government marine units, FWC Wildlife Officers, and other local government contacts to discuss the proposed sign plans. To ensure markers are well posted for enforcement and safety, the discussion includes types of markers recommended for use in the area, marker spacing, educational outreach concepts, and areas of high vessel activity. Based on these meetings, additional on-water evaluation of areas may be required, which may modify the sign plan. The preliminary plan is submitted to USCG, USACOE, and the Florida DEP for authorization. External communication has proven to be extremely helpful in the development of the plan to address local boater needs and to consider current, as well as historic, use of the waterways.

Once the final plan is determined, FWC begins the formal bid process for marine contractor services and waterway marker production. FWC develops press releases and, if appropriate, brochures for distribution by local and state marine units to boaters and marine-related businesses describing project objectives. Upon installation, regulatory markers are inspected and adjustments are made to address concerns.

Waterway Marker Posting and Maintenance Schedule

Manatee protection area uniform waterway marker inventories and maintenance are being conducted throughout the state. The purpose is to locate, map, and document specifications to properly maintain all FWC uniform waterway markers on a quarterly basis. The following denotes manatee protection area inventories, posting, and maintenance projects completed and/or in progress in fiscal year 2006/2007:

- Manatee County—Bishops Harbor, Terra Ceia Bay, Manatee River, Braden River, Palma Sola Bay, Anna Maria Sound and Sarasota Bay
- Hillsborough County—Little Manatee River, Eastern shoreline of Tampa Bay
- Pinellas County—Safety Harbor
- Brevard County—Indian River, Banana River, Turnbull Basin and Sebastian Inlet area
- Volusia County—St. Johns River from Lake George south to Lake Monroe and coastal waterway assessment and repair/modifications
- Collier County—countywide assessment and repair of storm-related damage
- Citrus County—countywide repairs needed based on recent on-water assessment
- Duval, Clay and St. Johns counties—modification to existing installation based on FWC adoption of federal zones within St. Johns River and repairs based on recent on-water assessment
- Seasonal "sign flipping" operations within Palm Beach, Dade, Broward, Indian River, St. Lucie and Citrus counties

Pending the completion of the above projects in fiscal year 2006/2007, we anticipate beginning the following manatee protection area inventories, posting, and maintenance projects in fiscal year 2007/2008:

- Miami Dade County inventory, assessments, and maintenance
- Broward County inventory, assessments, and maintenance
- Palm Beach County inventory, assessments, and maintenance
- Martin County inventory, assessments, and maintenance
- Indian River inventory, assessments, and maintenance
- St. Lucie inventory, assessments, and maintenance
- Continuation of quarterly maintenance inspections of all state-owned manatee protection area signage

A "Uniform Waterway Marker Inventory Database" is being developed as inventories are completed. This project improves upon and develops an electronic GIS-based data collection system for all state boating safety and manatee uniform waterway markers. The system will increase the speed and ease of data collection, eliminate data translation errors, and allow for GPS/GIS data collection in the field. When complete, the improved data accuracy will allow us

to provide GIS web-based mapping capabilities. Once completed, FWC will explore the possibility of placing boating regulatory zones on maps and GPS software.

DLE Boating and Waterways staff is currently researching and developing smart sign concepts for certain uniform waterway markings in an attempt to improve human comprehension of boating safety and manatee protection signage. The anticipated deliverable will be a specification for signage that conforms to existing federal and state laws. Staff is currently drafting this specification document that includes alternative markings and identifying pilot areas. A stakeholder working group has been identified to continue to explore these issues. A member of staff has been appointed to a national boating advisory council that will better enable us to address any potential changes to the federal code of regulations that would further promote this project.

Manatee Harassment

Chapter 370.12 (2), F.S., prohibits harassment of manatees and is further defined in Rule 68C-22.002, F.A.C. While these laws seem to answer most questions surrounding harassment, there are social and biological issues that still need to be addressed prior to law enforcement taking a more active role. The Manatee Protection Working Group (MPWG), previously part of the Federal Recovery and Implementation Team, began addressing the issue of manatee harassment. This team consists of members from FWC and USFWS as well as several stakeholder groups. Working group members began gathering information about known harassment sites throughout the state and identifying ways to mitigate harassment on a site-specific basis. Ultimately, the group plans to continue to coordinate with staff from the National Marine Fisheries Service on marine mammal approach guidelines to ensure that messages about manatees and dolphins are consistent and comply with the Marine Mammal Protection Act, the Endangered Species Act, and the Florida Manatee Sanctuary Act. The group may also consider recommendations on expansion of manatee refuge boundaries, increased enforcement, and changes to rules and/or statutes on manatee harassment.

The act of provisioning and pursuing animals has been and will continue to be addressed by FWC's Division of Law Enforcement. We have responded to a number of active harassment sites by improving signage and providing law enforcement educational and enforcement initiatives. There is ongoing legal debate about what constitutes harassment. The MMPA defines the term as "any act of pursuit, torment, or annoyance that has the potential to disturb a marine mammal or marine mammal stock in the wild." The FWC recommends that people view wild marine mammals responsibly. Human interaction with marine mammals sometimes leads to harassment, which is illegal. The FWC is working with our federal partners to develop consistent best practices for viewing marine mammals (including manatees) that, if followed, would avoid harassment.

An interagency team composed of staff from FWC and USFWS has been formed to address recent harassment concerns about the Crystal River National Wildlife Refuge. Swimming with or petting manatees has been common in Florida for years, and there is disagreement among managers regarding the significance of the effects of this practice on the animals. Researchers, however, have documented manatee disturbance resulting from human interactions. Vessel traffic and recreational activities that disturb manatees may cause them to

leave preferred habitats and may alter biologically important behaviors such as feeding, suckling, or resting (Powell 1981; Buckingham 1990; O'Shea 1995). In Crystal River, Buckingham (1990), Buckingham *et al.* (1999), and King and Heinan (2004) documented increased manatee use of sanctuaries at times of increased boat traffic. King and Heinan (2004) also reported changes in manatee behavior in response to the presence of human swimmers. These changes included decreased resting and suckling, and increased swimming. This issue is complicated by increased public awareness of the highly publicized and growing ecotourism industry in the area. The Crystal River National Wildlife Refuge is attempting to manage manatee-human interactions through cooperative public education and enforcement.

Boater Education

The FWC has pursued additional requirements for boater education to improve boating safety, recognizing the associated environmental benefits of such programs. Education programs include a resource-protection component that attempts to build environmental stewardship in boaters as resource users. The FWC will continue to pursue legislation toward enhanced boater education. (See Appendix XI, "Background Information for Mandatory Boater Education.")

Table 18. Law Enforcement actions.

FWC Law Enforcement Actions	Year One	Year Two	Year Three	Year Four	Year Five
A. Enforcement Tasks					
1. Conduct 50,000 hours of manatee protection patrols annually (ongoing).					
2. DLE will work to form additional regional task forces within the state.					
3. Develop strategic manatee enforcement operational plans.					
4. Develop annual manatee enforcement officer workshops.					
B. Enforcement Coordination with USFWS					
1. USFWS Special Agents and Manatee Refuge Officers will work with FWC officers during each joint enforcement operation. (ongoing)					
2. There will be five to six USFWS agents working with five to six FWC officers during each enforcement operation.					
C. Manatee Regulatory Zone Sign Posting					
1. DLE is responsible for posting and maintaining waterway markers statewide (ongoing).					
2. FWC will develop standards for waterway marking and update such standards as necessary.					
D. Manatee Harassment					
FWC will work with USFWS, NMFS, and other agencies to develop solutions to marine mammal harassment.					

CHAPTER 9: MONITORING ACTIVITIES

Data from monitoring activities are collected over multiple years and are used to answer a variety of research questions. FWRI's core monitoring activities related to Florida manatees include photo-identification, aerial surveys, carcass salvage and necropsy, rescues, and boating surveys. Data from these activities are used to answer research questions about manatee populations, life history, biology, and habitat use, as well as human impacts to manatees. The results of these activities also are used to address management needs. New monitoring techniques and methods (discussed in Chapter 10, "Ongoing and Future Research") will be incorporated into the FWC's monitoring program upon refinement.

Photo-Identification

Manatee photo-identification uses the unique pattern of scars and mutilations on the dorsum and tail fluke of a manatee to track an individual animal over time. By photographing an individual manatee annually, we are able to develop a history of that animal's movements and life history attributes. Capture histories produced through photo-identification efforts directly contribute to calculating adult survival rate estimates. Survival rates are widely used in population biology and are important for assessing population status and trends. Photo-identification is a noninvasive method that also allows researchers to examine manatee movements and site fidelity, and to determine certain reproductive parameters, such as frequency of calving, inter-calf interval, and length of calf dependency.

Manatee photo-identification in the southeastern U.S. is a multi-agency effort that includes the U.S. Geological Survey's Sirenia Project (USGS), the Florida Fish and Wildlife Conservation Commission (FWC), and the Mote Marine Laboratory (MML). Additional cooperators also provide photographs and associated data to these three main partners. The USGS is responsible for photographing manatees and managing associated data in the northwest and east coast portions of Florida, supplemented by photographs from FWC. The FWC, in collaboration with MML, is responsible for the southwestern portion of the state, which includes Tampa Bay and areas farther south.

The first manatee photographs date back to the late 1960s. However, a concerted photo-identification effort was not initiated until 1978. The USGS began the program by photographing manatees at Crystal River, Blue Spring, and the east coast power plant aggregations. In the early 1980s, they added efforts at the Ft. Myers power plant. In 1988, the USGS transferred responsibility of data collection in the southwest to the Florida Marine Research Institute (FMRI, now FWRI). However, lack of funding for the photo-identification program prevented significant effort by FMRI until the mid-1990s, resulting in a data gap for southwestern Florida. Mote Marine Laboratory joined the photo-identification effort in 1993. FWC currently works with partners to share data, coordinate field efforts, maintain consistent, high-quality data collection and management protocols, and modify the Manatee Individual Photo-identification System (MIPS) to meet the needs of current and future applications of the data.

Currently, the majority of photo-identification field effort is allocated during the winter months (December–March) when manatees aggregate at natural and man-made warm-water sources. USGS, FWC, and MML cover all major aggregation sites, with the exception of Port of the Islands in Collier County. (In Chapter 10, "Ongoing and Future Research," see the section titled "Improve Methods of Core Monitoring.") In addition, members of the partnership opportunistically cover a number of secondary aggregation sites where manatees visit in smaller numbers or during warmer weather. Effort at sites is dependent on a number of factors, including weather, manatee use, study goals, and accessibility.

Historically, photo-identification data have been managed at three separate locations and in three separate databases. To improve the accuracy and efficiency of matching animals throughout the state and the efficiency of disseminating photo-identification data to managers, all organizations involved are working toward a single, integrated, statewide manatee photo-identification database. In May 2005, photo-identification partners signed a Memorandum of Understanding (MOU) that detailed partner roles and responsibilities regarding the integration of photo-identification data. Partners are currently completing the digitization of primary data and are working on the transition of MIPS to an SQL platform. As of August 2006, MIPS included the sightings records of 2,219 manatees, some of which are dead and all of which have met stringent criteria for cataloging.

Estimating adult survival rates provides information on population dynamics and trends needed for assessment and management of manatee populations in Florida. Photo-identification data from southwestern Florida are collected and censored by FWC. USGS then applies a capture-recapture method to calculate survival rates for adult manatees. USGS also calculates adult survival rates for all Florida manatee management units. Upcoming research will focus on new models for assessing future trends in the manatee population as they relate to growth rate and survival. These estimates are used by the FWC and the USFWS for developing manatee protection strategies, and by research programs from other agencies.

One of the largest challenges involved in photo-identification of manatees is the amount of laboratory time required to match images to known animals. While computers and scar codes are used to help identify potential matches using MIPS and other software, the matching of manatee images is not automated and is accomplished entirely by the human eye. The combination of the manatee's large size, round shape, and behavior means that all sides and features of a manatee cannot be documented in one photograph. Thus, a biologist must mentally combine multiple images of an individual to develop a search image. These and other factors combined result in a steep learning curve for researchers. Consequently, long-term, trained staff is far more efficient at the process of matching known animals than newly hired employees. Currently, FWC has three employees dedicated to the photo-identification project, two of whom are Other Personal-Services (OPS) temporary employees. Like many projects that rely on OPS staff, limited staff retention within these types of positions impacts efficiency.

Improving Photo-Identification Methods

The continued integration of all three partner data sets (USGS, FWC, MML) and the development of a single, statewide photo-identification sightings database will be essential for timely dissemination of information to managers. The first phase of this project was completed

in May 2005 when partners developed and signed the MOU described above. The second phase of the process involved securing funds for the subsequent task of converting all slides and prints managed by the photo-identification program to a digital format. This step is essential in the facilitation of efficient exchange of information between partners. FWRI staff has completed this step, having digitized 69,000 photo-identification slides. Digitization of slides documenting carcasses archived by the Marine Mammal Pathobiology Lab has also been initiated; additional funds will be needed for project completion. Scanning these images will ensure integration of the carcass salvage and the photo-identification programs. Staff at MML and USGS continue to convert their images to digital format. Complementary to the digitization of program slides is the scanning and proper archiving of project data sheets. Partners are in the early stages of this extensive task. The digitization and subsequent distribution of project data is necessary to complete the integration process.

Partners at the USGS Fort Collins Science Center are laying the groundwork for the conversion of MIPS from Microsoft Access™ to an SQL platform. The new platform should allow for more robust management of sightings data and should facilitate access and maintenance of a single integrated database by the multiple agencies of the partnership, each with its own security requirements and tasks. This transition of MIPS to SQL must be completed before a single, integrated statewide database is possible.

Process and database improvements will increase the speed, accuracy, and precision of adult survival rate analyses and will provide information to assess movements between subpopulations, overwintering behavior, reproductive rates, and other life-history parameters. In addition to these improvements, alternative methods for determining the reproductive status of adults in southwestern Florida needs to be identified in order to provide data for estimating reproductive rates in this region. Accurate reproductive rates are valuable parameters in population modeling.

Population monitoring of manatees in southernmost southwestern Florida (Ten Thousand Islands and the Everglades) is essential if accurate estimates of population status are to be made. An understanding of population dynamics in this area will aid in the status assessment of the Southwest Florida management unit as well as the total Florida manatee population. Currently, traditional methods of population monitoring, such as photo-identification for the estimation of adult survival rates, have proved challenging in this far southwestern region. This geographic area is difficult to cover because of its considerable size, numerous access constraints, and dark and turbid waters. In addition, manatees in this area have been observed to avoid research vessels. They also often surface with mud on their backs, making photo-documentation of scars difficult. Preliminary evidence suggests that a large number of resources could be dedicated to expanding photo-identification to this area with little payoff in terms of data collected. While the need for population monitoring in this area is clear, the best approach still needs to be determined. (See the genetic markers discussion in Chapter 10, “Ongoing and Future Research.”)

Table 19. Proposed timeline for implementing photo-identification monitoring activities.

PHOTO-IDENTIFICATION (INVOLVES COORDINATION WITH USGS AND MML)	YEAR ONE	YEAR TWO	YEAR THREE	YEAR FOUR	YEAR FIVE
Photo-ID monitoring - data collection, matching, database management, analyses, etc.					
Photo-ID improve methods - Integrate MIPS database and continue improvements/upgrades (involves USGS and MML), digitize MMPL slides, scan and archive past datasheets, change database to SQL (USGS responsibility)					
Photo-ID analyses of population parameters (survival rates in SW FL; movements among subpopulations) - these require MIPS database integration					

Aerial Surveys

FWC staff uses two types of aerial surveys to acquire information on manatee counts, distribution, and habitat use—synoptic surveys and distribution surveys. "Synoptic" means presenting a general view of the whole. A manatee synoptic survey is a simultaneous count of manatees in all known manatee winter habitats in Florida. These surveys are conducted up to three times between January and March of each year, are used by FWC to obtain a minimum count of manatees statewide, and are conducted in accordance with Section 370.12 (4), Florida Statutes, which requires an annual "impartial, scientific benchmark census of the manatee population in the state." Flights occur after strong cold fronts when manatees aggregate at warm-water sites, including natural springs, passive basins that retain heat, and industrial thermal discharges from power plants (see also http://research.myfwc.com/features/view_article.asp?id=15246). Several agencies participate in the surveys coordinated by FWC, including state, federal, county, university, and private research groups. From 1991 to 2006, 23 synoptic surveys have been conducted (Table 20). However, these counts are impaired by detection and availability biases that are not quantifiable using current survey methods (Packard 1985; Lefebvre *et al.* 1995; William *et al.* 2002). Aerial surveys are generally thought to underestimate manatee numbers because it is assumed that observers will not see every animal (Hartman, 1974; Caughley 1977; Eberhardt 1982; Packard 1985; Pollock and Kendall 1987; Lefebvre *et al.* 1995; Pollock *et al.* 2006). Biologists have attempted to avoid the problem of imperfect detection by using a standard count protocol and then assuming that detecting a manatee is constant over time and place, so that the counts can be used as a valid population index. However, this is a poor assumption to make about animals in general (Williams *et al.* 2002), and for marine mammals in particular (Marsh and Sinclair 1989; Pollock *et al.* 2004, Pollock *et al.* 2006). At a minimum, one should estimate the detectability of animals in each survey and adjust counts based on an estimate of the number of animals not seen and therefore not counted by observers. This can be costly and time consuming, but is important

in producing a statistically reliable method for assessing trends in the population. (See Chapter 10, "Ongoing and Future Research," for details.)

Table 20. Synoptic aerial surveys of manatees, east and west coasts of Florida, 1991 to 2006.

YEAR	DATE	EAST	WEST	TOTAL
1991	January 23–24	687	580	1,267
1991	February 17–18	828	650	1,478
1992	January 17–18	904	940	1,844
1995	January 21–22	669	787	1,456
1995	February 06–07	917	906	1,823
1996	January 09–10	1,223	1,054	2,277
1996	February 18–19	1,452	1,178	2,630
1997	January 19–20	906	1,335	2,241
1997	February 13	797	918	1,715
1998	January 29–30	1,110	908	2,018
1999	January 06	842	1,023	1,865
1999	February 23	900	1,123	2,023
1999	March 06	960	1,400	2,360
2000	January 16–17	634	1,012	1,646
2000	January 26–27	1,138	1,085	2,223
2001	January 05–06	1,559	1,741	3,300
2002	March 01	864	894	1,758
2003	January 09	1703	1140	2,843
2003	January 21–22	1813	1314	3,127
2003	January 26–28	1,705	1,311	3,016
2004	February 20	1,198	1,307	2,505
2005	January 26	1,594	1,549	3,143
2006	February 13-17	1,639	1,474	3,113

FWC uses distribution aerial surveys to determine the seasonal distribution of manatees and to assess habitat use. Surveys are typically conducted in near-shore waters in a particular county or region. Flights are usually four to six hours long and flown twice monthly for two years. As with synoptic surveys, most distribution surveys are conducted from small, four-seat, high-winged airplanes (Cessna 172 or 182). Occasionally, small helicopters are used in urban areas or where waters are particularly opaque. The flights follow a standardized survey route

designed to maximize the manatee counts by concentrating on shallow, near-shore waters and other areas where manatees and their requisites are located. Flight paths follow the general contour of the shoreline. The airplane circles when manatees are spotted until a count of the number of animals in each group is obtained. Though not used for population estimation, inference from distribution surveys is hampered by the same biases as the synoptic survey, so that manatees may be missed in a systematic way due to heterogeneous detection or availability.

Currently, FWC biologists are flying manatee distribution surveys in coastal Flagler and St. Johns counties. The surveys will be completed in September 2007. Also, staff is partnering with Collier County in conducting new distribution surveys from Marco Island north to the Collier County line (other portions of the county are being flown by outside agencies). These surveys will be completed in June 2008. Future surveys will be determined by management needs. Manatee distribution surveys conducted by FWC between 1984 and 2006 are listed in Table 21.

Table 21. Aerial surveys of manatee distribution by county, 1984 to 2008. Table includes surveys flown by FWC researchers and other entities.

COUNTY	SURVEY PERIODS	COUNTY	SURVEY PERIODS
BREVARD	SEP. 1997-SEP. 1999	LEE	OCT. 1994-NOV. 1995
	NOV. 1989-JUN. 1992		FEB. 1990-DEC. 1993
	JAN. 1985-JAN. 1987		JAN. 1987-DEC. 1988
	1977-DEC. 1990		JUL. 1986-DEC. 1988
BROWARD	NOV. 1991-SEP. 1992		APR. 1985-NOV. 1989
	JAN. 1988-MAR. 1990		JAN. 1984-DEC. 1985
CHARLOTTE	JAN. 2002-MAR. 2004	MANATEE	JAN. 1995-JUN. 1997
	SEP. 1997-OCT. 1999		FEB. 1990-DEC. 1993
	FEB. 1990-DEC. 1993		NOV. 1987-MAY 1994
	JAN. 1987-DEC. 1988		APR. 1985-NOV. 1989
	APR. 1985-NOV. 1989		MAY 1985-DEC. 1986
CITRUS	SEP. 1991-DEC. 1992	MARTIN	NOV. 1990-JUNE 1993
CLAY	MAR. 1994-SEP. 2003		JAN 1986-JAN. 1987
	JUN. 1994-JUN. 1995	MONROE	JAN. 2000-OCT. 2000
	MAY 1993-MAY 1994		JAN. 1999-SEP. 1999
	MAY 1990-MAR. 1997		JAN. 1998-OCT. 1998
	MAY 1988-APR. 1990		JAN. 1997-NOV. 1997
COLLIER	JUL. 2006-JUN. 2008		JAN. 1996-OCT. 1996
	JAN. 1991-NOV. 1993		FEB. 1995-JAN. 1996
	JAN. 1990-DEC. 1990		JAN. 1992-NOV. 1993
	JAN. 1989-DEC. 1989		DEC. 1989-JUL. 1994
	MAR. 1987-DEC. 1988	NASSAU	OCT. 1986-OCT. 1988
	MAY 1987-SEP. 1987	PALM BEACH	NOV. 1990-JUN. 1993
	JAN. 1986-DEC. 1990		AUG. 1990-JUN. 1993
	JAN. 1986-JAN. 1987		JAN. 1988-MAR. 1990
DADE	JAN. 2000-OCT. 2000		JAN. 1986-JAN. 1987

DADE (cont'd.)	JAN. 1999-SEP. 1999	PUTNAM	MAR. 1994-SEP. 2003
	JAN. 1998-OCT. 1998		JUN. 1994-JUN. 1995
	JAN. 1997-NOV. 1997	SARASOTA	JAN. 2000-NOV. 2001
	JAN. 1996-OCT. 1996		FEB. 1990-DEC. 1993
	FEB. 1995-JAN. 1996		JAN. 1987-DEC. 1991
	DEC. 1989-JUL. 1994		APR. 1985-NOV. 1989
	JAN. 1986-OCT. 1988	ST. JOHNS	OCT. 2005-SEPT. 2007
DUVAL	MAR. 1994-SEP. 2003		MAR. 1994-SEP. 2003
	JUN. 1994-JUN. 1995		MAY 1993-MAY 1994
	MAY 1993-MAY 1994		MAR. 1991-NOV. 1993
	MAY 1990-MAR. 1997		MAY 1990-MAR. 1997
	MAR. 1991-NOV. 1993	ST. LUCIE	NOV. 1990-JUN. 1993
	MAY 1988-APR. 1990		JAN. 1986-JAN. 1987
	OCT. 1986-OCT. 1988		JUN. 1985-DEC. 1987
FLAGLER	OCT. 2005-SEP. 2007	TAMPA BAY	JAN. 1995-JUN. 1997
	MAR. 1991- NOV. 1993		NOV. 1987-MAY 1994
FRANKLIN	MAY 1997-AUG. 1998	VOLUSIA	JUL. 2002-JUL. 2004
INDIAN RIVER	JUL. 2002- JUL. 2004		OCT. 1994-SEP. 1996
	SEP. 1997-SEP. 1999		JUN. 1994-JUN. 1995
	JUN. 1985-DEC. 1987		MAR. 1991-NOV. 1993
LEE	JAN. 2002-MAR. 2004		DEC. 1985-JAN. 1987
	SEP. 1997-OCT. 1999		MAY 1985-DEC. 1985
	JAN. 1997-JAN. 1998	WAKULLA	OCT. 1994-SEPT. 1996

The availability of spatially referenced data enables researchers and managers to better define seasonal hot spots and further analyze the manatee distributional data with auxiliary habitat data. Data are entered into a Geographic Information System (GIS) and reviewed for quality control. Data are frequently requested by stakeholders and are available to outside users on computer CD-ROM and via the FWRI Internet Map Service (http://ocean.floridamarine.org/mrgis/viewer.htm). Staff are preparing an FWRI technical report of distributional survey results from data collected up through 2004.

Table 22. Proposed timeline for implementing aerial survey monitoring activities.

Aerial Surveys	Year One	Year Two	Year Three	Year Four	Year Five
Conduct annual synoptic survey (organize field effort, collect data, create and maintain database and GIS maps, QA/QC, respond to info. requests, etc.). Involves coordination with a variety of partners.					
Estimate manatee population abundance by implementing redesign of the synoptic surveys (see "Improve Methods of Core Monitoring" in the chapter titled "Ongoing and Future Research.")					
Conduct manatee distribution surveys as determined by management needs: Coastal Flagler and St. Johns counties					
Conduct manatee distribution surveys as determined by management needs: Collier County (partner with the county)					
Complete Aerial Survey Technical Report					
Conduct manatee distribution surveys as determined by management needs: Other counties	Determined by management needs				

Manatee Carcass Salvage, Necropsy, and Rescue

The purposes of the manatee carcass salvage and recovery program are to characterize and record necropsy information to determine cause(s) of death and obtain information on manatee morphology, life-history parameters (*e.g.*, age), health, and physiology. The program is a source of information used to determine and mitigate human-related causes of manatee death. Current efforts focus on cold stress and thermoregulation, brevetoxicosis, watercraft injury, and other mortality factors, and are aimed at understanding the obstacles to sustained recovery of the Florida manatee population.

In 1985, the responsibility for manatee carcass salvage was transferred to the State of Florida from the federal government, albeit without long-term funding support. In 1992, the Marine Mammal Pathobiology Laboratory (MMPL) was built in St. Petersburg to centralize the program and to allow staff to perform consistent, high-quality, post-mortem examinations. Staff members from five field stations (including MMPL) collect carcasses from around the state and transport the majority (~ 70%) to the MMPL. Field necropsies are performed when carcasses are too decomposed for transport. The MMPL was designed and constructed to meet the needs of the time—roughly 150 manatee carcasses per year. Since then, the average number of manatee carcasses has increased by approximately 7% annually, with current mortality numbers ranging up to 400 manatees per year. MMPL staff initially included two full-time employees (FTEs) and one OPS employee; over the years, it has expanded to four FTEs and two OPS employees. Staff

processes more than twice as many carcasses as when the MMPL was originally constructed. However, despite some improvements to the MMPL, facility capacity lags behind the increasing carcass load. To maintain the current level of service with the increasing number of manatee carcasses, expansion of the MMPL or additional necropsy facilities and staff are warranted. Figure 11 illustrates how carcasses are processed from the time they are reported through the necropsy report.

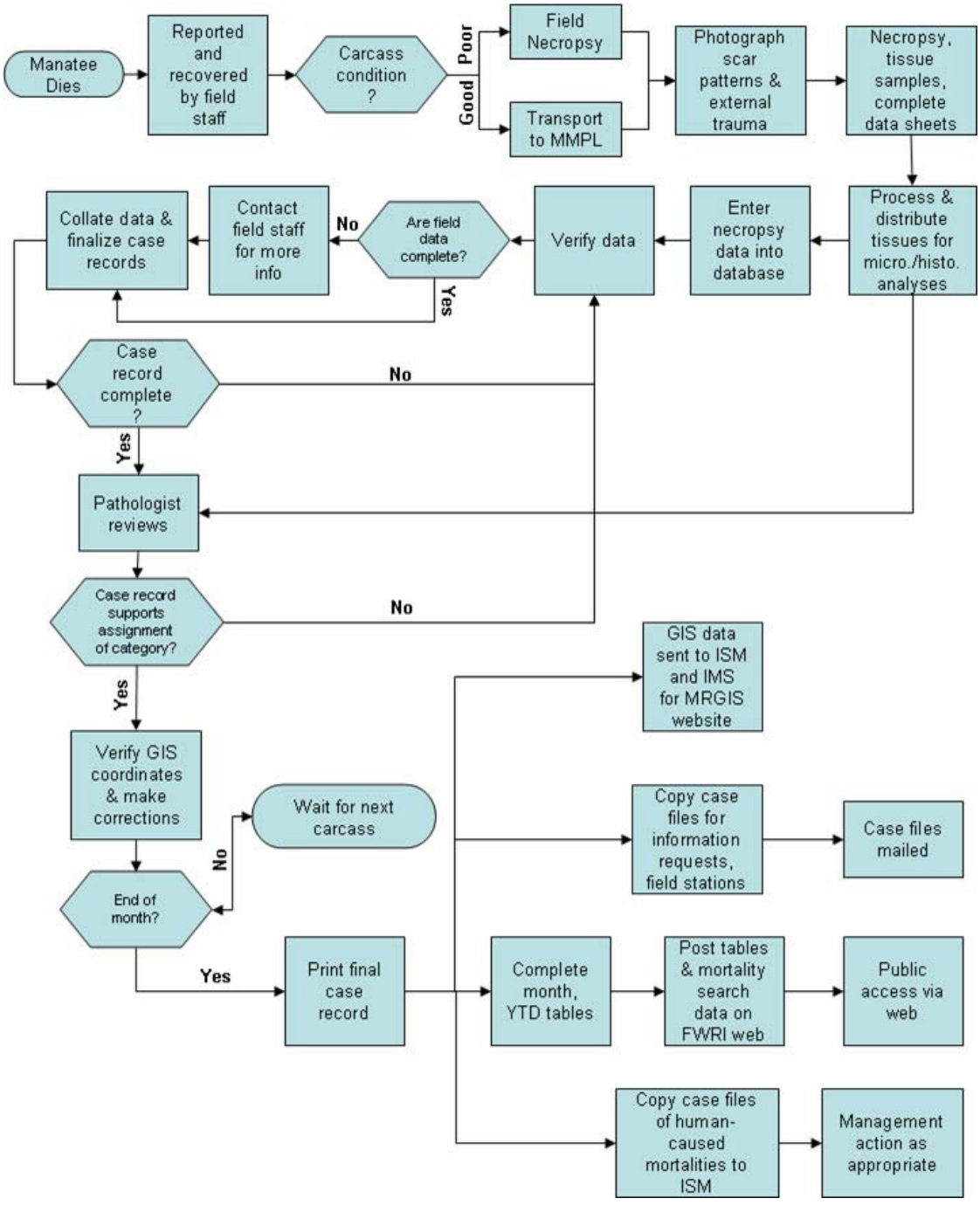


Figure 11. Process analysis of manatee carcass salvage and necropsy program.

FWRI staff relies heavily on the cooperation and participation of FWC's Division of Law Enforcement (DLE). DLE staff provides the critical first step in the manatee carcass salvage and rescue response. Law enforcement officers verify reports and tow carcasses to boat ramps in addition to assisting with manatee rescues. The success of the FWC's carcass salvage and rescue program also depends on DLE's communications network. Dispatchers play a critical role in notifying FWRI field staff of carcasses and manatees in distress.

During manatee necropsies, FWC staff members examine manatee organ systems to assist in the determination of the cause(s) of death. If the carcass is fresh, histology and toxicology samples are collected. Histology samples are sent to a pathologist whose comments are included in the final necropsy report. These samples are currently processed and read by the University of Florida, a FWC partner. Additionally, anatomical, physiological, and life-history information is collected from each carcass. Manatee carcasses are photographed and scanned for PIT (passive integrated transponder) tags to determine if the carcass was a known individual; this information is used to support assessments of adult survival rates. Staff members generate a necropsy report that documents the findings from each carcass. This necropsy report undergoes a great deal of quality control before it is finalized. In addition, the carcass retrieval location is verified and the location coordinates are mapped and recorded using a GIS. Staff append the coordinates within a master GIS database and make these data available to managers and the public via the FWRI Internet Map Service (IMS) (http://ocean.floridamarine.org/mrgis/viewer.htm). The MMPL has created and curates a database that contains mortality information from 1974 to the present and produces monthly and annual reports (Table 23). The MMPL also receives tissue sample requests from researchers and education institutions of all levels. Requested samples have been sent to facilities around the world.

In addition to manatee carcass salvage, FWC receives calls from the public reporting manatees in distress. Field staff members respond to these calls and coordinate a network of personnel from various agencies and organizations to work with FWC biologists to rescue and, when necessary, transport manatees to rehabilitation facilities. An average of about 65 manatees are rescued annually, some of which are released on site. Staff biologists also participate in the following groups dedicated to developing protocols for the rescue and rehabilitation of sick or injured manatees and the monitoring of their health, behavior, and survival after their return to the wild: USFWS' Facilities Management Team, Manatee Rehabilitation Partnership, and the Interagency/Oceanaria Working Group. Staff also participated in the Florida Manatee Recovery Team's Entanglement Working Group and in monofilament recovery and recycling programs to address and find solutions to the increasing number of manatees entangled in fishing gear and monofilament line.

Since 2000, FWRI also has managed the Oceanaria Reimbursement Assistance Program for rescued, rehabilitated, and released Florida manatees. From July 1991 to June 1999, $400,000 per year was available to reimburse the three contracted and federally permitted manatee rehabilitation facilities in Florida: Lowry Park Zoo, Miami Seaquarium, and Sea World Florida. These facilities were involved in the rescue and full-time acute-care, veterinarian-based rehabilitation of manatees. Effective July 2000, the Florida Legislature modified this program and increased the program appropriation for the previous fiscal year and subsequent fiscal years

to $1.15 million and transferred management of the program from Tallahassee to the Fish and Wildlife Research Institute.

FWRI biologists also respond to large-scale manatee die-offs called Unusual Mortality Events (UMEs). UME response involves the cooperation and participation of many sections within FWC and with outside partners. These sections and entities include Harmful Algal Blooms, Fish and Wildlife Health, Fisheries Independent Monitoring, Community Relations, Division of Law Enforcement, the Oceanaria, USFWS, MML, USGS, National Park Service, National Marine Fisheries Service, and the Working Group for Marine Mammal Unusual Mortality Events. A typical manatee UME involves large numbers of manatee carcasses in a particular area during a relatively short period of time, and may involve elevated numbers of rescues. Carcasses of other marine species and fish kills are also often associated with manatee UMEs. Over the past 10 years, manatee UMEs have been caused by manatee exposure to *Karenia brevis*, the Florida red tide organism. Typical manatee red tide UMEs take place in southwestern Florida during spring. Agency and partner response includes manatee rescue and rehabilitation, carcass salvage and necropsy, environmental sampling and testing, sampling and testing of manatee tissues, coordination of media relations, and extensive communications with federal, state, and local governments and private institutions. Since 1996, FWRI staff and partners have responded to five manatee UMEs in southwestern Florida.

Table 23. Breakdown of annual manatee deaths in the southeast U.S., 1974–2005.

Year	Watercraft	Flood gate/lock	"Other Human"	Perinatal	Cold Stress	"Other Natural"	Verified not Recovered	Undetermined too Decomposed	Undetermined	Total
1974	3	0	2	0	0	0	1	1	1	8
1975	6	1	2	7	0	1	3	4	6	30
1976	10	4	0	14	0	2	10	6	16	62
1977	13	6	6	9	0	1	16	10	54	115
1978	21	9	1	10	0	3	6	7	27	84
1979	24	8	9	9	0	4	5	0	19	78
1980	16	8	2	13	0	7	4	0	17	67
1981	25	2	4	13	0	9	3	0	63	119
1982	20	3	2	14	0	41	6	0	34	120
1983	15	7	5	18	0	6	2	0	28	81
1984	34	3	1	26	0	25	1	0	41	131
1985	35	3	5	25	0	20	6	4	30	128
1986	33	3	1	27	12	1	6	34	8	125
1987	39	5	4	30	6	10	1	15	8	118
1988	43	7	4	30	9	15	2	17	7	134
1989	51	3	5	39	15	18	3	25	17	176
1990	51	3	5	45	50	21	1	27	15	218
1991	56	9	7	53	2	13	0	35	6	181
1992	38	5	7	48	1	20	1	40	8	168
1993	35	7	7	39	2	22	2	29	5	148
1994	51	15	5	46	4	33	3	33	4	194
1995	43	8	5	56	0	35	2	50	4	203
1996	60	10	1	61	17	101	12	144	10	416
1997	55	8	9	61	4	42	6	56	5	246
1998	67	9	6	53	12	13	5	69	10	244
1999	83	15	8	54	6	37	7	59	4	273
2000	79	8	8	60	14	37	8	61	4	279
2001	82	1	8	63	32	34	2	110	4	336
2002	98	5	9	53	18	59	5	62	6	315
2003	75	3	7	71	48	102	10	66	1	383
2004	69	3	4	72	53	24	5	49	4	283
2005	79	6	9	91	31	88	4	86	4	398
Total	**1409**	**187**	**158**	**1210**	**336**	**844**	**148**	**1099**	**470**	**5861**
%	**24.0%**	**3.2%**	**2.7%**	**20.6%**	**5.7%**	**14.4%**	**2.5%**	**18.8%**	**8.0%**	

Improve the Manatee Mortality Database

Researchers from the FWC, USFWS, USGS Sirenia Project, USGS Patuxent Wildlife Research Center, USGS Georgia Cooperative Research Unit, Montana State University, Mote Marine Lab, and the University of Florida met in April 2006 to discuss creating and implementing improvements to the manatee mortality database. The workshop was motivated by perceived limitations with the current database from the perspectives of both maintainers and users of the data. As a first step in addressing these limitations, this meeting assembled key personnel to identify and discuss specific problems. The majority of the meeting consisted of a directed discussion about a range of issues from the very general principles of database design to the role of the database in FWRI's research program, and to specific data fields to be included in the new database (*e.g.*, red tide). Improvements will facilitate more efficient input and querying of the database, and result in novel applications of necropsy information. Potential uses include analysis of demographics, identification of harmful contaminants, vessel strike analysis, and estimation of carcass recovery rates.

An important outcome of this meeting was a recommendation that a new database be developed to comprehensively address the critical issues in a unified manner. It is crucial that the new database design does not alter or constrain current laboratory procedures, while making both the input and output of information more efficient and comprehensive. This will require significant investment of resources. A first step in the database development process is the creation of four working groups to fully establish the scope of the project. These working groups include the following: database technology team; data structure team; user interface team, and implementation team. Reports issued by these teams will help determine the resource requirements for developing an adequate manatee mortality database, including the required financial commitment.

Improve Methods to Determine Cause of Death (see also "Analysis of Manatee Injuries from Collisions with Boats" in Chapter 10, "Ongoing and Future Research.")

Through thousands of necropsies, the carcass salvage program has provided a wealth of insight into manatee anatomy and physiology and has contributed to a basic understanding of manatee disease and mortality factors. However, the cause of death is still undetermined in roughly one-third of mortality cases. Similarly, much remains unknown about the causative factors that play a role in established manatee death categories. For example, perinatal death is determined based on measurement of total body length (< 150cm), but information on actual causes of perinatal death is scant. Refining and expanding diagnostic tools such as bacteriology, virology, toxicology, and forensics will lead to a better understanding of manatee disease and mortality. In addition, continued research on known diseases and toxins is essential in monitoring manatee mortality. Brevetoxin screening has proven valuable in determining deaths caused by red tide. Additional methods such as immunohistochemistry will aid in understanding the pathophysiology of this disease and in better defining this category for the manatee mortality database.

In addition to insight into manatee disease and mortality, the carcass salvage program also provides a window into the health of the manatee population. A new approach to analysis of specific manatee tissues may include evaluation of adrenal glands and reproductive organs as indicators of chronic stress and/or overall health. The tissue samples that are collected and archived by the carcass salvage program provide historical data that can be used retrospectively for comparative analysis. Not only will these tissues provide useful information on manatee health, but analysis for biomarkers may also benefit assessment of ecosystem health.

Table 24. Proposed timeline for implementing carcass salvage, necropsy, and rescue monitoring activities.

Carcass Salvage and Necropsy, and Manatee Rescues	Year One	Year Two	Year Three	Year Four	Year Five
Recover carcasses, necropsy to determine cause of death, collect tissues, maintain database, create GIS maps of carcass recovery locations, QA/QC, respond to info. requests, distribute tissues, etc.					
Improve methods to determine cause of death, investigate entanglements, investigate red tide, investigate cold stress, etc. (see also Chapter 10, "Ongoing and Future Research").					
Improve mortality database and implement changes					
Manatee carcass salvage database analyses - estimation of carcass recovery rate, age-specific mortality and reproductive rates, and characterization of patterns and trends in mortality					
Conduct manatee rescues					
Oceanaria reimbursement program					

Human Dimensions: Monitoring Boat Vessel Traffic

Wildlife managers traditionally have relied on biological data to assess the status of the manatee and set recovery goals and use laws, regulations, and outreach as their tools to achieve these goals. In most cases, wildlife management is actually management of people, because human behavior markedly influences the success of wildlife management actions.

FWC's human dimensions monitoring projects include surveying boat traffic patterns. In addition to guiding management decisions, data from monitoring vessel traffic are used in assessing speed zone effectiveness. (See Chapter 10, "Ongoing and Future Research.")

Table 25 lists human dimensions studies conducted or funded by FWC and other organizations since 1990. These included vessel traffic monitoring as well as research on boater attitudes and behaviors, both of which are discussed in Chapter 10, "Ongoing and Future Research."

Table 25. Human dimensions studies conducted and/or funded by FWC, 1990–present.

COUNTY	TYPE OF STUDY	YEAR	ORGANIZATION
Brevard	Traffic	2006-2007	FWRI, Mote
Brevard	Traffic, Compliance	1999	FWC
Brevard	Traffic, Compliance	1994	FIT
Brevard	Traffic	1990	FIT
Brevard, Volusia	Compliance	2004	FWRI
Brevard, Citrus, Duval, Miami-Dade, Martin, Indian River	Traffic, Compliance	2000-2001	FWRI
Broward	Traffic, Compliance	2004-2005	Mote
Charlotte	Traffic	2002-2006	Mote, FWRI
Charlotte Harbor	Traffic, Compliance, Attitudes	2000-2002	FWRI, Mote, Sea Grant
Charlotte, Sarasota, Lee	Traffic	2005	Mote, Sea Grant
Charlotte, Sarasota, Lee	Boat ramp use	2002-2003	FWRI
Citrus, Collier, Orange, Volusia	Halo effect	2000	FWRI
Collier	Traffic	1994	Collier County
Collier, Lee, Manatee	Traffic	2005	Mote
Duval	Boating Activity	1991	USF
Hillsborough – Apollo Beach	Traffic	2001-present	FWRI
Indian River	Traffic, Compliance	2005-2006	FWRI
Indian River, St. Lucie, Martin	Traffic	1996	FIT
Lee	Traffic, Compliance	2003	Mote
Lee	Traffic, Compliance	2002	Mote
Lee	Traffic, Compliance	2000	Mote
Lee	Traffic, Compliance	1998	Mote
Manatee – Anna Maria	Traffic, Compliance	2005-present	FWRI
Manatee – Manatee River	Traffic	2003-present	FWRI
Miami-Dade	Attitudes, Traffic, Compliance	2003	FIU, FWRI

COUNTY	TYPE OF STUDY	YEAR	ORGANIZATION
N.A.	Vessel planing speed characterization	2005-2006	FWRI
N.A.	Attitudes	2001	UF
Sarasota	Halo effect	2001	Mote
Sarasota	Traffic, Compliance	1998	Mote
Sarasota	Traffic, Compliance	1996	Mote
Sarasota and Tampa	Traffic	2004	Sea Grant, FWRI
St. Lucie and Martin	Boating Activity	1996	FAU
Tampa Bay	Attitudes	2000-2003	FWRI, UF
Tampa Bay	Traffic, Compliance, Attitudes	1999-2002	FWRI
Volusia	Traffic	1996	Volusia County

Characterization of boat traffic patterns involves field data collection from an airplane, boat, shore, or mail surveys. Data include vessel traffic volume, locations of boats, boat types, origin and destination points, direction of travel, and environmental conditions. These data are entered into a GIS to produce maps of boat traffic patterns, and origin and destination points. Currently, staff is working with MML and Florida Sea Grant to collect information on boat traffic in Brevard County. Aerial surveys began in May 2006 and are scheduled to be completed in July 2007. Mail-out surveys will be completed and analyzed in 2007.

There are important constraints and limitations in using either aerial or mail surveys to monitor boating over the long term. Aerial surveys provide a cost-effective, broad overview of seasonal vessel traffic countywide. However, an appropriate method for interpreting waterway use from boat observations collected during aerial surveys has yet to be developed and is needed in order to characterize boat traffic. In addition, similar to aerial surveys of manatees, field data collection can be hampered by weather conditions and restricted airspace due to U.S. Department of Homeland Security activities. Aside from flights coordinated by MML with funds they receive from the Save the Manatee Trust Fund (STMTF), other flights are supported with external funding and, when available, funding from the Division of Law Enforcement's Office of Boating and Waterways.

By comparison, mail surveys are more expensive to conduct, given current levels of effort; however, mail surveys provide data that complement aerial surveys, including travel routes, trip origins, destinations, regions served by facilities, and locations of perceived boating congestion. Questionnaire responses provide information about why people use specific locations and travel routes. Interpreting maps of travel routes in terms of boating densities is problematic partly because of an unknown response bias. Collection of returned questionnaires does not necessarily reflect a true cross-section of the boating community or facility. Also, the data are not conducive to mapping the spatial arrangement of boats over an instant in time. Densities mapped from the travel routes are dependent on responses and are not based on direct observations. Similar to the aerial surveys, all mail surveys are funded externally.

Data from both types of surveys are used to develop parameters for modeling risk to manatees of interactions with watercraft. These models will then help researchers evaluate the effectiveness of manatee protection measures. (See Chapter 10, "Ongoing and Future Research.") Collecting and interpreting appropriate and timely information regarding manatee biology, distribution, and habitats, as well as human behavior, will help support informed decision-making and provide insights into potential consequences of management actions.

Table 26. Proposed timeline for implementing human dimensions (boat traffic) monitoring activities.

Human Dimensions	Year One	Year Two	Year Three	Year Four	Year Five
Boat traffic monitoring and data analysis as determined by management needs (involves MML and Sea Grant): Brevard County					
Boat traffic monitoring and data analysis: St. Johns and Flagler Counties					
Boat traffic monitoring as determined by management and LE needs: Other counties	Determined by management and LE needs				

CHAPTER 10: ONGOING AND FUTURE RESEARCH

Research consists of studies with defined start and end points that are designed to answer specific questions. Although the Florida manatee is a relatively well-studied marine mammal, many unanswered questions remain. The research questions posed today are more complex than ever before, and their answers require a higher level of resolution. In addition to the monitoring activities described in the previous section, future research will involve refining field data collection and analytical methodologies, improving data management, investigating interactions between manatees and humans, exploring how changes to manatee habitat may affect the manatee population, and evaluating the effectiveness of management actions. The majority of funds for manatee research are allocated to FWRI's core monitoring projects. (See Chapter 9, "Monitoring Activities"). As a result, most of the research discussed below must be funded externally through grants and partnerships with other divisions within the agency.

The amount of information required by managers to better protect the species is not collected and analyzed by one entity alone. FWC researchers work with scientists from around the world to answer important questions about the Florida manatee population, ecology, behavior, anatomy, physiology, health, habitats, and human dimensions. Each agency and organization specializes in certain subject areas. Researchers from these institutions often work together in teams and partnerships on large-scale projects. Examples of these teams include the Federal Recovery Team working groups (*e.g.*, Manatee Population Status Working Group, Manatee Habitat Working Group, Manatee Warm Water Task Force), the genetics research team, the speed zone effectiveness team, and the manatee photo-identification program. The following chapter describes FWRI's role in helping to answer important research questions so that we can provide the best available information to managers.

Warm-Water Habitat Investigations

Manatee behavioral and physiological responses to cold and their familiarity with the network of warm-water refuges play a large role in their susceptibility to cold-related stress and mortality. The Florida Manatee Recovery Plan (USFWS 2001) recommends that research efforts focus on filling in data gaps concerning manatees, warm-water requirements, and behaviors associated with obtaining and maintaining optimal body temperatures. Furthermore, foraging resources near winter aggregation sites must be assessed to ensure that they are adequately protected. (See discussion on carrying capacity below.)

The Warm Water Task Force and Manatee Habitat Working Group, a subgroup of the former Florida Manatee Recovery and Implementation Team, identified a number of questions relating to manatee behavior, physiology, and warm-water habitat where further research is needed. Information acquired from these research efforts will be critical in developing a consistent, reliable, and protected network of warm-water refuges that will sustain the manatee population both regionally and statewide. An adequate warm-water network is required for the recovery of this population. An outline of the priority areas of research (with emphasis on FWC activities) along with recently completed, ongoing, or proposed studies follows (see also Chapter 7, "Management Actions").

FWC Contingency Plan

FWC staff is initiating the development of a comprehensive plan to avoid a catastrophic cold-related mortality event and to mitigate the potential impacts on manatees resulting from the closure of a primary industrial thermal refuge. This plan consists of two components: proactive research and monitoring, and preparation of a coordinated response plan. Due to the multi-faceted nature of the plan, it will need to incorporate input from research and management partners and non-governmental organizations such as oceanaria.

FWC staff will develop a framework for the research and monitoring component in coordination with biologists from USGS, USFWS, and other research organizations, and with input from the Warm Water Task Force. The principal objectives of this effort are to identify and characterize passive secondary warm-water sites in the region of the power plant, investigate the feasibility of enhancing those sites to sustain manatees through a cold period, and identify and test methods to encourage manatees to migrate south or find alternative warm-water sites. The latter objective will require close coordination and cooperation with the electric utility industry to test effects of altered warm-water availability on manatee behavior. The logistics of power generation, however, are expected to place severe constraints on the ability to manipulate warm-water outflows. Monitoring the response of manatees to the construction of alternative warm-water sites also would be part of the plan if funding and permits were obtained to implement the proposal. USGS has drafted a monitoring plan for that possibility, to which FWC has provided input. The next step is to establish partnerships, create study plans that include methodologies and timelines, and seek funding.

The second part of the FWC contingency plan involves creating a response plan for a possible manatee cold-related die-off. Working with our partners in the oceanaria and in management (*e.g.*, USFWS), the FWC has begun revising the Florida Manatee Contingency Plan for Health-Related Events (Geraci and Lounsbury 1997). Revisions will include identifying key partners, updating contact information, creating Memoranda of Understanding between agencies, and hosting training workshops for first responders. Revisions will take approximately one year to complete. The plan will be updated annually. For additional information, see Chapter 7, "Management Actions."

Investigations of Industrial Warm-Water Discharges

Understanding how manatees use individual discharge sites and the regional network of warm-water sites will provide an important foundation for managers designing a future warm-water network that includes a combination of industrial, natural, and non-industry-dependent alternative sites. Telemetry and photo-identification studies in addition to aerial surveys provide complementary information on manatee use of power plant discharges. FWRI recently completed field work on a GPS telemetry study of manatee use of industrial warm-water sources and surrounding foraging habitat in Tampa Bay (Deutsch *et al.* 2006). Although difficult to plan for, it will be crucial to take advantage of temporary or permanent shutdowns through research and monitoring of manatee movements, behavior, and survival (*e.g.*, Packard *et al.* 1989) to gain better predictive ability on manatee population response to changes in warm-water availability.

Investigations of Natural Spring Habitat

This component of the warm-water network is crucial to maintain because springs are reliable sources of warm water that require minimal maintenance relative to other options under consideration. Research efforts are required to identify springs that could provide valuable warm-water habitat for manatees if human barriers are removed or enhancement efforts are taken to provide greater access. To identify these sites, physical characteristics necessary for a spring to provide suitable warm-water habitat must be identified and manatee movements must be characterized on a fine scale in and near these spring systems. FWRI recently completed a field study of Warm Mineral Springs (Sarasota County)—based on telemetry, photo-identification, and ground counts—to document attendance patterns, foraging movements, and site fidelity of manatees overwintering at this site. Data management and analyses will be completed within one year of approval of the plan. Wildlife Trust has recently completed a study to address issues of manatee access to springs (Taylor 2006).

Investigations of Passive Warm-Water Habitats

Thermal basins and other passive warm-water habitats may become an increasingly important component of the warm-water habitat network for manatees, especially in southernmost Florida, as industrial sources disappear over the next few decades. These habitats are poorly understood, however, and require further investigation to identify such sites, characterize the physical features that maximize heat retention, and assess their potential to support manatees through a cold winter either with or without enhancement (Laist and Reynolds 2005b). Mote Marine Laboratory has studied manatee use of a secondary aggregation site at Matlacha Isles (Lee County) and has characterized the habitat attributes at this site (Barton and Reynolds 2001). The USGS Sirenia Project is studying manatee use of passive warm-water habitat in Ten Thousand Islands (*e.g.*, Port of the Isles) and the southwestern Everglades. FWRI plans to identify and characterize passive warm-water habitat and its current use by manatees in Brevard County. The Brevard County area is of particular importance because it is at the northern extent of the manatee's winter range and has very high numbers of manatees using the two existing power plants. Temporary or permanent loss of these power plants could result in significant manatee mortality. The Tampa Bay region may also be considered as a future study area for similar reasons.

Evaluation of Alternative Warm-Water Sources

As an interim measure to avoid potential catastrophic mortality resulting from power plant changes, the Warm-Water Task Force (WWTF) is considering the creation of various alternative non-industry dependent warm-water sources including groundwater, aquifer storage and recovery (ASR) wells, and solar and other technologies. Research is needed to assess the feasibility, cost, and efficacy of these alternative approaches. FPL and Reliant Energy have funded various efforts relating to alternative technologies and feasibility studies have been completed for a solar-heated prototype design (Gu 2005). Creation of any such thermal refuge requires a monitoring plan to assess how quickly manatees find the new warm-water source and whether they adopt it in lieu of other available sites. FWC biologists are coordinating with USGS on a draft monitoring plan for a pilot project proposed for the Reliant Energy power plant in Brevard County.

Identifying Potential Sites for New Alternative Thermal Refuges

Before individual industrial warm-water sites are lost, new warm-water sites need to be made available by enhancing existing areas or creating new ones. Wildlife Trust is documenting manatee response to the enhancement of Homosassa springs (http://www.wildlifetrust.org/edge_of_the_sea/homosassa). Initial investigations have developed methods to identify potential locations of new warm-water habitat along Florida's southeastern coast (Reynolds 2000). This approach has considered manatee habitat requisites (*e.g.*, forage) as well as human activities and shoreline land-use patterns. Pursuant to these methods, Reynolds (2000) identified possible sites in southeastern Florida. Additional work is required to create an inventory of suitable sites that could potentially serve as alternative thermal refuges. This will help mitigate the elimination of existing industrial warm-water sources as they go off-line or become unreliable. Once identified at a broad scale, further evaluation of the most promising alternative refuge sites can be performed, including investigating the feasibility of prototype devices that generate warm water such as that detailed in Gu (2005). Initial efforts to identify potential alternative refuges in southwestern Florida such as gathering key environmental data for inclusion in a GIS are being undertaken by FWRI researchers.

Assessing Manatee Physiological Responses to Temperature Change

While there have been some studies on manatee metabolic rate and gastrointestinal activity and how those functions change in response to cold water temperature, we still lack a good understanding of the physiological mechanisms underlying the lethal effects of cold stress (Bossart *et al.* 2002), the sublethal effects of chronic exposure to cold ambient waters, and general cold and heat tolerance ranges of manatees. Although the cold winter season is thought to be energetically stressful for manatees in much of their Florida range, we have no data on energetics and relatively little data on changes in body condition over the winter. Analysis of seasonal and inter-annual variation in condition using the necropsy database is needed. Relating the thermal regimes experienced by free-ranging manatees to changes in body condition and health from overwintering would complement the physiological studies carried out on captive animals. FWRI researchers have collected and plan to publish data on overwinter changes in manatee body mass/condition/health in Tampa Bay for 10 manatees, as well as a continuous record of the thermal regime that they have experienced over the winter.

Development of a Model of Manatee Response to Changes in the Warm-Water Refuge Network

The key question of how the manatee population will respond to various future changes in warm-water habitat availability is the most difficult to address directly, because the warm-water network is extensive spatially, experimentation is costly or logistically impractical, replication is not possible, and the number of possible scenarios is large. Therefore, simulation modeling based on the best available data from behavioral, physiological, and population studies, as well as expected trends in the availability of warm-water sources, must be an important tool in the decision-makers' kit. USGS and FWRI have completed a core biological model of manatee population dynamics (Runge *et al.* 2007b), and this model has been modified

by USGS to address this issue. Data collection for use in this model has been ongoing by USGS, FWRI, and MML.

Table 27. Proposed timeline for implementing warm-water investigations.

Warm-Water Investigations (see also Chapter 7, "Management Actions")	**Year One**	**Year Two**	**Year Three**	**Year Four**	**Year Five**
FWC Contingency Plan–Revise contingency plan for response to large-scale mortalities due to changes in warm water (see Chapter 7, "Management Actions"					
Industrial ww discharges–Analyze data and publish results from the Tampa Bay Study					
Natural springs habitat–Analyze data and publish results from the Warm Mineral Springs study					
Passive warm-water habitats–characterize passive sites (*e.g.*, thermal basins) in Brevard County					
Alternative warm-water sites–Develop a monitoring plan with USGS for proposed warm-water basin at Reliant plant					
ID potential sites for new refuges–Create inventory of suitable sites, create spatial database of habitat variables in SW Florida (see Manatee Habitat Characterizations)					
Monitor water temperatures at warm-water aggregation sites statewide in winter and maintain database					
Physiological responses to cold–Examine necropsy data for chronic and acute effects of exposure, energetic effects of cold by examining body condition of carcasses, changes in overwinter condition from captures					
Create model of manatee responses to changes in the warm-water network–Work with partners on core biological model, other models					

Environmental Carrying Capacity for Manatees

Carrying capacity (K) can be defined as the population density or maximum population size of a species that a given environment can support based on available resources (Keeton *et al.* 1986; Futuyma 1986; Campbell 1987). Carrying capacity is not static, but rather is

dynamic, as availability of resources changes due to natural events (*e.g.*, hurricanes that affect SAV) and human activities (*e.g.*, obstructions that block access to habitat requisites).

Available resources necessary to support most mammalian species are food, water, and shelter. In the case of manatees, there is some debate regarding the extent to which manatees physiologically require fresh water beyond what they can extract from their diet (Hartman 1979; Ortiz 1994). Manatees do, however, seek out, access, and drink fresh water throughout their range. For the most part, fresh water is available to manatees statewide although exceptions may include regions such as Biscayne Bay where fresh water may be a limiting factor. Therefore, this discussion will focus on the other two potentially limiting resources for manatees: shelter (warm water) and food (aquatic vegetation) associated with warm water sites. Availability of warm-water habitat and adequate forage is not currently limiting the growth of the Florida manatee population. However, projected declines in the availability of warm-water habitat due to power plant closures and reduction in natural spring flows are likely to limit the environmental carrying capacity for manatees some time in the near future. (See Chapter 2, "Threat Assessment" and the Measurable Biological Goals section of Chapter 4, "Conservation Goal and Objectives"). With the disappearance or reduction of warm-water aggregation sites, manatees will be forced to overwinter in a smaller number of areas. Once this occurs, the availability of adequate forage associated with the remaining warm-water habitat may become a factor in carrying capacity.

Current estimates of carrying capacity used in the biological status review and to calculate the measurable biological goals are based on expert opinion. Expert opinion was solicited on the number of manatees that could be supported in existing warm-water habitat within each management unit, as well as in the future under a scenario of no power plant thermal discharges (Runge *et al.* 2007b). Work on calculating K for manatees is in its infancy and a conceptual framework for studies to determine K for manatees in Florida is needed. Various organizations associated with the former USFWS Recovery Team began to gather existing data and information to quantify the amount and quality of current warm-water discharges (natural and industrial) and winter forage resources in proximity to these sites. Staff at FWRI are creating a spatial database of habitat variables in southwestern Florida that may inform carrying capacity analyses. In addition to quantifying resource availability, studies of carrying capacity must also include information about manatee behavior and access to requisites. (See discussion of warm-water research above.)

To begin addressing the adequacy of available forage associated with a warm-water refuge, staff at FWRI collected data in Tampa Bay near the Tampa Electric Company's Big Bend power plant (TECO). The objectives of this study were to assess the short- and long-term effects of manatee foraging activity on seagrass communities near the TECO power plant; characterize manatee foraging behavior and identify key feeding grounds in winter around this site; and assess the adequacy of seagrass forage for manatees that spend the winter at the power plant. Seagrass biomass and productivity data collected during this study will be used for the calculation of winter forage resources available for manatees overwintering in Tampa Bay. A similar study on manatee feeding habits, seagrass impacts, and seasonal carrying capacity of forage resources was conducted by Wildlife Trust near the Florida Power and Light power plant discharge in Riviera Beach, Florida.

Other research regarding warm-water refuges (see above) will be valuable in helping to calculate carrying capacity. Over the next five years, agencies and organizations need to continue to gather existing information to quantify warm-water resources and associated forage, identify data gaps, create a conceptual framework for future research, and begin writing and reviewing proposals to initiate research within the established framework. This research may involve projecting how and where warm-water refuges and associated forage may change over time and developing a flexible, predictive model to determine K that will accommodate environmental changes. For more information, refer to Chapter 7, "Management Actions."

Table 28. Proposed timeline for multi-agency research about carrying capacity. See Chapter 7, "Management Actions."

Carrying Capacity (*multi-agency effort)	Year One	Year Two	Year Three	Year Four	Year Five
Develop conceptual framework for studies to determine K for Florida					
Assessing Carrying Capacity - evaluate impact of manatee foraging on seagrass beds around a primary warm-water aggregation site in winter. (See Chapter 7, "Management Actions")					

Investigations of Manatee-Boat Interactions and Effectiveness of Manatee Protection Measures

Management has used speed restrictions as a tool for protecting manatees from boat collisions for a number of reasons: collisions occurring at slower speed may minimize the severity of collision-related trauma and, as a result, may reduce mortalities and serious injuries; slower speed may provide boaters with more response time to detect and avoid manatees; and slower speed may give the manatee more time to react to and avoid an approaching vessel. Although these premises make sense intuitively, to date few studies have been conducted specifically to assess whether they are true. Doing so is very complex and has many facets.

To address this complexity, an interagency team consisting of staff members from the FWC and the USFWS was formed. The first task of this team was to define speed zone effectiveness and parse the topic into discrete components. The team defined speed zone effectiveness as "the extent to which manatee protection zones reduce the risk of watercraft-related manatee mortality, injury, or disturbance." They also identified two principle components—human and manatee. The human component focuses on those human behaviors that may increase or reduce risk of boat collisions with manatees. Compliance with speed zones is one example. The manatee component focuses on manatee behaviors that influence the risk of a manatee-boat collision. For example, how does the spatial arrangement of forage, freshwater sources, and warm water influence manatee travel routes and the likelihood of

manatees and boats being in the same place at the same time? A typical question that would be addressed under the umbrella of protection zone efficacy is "how is the risk to manatees affected by the speed zone configuration that is in place?" Are fewer manatees expected to be killed or injured as a result of the zones than without the zones or with zones in a different configuration?

The interagency team also concluded that estimates of effectiveness of speed zones vary depending on the spatial scale and will require a mix of empirical studies and simulation modeling. Scale refers to the spatial resolution at which the zones are being evaluated. For example, assessing speed zones on a two-mile section of a river system presents different challenges than evaluating a larger estuarine bay system that includes portions of two counties.

One effort under way is an examination of changes in the number of carcasses collected after the establishment of speed zones. This approach may be promising in discrete, relatively closed areas, but uncertainties about boat-strike locations relative to the carcass recovery location confounds meaningful inferences. Another study of vessel planing speed characterizations seeks to determine the minimum speed at which most boats can reach and maintain a plane. (See the Human Dimensions section in Chapter 9, "Monitoring Activities").

Empirical studies, primarily field observations, include those studies that are designed to address effectiveness directly, such as comparisons of boat traffic patterns before and after zones are implemented; and those that contribute knowledge to models that integrate a considerable amount of information. Simulation models are simplified representations of real systems and can be valuable tools for understanding aspects of speed zone effectiveness because they can generate replications that we could not accomplish from field studies alone. Types of studies that can contribute to the evaluation of effectiveness of zones include the following:

Boating Studies (also see the Human Dimensions section of Chapter 9, "Monitoring Activities")

Methods for conducting boating studies are well-established, although refinement occurs continuously. A few areas where we need to focus future work include transforming aerial survey point data of boats to surfaces of relative abundance that accurately reflect boating patterns; mapping estimates of relative abundance from mail survey data; and analyzing data compiled from mail surveys to increase our understanding of variability of use among facilities and boat routes.

Manatee Behavioral Studies

A thorough understanding of manatee behavioral and sensory mechanisms underlying manatee-boat interactions is necessary in order to devise effective avoidance approaches, whether they are technological or regulatory. Relatively little research has been conducted with regard to behavioral responses of manatees to approaching vessels. For example, only two studies have examined manatee responses to passing or approaching watercraft (Nowacek *et al.* 2004) or to simulated vessel approaches (Miksis-Olds *et al.* 2007). The former study was somewhat limited in that manatee responses frequently could not be observed due to the

murkiness of the water. Technological advancements now make it possible to record response data during a boat approach even if the manatee cannot be seen. Various behavioral scenarios using simulation methods can also be explored. Two principle areas of research being considered include development and application of a digital acoustic recording device (d-Tag) and simulation of general manatee behaviors to quantify the likelihood of manatees and boats being in the same place at the same time. (See the Risk Assessment section in Chapter 10, "Ongoing and Future Research").

The d-Tag was developed by Woods Hole Oceanographic Institution (WHOI) to study the behavioral response of marine mammals to underwater manmade sound (Johnson and Tyack 2003; Nowacek *et al.* 2002). This state-of-the-art tag records the acoustic environment simultaneously with a suite of behavioral parameters (*e.g.*, pitch, roll, heading, depth, fluke rate, vocalizations). The d-Tag has been re-engineered by WHOI specifically for application to manatees and is now ready for deployment on free-ranging animals. The goal of the study is to be able to create a combined picture of manatee behavior, acoustics, and vessel trajectories so that we can better understand the responses displayed by manatees approached by boats and the acoustic cues that may mediate such responses. FWRI researchers are partnering with biologists and engineers at Florida State University and WHOI to employ this new technology on manatees in a study on manatee-boat interactions in southwestern Florida.

Analysis of Manatee Injuries from Collisions with Boats (also see the Manatee Carcass Salvage section in Chapter 9, "Monitoring Activities")

Collisions of boats with manatees, on average, account for approximately 25% of the total annual mortalities, 35% of all documented deaths of known cause. Collisions typically involve blunt-force injuries, propeller lacerations, or a combination of the two. Staff at the Marine Mammal Pathobiology Laboratory (MMPL) has created a novel method for estimating the size of a propeller by obtaining a cord length and cord depth measurement from penetrating propeller wounds (Rommel *et al.* 2007). Propeller diameter estimation can subsequently be used to infer vessel size. The next step will be to conduct a quality-controlled analysis by compiling a data set of carefully measured wounds on relatively fresh carcasses. Also, additional forensic methods that can contribute information on age and behavior of wounds will be explored. These methods should help decrease the number of cases where watercraft-induced death are suspected but not proved.

Investigations of Manatee Avoidance Technology

In 2001, the Florida Legislature appropriated funds ($200,000 annually) from the Marine Resources Conservation Trust Fund (MRCTF) for research projects that directly address the problem of reducing manatee-boat collisions by means of technological solutions. It was the intent of the Legislature to provide funding authority in order to quickly evaluate any possible existing technological solutions and, if appropriate, provide a funding mechanism to assist in bringing new technologies to a level that will eventually make these solutions available to the managers and public at acceptable costs and risks.

The following are the areas of study eligible for funding through the Florida Manatee Avoidance Technology grant program: technology designed to alert manatees to the presence

of oncoming watercraft so the animals can modify their behavior to avoid collisions; technology designed to alert boaters to the presence of manatees to enable boaters to avoid manatees without changing the behavior of the animals; hull or propulsion-system design or other technology that may reduce the risk of manatee-watercraft collisions or minimize injuries to the animals in the event of a collision, and other technology designed to reduce the risk of manatee-watercraft collisions or minimize injuries to the animals in the event of a collision; and research on manatees to obtain data required for avoidance technology development (*e.g.*, studies about manatee hearing, sound production, and responses to boat noise including, but not limited to, behavioral and anatomical approaches).

To date, FWC has made three solicitations for avoidance technology proposals. The third round of funding was awarded in fall 2006 and includes support for two projects: the manatee d-Tag study described earlier in this chapter, and a captive study to gather additional information on the hearing abilities of manatees. Funded studies have included research on using automatic manatee vocalization detectors, sonar, infrared cameras, a manatee alerting device, and baseline research on manatee sound localization. The solution for the near future will likely be one that combines the use of technology with existing manatee protection efforts. For additional information and copies of reports from funded projects, please see our website at http://research.myfwc.com/.

Compliance with Manatee Protection Zones

Two major aspects of the human component of efficacy of speed zones are compliance and how the public responds to the state's efforts to protect manatees. (See Chapter 13, "Social Impacts.") Understanding compliance includes characterizing compliance rates in specific sites, studying motivations behind compliance, and experimenting with different interventions that might lead to increased compliance. Understanding how the public responds to manatee protection efforts includes monitoring public attitudes toward manatees, regulations, and state competence and trust. (See Chapter 13, "Social Impacts.") FWRI staff, in collaboration with MML, has characterized compliance for many areas in Florida. (See Chapter 9, "Monitoring Activities.") FWC and MML also have conducted and are conducting studies to compare boating patterns and compliance before and after speed zones are posted, and have experimented with halo effects resulting from law enforcement presence.

In January 2006, staff completed the first year of field sampling for a multi-year study to characterize vessel traffic and boat speeds prior to implementation of new manatee protection zones in Anna Maria Sound. Field sampling included surveys from land and boat of vessel traffic and vessel speed, and aerial surveys of vessel traffic. Field sampling will resume one year after posting of the new speed zones to determine if the new zones alter boat traffic and vessel speeds. In 2006, staff from MML completed additional boater behavior studies, pre- and post-speed zone implementation, in Terra Ceia Bay and Lemon Bay. FWRI staff are conducting two additional, long-term boat traffic and boater behavior projects. These studies involve field data collection before and after completion of new waterfront development projects to ascertain and document changes in boat traffic and vessel speeds post-development.

Compliance studies provide the best assessment of boater behavior in and around a speed zone. However, compliance behavior is site-specific, and each county has many sites

where compliance is or might be a problem. Since compliance data collection requires from one to four staff, depending on what is being measured, and often requires a boat, each monitoring site can involve a significant amount of resources. Compliance studies have been funded by STMTF via contract with MML and by external grants.

Needed studies include characterizing the variability in compliance among sites by understanding the differences between those boaters that participate in recreational activities at a site and those that instead travel through the area to get somewhere else; increasing our understanding of what interventions might lead to increased compliance; and including what we know about compliance in risk assessment models (see below).

Development of Risk Assessment Models

Staff at FWRI has begun to create risk assessment models that will estimate the probability of a boat and a manatee co-occurring in space and time. These risk assessment models will rely on information derived from the studies described above and from monitoring activities described in Chapter 9, "Monitoring Activities." The general risk assessment strategy is to create maps of boating-use patterns and manatee-use patterns, overlay these maps, and generate a map from the overlay that illustrates relative spatial coincidence of manatees and boats being in the same place. "Relative risk" means estimates that are only relevant to comparison among areas within the map (*e.g.*, area A has three times the relative risk as area B). The next step is to refine the analysis possibly by including spatial covariates such as bathymetry, location of boating routes and manatee habitat, local boating knowledge and behavior, etc., to map relative risk of a collision. Ideally, the full risk assessment approach would include additional information such as vessel speed.

Maps illustrating manatee distributions are described in the aerial survey discussion. Maps characterizing boating activity are created in two ways. One way is by conducting mail and/or aerial surveys of boating in an area (see Chapter 9, "Monitoring Activities"). Currently, staff is collecting boat traffic data in Brevard County (see Chapter 9, "Monitoring Activities"**)** that will be applied to this risk assessment. The initial product will be a map of the coincidence of manatees and boats, and will be completed in 2007. An alternative method applicable when data are absent or when we are interested in estimating future boating patterns is to develop a boat pattern simulator. This model will apply the best available knowledge to generate patterns of boating and will enable staff to address waterways management questions that cannot be addressed empirically. A typical question is "how might boating patterns change if we add several facilities to a county or change the configuration of speed zones?" These maps of boating patterns are then compared to maps of manatee distribution as one aspect of risk. FWRI scientists are working with researchers at the Institute of Environmental Modeling at the University of Tennessee to build the simulator. Phase 1, which included the design framework and a very basic simulation model, was completed in April 2006. Phase 2 was initiated in fall 2006. This entails revisiting modules created in Phase 1, refining the model, and generating simulated boat traffic patterns that closely match current empirical data. Phase 3 will be the first application of the model in a decision-support scenario.

Table 29. Proposed timeline for investigations of manatee-boat interactions and effectiveness of manatee protection measures.

Investigations of Manatee-Boat Interactions and Effectiveness of Manatee Protection Measures	Year One	Year Two	Year Three	Year Four	Year Five
Analysis of the number of carcasses in zones to measure effectiveness of protection measures (change point analysis)	▒	▒			
Boating studies - before/after: Anna Maria Sound		▒	▒		
Boating studies - before/after: Apollo Beach					▒
Boating studies - before/after: Manatee River					▒
Manatee responses to boats - d-Tag	▒	▒	▒		
Wound analysis	▒	▒	▒	▒	▒
Avoidance technology grant program	▒	▒	▒	▒	▒
Boater compliance studies as determined by management and LE needs	Determined by management and LE needs				
Risk assessment - boat pattern simulator (refine and ground-truth model; continue to ground-truth and apply model in decision-support scenario).				▒	

Manatee Habitat Characterizations

Understanding the complex interactions among environmental variables that make up manatee habitat is difficult. One approach is to compile, standardize, and reformat relevant habitat variables in a GIS and then analyze them using a method called multivariate geographic clustering. The long-term goal of this work is to create a process for conducting regular habitat assessments that can be evaluated objectively.

Currently, FWRI is building the spatial database necessary for clustering and expect this phase of the work to be completed by July 2007. The primary data categories being considered are bathymetry, submerged aquatic vegetation, freshwater sources including point source runoff along seawalls, warm-water sources, and water temperature. Boating and manatee themes will serve as dependent variables during data analysis. The availability of the acquired spatial data layers in and of itself may prove useful to other research efforts, such as telemetry and mortality analyses, and future aerial distribution surveys.

After the clustering process (see Hargrove and Hoffman 1999), the resultant map grids can be examined from a variety of perspectives, such as freshwater access, usability as warm-water refuges, and likelihood of use as manatee forage sites or travel corridors. In addition, results of the cluster analysis can be combined with other data sets to investigate research questions such as why certain areas that appear suitable are not currently used by manatees. Data on boating intensity could also be added to help evaluate the potential risk of collisions. This project is funded by grants from the Marine Mammal Commission and the USFWS. Additional information on geographic clustering analysis can be found in Hargrove and Hoffman (1999) and Hargrove and Luxmoore (1997).

Another investigation evaluates existing habitat and manatee information from completed or ongoing studies on a regionwide basis. These "regional assessments" provide an assessment of the status of manatees in a region using a qualitative, weight-of-evidence analysis of available data. Outputs include an inventory of available information regarding boating, manatees, habitat, and law enforcement for each region; a list of relevant analytical techniques; identification of data gaps, information needs, and data format; recommendations for monitoring and research to fill in data gaps; a qualitative habitat characterization; and a characterization of manatee and human use of a particular region and the relationship between the two. Managers can use these studies to evaluate the adequacy of existing manatee protection regulations. Regional assessments have been conducted for Lee County, the Ten Thousand Islands, and a portion of the St. Johns River. A regional assessment of Volusia, Brevard, and Indian River counties has been initiated.

Table 30. Proposed timeline for manatee habitat characterization projects.

Manatee Habitat Characterizations	Year One	Year Two	Year Three	Year Four	Year Five
Characterize manatee habitat using multivariate geographic clustering					
Characterize manatee habitats and habitat-use through regional assessments: Brevard, Indian River, and Volusia counties (involves coordination with state, federal, and local governmental agencies)					
Characterize manatee habitats and habitat-use through regional assessments: Other regions		Determined by management needs			

Improve Methods of Core Monitoring

Improve Aerial Surveys to Estimate Statewide Abundance of Manatees

Several methods are used to estimate abundance of animal species, including distance sampling, plot sampling, and capture-mark-recapture (CMR) techniques. Current synoptic survey methods do not produce statistically reliable population estimates or reliable estimates of changes in population size over time. Unlike marine mammals that inhabit large, open-water areas, manatees often reside in narrow, irregularly shaped bodies of water (*e.g.*, man-made canals, rivers, creeks) that are difficult or impossible to survey using standard methods like distance sampling (Barlow 1995; Buckland *et al.* 2001; Calambokidas and Barlow 2004). Florida manatees aggregate in warm-water outfalls of power plants and natural springs in winter, seeking refuge from the colder ambient waters of surrounding bays, rivers, and estuaries. Aerial surveys that intensively cover manatee habitat in small, well-defined areas, like these winter aggregation sites (Packard *et al.* 1985), have obtained minimum population counts (Shane 1984; Packard *et al.* 1989; Garrott *et al.* 1994; Reynolds and Wilcox 1994; Ackerman 1995), but such counts are not useful measures of population size, even as a relative index (Williams *et al.* 2002).

If properly designed, an aerial survey monitoring program can provide statistically unbiased and acceptably accurate estimates of population size, which may be compared across years and regions to provide inference on population dynamics. Additionally, an adequate survey can provide an independent means of validating model-based estimates of population size and rates of growth. Currently, aerial surveys are the only means of obtaining information on manatee abundance and distribution and may be the most efficient means of providing population estimates in the future, although other methods of capture-recapture of genetically identifiable manatees may prove useful.

Broad changes to the statewide synoptic survey design are being proposed, based on long-established, fundamental survey design principles and innovative modeling techniques. As a means of moving this effort ahead, the general strategy for the development and implementation of a new survey design is comprised of four stages: convene meetings of experts for consultation on survey design; develop a draft methodology; test and revise the methodology based on flights conducted in a small region of the state; and implement finalized survey methodology to replace the current approach. Depending on availability of resources, stages one through three will be implemented throughout fall and winter 2006-2007. Following successful testing and revision, the new survey methodology will replace the existing synoptic survey methodology. In the interim, preparatory activities will include expanding and adapting the methods used in the survey test-area to the rest of the state, conducting training sessions to teach the new methodology to surveyors, developing adequate map coverages for a statewide survey, and establishing a computer database for survey data management. Depending on available funding, researchers hope to complete revisions to the synoptic survey design and begin implementation in 2008.

Improve Aerial Surveys of Manatee Distribution

Improvements in sampling methods for synoptic surveys will also benefit distribution surveys and may change the way these latter surveys are used. FWC staff is working with researchers from USGS, USFWS, and other agencies to improve the design of distribution surveys. New methodologies that incorporate information such as presence or absence of manatees or patch occupancy may prove useful for describing manatee distribution in a way that can more effectively be compared over time and space. FWC staff is currently testing new methods in Collier County and will continue to work with partners to improve distribution surveys and the products derived from them.

Table 31. Proposed timeline for improving manatee aerial survey methodologies.

Improve Aerial Surveys to Estimate Manatee Abundance and Distribution	Year One	Year Two	Year Three	Year Four	Year Five
Convene workshop of experts (completed Fall 2006)					
Develop draft methodology					
Test and revise methodology					
Implement finalized survey design and modify as necessary					
Improve aerial surveys of manatee distribution					

Develop Genetic Markers and Population Analyses of Manatees in Southwestern Florida

Efforts by the University of Florida (UF), USGS, FWRI, MML, and others to expand and refine the array of genetic tools for the Florida manatee are ongoing. Recent research has focused on the development of sufficient microsatellite DNA markers to identify individual manatees (*i.e.*, fingerprinting). Additional work is still needed to refine the fingerprinting techniques and expand our ability to identify parent-offspring relationships.

Ongoing FWRI research is being directed primarily toward assisting with genetic marker development and with field and laboratory work to determine how best to routinely collect DNA from free-swimming, wild manatees with minimal difficulty and disturbance to the animals. Because of the need to repeatedly, efficiently, and accurately identify individual manatees, refinement of the genetic-tag is a high priority. Inherently low genetic variability in Florida manatees makes this difficult, requiring more markers for reliable identification. Because of their expertise in developing genetic tags for other species, FWRI scientists began to assist with this effort in the first quarter of 2006. Since then, more than 100 additional candidate microsatellite markers have been isolated. To date, 18 markers proved to be empirically suitable and contain useful polymorphism (Tringali *et al.* in press). In December 2006, these and other markers were posted in the international web-based repository GenBank and were made available to our research partners and other Sirenia scientists. Used in

conjunction with markers developed by our research partners, they will contribute to an efficient and highly reliable genetic screening procedure for fingerprinting and other genetic analyses. This assay should be available for routine use in the first quarter of 2007.

Baseline population genetic data (*e.g.*, allele frequency data, inbreeding and relatedness coefficients) will be a necessary component of genetic tagging applications. Fortunately, FWRI has an extensive manatee tissue bank, derived from its statewide carcass recovery program. DNA has been extracted from more than 1,100 specimens from this tissue bank. FWRI researchers have been conducting genetic assays for these specimens by using eight previously published microsatellite loci. Because of tissue degradation, not all specimens were suitable for genetic assay; however, genotypes at these loci have been determined for more than 900 individuals so far. Assuming funding remains available, FWRI will complete a genotype library with these individuals for all markers and subsequently make it available to all research partners.

Gender determination is an important component of genetic studies involving field-sampled manatees and requires DNA-based gender markers that will work in concert with microsatellite DNA markers in fingerprinting and parentage assays. During 2006, FWRI scientists completed the design and testing of gender markers for manatees. A manuscript describing the development process and the new research tool has been accepted for publication in *Marine Mammal Science* (Tringali *et al.* in press).

Theoretically, the existence of a genetic tag that identifies individual manatees could enhance existing monitoring methods in a suite of capture-recapture, and capture-recapture-recovery studies. These include studies of demographics and individual movements (stock structure), population estimates, and survival rate estimates. Application of genetic markers may be able to provide a means for identifying badly decayed or otherwise unidentifiable carcasses; identifying non-scarred, live manatees and possibly those in areas where photographic conditions are limiting; and determining gender without capturing the animal or getting in the water with it. In any case, genetic identification will be most effective when used in conjunction with other methods. It will not replace photo-identification, aerial surveys, or other monitoring tools.

The timeframe for the adoption of genetic-identification tags for population inferences depends directly on the development of adequate field sampling techniques, which is at a very early stage. Currently, while conducting photo-identification sampling in Sarasota Bay, MML scientists are opportunistically sampling known individuals using one tissue-sampling tool (Carney *et al.* in press). DNA quality from this sampling method must be verified. If the DNA quality is good, then the sampling methods and tools must be tested at other sites. Other tools have been explored that also show promise, including a minimally invasive biopsy needle designed originally for marine fish. Pending approval from the USFWS, we will begin comparing the competing sampling methods so that the most efficient tool can be chosen. Additional resources may be required for FWRI to conduct pilot genetic sampling concurrently with existing photo-identification monitoring. The majority of FWRI photo-identification field sites are accessed only by land, in some cases limiting the ability to collect genetic samples and possibly necessitating the development of new sampling methods (*e.g.*, kayak or swimming approaches) and the hiring of additional staff or recruitment of volunteers.

Prior to expanding existing monitoring studies to include genetic-based recaptures, the aforementioned issues must be addressed. The utility of the technique will depend on the degree to which manatees can be sampled routinely, efficiently, and in a nonbiased fashion. As with photo-identification, the success of tissue sampling for genetic identification may vary by location, abundance of manatees, proximity of manatees to researchers, water clarity, weather conditions, and manatee behavioral state or reproductive condition. Therefore, field tests must occur in various locations throughout the state and the timeframe for general application of genetic identification in monitoring cannot yet be specified.

Additionally, a cooperative, multi-agency, shared database for genetics data must be established. This may be accomplished through revisions to the current Memorandum of Understanding (MOU) between FWRI, UF, MML, and USGS. A meeting has been scheduled to discuss revisions to the existing MOU. In addition, the genetics database must integrate seamlessly with MIPS.

The use of any capture-recapture technique for abundance estimation is problematic for manatees, which are wide-ranging animals and have a low probability of capture. Such populations require more complex statistical models, with more parameters, requiring larger sample sizes for reliable estimation. However, provided the sampling issues are resolved, genetic capture-recapture may significantly increase sample sizes in areas where photo-identification already occurs and may provide improved estimates of vital rates in areas that are not easily monitored with photo-identification (*e.g.*, far southwestern Florida).

Table 32. Proposed timeline for manatee genetics research.

Manatee Genetics Research (collaborate with MML, USGS, & UF)	Year One	Year Two	Year Three	Year Four	Year Five
Develop and refine genetic markers					
Develop field sample collection methods for live manatees					
Obtain USFWS authority to test sampling methods on captive and free-ranging manatees					
Implement testing of sample collection methods on captive and free-ranging manatees					
If sample collection methods are successful, create sampling design for free-ranging manatees in SW Florida					
Implement sample collection in SW Florida					
Continue to sample manatee carcasses					
Develop and refine cooperative database					

CHAPTER 11: IMPLEMENTATION STRATEGY

Conservation and recovery of the Florida manatee through the implementation of this plan will require the cooperation of local, state, and federal agencies, non-governmental organizations, business interests, and the public. The cooperation of state and federal agencies, in particular between the FWC and USFWS, has been a central component of manatee conservation for over 30 years. Continued close collaboration and cooperation on this plan with the USFWS and the Federal Manatee Recovery Team is key to our long term strategy. At the state level, it is recognized that a number of agencies have important roles in manatee conservation. While this plan was developed by FWC staff, it cannot be successfully accomplished without significant direct involvement of other state agencies. Close work with water management districts, the Florida Department of Environmental Protection (DEP), and the Florida Department of Community Affairs (DCA) will be required to address the significant problems associated with loss of artificial and natural warm-water sources and implementation of county manatee protection plans. The cooperation of counties in all our efforts is essential as well. Enforcement of waterway regulations depends on a strategy of maximizing available resources through close teamwork among the many levels of government. This is exemplified by some of the existing interagency on-water law enforcement task forces that include federal, state, county, and city enforcement staff. This strategy will be expanded as it is rolled out to new areas of the state.

Complex natural resource problems cannot be solved by government alone. Collaboration and cooperation with the private sector and support from the public will be necessary for the long-term successful management of manatees in Florida. In recent years, the FWC and USFWS have greatly expanded our efforts to reach out and involve non-governmental organizations, business interests, and other stakeholders in finding solutions to difficult manatee-related problems. This strategy of cooperation will continue. Partnerships with companies that generate electricity in Florida will need to be strengthened and expanded in order to face the challenges of potential loss of manatee warm-water sources.

Effective management actions and decisions depend on an understanding of the best available science. Our knowledge and understanding of manatee biology and ecology has increased tremendously over the past 30 years. Despite these gains, we remain committed to ongoing research, and to investigating and testing current assumptions in an effort to improve our knowledge base. Accordingly, we will adapt this plan, and modify our approach and our management actions as necessary when new information becomes available.

Priority Tasks

The six objectives listed in the Executive Summary and in Chapter 4, “Conservation Goal and Objectives,” are the top priorities of this plan. All tasks that contribute to accomplishing these objectives are therefore high priorities. The priorities of this plan are tasks intended to reduce human-caused manatee mortality and those tasks that focus on reducing risks associated with future changes in warm-water habitat. Tasks associated with estimating manatee population and assessing progress using measurable biological goals are also high priorities.

Within Chapters 7-10 of this plan, there are a number of tables that provide proposed work plans for a five-year period following approval of the management plan. For example, Table 4 in Chapter 7 provides a prioritization for review of existing protection zones based on evaluating specific criteria. However, while these tables found throughout the plan provide a timeframe for completing tasks, they do not necessarily equate to a prioritization in every case. In some cases, a task scheduled for completion in year one may not necessarily be more critical than a task scheduled for completion in year five. The reason for this is that some tasks are sequential and completion of one task is required before initiation of the next task. While the preceding sequential tasks may seem more mundane, they must be completed before the task that is ultimately more critical. The team experimented with different approaches to prioritizing the tasks in the plan and ultimately decided a discussion/consensus approach was most satisfactory. All the tasks of the plan are combined into one table (Table 34) at the end of this chapter.

Required Resources and Other Costs Associated with Implementation

It is beyond the scope of this plan to estimate the total cost (historical or projected) of manatee conservation. It is estimated that Florida spends between nine and 11 million dollars annually on manatees. Funds come from the Save the Manatee Trust Fund, the Marine Resources and Conservation Trust Fund, marina fuel taxes, and general revenue. The amount spent by the USFWS has varied substantially in recent years. Over the past 10 years, the USFWS estimates it has spent an average of approximately $976,000 annually on manatee conservation.

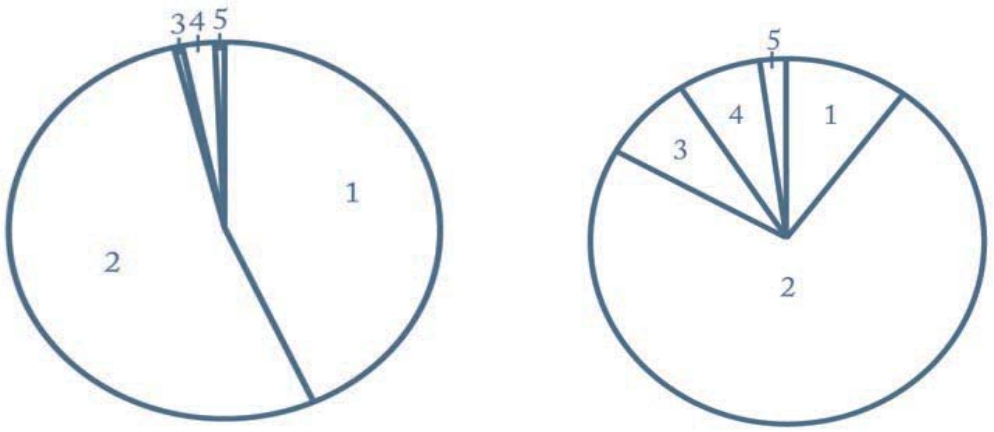
Many of the tasks outlined in this plan are ongoing activities expected to be completed with existing staff and current funding. However, expenses associated with the manatee program continue to increase for a number of reasons. Increasing fuel costs impact the use of vehicles, boats, and aircraft required for research, monitoring, and management activities. In order to accomplish the goals and objectives of this plan, and to complete the many separate tasks, additional resources will likely be needed, or some current programs will need to be altered or dropped. Each year, assessments will be made regarding sufficiency of funding to accomplish management and research tasks for the subsequent fiscal year. If projected costs are anticipated to exceed expected legislative funding, additional funding will be requested from the Legislature or sought from other sources.

Not all proposed tasks or activities can be initiated or worked on simultaneously, given the existing staffing and funding levels. If the public, stakeholders, or policy-makers wish to accelerate implementation of this plan and the recovery of the manatee, additional funding and resources need to be identified. Conversely, if funding decreases, we will not likely be able to meet the timetables outlined in this plan, and recovery of the manatee will be delayed.

Florida Statute 370.12 (4)(b) requires that the FWC provide the President of the Senate and the Speaker of the House by December 1 of each year a written report enumerating the amounts and purposes for which all proceeds in the Save the Manatee Trust Fund (STMTF) are expended. The reports from 1995 to the most recent report 2004/2005 can be found on our website at: http://research.myfwc.com/features/category_sub.asp?id=3686.

Funding for the state's manatee-related research and conservation activities (with the exception of law enforcement) is provided primarily from the STMTF which receives money from sales of manatee license plates and decals, boat registration fees, and voluntary donations. The STMTF was created by the Legislature and is not affiliated with the Save the Manatee Club. Revenues for fiscal year 2004/05 totaled $3,548,984. Appropriations for the same period were approximately $4,280,567, with $325,000 provided for manatee research activities at Mote Marine Laboratory and a charge to General Revenue of $99,830. Details are presented in Figure 12 below.

REVENUE **APPROPRIATIONS**



1 Save the Manatee License Plate ($1,542,458)
2 Vessel Registration ($1,879,893)
3 Interest ($20,752)
4 Decals and Donations ($87,095)
5 Miscellaneous ($18,786)

1 Law Enforcement ($425,830)
2 FWC Manatee Program ($3,145,885)
3 Mote Marine Laboratory ($325,000)
4 Administrative Overhead ($284,022)
5 Service Charge to General Revenue ($99,830)

Figure 12. Revenues into and appropriations from the Save the Manatee Trust Fund, for fiscal year 2004/05.

Revenues into the Save the Manatee Trust Fund are not keeping pace with inflation (see Table 33). Based on current estimates of costs associated with manatee research and management, the trust fund balance will be fully depleted by fiscal year 2009/10. This projected funding deficit could impact our ability to support this plan in the future. The FWC has developed a business plan to address this and other funding problems and is working with the Florida Legislature to explore further solutions.

Table 33. Projected revenues and expenditures for the Save the Manatee Trust Fund.

SAVE THE MANATEE TRUST FUND EXTENDED PROJECTION July 2007	Estimated* 2006-07	Projected 2007-08	Projected 2008-09	Projected 2009-2010	Projected 2010-2011
A. Beginning Cash Balance	423,493	183,469	267,789	83,281	(68,870)
B. Revenues					
Manatee Tag Sales (with marketing beginning in 07/08)	1,277,133	1,407,631	1,440,927	1,486,791	1,496,054
Interest	17,000	15,000	10,000	5,000	1,000
Donations	94,539	95,603	95,603	95,603	95,603
Vessel Registration	1,936,703	1,973,501	2,010,997	2,049,206	2,088,141
Miscellaneous	30,350	30,350	30,350	30,350	30,350
Nonrecurring	0	0	0	0	0
Total Revenue	3,355,725	3,522,085	3,587,877	3,666,950	3,711,148
C. Expenditures					
Manatee Research	2,099,511	2,111,610	2,111,610	2,111,610	2,111,610
Manatee Management	1,375,483	1,387,502	1,387,502	1,387,502	1,387,502
Law Enforcement	191,330	0	0	0	0
Nonrecurring & Amendments	0	0	0	0	0
Service Charge to GR	97,836	102,794	104,768	107,140	108,466
Administrative Overhead	281,590	285,858	285,858	285,858	285,858
Reversions	(450,000)	(450,000)	(150,000)	(150,000)	(150,000)
Cumulative Pay Increases		35,401	32,647	76,991	122,445
Total Expenditures	3,595,750	3,437,764	3,772,385	3,819,102	3,865,881
D. Ending Cash Balance	183,469	267,789	83,281	(68,870)	(223,604)

* Final year-end figures not available at time of printing

The FWC is taking steps to increase revenues from sales of the manatee license plate. First created by the Save the Manatee Club in 1990, the manatee license plate raises funds for manatee conservation and research. To date, over 559,000 manatee license plates have been issued, and nearly $34,000,000 collected to fund manatee research and protection in Florida.

The manatee license plate, once the most popular, is now the fifth most popular. Two explanations for the drop in sales of the manatee license plate are that it has not been marketed as effectively as many of the new plates, and it has not been redesigned since its inception. Statutory changes to allow a portion of the license plate funds to be used for marketing were

authorized in HB 7173 (Ch. 2007-223, Laws of Florida) during the 2007 session of the Legislature. In addition, the manatee license plate is being redesigned to enhance market potential and to increase revenue.

Florida artist, Nancy Blowers designed the new tag. The artwork is now in the final stages of preparation and the process of developing the new plates will begin soon. A letter of intent was sent to the Department of Motor Vehicles indicating the FWC's plans to redesign the plate. The design has the approval of both the FWC and the Save the Manatee Club. Once production has begun on the new design, the new plate will be ready for distribution in approximately seven months. Old plates will be purchased as surplus to facilitate the roll-out of the new design.

The manatee license plate generated $1,494,520 in revenue in 2005, with the sale of nearly 75,000 plates. FWC projects a 20% increase in revenue following improved marketing and release of the redesigned plate, which could add several thousand dollars of additional revenue.

Increasing revenues from the license plate will help in the short-term, but a long-term funding solution will require a multi-agency approach. A greater proportion of the cost associated with manatee conservation may need to be assumed by the federal government, non-governmental organizations, and the private sector, if we are to be successful.

Management Plan Review and Revision

This plan is a living document that will be monitored, evaluated, and revised as necessary to ensure continued progress toward the complete recovery and continued management of the manatee. After adoption of the plan, a new standing implementation team will be chartered by the FWC, with many of the same staff members that drafted this plan. Staff from the Division of Law Enforcement, at least two sections within the Division of Habitat and Species Conservation, and the Fish and Wildlife Research Institute will all serve on the standing Manatee Plan Implementation Team. This FWC team will coordinate efforts to implement the plan, ensure that coordination with external partners is initiated, and assess annual progress.

The team will oversee preparation of an annual progress report. The annual report to the Legislature on the expenditures of the Save the Manatee Trust Fund will be expanded to include an update on progress made on implementation of the tasks and objectives of the management plan. This progress report will be made available by December 1 of each year. To ensure that key stakeholder groups are apprised of progress on the plan, the annual report will be provided to the Manatee Forum, and staff will be available to provide updates on management plan progress at regularly scheduled Manatee Forum meetings.

The timeline for this version of the plan is five years. This does not suggest that all necessary tasks to accomplish the goal of this plan will be completed in five years. FWC staff, in coordination with other scientists and managers, will review the status of the Florida manatee as

needed and recommend proposed changes to the management plan as appropriate. When possible, FWC will coordinate the five-year review with the U.S. Fish and Wildlife Service's five-year review required by the Endangered Species Act. However, if the measurable biological goals indicate a statewide or significant regional decline in the population or a demonstrated significant increase in the risk of extinction, the FWC will implement additional actions deemed necessary to protect and conserve the species and revise the plan accordingly.

Table 34. Combined list of tasks in the MMP.

FWC Rule-Related Conservation Actions	**Year One**	**Year Two**	**Year Three**	**Year Four**	**Year Five**
A. Review of Existing Protection Zones					
1. Review zones in Sarasota County	■	■			
2. Review zones in Broward County		■	■		
3. Review zones in Collier County			■	■	
4. Review zones in Indian River and Volusia counties [1]				■	■
B. Review of New Areas for Protection Zones					
1. Review Flagler County, and coastal St. Johns and Duval counties		■	■		
2. Review springs for possible safe havens (mostly St. Johns River)		■	■		
3. Review western Pinellas County (Pass-a-Grille to Clearwater Pass) [1], [2]			■	■	
4. Review Monroe County (Upper Keys) [1], [2]			■	■	
C. Other Rule Activities					
1. Review of existing fishing guide and commercial fishing permits for elimination, except for net-setting.	■	■			
2. Re-evaluation of the informal petition for rule amendments in Brevard County submitted by CFFW.	■	■			

Notes:

[1] Action dependent on collection of boating data

[2] Action dependent on collection of new or additional manatee data

ISM Coordination with DLE	Year One	Year Two	Year Three	Year Four	Year Five
Disseminate manatee education materials to regional law enforcement offices in targeted counties.					
Provide updated, county-specific manatee mortality, distribution, and abundance data (if available) for consideration during future law enforcement details.					
Provide updated poster-size maps of manatee mortality on a county-specific (or regional) basis.					
Alert law enforcement to areas that are "hot spots" for manatees, either because of unusual aggregations or areas with higher than usual manatee deaths, for consideration during law enforcement details.					
Provide training on manatee biology, ecology, and conservation to the FWC Law Enforcement Academy.					
Investigate innovative vessel designs					

FWC permit review-related conservation actions	Year One	Year Two	Year Three	Year Four	Year Five
A. Manatee Impact Reviews					
1. Review and comment on potential state permitting actions to DEP and water management districts (ongoing)					
2. Refine and improve efficiencies in coordination with FWS, DEP, WMDs, and USACOE (ongoing)					
3. Develop consultation guideline to streamline permitting process in cooperation with agency partners					
B. Development of Protocols					
1. Develop and improve protocols for in-water blasting with USFWS, NMFS, & MMC (in progress)					
2. Develop and improve protocols for seagrass protection with partners					
C. Data Collection for Permit Related Cumulative Analysis					
1. Create GIS layer of existing boat facility inventories for consideration in permit review process (ongoing)					

2. Modify and update permit database to include Lat/Longs of projects to create a GIS layer (ongoing)					
FWC MPP-related Conservation Actions	**Year One**	**Year Two**	**Year Three**	**Year Four**	**Year Five**
A. Develop MPPs in the 13 "Key" Counties					
1. Assist Broward County in developing an approved MPP with FWS (in progress)					
2. Assist Palm Beach County in developing an approved MPP with FWS (in progress)					
3. Review comprehensive plan amendments related to MPPs for DCA (ongoing)					
B. Review Existing MPPs in the 13 "Key" Counties for Possible Revisions					
1. Review MPP for Duval County with FWS					
2. Review MPP for Collier County with FWS					
3. Review minor revisions to existing plans with FWS (ongoing)					
4. Determine schedule for review and revisions of all existing MPPs[1] with FWS					
C. MPPs in the "Non-Key" Counties					
1. Develop a MPP template for use by existing 13 counties for MPP revisions and for new counties developing MPPs, with FWS coordination.					
2. Conduct analysis of counties with manatee use to evaluate relative risk for manatees with FWS coordination.					
3. Develop guidance document explaining MPP approval requirements with FWS cooperation.					
D. Evaluation and Monitoring of Effectiveness					
1. Develop method and assess implementation of permit reviews and MPPs with FWS					
2. Develop method and assess, statewide and over time, whether adverse impacts to manatees are being addressed by permit review and MPPs with FWS					

Notes: [1] Action dependent on collection of new or updated manatee and boating data

Future Conservation Measures – Warm-Water Habitat (see also Chapter 10, "Ongoing and Future Research.")	**Year One**	**Year Two**	**Year Three**	**Year Four**	**Year Five**
Develop comprehensive interim and long-term plans for the management of manatee warm-water habitat.	■				
Warm-water habitat plan - Complete a thorough analysis of endangered species case law related to issues associated with changes to industrial warm-water habitat.	■				
Identify components of regional warm-water habitat networks and establish protection measures for sites that require this action.	■	■	■	■	
Conduct an analysis of public attitudes and expectations regarding warm-water options and their potential consequences.	■				
Assess management response alternatives for the loss of industrial warm-water habitat including weaning, maintaining warm-water sites and monitor/rescue. (See "Ongoing and Future Research" chapter for further information).				■	■
Identify funding sources that will assist in the implementation of warm-water research and management activities.	■	■			
Assess carrying capacity of warm-water habitat in Florida. (See "Ongoing and Future Research" chapter for further information)					■
FWC Contingency Plan - Complete an interagency contingency plan for responding to a temporary or permanent shutdown of all industrial warm-water sites. (See "Ongoing and Future Research" chapter for further information)	■				
Industrial warm-water sites - Coordinate with power companies to identify timelines, methods, and procedures for reducing the risk to manatees in the event of a change in plant operations that affect existing warm-water habitat.	■	■	■		
Update and modify existing NPDES Manatee Power Plant Protection Plans.			■		
Passive warm-water habitats - Identify, assess, protect, and enhance existing and potential passive warm-water habitat (*e.g.*, thermal basins, groundwater seeps, canals).			■	■	■
Alternative warm-water sites - Evaluate technological methods that may be employed to create small warm-water sites (*e.g.*, solar, thermal blankets, donkey boilers).			■	■	■

Future Conservation Measures – Springs/Riverine Habitat	Year One	Year Two	Year Three	Year Four	Year Five
Identify and assess Florida springs that may provide warm-water habitat for future use.	■	■			
Review all Florida natural springs that provide warm-water habitat for manatee protection and establish seasonal protection where needed.			■	■	
Establish minimum flows and levels on a priority basis at all Florida springs that provide primary or secondary manatee warm-water habitat.	■	■	■		
Establish minimum flows and levels on all riverine and estuarine systems that provide manatee habitat.	■	■	■		
Review and assess manatee accessibility to all Florida natural springs that provide potential warm-water habitat and prepare recommended management actions as needed to ensure accessibility.	■	■			
Promote restoration of potential natural Florida spring warm-water habitat that is currently inaccessible to manatees.			■	■	■
Continue to actively pursue springs protection through the state's Florida Springs Task Force.	■	■	■	■	■

Future Conservation Measures – Submerged Aquatic Vegetation	Year One	Year Two	Year Three	Year Four	Year Five
Implement statewide Seagrass Management Plan.			■	■	■
Organize a statewide interagency seagrass monitoring program.		■	■		
Develop and implement statewide legislation that deters seagrass scarring by vessels. Use fines collected under this statute for restoration of vessel-damaged seagrass.	■	■			
Evaluate the feasibility of a statewide comprehensive seagrass protection rule.				■	■
Complete HWG assessment of manatee carrying capacity relative to food resources and warm-water habitat needs at selected regional sites. (See "Ongoing and Future Research" chapter for further information.)	■	■			
Assess the efficacy of seagrass mitigation projects.		■	■		
Assess the effectiveness of new over-water structure design techniques for seagrass protection.				■	■
Develop permit guidelines for the construction of over-water structures that will further promote seagrass protection.				■	■

Future Conservation Measures–Water Control Structures and Navigational Locks	**Year One**	**Year Two**	**Year Three**	**Year Four**	**Year Five**
Complete all PCA Phase I manatee protection retrofitting at water-control structures and spillways.	■				
Complete all PCA Phase II manatee protection retrofitting of navigational locks and spillways.	■	■	■		
Complete manatee protection retrofitting of SWFWMD structures.		■	■		
Review new technology for the protection of manatees at water-control structures, spillways, and navigational locks to enhance manatee protection and provide water managers with additional flexibility.	■	■	■	■	■
Identify any other water-control structures, spillways, or navigational locks that may require manatee protection devices.				■	■
Continue to participate in the Comprehensive Everglades Restoration Plan through review and comment on specific projects and teams (KOEBCC and the CERP Manatee Task Force).	■	■	■	■	■
Future Conservation Measures–Aquatic Plant Management	**Year One**	**Year Two**	**Year Three**	**Year Four**	**Year Five**
Continue to represent manatee interests on the Blue Spring Aquatic Plant Management Working Group.	■	■	■	■	■
Continue to represent manatee interests at the annual Crystal River Aquatic Plant Management Working Group meeting.	■	■	■	■	■
Continue interagency coordination on the conservation and restoration of submerged aquatic vegetation in Kings Bay.	■	■	■	■	■
Assess and map freshwater aquatic plant resources near manatee warm-water habitat.			■	■	
Outreach and information activities Action Items	**Year One**	**Year Two**	**Year Three**	**Year Four**	**Year Five**
Implement recommendations from the survey of manatee education materials for revisions to current materials and development of new products and evaluate effectiveness (ongoing)	■	■	■	■	■
Maintain distribution of outreach materials around state (ongoing)	■	■	■	■	■
Develop new permit-related education materials and programs for marinas	■	■			
Develop new docking guidelines for large vessels			■		
Develop new materials to improve compliance with slow-speed zones in cooperation with law enforcement staff	■	■			
Work with federal and state partners to develop guidelines for manatee harassment issues	■	■			
ISM, FWRI, and Community Relations will work together to develop an agency strategy for improving the dispersal of accurate information about manatees to the public	■	■			

FWC Law Enforcement Actions	Year One	Year Two	Year Three	Year Four	Year Five
A. Enforcement Tasks					
1. Conduct 50,000 hours of manatee protection patrols annually (ongoing).					
2. DLE will work to form additional regional task forces within the state.					
3. Develop strategic manatee enforcement operational plans.					
4. Develop annual manatee enforcement officer workshops.					
B. Enforcement Coordination with USFWS					
1. USFWS Special Agents and Manatee Refuge Officers will work with FWC officers during each joint enforcement operation. (ongoing)					
2. There will be five to six USFWS agents working with five to six FWC officers during each enforcement operation.					
C. Manatee Regulatory Zone Sign Posting					
1. DLE is responsible for posting and maintaining waterway markers statewide (ongoing).					
2. FWC will develop standards for waterway marking and update such standards as necessary.					
D. Manatee Harassment					
FWC will work with USFWS, NMFS, and other agencies to develop solutions to marine mammal harassment.					

PHOTO-IDENTIFICATION (INVOLVES COORDINATION WITH USGS AND MML)	YEAR ONE	YEAR TWO	YEAR THREE	YEAR FOUR	YEAR FIVE
Photo-ID monitoring – data collection, matching, database management, analyses, etc.					
Photo-ID improve methods - Integrate MIPS database and continue improvements/upgrades (involves USGS and MML), digitize MMPL slides, scan and archive past datasheets, change database to SQL (USGS responsibility)					
Photo-ID analyses of population parameters (survival rates in SW FL; movements among subpopulations) - these require MIPS database integration					

Aerial Surveys	**Year One**	**Year Two**	**Year Three**	**Year Four**	**Year Five**
Conduct annual synoptic survey (organize field effort, collect data, create and maintain database and GIS maps, QA/QC, respond to info. requests, etc.). Involves coordination with a variety of partners.					
Estimate manatee population abundance by implementing redesign of the synoptic surveys (see "Improve Methods of Core Monitoring" in the chapter titled "Ongoing and Future Research.")					
Conduct manatee distribution surveys as determined by management needs: Coastal Flagler and St. Johns counties					
Conduct manatee distribution surveys as determined by management needs: Collier County (partner with the county)					
Complete Aerial Survey Technical Report					
Conduct manatee distribution surveys as determined by management needs: Other counties	Determined by management needs				
Carcass Salvage and Necropsy, and Manatee Rescues	**Year One**	**Year Two**	**Year Three**	**Year Four**	**Year Five**
Recover carcasses, necropsy to determine cause of death, collect tissues, maintain database, create GIS maps of carcass recovery locations, QA/QC, respond to info. requests, distribute tissues, etc.					
Improve methods to determine cause of death, investigate entanglements, investigate red tide, investigate cold stress, etc. (see also Chapter 10, "Ongoing and Future Research").					
Improve mortality database and implement changes					
Manatee carcass salvage database analyses - estimation of carcass recovery rate, age-specific mortality and reproductive rates, and characterization of patterns and trends in mortality					
Conduct manatee rescues					
Oceanaria reimbursement program					

Human Dimensions	Year One	Year Two	Year Three	Year Four	Year Five
Boat traffic monitoring and data analysis as determined by management needs (involves MML and Sea Grant): Brevard County					
Boat traffic monitoring and data analysis: St. Johns and Flagler Counties					
Boat traffic monitoring as determined by management and LE needs: Other counties	Determined by management and LE needs				

Warm-Water Investigations (see also Chapter 7, "Management Actions")	**Year One**	**Year Two**	**Year Three**	**Year Four**	**Year Five**
FWC Contingency Plan–Revise contingency plan for response to large-scale mortalities due to changes in warm water (see Chapter 7, "Management Actions"					
Industrial ww discharges–Analyze data and publish results from the Tampa Bay Study					
Natural springs habitat–Analyze data and publish results from the Warm Mineral Springs study					
Passive warm-water habitats–characterize passive sites (*e.g.*, thermal basins) in Brevard County					
Alternative warm-water sites–Develop a monitoring plan with USGS for proposed warm-water basin at Reliant plant					
ID potential sites for new refuges–Create inventory of suitable sites, create spatial database of habitat variables in SW Florida (see Manatee Habitat Characterizations)					
Monitor water temperatures at warm-water aggregation sites statewide in winter and maintain database					
Physiological responses to cold–Examine necropsy data for chronic and acute effects of exposure, energetic effects of cold by examining body condition of carcasses, changes in overwinter condition from captures					
Create model of manatee responses to changes in the warm-water network–Work with partners on core biological model, other models					
Carrying Capacity (*multi-agency effort)	Year One	Year Two	Year Three	Year Four	Year Five
Develop conceptual framework for studies to determine K for Florida					
Assessing Carrying Capacity - evaluate impact of manatee foraging on seagrass beds around a primary warm-water aggregation site in winter. (See Chapter 7, "Management Actions")					

Investigations of Manatee-Boat Interactions and Effectiveness of Manatee Protection Measures	Year One	Year Two	Year Three	Year Four	Year Five
Analysis of the number of carcasses in zones to measure effectiveness of protection measures (change point analysis)					
Boating studies - before/after: Anna Maria Sound					
Boating studies - before/after: Apollo Beach					
Boating studies - before/after: Manatee River					
Manatee responses to boats - d-Tag					
Wound analysis					
Avoidance technology grant program					
Boater compliance studies as determined by management and LE needs	Determined by management and LE needs				
Risk assessment - boat pattern simulator (refine and ground-truth model; continue to ground-truth and apply model in decision-support scenario).					

Manatee Habitat Characterizations	Year One	Year Two	Year Three	Year Four	Year Five
Characterize manatee habitat using multivariate geographic clustering					
Characterize manatee habitats and habitat-use through regional assessments: Brevard, Indian River, and Volusia counties (involves coordination with state, federal, and local governmental agencies)					
Characterize manatee habitats and habitat-use through regional assessments: Other regions		Determined by management needs			

Improve Aerial Surveys to Estimate Manatee Abundance and Distribution	Year One	Year Two	Year Three	Year Four	Year Five
Convene workshop of experts (completed Fall 2006)					
Develop draft methodology					
Test and revise methodology					
Implement finalized survey design and modify as necessary					
Improve aerial surveys of manatee distribution					

Manatee Genetics Research (collaborate with MML, USGS, & UF)	**Year One**	**Year Two**	**Year Three**	**Year Four**	**Year Five**
Develop and refine genetic markers					
Develop field sample collection methods for live manatees					
Obtain USFWS authority to test sampling methods on captive and free-ranging manatees					
Implement testing of sample collection methods on captive and free-ranging manatees					
If sample collection methods are successful, create sampling design for free-ranging manatees in SW Florida					
Implement sample collection in SW Florida					
Continue to sample manatee carcasses					
Develop and refine cooperative database					

CHAPTER 12: ECONOMIC IMPACTS

Overview

The potential economic impacts of implementing this management plan or, alternatively, if this management plan was not implemented are difficult to predict or estimate. There are many expenses associated with manatee conservation, including costs to government at all levels, as well as direct and indirect costs to the private sector. Conversely, the public's interest in manatees can produce economic benefits, particularly benefits related to the recreational and tourism sectors of the economy. In addition, the public values manatee conservation, and that too can be given an economic value. Given the timeframe for development of this management plan (approximately one year) a comprehensive economic study to estimate the costs and benefits associated with implementation of this plan was not possible.

There have been a number of published studies done by economists that looked at various aspects of economics associated with manatee conservation (Fishkind and Associates, 1993; Thomas and Stratis, 1995; Bendel and Bell, 1995; Bell, 2002; FWC, 2002). A brief review of these studies is provided in Appendix XII. As the most recent of these economic studies was completed in 2002, some caution should be used in generalizing from these findings. Overall, the published studies have shown both economic costs and benefits associated with some manatee conservation activities such as implementation of boat speed rules. Thus far, no studies have concluded that manatee conservation has had a significant detrimental or beneficial impact on Florida's overall economy. However, it should be noted that the focus of these studies was on the potential economic impacts of speed zones and did not address economic impacts on real estate or development.

Impacts on the Boating Industry

The economic output of boating in Florida is estimated at $18.4 billion dollars and 220,000 jobs (Murray 2005). Marine industry representatives and other stakeholders suggest that manatee protection has had a significant negative impact on boating-related industries. Actions that potentially affect the diverse marine industries include the imposition of speed zones, and restrictions or prohibitions on construction of docks, marinas and boat ramps, implemented through state or federal permitting. No doubt, the burden of speed zones imposes a cost to specific recreational boaters depending on location. However, Thomas and Stratis (1995) found that in Lee County the overall effect was that boaters redistributed their boating activities to other sites; they did not tend to stop boating. There are anecdotal accounts of individuals giving up boating because of manatee regulations. However, to date, there are no studies that provide data to support this suggestion or to provide any measure of magnitude or significance.

Impacts related to restrictions on coastal development (*e.g.*, marinas, docks) have occurred, but again no comprehensive study has been done to determine the magnitude or implications of the impacts. While restrictions or delays in construction have most certainly resulted in economic cost, or lost opportunity to sectors of the marine industries such as marine contractors, protection of the manatee may have created benefits for other sectors of the economy.

It appears that the recreational boating industry is facing major challenges economically in Florida, as well as in many parts of the country, and that manatee protection measures are one of many factors affecting the industry in Florida. In particular, assuring that there is adequate water access for Florida's growing population is a significant concern. The FWC is committed to working cooperatively with the boating industry to ensure that Florida remains a popular boating destination with high quality recreational opportunities that are compatible with sustainable fisheries, healthy ecosystems, and wildlife conservation. Boating is a vital part of Florida's economy and a treasured activity for residents and visitors alike. Because of this, maintaining boating access to our state's coastal and inland waters and their scenic and natural resources is crucial. The Florida Fish and Wildlife Conservation Commission has partnered with a team of university researchers and private firms to conduct a statewide inventory of boating access facilities, including public and private boat launch ramps, marinas, and similar facilities. The information from this inventory will provide important baseline data that can assist future assessments of waterway access.

Impacts on Tourism and Recreation

There are no comprehensive studies that estimate the total economic impacts of manatee-based recreation and tourism. Manatee-based tourism is found in many locations around the state, both west and east coasts as well as the St. Johns River. While estimating the value of the numerous manatee viewing opportunities is beyond the scope of this management plan, the FWC recognizes that manatees are a part of what makes Florida a top tourist destination. Two of Florida's state parks that feature manatee observation (Homosassa Springs Wildlife State Park and Blue Spring State Park) are estimated to attract 389,244 out-of-county visitors, generate $23.6 million in direct expenditures, and create 380 jobs (Bonn and Bell 2003). Park managers indicate that manatees are a key component contributing to the high visitation and popularity of these two parks. The USFWS and Citrus County are pursuing funding for an economic impact study of manatee-based tourism on the local economy. This study, if undertaken, may provide additional insight regarding the economic benefits of manatees.

Legal Requirements of Economic Evaluation

When management actions such as development of speed zones are considered by the FWC, economic factors are evaluated to the extent possible. Economic information can be provided by the general public, stakeholder groups, and particularly through the required local rule review committees. Consideration of economic impacts is an important part of the rule-making process. In addition, there is a statutorily created process under which an agency may gauge regulatory costs when proposing a new rule or a rule change. This process is found under §120.54(3)(b), Florida Statutes, and encourages agencies to produce a "statement of estimated regulatory costs" prior to any rule adoption, amendment, or repeal, other then an emergency rule.

According to §120.541(2), F.S., if the estimated regulatory cost statement is produced, it must include, among other factors, a good-faith estimate of the cost to the agency, or other governmental entities, to implement or enforce the rules, as well as a description of the types of individuals likely to be affected and the number of them likely to be required to comply with the rule. Individuals may provide an agency with information regarding the estimated regulatory costs or, if they are likely to be substantially affected, an individual may submit a good-faith

proposal for a "lower cost regulatory alternative," §120.541(1)(a), F.S. An agency is not required to adopt a suggested lower-cost alternative; the agency may adopt it and revise the original statement but, if the agency rejects the alternative, the agency must prepare a statement explaining the reasons for doing so.

Recommendations Regarding Future Economic Analysis

A number of stakeholder groups have requested that this management plan provide a more detailed examination of the costs associated with manatee conservation. Suggestions include greater recognition of the economic implications to marine industries and the development community, while others requested more information on possible economic benefits derived from manatee-based tourism and recreation. The most common and generally the optimal method for securing economic information regarding management actions is benefit/cost analysis. Benefit/cost analysis measures the net gain or loss to society of a policy or action. Because it focuses only on economic benefits and costs, benefit/cost analysis determines the economically efficient option. It is important to remember that economic values are based on people's preferences, which may not coincide with what science suggests is best ecologically for a particular resource.

Policy-makers must identify how important comprehensiveness and precision are in the assessment of economic impacts to the overall policy or management action. For example, many times when measuring benefits, only use-values are included in the analysis. However, a comprehensive benefit analysis would include existence, option, and bequest values in addition to use-value. The expense and time needed to undertake economic analysis are directly related to the comprehensiveness and precision.

If economic impact analysis is desired, benefit/cost measures must be secured before the analysis can be performed. Managers should secure benefit/cost measures first, with the understanding that the economic impact analysis is performed after the benefit/cost data are provided.

Economic analysis can be an important tool for natural resource decision-makers. As such, like any other scientific tool, economic analysis takes resources (time, expertise, and money). It is impossible to identify or provide a reasonable estimate of time and costs without an understanding of the management options under consideration. With that said, the following estimates of time and cost are provided by the FWC staff economist.

Many projects can be completed in 12 to 15 months. The 12- to 15-month timeline is exclusive of planning time. A good example of time requirements is the economic study of wildlife management areas completed by FWC in 2003. Data collection, analysis, instrumentation, conclusions, writing, and printing the final report took 16 months and two economists. The planning for the study was extended over a six-month period. The total time from planning to final report was 22 months. It is not uncommon for robust economic studies to require multiple levels of expertise (two or three economists) and six-figure costs.

Prior to directing limited state resources toward an undertaking of this magnitude, policy-makers should first consider if having a comprehensive economic analysis would provide

sufficient relevant information to justify the cost. This type of information, while interesting, is not required under state or federal law and may have very limited value to resource managers in achieving conservation goals. However, marine industry groups, development interests, and non-governmental conservation organizations may wish to work together to fund additional economic studies.

CHAPTER 13: SOCIAL IMPACTS

The social impacts of this manatee management plan are difficult to quantify. No studies were done to assess the social impacts of this plan and only limited studies have been done to evaluate social impacts of manatee conservation in general. Manatees combine a number of characteristics that cause them to affect the activities of, or be the concern of, a very wide range of people. They are one of Florida's most popular and charismatic species, with wide public appeal. They are protected by overlapping federal (MMPA and ESA) and state regulations, and these regulations affect many coastal and shoreline activities. This has inevitably led to quite divergent opinions and sometimes conflicts over manatee protection measures. Balancing conflicting interests and opinions of stakeholders with the requirements of state and federal regulations has been, and remains, one of the challenges for manatee management.

The establishment of boating speed zones and impacts to the size and placement of boat facilities in Florida are the most visible manatee conservation efforts that have the potential for social impacts. Manatee speed zones can create longer transit times, may eliminate certain types of water sports, and can affect traffic patterns and boat distribution. While impacts on individuals' ability to engage in specific activities at specific sites may be significant, the degree to which each waterway user is impacted varies. While speed zones may be viewed negatively by some water sport enthusiast such as water skiers, other users such as canoeists and kayakers may enjoy an improved water experience from the placement of speed zones. Because of the availability of unregulated waters, some users may adapt their use patterns, but effects on other users may be more detrimental. Many of the slow-speed or non-motorized zones (although these are limited in size) are in areas where fishing occurs, and these restrictions can have both negative and positive effects on the fishing experience. Negative effects include longer times to reach the areas and the inability to fish in as many areas within a certain amount of time. Positive impacts include less frequent disturbance from other boaters in these sites, resulting in a higher-quality fishing experience.

Other types of management actions that may have social impacts are the effects on permits for developments and boating facilities that are limited due to anticipated adverse impacts to manatees. These types of actions can have a negative impact on developers and the projects they work on. In contrast, their effect might be positive for those residents and citizens of an area who are opposed to new developments in their neighborhoods because of the impacts they may have on their current quality of life. The permit-related effects may also impact the placement of public facilities, affecting the availability of public access to the water.

Overview of Studies Regarding Boaters' Opinions of Speed Regulations

Several studies have been conducted to assess the attitudes and knowledge of the public with respect to manatees and their protection. Most studies revealed support for manatees and a willingness to be inconvenienced by regulations if they protected the animals. There was a preference for education and outreach over regulations and increased patrols. Note that many of the studies are over 10 years old and might be outdated because attitudes toward manatees may have shifted since that time.

Interviews of 911 boaters revealed that 91% of the respondents supported programs to protect manatees even it if meant reducing the speed on some waterways, while 47% supported strengthening current regulation to protect manatees (Parker 1989). Seventy-eight percent supported increased patrols by law enforcement to protect manatees, 80% supported designating no-entry areas, 76% supported restricting motorized vessels in a specific area, and 50% supported permanently closing some areas to protect manatees.

Similar studies were completed by Parker and Wang (1996) and the Boating Research Center (1991). Parker and Wang (1996) interviewed 879 Florida residents who were at least 18 years old and found that more than 90% of the respondents felt that laws protecting endangered species were very or somewhat important, and they were in favor of reducing boat speeds to lessen the numbers of manatees killed by boats. Respondents favored regulating boat speeds over education as the best way to protect manatees by more than three to one—a result different from other studies. Eighty-nine percent favored the creation of a boat license obtained after passing a written test on boating safety. Eighty-four percent felt it important that local governments plan long-term for boating facility locations. The Boating Research Center (1991) concluded that proper use of speed restrictions on boat traffic could significantly reduce the exposure of manatees to the risk of a collision with a boat. The survey revealed that boaters overwhelmingly supported speed restrictions for boating safety and marine life protection.

A four-year study was conducted at two sites in Tampa Bay to compare the effectiveness of current outreach practices with the effectiveness of regulations in modifying boater behavior (Aipanjiguly *et al.* 2004; Flamm *et al.* 2002; Flamm 2005). Speed regulations were posted at one site after year two while the other site remained unregulated; outreach occurred at both sites. Three telephone surveys were conducted: one to provide a baseline of boater knowledge and attitudes, the second to assess the education program, and the third to examine attitudes toward regulations and education. The regulations had a clear influence on boating patterns, while the implemented education program showed no measurable effect. Results from the surveys indicated that respondents were highly motivated to comply with law enforcement, that education programs had no measurable effect, and that there was heterogeneity among boaters at different sites.

The general lesson is that regulations are effective in changing behavior, but should not be the only method. When applying outreach, broad-brush approaches to education may be less effective than more targeted messages. An understanding of the context (Gulf vs. Tampa Bay, water sports vs. touring vs. sport fishing) will help educators construct targeted messages for the different boater types.

Communicating risk to the public

An increasingly important aspect of protecting endangered species and reducing the potential for social impacts is the effective communication of risk to the public. For example, regulations are put in place based on assessments that certain behaviors are incompatible with achieving recovery of a species. If the risk is perceived to be low and the regulations excessive, then it is likely that unintended consequences of the protective actions will result, such as low compliance, loss of public confidence, or legal challenges to the state's efforts (Greenberg and

Chess 1992; Lipset and Schneider 1983; National Civic Review 1992). Therefore, it is important that risk communication be taken seriously by the state.

First, it is important to understand that perceived risk is not the same as scientifically estimated risk. Closing this gap between the results of these two models should be one goal of any risk communications effort. Research has shown that there are approximately 25 factors that cause people to perceive an action as either more or less risky (Environmental Manager 1992). Understanding these factors can certainly help close an existing gap. In addition, citizens want information in a clear and simple format, and they want their perceptions taken into account (Environmental Manager 1992).

Effective communication of risk is well-established in public health programs. This concept has not been extended to fish and wildlife agencies who must apply information about risk when designating rules for species conservation. Specifically, agencies must address risks of extinction and population decline that become evident through biological status reviews, risks originating from cumulative impacts of coastal development and increased boat use, and risks of "take" by individuals such as collisions between manatees and boats and harassment of wildlife. More information on communications to the public is provided in Chapter 7, "Management Actions."

CHAPTER 14: ECOLOGICAL IMPACTS

This section attempts to address the anticipated ecological impacts of the actions proposed in this manatee management plan. Ecological Impacts Assessment (EIA) has emerged as a sub-discipline of Environmental Impact Analysis (Schmitt and Osenberg 1996; Treweek 1996). Environmental Impact Analysis involves several fields of study, including physics, chemistry, engineering, toxicology, sociology, ecology, economics, and political science (Osenberg and Schmitt 1996). Generally, EIA involves evaluating the effects of human-related activities on ecological systems (Schmitt and Osenberg 1996). Standard methodologies for these evaluations use "before and after" sampling to compare variables before and after a perturbation, and compare ecological changes spaced around an impacted area (*e.g.*, larger effects closer to the impact site), also known as "after-only" studies (Schroeter *et al.* 1993; Osenberg *et al.* 1994; Wiens and Perker 1995; Underwood 1995; Hewitt *et al.* 2001).

Manatee researchers are investigating ways of assessing the effects of management actions on manatees. Unfortunately, "before and after" studies are not feasible in many cases due to the absence of controls ("before" data) and existence of unmeasured variables. As described in Chapter 7, "Management Actions," and Chapter 9, "Monitoring Activities," FWC will try to develop methods for evaluating impacts in the absence of "before" data. A few studies have been designed to address impacts of manatee protection measures on aquatic and marine ecosystems, including assessing the effects of docks and propeller scarring on seagrass beds. (See below.) However, additional studies are needed.

Background

Some imperiled species can act as sentinels of environmental health. Implementing protection measures for an imperiled species may enhance protection of other species that occupy the same habitats, including humans, as well as the ecosystem as a whole (Domning 1991; Reddy *et al.* 2001; Bonde *et al.* 2004; Bossart 2006). The sentinel species concept is one reason why anticipated ecological impacts were added as a requirement for state management plans. Measures implemented to protect one species, however, may not necessarily protect all species or all habitats within an ecosystem, and some measures actually may harm other taxa.

Florida manatees are difficult to fit into the sentinel species paradigm (Reddy *et al.* 2001; Bonde *et al.* 2004) because they are near the base of the food chain, have no predators, and have adapted well to urban landscapes. Manatees use dredged canals for resting, calving, and thermoregulation. They visit marinas and sewage treatment plant outfalls to drink fresh water and wallow in their soft, organic sediments. Such areas are generally of poorer water quality, and provide polluted habitat for other aquatic species. Manatees have modified their behaviors to take advantage of industrial thermal discharges for thermoregulation. Despite their adaptive capabilities and hardy nature, however, manatees are vulnerable to the effects of natural events such as harmful algal blooms (red tide) and human-caused events such as watercraft collisions. Therefore, studying manatees gives researchers an opportunity to monitor the health of the coastal marine environment as it relates to these events (Domning 1991; Reddy *et al.* 2001; Bonde *et al.* 2004).

What role does the manatee play in the environment? Manatees occupy a unique niche in that they are the only herbivorous marine mammal in North and Central America (Domning 1991). Manatees have co-evolved with seagrass species found in Florida's coastal ecosystems, and manatee grazing effects on seagrasses have been documented (Packard 1981; Lefebvre and Powell 1990; Smith 1993; Lefebvre *et al.* 2000). Manatees can consume up to 10% of their body weight per day, foraging on both native and exotic marine and freshwater plants. Although localized grazing can be heavy, studies have found that grassbeds recovered well after intensive winter grazing by manatees (Packard 1981; Lefebvre and Powell 1990; Smith 1993; Lefebvre *et al.* 2000). The beneficial effects of grazing by marine herbivores also have been documented through observations and experiments. Grazing on leaves and shoots promotes new growth and can improve the nutrient composition (*e.g.*, nitrogen content) of seagrass beds. Foraging that involves rooting can increase species diversity by allowing fast-growing species to colonize areas that previously were monocultures (Lefebvre and Powell 1990; Provancha and Hall 1991; Smith 1993; Preen and Marsh 1995). The increased structural complexity of seagrass beds that occurs with greater seagrass species diversity may also enhance faunal species diversity and may increase survivorship of juvenile fish (Beck *et al.* 2001). It is often assumed that manatee fecal material is harmful to seagrass beds. However, manatee defecation plays an important role in the cycling of nutrients in coastal ecosystems, as do fish, crabs, and other marine species, ultimately stimulating growth of primary producers (Domning 1991). By foraging on aquatic plants such as seagrass, manatees turn over nutrients locked in plant tissues and make those nutrients available to biota through the passage of metabolic wastes. Far from adding nutrients to the aquatic system as human pollution does, manatees release nutrients already in the system from the plants they consume, adding to the regenerative capacity of the system. Manatees are a natural component of Florida's coastal ecosystems. According to Domning (1991, p. 169), "we would be very foolish if we extirpated manatees in Florida before we fully understood how we benefit from their presence."

This section will provide a general, qualitative description of possible ecological impacts of manatee conservation measures. The following manatee conservation actions are described:

- Maintaining industrial warm-water refuges.
- Creating and enforcing manatee protection zones.
- Maintaining minimum spring flows and levels.
- Recommending manatee protection measures for environmental resource and dredge-and-fill permits.
- Minimizing entanglement.

Manatee protection plans are a holistic approach to manatee protection that enlists the resources and efforts of local governments and stakeholders. (See Appendix I, "Historic and Ongoing Manatee Conservation in Florida.") They involve all of the conservation measures mentioned above and, therefore, will not be singled out for discussion.

Industrial Warm-Water Refuges

Warm-water discharges are a by-product of the once-through cooling systems used by older electric utility power plants in Florida. Manatees adapted their behavior to the presence of these effluents and took advantage of the newly available warm water. However, the effects of thermal pollution on aquatic systems overall have been negative.

The ecological impacts of heated industrial effluents in Florida range widely. Whereas artificial warm water can protect fish and invertebrates from extreme or unusual cold in winter, chronic exposure to thermal pollution in summer can eliminate ecologically important species, resulting in the long-term denuding of estuarine habitat in the vicinity of the effluents (Nugent 1970; Zieman and Wood 1975). In the tropical and semitropical habitats of Florida, estuarine species live near their upper thermal limits in summer, putting them at high risk of lethal and sub-lethal impacts from temperature increases as small as 2-4ºC (3.6-7.2ºF) (Coutant 1969; Nugent 1970; Carr and Giesel 1975; Zieman and Wood 1975; Zieman 1982; Clark 1992). Survival of most algae, sponges, mollusks, and crustaceans decreases between 30º and 35ºC (86º-95ºF). These same species reach their lethal limits around 37ºC (98.6ºF) (Zieman and Wood 1975; Zieman 1982; Clark 1992).

Effects of increased temperatures are particularly damaging to sessile organisms like seagrasses and their associated epiphytes and infauna. Near the Turkey Point power plant in Miami-Dade County, for example, prolonged water temperatures averaging 5ºC above ambient during summer destroyed 40 ha (99 acres) of turtle grass (*Thalassia testudinum*) and associated fauna (Nugent 1970; Zieman and Zieman 1989). In Tampa Bay, large-scale decreases in diversity and density of benthic infauna in summer were caused by a power plant discharge (Virnstein 1972). In a thermally impacted creek that was as much as 10.8ºC (~ 19ºF) above ambient, Carr and Giesel (1975) detected substantial (three- to 10-fold) decreases in the numbers and biomass of commercially and recreationally fished species. Although Nugent (1970) characterized the effects of heated effluent as both beneficial and harmful, he concluded that the Turkey Point power plant "is detrimental to many of the animals of the waterways within the mangrove region through which the effluent water flows." (p. 171).

Not all effects of thermal effluents are negative, however. A study of effluents from the Crystal River power plant found increased species abundance and diversity in winter, but lower abundance and diversity in summer when compared to unaffected areas (Grimes and Mountain 1971). Grimes and Mountain (1971) also detected changes in behavior of Gulf fishes, where fish were attracted to the discharge in winter and repelled by it in summer. In fact, the thermal effluents from power plants are popular fishing sites in much of Florida during the winter because of the large numbers of recreationally desirable fish attracted to the warm water.

Summary

The ecological impacts of warm water in winter (when manatees require it) are not as significant as in summer, and can confer some level of protection to species that are susceptible to cold temperatures. The effects from thermal effluents would not be as pronounced if warm water were released only in winter, specifically for manatee thermoregulation. In summer, however, there is overwhelming evidence that heated effluents are destructive to tropical and semitropical estuarine ecosystems. Consequently, management efforts focused on protecting

natural warm-water sites (see below) and enhancing secondary sites would have positive ecosystem effects, especially when compared with maintaining heated industrial effluents.

Manatee Protection Zones

Manatee protection zones regulate the speed and operation of motorboat traffic on Florida waterways. These protection zones can be configured in a number of ways with various restrictions. Examples of manatee protection zones include idle- and slow-speed areas, higher-speed travel corridors (usually 25 or 30 MPH) within slow-speed zones, shoreline buffer zones, seasonal zones, nonmotorized areas, and no-entry areas. (See Chapter 7, "Management Actions.")

Environmentally sensitive habitats such as seagrass beds can be safeguarded by manatee protection zones. Seagrass ecosystems are one of the most productive marine habitats in the world. During peak conditions, short-shoot blade-growth can exceed 5-10 mm/day and generate more than 10 tons of leaves per acre per year, exceeding the productivity of some terrestrially farmed areas (Wood *et al.* 1969; Zieman and Zieman 1989; Hill 2002). Currently, there are approximately two million acres of seagrasses in Florida (Sargent *et al.* 1995). Seagrasses provide food for marine species through direct grazing of plant materials and attached epiphytes, and decomposition products in the detrital pathway; shelter and structurally complex habitat for commercially and recreationally important fish and invertebrate species; sediment stabilization (which improves water quality); and an environment for nutrient recycling (Wood *et al.* 1969; Zieman and Zieman 1989; Sargent *et al.* 1995, 1996; Kemp 2000). According to Hill (2002), one acre of seagrass, valued at $20,500 per year, can support up to 50 million invertebrates and 40,000 fish. The ratio of organisms found in seagrass beds versus sandy areas can be as high as 42:1 (Zieman and Zieman 1989).

Threats to seagrass include dredge-and-fill operations, propeller scarring, boat anchoring and mooring, poor water quality as it relates to water column transparency, fluctuations in salinity, shading from structures, and excessive nutrient enrichment (Zieman and Zieman 1989; Smith 1993; Sargent *et al.* 1995, 1996; Beal and Schmitt 2000; Kemp 2000; Tomasko and Hall-Ruark 2000). Sargent *et al.* (1995) calculated that 6.5% (173,960 acres) of seagrass beds in Florida were scarred from boat propellers. Almost half of the state's seagrass beds are located in the Florida Keys, with Monroe County having the most seagrass scarring (30,050 acres). Monroe, Dade, Lee, Pinellas, and Charlotte counties had the greatest amount of moderate to severe scarring (Sargent *et al.* 1995). The Big Bend area, the least populated area examined, had the second highest amount of seagrass in the state. The majority of seagrass scarring in that area was classified as light (Sargent *et al.* 1995).

The manatee protection zones that confer the greatest protection to seagrass habitats are year-round safe havens—no-entry and nonmotorized zones. Preventing the use of mechanical engines prevents propeller scarring (Sargent *et al.* 1995). Slow- and idle-speed zones confer less protection than safe havens, but they help conserve seagrasses by reducing wake-wave action and resulting turbidity. However, boats that ride lower in the water (traveling at slow speed in particular) may damage seagrasses in very shallow areas (Sargent *et al.* 1995). High-speed corridors embedded within slow-speed zones re-route traffic into the dredged, often denuded, deep areas of the channel, thereby protecting the surrounding habitats. Reducing boat speeds and

restricting vessel traffic to previously disturbed areas (channels) also decreases noise pollution and disturbance of noise-sensitive habitats, such as bird rookeries. Finally, manatee protection zones also reduce the risk of watercraft collisions with other marine species such as dolphins and turtles, and collisions with other boats and people recreating on or in the water. (See Chapter 8, "Law Enforcement.")

Alternatively, manatee protection zones may lead to negative effects on marine ecosystems. Boaters may try to avoid manatee protection zones by cutting across shallow seagrass beds, causing scarring and propeller dredging, and putting other marine species at risk of harmful boat collisions. Re-routing of vessel traffic by manatee protection zones may cause congestion in narrow areas, or may confine recreational activities (*e.g.*, water skiing) into smaller areas, putting boaters and other marine species at increased risk of harmful collisions. Places with confined, intense boat traffic would increase the likelihood of disturbance to sensitive habitats and increase concentrations of physical damage and chemical pollutants in a small area.

Increasing law enforcement patrols as proposed in this plan can mitigate these risks. The presence of law enforcement significantly increases boater compliance with manatee protection zones (Gorzelany 1996, 1998; Shapiro 2001; Sorice *et al.* 2004). High compliance levels will maximize the ecological protections to seagrass beds and marine ecosystems conferred by manatee protection zones. In addition, law enforcement officers educate the public about manatee speed zones, marine life, and safe boating practices, which presumably cause lasting impacts by creating better environmental stewards among the boating public. (See Chapter 8, "Law Enforcement" and Chapter 13, "Social Impacts.")

Minimum Flows and Levels

According to the Southwest Florida Water Management District (SWFWMD 2005), "springs are areas where water flows directly from the aquifer to the surface, supplying flow to a river or other water body." Springs supply fresh water to Florida's rivers and estuaries and are home to 40 troglobytic (cave-dwelling) and troglophilic (cave-loving) species, many of which are endemic only to specific spring cave networks. Springs also provide unique habitats for 115 species of snails, as well as freshwater plants, alligators, river otters, turtles, birds, fish, and other invertebrates (Morris 2000; SWFWMD 2005; Bascom *et al.* 2002). Like seagrass beds, springs are highly productive ecosystems (Nordlie 1990). Spring health is closely linked to the health of the aquifer and many of the state's biological resources. Impacts to the springshed and spring run ultimately affect ecosystems and organisms far downstream from the source. Protection of springs based on manatee needs can benefit many species that use springs and their river systems and provide clean water and habitat for other associated species.

Threats to Florida's springs include decreased water quality from land-use changes of the associated drainage basin and recharge areas (*e.g.*, urban runoff, landscape practices, agricultural runoff, other pollutants, debris), disturbance caused by recreational activities, increases in invasive exotic plants, and decreased spring flows from increased demands for groundwater (SWFWMD 2005; Bascom *et al.*, 2002). The Florida Springs Task Force (2000) recommended a strategy for reducing threats to springs and their associated ecosystems. This strategy includes four elements: outreach, information, management, and regulation. For protection of manatees and other rare, threatened, and endangered species, the Springs Task Force has recommended

enhancing native plant communities, avoiding the use of pesticides and fertilizers above caves, avoiding the use of both herbicides and mechanical aquatic weed control where possible, prohibiting human activities that cause manatee harassment, and acquiring land that contains spring systems used by manatees.

State law requires the water management districts (WMDs) to establish and maintain minimum spring flows and levels (MFL) (Chapter 373, F.S.). A minimum flow is "the limit at which further withdrawals would be significantly harmful to the water resources or ecology of the area" (§373.042(1), F.S.). In coastal areas, spring flows below the MFL can deprive estuaries of important freshwater inflows necessary for healthy habitat and can cause saltwater intrusion into the aquifer.

The FWC has provided to the WMDs a list of springs prioritized by their importance to manatees. Maintaining minimum flows for manatees may actually require greater flows than what is necessary to sustain other ecological resources. For example, draft recommended minimum flows established for Sulphur Springs are as low as 13 cfs during periods when the Hillsborough River reservoir falls below 19 feet National Geodetic Vertical Datum (NGVD). However, 13 cfs is not high enough to maintain adequate water temperatures for manatees in winter. Therefore, a stipulation was added to the draft Sulphur Springs MFL requiring a minimum flow of 18 cfs (regardless of the levels in the Hillsborough River reservoir) if temperatures near the mouth of the spring fall below 15ºC (SWFWMD 2004).

Blue Spring (Volusia County) is the primary warm-water refuge used by the vast majority of the Upper St. Johns River management unit of the Florida manatee. The population in this region grew at an average annual rate of 6.2% during the decade of the 1990s (Runge *et al.* 2004), the highest among the management units. However, manatees in this management unit represent a small portion of the total population, generally less than 5% of the statewide synoptic counts. The stable 23ºC warm-water habitat provided by Blue Spring is a key factor in this population growth. The continued recovery of this portion of the manatee population is dependent upon adequate warm-water delivery to this system. The tenuous nature of artificial warm-water refugia in the Atlantic region, which exchanges a few individual manatees with the Upper St. Johns region, elevates the importance of Blue Spring and nearby springs to sustain a healthy manatee population into the foreseeable future. Blue Spring is also an important release site for rehabilitated manatees that have been in captivity for long periods of time.

The proposed amendments to Chapter 40C-8, F.A.C., will establish a minimum average annual flow of 136 cfs in Blue Spring, based on the quantity of warm-water habitat currently modeled as required by the population of manatees using the spring run during winter. The MFL will be incrementally increased over five-year intervals based upon the warm-water habitat requirements of this manatee population with its projected growth until 2024, when the MFL will be established at the average annual historic flow rate of 157 cfs. The spring flow then will be considered fully recovered. The St. Johns River Water Management District concluded that all water resource values (recreation, fish and wildlife habitat, estuarine resources, transfer of detrital material, water quality, etc.) would be protected by achieving and maintaining 157 cfs in the long term.

Large numbers of manatees overwintering in small, confined areas can affect spring runs and neighboring habitats. Manatees can alter the submerged aquatic vegetation (SAV) community of spring runs and nearby areas by consuming a large amount of SAV during the winter. Studies have documented significant reductions in tapegrass (*Vallisneria americana*) in winter warm-water refuges (Hauxwell *et al.* 2004; Smith and Mezich 2004). Factors influencing tapegrass recovery include grazing of nonnative species during the recovery period (warm season), high turbidity, and nutrient contamination. Excluding manatees from small areas within confined spring runs may be an effective means of protecting mature tapegrass during the winter, and would allow more rapid recovery of the SAV community after manatees leave the system in the warm season (Hauxwell *et al.* 2004; Smith and Mezich 2004). Freshwater SAV communities are able to recover during the lengthy warm growing season. Kings Bay at the head of Crystal River, for instance, shelters about 300 manatees during the winter. Even so, there is abundant SAV during the warm season, such that about 50 manatees are now summering there.

Summary

Maintenance of spring MFLs for manatee thermoregulation confers protection to spring ecosystems as a whole. These protections extend to other rare species, some of which are unique to particular springs in Florida. Conservation of spring habitats also preserves the natural resources of estuaries and wetland ecological systems. Although protecting manatee use of confined spring runs can result in a seasonal reduction in local SAV, these communities can be protected by excluding manatees and other large grazers from small areas to expedite seasonal recovery. Recovery of SAV can be enhanced by improving water quality, especially those factors contributing to water clarity, and reducing grazing by exotic species.

Permit Reviews

FWC staff reviews applications for dredge-and-fill permits (northwest Florida only), environmental resource permits, and sovereign submerged land leases, and provides comments to the Florida Department of Environmental Protection (DEP) or WMDs regarding provisions for manatee protection. Comments may include provisions for dock construction that minimize impacts to seagrasses, vessel draft restrictions, marine education signs, slip restrictions, recommendations about dredging techniques, and recommendations regarding blasting.

Recommendations regarding dock design are intended to protect seagrasses. Dock height can affect seagrass densities, growth rates, and blade length. Burdick and Short (1999) concluded that greater damage to eelgrass (*Zostera marina*) was caused by floating docks than by docks that were supported by piers. Seagrasses (shoal grass and manatee grass) in the Indian River Lagoon under docks 1.5 m above mean high water had greater shoot density than those near piers or under docks that were lower to the water (0.91 m) (Beal and Schmit, 2000). Altered current regimes and bioperturbation (habitat disturbance) associated with pilings also contributed to lower seagrass shoot densities in close proximity to these structures. In addition, dock orientation impacts seagrass beds. In New England, for example, north-south facing docks created the fewest negative impacts (Burdick and Short 1999). Techniques to minimize seagrass impacts, such as designing narrow docks, using light-transmitting materials like gratings, and elevating docks, all increase the ability of seagrasses to persist under and adjacent to docks (Burdick and Short 1999; Shafer 1999; Beal and Schmitt 2000).

Recommendations on vessel draft and slip restrictions also minimize impacts to seagrasses. Such restrictions reduce the number and density of boats in a particular area, and decrease turbidity, wake action, noise, pollution, and the probability of propeller scarring. (See the previous discussion about manatee protection zones.)

FWC staff also makes recommendations about dredging techniques and timeframes. Dredge observers minimize the incidence of marine mammals and turtles becoming entrapped in a dredge, and the use of hydraulics lessens the impacts should this occur. Staff generally recommend against issuance of permits involving blasting because of high risks of direct mortalities, habitat loss, and extreme disturbance. If a blasting permit is issued, a blasting plan must be developed and submitted for approval. To reduce impacts to species other than manatees, FWC's Imperiled Species Management staff consults with fisheries and marine mammal experts when making recommendations. Blasting plans require approved marine species observers, a lead aerial observer, protocols for the blasting events, determination of a safety radius, and prohibition of blasting if marine species are spotted within the safety radius. In some instances, however, conditioning a permit to reduce impacts to manatees might result in potentially increasing impacts to other species.

Finally, staff also recommends that local governments and waterfront projects create manatee education programs and provide input regarding content. These education programs include signs and displays about seagrass protection, manatee protection zones, and safe boating behavior, all of which benefit the local ecosystem and the boating experience.

Minimizing Entanglement

Numerous species inhabiting marine ecosystems can ingest or become entangled in debris. Sources of entanglement of manatees include monofilament fishing line, commercial and recreational nets, and trap fishery gear. Between 1991 and 2005, 138 manatees were rescued from entanglements, 47 in monofilament line and 91 in crab pots. From 2001 to 2005 in Florida, 36 dolphins were stranded with hook and line or monofilament line found on or in the body (ingested or entangled), 11 were entangled in crab pots, and one was entangled in a lobster pot (preliminary data, provided by the Southeast U.S. Marine Mammal Stranding Network). Between 2000 and 2004, 166 sea turtle carcasses recovered in Florida were entangled in fishing line, and hundreds of fish, birds, and terrestrial animals in Florida are entangled in monofilament every year (FWC, unpublished data). The effects of monofilament pollution are long-lasting; monofilament line can persist in the environment up to 600 years (http://fishinglinerecycling.com/). Wildlife can ingest monofilament or become entangled in it, leading to drowning, starvation, infection, gastrointestinal problems, or loss of limbs (flippers, tails, wings, etc.). Divers and boats can become entangled as well.

FWC staff aim to work with various organizations to decrease and minimize manatee entanglements in fishing gear through outreach, research, gear recovery, and gear modifications. Decreasing marine debris, monofilament waste, and ghost traps protects many organisms in the marine environment and makes human recreation safer and more enjoyable.

Ecological Impacts Summary

The ecological impacts of manatee habitat protection, education, law enforcement, manatee protection zones, permit restrictions, and siting of boat facilities are varied, ranging from detrimental impacts of heated industrial effluents and altered vessel traffic patterns to protection of seagrass beds and springs, two of the most productive and valuable habitats in Florida. Maintaining clean, healthy marine and aquatic ecosystems for manatees will ultimately conserve the biodiversity of those ecosystems.

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GLOSSARY

anthropogenic—of human origins, human-related, caused by humans.

bathymetry—measurement of the depth of large bodies of water.

Bayesian approach—statistical approaches to parameter estimation and hypothesis testing which use prior distributions rather than parameters (http://ccrma.stanford.edu/~jos/bayes/).

benthic—on the bottom of the ocean or sea floor.

bioperturbation—disturbance to nature or natural systems.

capture-mark-recapture (see also **sight-resight or mark-recapture)—**method used in ecological research that involves capturing individuals, marking them, releasing them, then recapturing some of the same individuals during one or more recapture periods. Using the history of recaptured individuals over time, statistical models can estimate population size or vital rates (*e.g.*, survival, growth, movement).

carrying capacity (K)—the population density or maximum population size of a species that a given environment can support based on available resources (Keeton *et al.* 1986; Futuyma 1986; Campbell 1987).

detritus—dead organic matter.

d-Tag—a digital acoustic recording device.

elasticity analysis—an examination of *proportional* sensitivity (*i.e.*, scale-independent).

epiphyte—a plant that grows on another plant.

epizootic—an outbreak or epidemic of disease in animal populations (www.cdc.gov/ncidod/dvrd/spb/mnpagesz/glossary.htm).

fauna—animal life.

founder effect—a population that was started by a few individuals–can result in lack of genetic diversity.

generalist herbivore—feeds on a wide variety of plants.

infauna—organisms living in submerged sediment.

K (carrying capacity)—the population density or maximum population size of a species that a given environment can support based on available resources (Keeton *et al.* 1986; Futuyma 1986; Campbell 1987).

life-history strategy—combinations of evolutionary traits of a species that allow it to survive and reproduce in its environment (*e.g.*, age at maturity, reproductive rates, parental investment).

macrofauna—animals large enough to be seen with the naked eye.

mark-recapture (see also **sight-resight or capture-mark-recapture)—**method used in ecological research that involves capturing individuals, marking them, releasing them, then recapturing some of the same individuals during one or more recapture periods.

Using the history of recaptured individuals over time, statistical models can estimate population size or vital rates (*e.g.*, survival, growth, movement).

mature population size—the number of individuals known, estimated, or inferred to be capable of reproduction.

metapopulation—groups of spatially separated populations of a species with limited dispersal between them.

mortality rate—ratio of deaths in a population to total population size.

necropsy—the post-mortem examination (*i.e.*, dissection) of an animal carcass to determine cause of death.

parental investment—amount of energy a parent uses in rearing offspring, includes period of offspring dependency.

philopatry (see also **site fidelity)—**tendency to return to the same area.

photo-identification (photo-ID)—method to identify individual manatees based on photographing distinct patterns of scars and mutilations.

PIT tag—passive integrated transponder tags

population bottleneck—a time when a population decreased to only a few individuals and can result in lack of genetic diversity.

sensitivity analysis—examines how model predictions vary when model inputs (parameters) are changed.

sessile—attached to the sea floor, not free-moving.

sight-resight (see also **mark-recapture or capture-mark-recapture)—**method used in ecological research that involves capturing individuals, marking them, releasing them, then recapturing some of the same individuals during one or more recapture periods. Using the history of recaptured individuals over time, statistical models can estimate population size or vital rates (*e.g.*, survival, growth, movement).

site fidelity (see also **philopatry)—**tendency to return to the same area; faithfulness to a particular area.

synoptic—presenting a general view of the whole.

thermal conductance—the rate of heat flow through a body.

thermoregulation—ability to adjust or control body temperature.

APPENDIX I

HISTORIC AND ONGOING MANATEE CONSERVATION IN FLORIDA

Manatee protection in Florida began in 1893 when state law (Chapter 4208.94) prohibiting the hunting of manatees was established. In 1907, Florida state law (Chapter 370.12) imposed a fine of $500 and/or six months' imprisonment for killing or molesting a manatee. The federal Endangered Species Preservation Act of 1966 (P.L. 89-669; 80 Stat. 926) first listed manatees as an endangered species. Further federal protection was implemented under the Marine Mammal Protection Act of 1972 (16 U.S.C. 1361 *et seq.*) and the Endangered Species Act of 1973 (16 U.S.C. 1531 *et seq.*). See manatee timeline on the web at http://myfwc.com/psm/manatee/Time line/Time line.htm.

The Florida Manatee Sanctuary Act was enacted by the Florida Legislature in 1978. Based on that legislation and authority provided to make rules, a number of small protected areas were established in 1979 in the vicinity of several winter manatee aggregation sites. The state manatee program, with a dedicated staff person, began in 1983 in the Marine Mammals Section of the Florida Marine Research Institute of the Florida Department of Natural Resources (DNR), now the Florida Wildlife Research Institute (FWRI) within FWC. The position was funded by the U.S. Fish and Wildlife Service (USFWS). In 1985, the state provided funding for the manatee program with the addition of three positions. Initial efforts were focused on research and data collection, including the recovery of manatee carcasses, determination of cause of death, and manatee distribution and tracking studies. Beginning in the mid-1980s, research staff also began providing input on coastal development proposals and on the need for speed zones in specific areas.

Early efforts by the State of Florida to assist in manatee recovery were guided by the federal Florida Manatee Recovery Plan, first produced in 1980. The USFWS listed the manatee as a federal endangered species and the federal recovery plan detailed the actions needed to protect and recover the manatee population. The plan identified tasks needed to protect manatees, such as speed zones, law enforcement, education, reviews of coastal developments, habitat protection, and manatee protection plans (MPPs) for specified counties. The plan also prioritized the tasks and assigned them to the most appropriate entity, such as federal or state agencies or other partner organizations. State personnel have historically assisted with the federal manatee recovery plans and continue those efforts today.

Recognizing that manatee protection efforts needed more focus, funding, and staff, the Governor and Cabinet directed DNR to make recommendations to protect the manatee and its habitat and to make the state's waterways safer for the boating public. Agency staff identified necessary actions to improve boating safety and manatee protection that could be accomplished under existing authority, as well as developed proposals for expanded authority for legislative consideration. This evaluation was compiled and described in a report entitled, "Recommendations to Improve Boating Safety and Manatee Protection for Florida Waterways." This report, approved by the Governor and Cabinet in October 1989 (1989 Directive; the web link is: http://myfwc.com/manatee/documents/1989%20Recommendations.pdf), identified 13

high-priority counties requiring manatee protection. It directed the agency to focus on these "key" counties and establish countywide protection zones, improve sign posting and maintenance capabilities, and develop MPPs with boat facility siting components. The report also provided guidance for commenting on marina development, protection of manatee habitat, and manatee education information for the public.

The 13 counties identified were Brevard, Broward, Citrus, Collier, Dade, Duval, Indian River, Lee, Martin, Palm Beach, St. Lucie, Sarasota, and Volusia. Sarasota County volunteered to be the 13th county (Figure 13). Along with the directives for manatee protection, this report also outlined several recommended amendments to the "Florida Manatee Sanctuary Act," subsection 370.12(2), Florida Statutes. The manatee license plate bill, passed by the 1989 Legislature, provided much of the additional revenue and the 19 new staff positions needed to meet manatee recovery objectives.

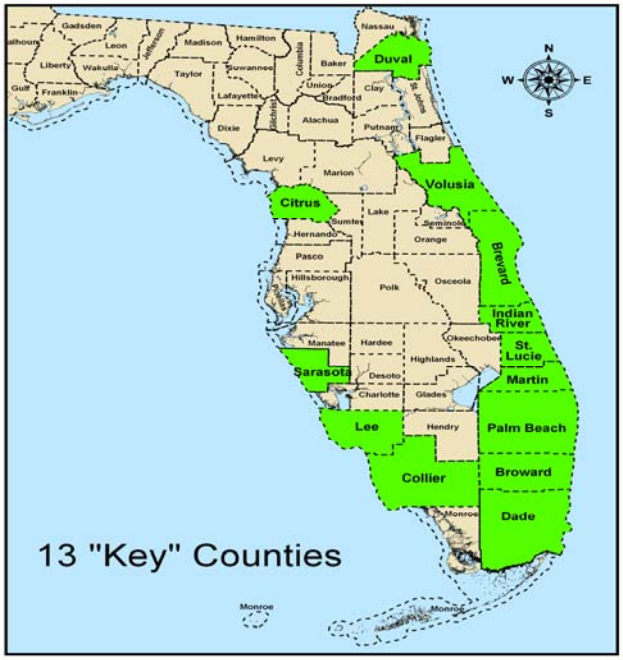


Figure 13. The 13 "key" counties.

The state manatee program began in the DNR (1983-1994). Due to agency reorganizations, it later was located in the Department of Environmental Protection (DEP) from 1994-1999, and then in the Fish and Wildlife Conservation Commission (FWC) from July 1999 to the present. The funding for state manatee work, initially provided by the federal government, has been provided by appropriations from the Florida Legislature since 1989. The Save the Manatee Trust Fund (not affiliated with the Save the Manatee Club) receives funds from a portion of boat registrations and from the sale of manatee specialty license plates and manatee decals, and other voluntary donations.

The trust fund has funded much of the manatee research efforts and management activities carried out by the program. The manatee data collected by researchers at FWRI and others is the foundation of information used to support management actions. Initial efforts focused on gathering data about local manatee abundance, distribution, and movement patterns,

and on understanding the various risk factors present throughout the state by recovering carcasses and determining causes of death. More recently, managers have requested that researchers assist with analysis of manatee/human interactions, the effectiveness of past management actions, and population dynamics (including analysis of the effects of the various risk factors). Thus, over the years, the program has grown from one that collected basic manatee data to one that analyzes more complex interactions between manatees and their environment. (See Chapter 9, "Monitoring Activities" for more details on research activities.)

Most recently, the FWC has worked very closely with the USFWS on management actions and research efforts. Greater coordination now occurs when assisting with the development and approval of county manatee protection plans and permit reviews. Combining the efforts of officers from both agencies and from municipalities has resulted in more effective enforcement of manatee speed zones. Research efforts also have benefited from increased collaboration among state, federal, and independent researchers. In addition, FWC staff have participated as members of many of the working groups established under the most recent Federal Manatee Recovery Team, which was overseen by the USFWS.

Both the federal and state wildlife agencies work together on the Manatee Forum, a stakeholder group that was created to ensure input from various interested organizations, including those representing environmental and boating interests. The goal of the Forum is to engage the diverse interest groups in dialogue instead of conflict or litigation, and to seek common ground on contentious topics. (More details on the Forum are provided under Other Management Efforts later in this section.)

The following sections provide further details on the efforts mentioned above: speed zones, permit reviews, manatee protection plans, education, habitat protection, stakeholder participation, and other actions that assist in manatee recovery:

Manatee Protection Zones

The first state-designated manatee protection zones were adopted in 1979. Most of these zones were established in close proximity to both natural and industrial warm-water sites (*e.g.*, springs, power plants, or other industrial sources) where manatees aggregated in large numbers during winter. These seasonal zones were in effect between November 15 and the end of March. Most of the zones required boats to operate at "idle speed" or "slow speed." All of the areas addressed in 1979 were specifically identified for rule-making by the Florida Legislature and included in §370.12(2), Florida Statutes, which is also referred to as the "Florida Manatee Sanctuary Act." The state agency responsible for establishing and managing the zones was the DNR; however, the zones were approved by the Governor and Cabinet. Rule-making continued to be handled this way until the DEP was created in 1994 when rules were approved by the Secretary of DEP. Rules are now approved by the Commissioners of the FWC.

The State of Florida uses three general types of manatee protection zones: safe havens and two categories of regulation that limit allowable boat speeds. Safe havens are the most protective type of zone and include "no entry" and "motorboats prohibited" zones. No entry zones prohibit all human activities (including swimming and fishing), whereas motorboats prohibited zones bar the entry of only those boats that are being propelled mechanically (*e.g.*,

outboard or inboard engines or trolling motors, but not sails, oars, or poles). One type of manatee protection zone limits boat speeds to non-planing speeds (*i.e.*, idle speed or slow speed). "Idle speed" is defined as the minimum speed necessary to maintain steerageway and headway. "Slow speed" means that a vessel must be fully off-plane and completely settled in the water. The other type of speed zone limits boat speeds to a set numeric limit, such as 25 MPH. Definitions of zone types are included in Rule 68C-22.002, *Florida Administrative Code*. [See Appendix IV, "Chapter 68C-22, Florida Manatee Sanctuary Act (Definitions)."]

The Florida Legislature amended the Manatee Sanctuary Act several times during the 1980s to identify additional areas for DNR to address through rule-making. In 1989, as mentioned previously, the Governor and Cabinet directed countywide rule-making in the 13 "key" counties. Following the approval of this directive, the Legislature amended the Manatee Sanctuary Act to provide DNR with the authority to adopt rules to protect manatees where necessary without the need for the areas to be specifically identified in statute. Further information about the statutory history is provided in Appendix IV.

Between 1990 and 1999, manatee protection rule-making was focused on establishing zones in the 13 "key" counties. The initial efforts to establish countywide manatee protection rules in these 13 counties were completed in 1999 when FWC adopted a countywide rule for Lee County. Since 1999, efforts have been spent primarily on readdressing some of the existing zones and considering the need for new zones in a few additional areas. In 2001, based on federal court litigation, a settlement agreement was reached. It identified 13 areas to evaluate for additional protection zones, three locations to evaluate for zone adequacy, and six areas to evaluate for the placement of safe havens. Nine of the 13 areas were approved by the Commission for new zones that were added in 2002. Three reports on existing zone adequacy were completed. All settlement obligations were completed in June 2006.

In 2002, legislation modified the Florida Manatee Sanctuary Act to provide for the formation of a local rule review committee (LRRC) in any county where the FWC was considering adding, removing, or modifying boat speed zones. The LRRC members are appointed by the county but operate independent of the county commission. The LRRCs provide local input to the FWC for consideration during the rule development process. The input from the LRRC is advisory; the FWC is not required to follow the recommendations of the LRRC. In many cases, the LRRC itself is divided on specific recommendations; in those cases, both majority and minority reports are provided to the FWC so that the diversity of opinions and recommendations can be evaluated. The LRRC process provides valuable local input and requires about 12 months to complete. Four LRRCs have been formed since the legislation was passed: Tampa Bay (this LRRC included three counties), Lee County, Charlotte County, and Duval County.

It should be noted that there are a variety of boat speed regulations in Florida in addition to zones promulgated under the authority of §370.12 (2), Florida Statutes. The FWC also establishes boat speed regulations for boating safety purposes listed in Chapter 68D-24, F.A.C. In addition, local municipalities have the authority to pass ordinances to regulate boat speeds for manatee protection. The USFWS has also established boat speed zones in Florida under a federal process for the purpose of manatee protection. In some cases, these federal zones cover the same areas as state zones, while in others there are only state or only federal zones. The

history and background of federal zones is not part of this management plan. Stakeholders have indicated that maps showing all the various types of speed zones would be helpful to illustrate the cumulative effects of combined regulations on Florida waterways. At this time, the FWC does not have maps of the many local zones. However, maps showing the locations of the federal zones can be found at http://www.fws.gov/northflorida/Manatee/Documents/MPARules/index-federal-mpa-maps.htm, and state manatee zones can be found at http://myfwc.com/psm/gis/mapref.htm. Boating safety zones will soon be available online at http://myfwc.com/boating/ and currently can be found in the *Florida Administrative Code*.

Table 35 below provides areas of waters regulated for manatee protection by county and statewide. It also provides the percentages of waters regulated compared to those waters left unregulated.

Table 35. Summary of FWC manatee protection regulations in Florida (2006).

Summary of FWC Manatee Protection Regulations in Florida (2006)

(Areas in acres)

COUNTY	No Entry, Year Round	No Entry, Seasonal	Motorboats Prohibited, Year Round	Motorboats Prohibited, Seasonal	Idle Speed, Year Round	Idle Speed, Seasonal	Slow Speed, Year Round	Slow Speed, Seasonal	Other Posted, Year Round	Other Posted, Seasonal	Total
BREVARD	0	63	12	1	626	1,663	50,654	0	185	0	53,204
BROWARD	195	0	0	0	72	132	1,631	647	0	0	2,677
CHARLOTTE	0	0	0	0	273	0	6,920	0	2,870	0	10,063
CITRUS	0	4	0	0	444	37	1,481	1,098	25,615	0	28,679
CLAY	0	0	0	0	0	0	1,340	0	0	0	1,340
COLLIER	1	0	0	0	2,539	0	9,868	0	20,384	0	32,792
DESOTO	0	0	0	0	0	0	194	0	403	0	596
DUVAL	0	0	0	0	0	0	5,946	0	0	0	5,946
FLAGLER	0	0	0	0	0	0	27	0	11	0	38
HERNANDO	0	0	0	0	0	0	0	52	338	0	390
HILLSBOROUGH	0	35	0	0	40	230	2,455	570	2,155	36	5,520
INDIAN RIVER	0	3	0	0	726	0	7,044	2,529	644	0	10,946
LAKE	0	0	0	0	0	0	2,347	0	513	0	2,860
LEE	0	5	0	0	631	0	32,004	12,763	2,128	0	47,531
LEVY	0	0	0	0	9	0	74	71	350	0	504
MANATEE	0	0	0	0	7	0	12,557	0	1,059	0	13,623
MARION	0	0	0	0	0	0	812	0	0	0	812
MARTIN	0	0	0	0	0	0	8,726	0	1,290	0	10,016
MIAMI-DADE	622	35	34	0	536	0	18,008	284	403	0	19,922
PALM BEACH	0	0	0	4	247	267	5,466	802	20	611	7,417
PINELLAS	0	0	0	0	0	0	0	1,670	0	0	1,670
PUTNAM	0	0	0	0	0	0	451	0	0	0	451
SARASOTA	74	0	0	0	102	0	9,002	0	597	0	9,775
SEMINOLE	0	0	0	0	0	0	359	0	0	0	359
ST JOHNS	0	0	0	0	0	0	195	0	0	0	195
ST LUCIE	1	1	0	0	836	0	10,109	543	397	0	11,887
VOLUSIA	0	0	0	4	209	0	17,256	250	21,957	0	39,676
Totals	893	146	46	9	7,297	2,329	204,925	21,279	81,319	647	318,888

No Entry - No human activities allowed unless specifically authorized or permitted
Motorboats Prohibited - No vessels powered or propelled by machinery allowed
Idle Speed - Minimum speed that maintains steerage and allows vessel to make headway
Slow Speed - Vessels must be off plane, completely settled in the water, and not creating an excessive wake
Other Posted - Numeric speed limits (20, 25, 30, or 35 mph)

Provided in Appendix VI is a summary of state manatee rule-making history for each county.

Permits and Variances Issued for Manatee Protection Rules

Administrative rules and statutes allow the FWC to issue permits and variances under certain circumstances that allow the recipient to perform activities that would otherwise be prohibited by the manatee protection rules. The permit process is set forth in Rule 68C-22.003, F.A.C., and applies only to FWC manatee protection rules. The variance process is set forth in §120.542, F.S., and can apply to any state agency rule, including FWC manatee protection rules. There are also several administrative and statutory exceptions. (Further information about these permits and variances can be found in Chapter 3, "Legal Framework" of this plan.) Each of these processes is discussed briefly below.

Permits

Rule 68C-22.003, F.A.C., allows the FWC to issue permits for six general types of activities. In all cases, a permit may be issued only upon a finding that the activity will not pose a serious threat to manatees and that the activity is justified. The criteria for justification of need vary by permit type, and are described in the rule. The FWC can place conditions on permits as needed to protect manatees and may modify or rescind a permit if appropriate.

- General Activities: This multi-purpose permit type is typically used to allow access to limited entry zones (*i.e.*, no entry or motorboats prohibited zones) for maintenance or construction purposes, to conduct monitoring, or for research-related activities. This permit type is issued infrequently, with two to three issued in a typical year.
- Resident Access to Limited Entry Areas: This permit type allows residents or guests to have access to waterfront property that is within, or requires transit through, a limited entry zone (*i.e.*, no entry or motorboats prohibited). The need for this permit is limited to a small number of areas in the state. The three main areas are located in Miami-Dade, Sarasota, and Indian River counties. The Division of Law Enforcement currently handles the issuance of these permits.
- Commercial Fishing and Professional Guiding: This permit type allows qualified commercial fishers or professional fishing guides to operate at speeds up to 20 MPH during their business activities. Permits can only be issued for activities and zones identified as eligible in the rule. As of August 2006, permits were available for these activities in portions of the following counties: Brevard, Citrus, Collier, Indian River, Lee, Manatee, Martin, St. Lucie, Sarasota, and Volusia. These permits are not issued within limited entry zones (*i.e.*, no entry or motorboats prohibited zones). This permit type is issued more frequently than any other permit type, with 150-200 typically being in effect at any one time. The Division of Law Enforcement currently handles these permits in consultation with the Imperiled Species Management Section.
- Testing of Motors or Vessels by Manufacturers: This permit type is used by manufacturers of motors or vessels to test their products while operating vessels at higher speeds than allowed by the manatee protection rules. These permits cannot be issued for activities within limited entry zones (*i.e.*, no entry or motorboats prohibited zones). This permit type is issued infrequently. Testing activities previously have been allowed in portions of the following counties: Brevard, Martin, Palm Beach, St. Lucie, and Volusia.

- Resident Access Through Speed-Controlled Areas: This permit type is used to allow residents to operate at speeds up to 25 MPH in order to have ingress and egress access to waterfront property that would otherwise be physically precluded because of speed restrictions (*i.e.*, higher speeds are needed to safely navigate over shoals or because of other physical factors). This permit type is issued very infrequently, with only two permits ever having been issued as of August 2006.
- Boat Races: This permit type is used to allow powerboat races to occur in areas where such intent is identified in the rule designating the manatee protection zones. Such intent currently exists in only three counties (Broward, Palm Beach, and Volusia), and no powerboat race has been conducted under authority granted by this permit type.

Variances

Section 120.542, F.S., allows any person to be granted a variance or waiver of any agency rule if the person can demonstrate that the purposes of the underlying statute will be achieved by other means by the person and when application of the rule would create a "substantial hardship" or would violate the "principles of fairness" as these terms are defined in the statute. As applied to FWC manatee protection rules, this process is similar to the permit process discussed above except that any type of activity can be requested in any area, and the standards for issuance are generally more difficult to meet. Since this process was created in 1996, the FWC has granted nine variances (not including renewals), with activities associated with feature film production (*e.g.*, filming scenes that require higher speeds than allowed by a rule) and water sports training/exhibition being the most common activities to be covered by a variance. As with permits, the FWC can place conditions on variances as needed to protect manatees.

Exceptions

Several activities are authorized by administrative rule or statute without the need for the FWC to issue a specific authorization. Rule 68C-22.003, F.A.C., allows law enforcement officers carrying out official duties or acting to directly protect manatees to engage in activities that otherwise would be prohibited by FWC manatee protection rules. This rule also provides an emergency exception that allows any person to engage in waterborne activity that is prohibited otherwise by a FWC manatee protection rule if such activity is reasonably necessary to prevent the loss of life or property or to render emergency assistance. (An almost identical statutory exception was added to §370.12(2), F.S., in 2004.)

Permit Reviews for Manatee Impacts

The Marine Mammal Section (of the manatee program) in the DNR began reviewing and providing manatee impact review comments in the summer of 1984. Responsibilities at that time included providing comments to the Division of State Lands for projects applying for sovereign submerged land leases and selected Developments of Regional Impact (DRIs). Concurrently, DNR's manatee program also provided comments and recommendations to the Department of Environmental Regulation (DER), when requested, on pending dredge-and-fill permit applications (which included dry-storage facilities as well as facilities on privately owned submerged lands).

The Governor and Cabinet's 1989 Directive to DNR included a section in the report entitled "Interim Boating Facility Expansion Policy and County Manatee Protection Plans," which states that the construction of new or expansion of existing boating facilities within the 13 "key" manatee protection counties shall be limited to a maximum of one powerboat slip for every 100 linear feet of shoreline owned or controlled by the applicant. This policy was applied unless the local government with jurisdiction had developed and implemented a state-approved manatee protection plan with a boating facility siting policy, in which case the MPP recommendations would be followed. This policy (known as the 1:100 policy) applied to the expansion of existing sites or construction of new boating facilities by the addition or construction of more than five powerboat slips. Variances from the 1:100 policy could be granted for projects near speed-regulated inlets if no adverse impacts were expected.

The Governor and Cabinet's Directive to DNR applied to projects on state-owned submerged lands that required sovereign submerged land leases. Similar recommendations for 1:100 were made to the Department of Environmental Regulation (DER) in appropriate areas, and DER would usually include these recommendations as a permit condition.

With the merger of the DNR and DER in 1994 to create DEP, dredge-and-fill permits and submerged land leases became the jurisdiction of DEP. While the Governor and Cabinet policy applied only to sovereign submerged lands, the boat traffic generated from a marine facility had the same potential manatee impacts regardless of the ownership of the submerged lands. Accordingly, the DEP manatee program provided 1:100 recommendations for dredge-and-fill permits for projects on privately owned submerged lands as well as on state-owned submerged lands. Applying the 1:100 policy to both types of authorizations was endorsed by the Policy Coordinating Committee (PCC) within DEP. In 1995, the rule establishing the environmental resource permit (ERP) was established, replacing the state dredge-and-fill permit in all regions of the state except northwest Florida. Also in 1995, delegations of certain ERPs were given to the water management districts (WMDs) to process, and the "linkage" rule was passed that coupled ERPs with submerged lands authorizations. This meant that both the regulatory permits and the sovereign lands authorization had to be processed simultaneously when both were needed by the applicant.

Rule-making for the 1:100 policy began in 1991 during a workshop held in Tallahassee. In 1994, three more workshops were held. Between the years 1995 and 1997, meetings with stakeholders, the Boating Advisory Committee, and PCC resulted in changing the proposed rule from the "1:100" rule to a "process" rule for marina review. In 1997, the manatee program was directed to no longer use 1:100 as an automatic policy, but to recommend it as a conservation measure if it was supported by data on a case-by-case basis. In 1999, when the program moved to the FWC, the 1:100 slip-to-shoreline ratio continued to be used, based on a case-by-case review of projects or as directed by recommendations of a county MPP.

The manatee program has conducted reviews and provided comments on approximately 6,000 projects in its 22-year history (summer of 1984 through June 2006). The number of projects submitted to the manatee program has tripled between 1996 and 2006. Approximately 591 reviews of projects were conducted from July 2005 to June 2006, compared to 564 reviews during the previous fiscal year.

Coordination procedures have been in place between the state regulatory agencies and the manatee program, and are modified as needed, based on relevant rule changes. The program began using desktop geographic information system (GIS) software to assist with data analysis of project reviews as soon as it became available (1994). Databases for tracking permit applications have also been developed and improved over time. The processing of manatee impact reviews has been facilitated and expedited by using word processing templates and by providing guidelines and standard permit conditions for certain types of projects.

FWC and USFWS Coordination

In November 2003, the FWC and the USFWS developed a coordination strategy that would provide a consistent approach to manatee protection at both the state and federal levels. The plan outlined several initiatives for manatee protection, including how to address impacts from construction projects receiving regulatory authorizations. This plan re-emphasized the need for countywide MPPs as guidance during the permit review process, and directed the federal and state wildlife agencies to develop a process for evaluating watercraft access projects. The process applied to all areas where manatees are present, with particular focus on the 13 "key" counties that were required to produce MPPs. The resulting interim plan was developed and implemented in July 2005, and is referred to as "Interim II." It was also incorporated into the federal "manatee key" used by the U.S. Army Corps of Engineers (USACOE) to identify projects with manatee impacts that require review by the USFWS.

This Interim II process typically results in shortened timeframes for evaluating permit applications without any reduction in protection for manatees. The process takes advantage of MPPs and other manatee protection measures (like speed zones and law enforcement for counties not required to have MPPs) to offset expected impacts of proposed projects. The process serves to reduce unnecessary delays and expense in the permitting of watercraft access facilities.

The Interim II process is described in a table found at the following weblink: http://www.fws.gov/northflorida/Manatee/Documents/Interim-II-version-1-1-August-2006.pdf . It categorizes the types of projects and status of manatee protection in the 35 counties in which watercraft-related manatee mortality has been recorded. It also provides guidance to prospective applicants as to the factors that will be considered in the collaborative review process between the state and federal wildlife agencies. The USACOE "manatee Key" used to determine what federal permits need manatee reviews, can be found at the following weblink: http://www.fws.gov/northflorida/Manatee/Documents/Manatee-Key-2005-August-28-2006.pdf .

Manatee Protection Plans

A manatee protection plan (MPP) is a comprehensive planning document that addresses the long-term protection of the Florida manatee through law enforcement, education, boat facility siting, and habitat protection initiatives. Although the MPPs are primarily developed by the counties, the plans are the product of extensive coordination and cooperation between the local governments, the FWC, the USFWS, and other interested parties.

The impetus for developing MPPs came from several federal and state initiatives. First, the Florida Manatee Recovery Team, an interagency group of manatee experts and managers, developed the Florida Manatee Recovery Plan, which was approved by the USFWS in 1980 and updated in 1989, 1996, and 2001. One task of the plan is to "develop site-specific manatee protection plans at the local level." The Florida Manatee Recovery Plan ranks this as a priority task for recovery of the species. Second, the state's l989 Directive identified 13 "key" counties to develop MPPs, and provided guidance for what should be included in a plan as described in Attachment K (see Appendix VII) of the previously referenced 1989 report. Finally and more recently, the 2002 Legislature amended Chapter 370.12(2), Florida Statutes, and the Florida Manatee Sanctuary Act, to codify the 1989 report recommendations for the development of county MPPs in the specified counties. This statute provided deadlines for MPP development, established criteria for approval, and required adoption of the boat facility element into county comprehensive plans.

Counties that have approved MPPs include Brevard, Citrus, Collier, Duval, Indian River, Lee, Martin, Miami-Dade, St. Lucie, Sarasota, and Volusia. Plans for Broward and Palm Beach counties are either being developed or are under review. Clay and Levy counties also have approved MPPs that they proactively developed even though they were not identified as one of the 13 "key" counties. In general, the plans are to include all relevant manatee data, information on boating (boat traffic studies and marina inventories), manatee habitat, law enforcement, port facilities, and education and outreach. The information is analyzed to develop measures to protect manatees and their habitat from expected risks. The plans need to include a boat facility siting element, seagrass protection measures, springs protection and other warm-water refuge protection, law enforcement strategies, a plan for outreach efforts to the public, monitoring initiatives, and an implementation plan to assure the listed activities will be addressed (see Appendix VIII for the August 2000 Boat Facility Siting Guide for more details).

Once approved, MPPs serve as valuable tools for planning future boat facility development and guidance for the state and federal wildlife agencies in reviewing coastal construction permits for manatee impacts and habitat protection. In setting policies to safeguard manatees and their habitats, the MPPs also have the effect of increasing boater safety, facilitating recreation planning, and protecting estuarine habitat critical to many species. Due to the complexity of the issues a county must address in its plan and the range of information that must be collected, plans often take several years to develop. Counties have the option of revising their MPPs every five years concurrent with their comprehensive plan environmental assessment review or on an as-needed basis.

Coordination between the FWC and USFWS on MPP approvals increased significantly in late 2003. Before that time, the USFWS provided extensive input during development of some plans; in other counties their input was provided after the state had assisted the county in developing a final draft MPP. This was because the state was the lead on MPP development under the federal recovery plan. The USFWS was extensively involved in the development of the Citrus MPP, which was the first one developed and which served as the model for the rest of the plans. The USFWS manatee coordinator was heavily involved in the multi-agency team that developed the Citrus County MPP. As a result, that plan was incorporated into the federal manatee key (used by the USACOE to screen federal permits for manatee impacts) shortly after approval and was implemented in federal permitting very early on. This was not true of the rest

of the county MPPs developed before 2005. Only in 2005, when Interim II was developed, were the state-approved MPPs then incorporated into the federal manatee key for use in the federal permit process. This has resulted in making the USFWS much more involved in the development of the MPPs. Their concurrence with state approval of the county MPPs is integral to the successful implementation of these plans.

Table 36. State comprehensive speed zones; MMP approved; amendment status into county comprehensive plans.

County	**State County-wide Speed Zones with Signs Posted**	**MPP Approved by the State of Florida**	**Comprehensive Plan Amendment Status** (as of 2/05)
Brevard	Jul 1991 Feb 2003	2003	Currently under review
Broward	Oct 1994	Draft 2007	No amendment received
Citrus	Dec 1992	1991	Adopted
Collier	Feb 1991 Oct 1998	1995	Approved
Miami-Dade	Apr 1993	1995	Adopted
Duval	Sept 1993	1999	Approved
Lee	Caloosahatchee River: Sept 1993 Countywide: Dec 2000 and 2005	2004	No amendment received
Indian River	Jul 1993	2000	Adopted
Martin	Jul 1991	2002	Adopted
Palm Beach	Nov 1991	Draft 2007	Not adopted
Sarasota	June 1993	2004	Approved
St. Lucie	Sept 1995	2002	Approved
Volusia	Jan 1992	2005	Not approved

*"Adopted" means adopted by the county commission and "approved" means approval of the state (DCA).

Provided in Appendix IX is a brief description of manatee protection plan development for the 13 "key" counties.

Information and Outreach

Public interest in Florida's manatees has grown steadily since the earliest efforts to provide information on manatees in the late 1970s. At one time, the manatee program regularly received manatee information requests from all over the world from thousands of individuals each year. To meet their needs, informational brochures and posters were developed, printed, and mailed on a regular basis. In 1996, manatee information was posted online through the internet, and the gate opened for individuals to access information directly, without having to write their requests. In 1999, the manatee web pages were updated to focus more on management and research activities regarding manatees, instead of just focusing on providing

information about the species. (FWC web pages on manatees include http://myfwc.com/manatee/ and http://research.myfwc.com/.) The web pages are updated regularly with new information about the state manatee program. Today, individual questions and requests are still answered using e-mail and letters and by mailing educational materials.

The FWC's primary public information, education, and outreach initiatives are designed to inform and educate the public about the manatee, its place in Florida's environment and ecosystems and the threats it faces; to minimize negative human effects on manatees by promoting a sense of stewardship about our use of aquatic and marine environments; and to explain and promote a variety of outlets for public involvement in the manatee conservation program.

An integral component of the Manatee Management Plan involves educating the public. In addition to Florida's citizens, FWC also targets the state's visitors to increase public awareness of manatees. FWC continues to develop press releases, public service announcements, publications and products for target groups, signs for boat ramps and marinas, and informational displays for public educational purposes. FWC staff assists county governments in developing the educational component of their MPPs and provides publications to a statewide network of oceanaria, parks (federal, state, county, and city), visitor centers, and environmental education facilities.

The manatee outreach program grew between 1996 and 2000 as FWC staff proactively targeted areas of the state where additional information and outreach efforts would be the most productive. Contacts were made in those key areas to help focus efforts to protect manatees. The contact network developed during this time is still active today.

During this period, staff also worked with the Florida Advisory Council of Environmental Education (and later the Advisory Council of Environmental Education) to assist grant applicants in the development of manatee-related projects. Staff also contacted oceanaria facilities that rehabilitate manatees to offer assistance with their outreach efforts. The following oceanaria have manatee education programs and staff: SeaWorld of Florida (Orlando), Walt Disney's Epcot "Living Seas" exhibit (Orlando), Lowry Park Zoo (Tampa), Mote Marine Laboratory and Aquarium (Sarasota), and the Miami Seaquarium (Miami).

The following parks and warm-water sites provide educational programs, viewing sites, or visitor centers that focus on manatees: Homosassa Springs State Wildlife Park (Homosassa Springs), Blue Spring State Park (Orange City), Ft. Pierce Utilities Manatee Education and Observation Center (Ft. Pierce), Tampa Electric Company Manatee Visitor Center (Apollo Beach), Florida Power and Light Lee County Manatee Park (Ft. Myers), and Crystal River National Wildlife Refuge (Crystal River). The Parker Manatee Aquarium (Bradenton) hosts the oldest known manatee in captivity, Snooty. The facility participates in rehab activities occasionally to help make space at other facilities but mostly serves as a museum with a manatee display pool.

In addition to the above, various federal, state, county, and city public parks; community environmental centers; and private organizations assist with manatee awareness and education programs at their facilities. Groups such as the Manatee Awareness Group (Miami-Dade,

Broward and Palm Beach counties), the Tampa Bay Watch (Tampa), Ramp Rangers (Tampa), Manatee Awareness Coalition (Tampa Bay) the HuManatee Club (St. Marks), and the Save the Manatee Club (Maitland) all provide outreach in the conservation of this imperiled species.

Over the past 10 to 15 years, several videos were produced for manatee awareness and education purposes. Some were created for specific needs; others contained more general manatee information. One focused on boaters and manatees, while others have focused on habitat issues. These videos have been used at tax collector offices, hotel and motel TV systems, counties, and cable companies (Time Warner Cable, Sunshine Network, Lee County Public Resources, Orange TV, and The Villages News Network).

New outreach opportunities for the internet began in 2003 when staff worked with an intranet company to develop an e-field trip about manatees. This self-guided tour into the life of the manatee gives elementary- through college-age students a way to learn about manatees. The field trip reaches students with much of the same information as the brochures, educational materials, and the local "treasure box" program that provides a box of manatee educational items and samples. Because it is on the internet, students outside of the U.S. also have access. Since the program's debut in 2003, about 40,000 public, private, and home-schooled students in 47 states have visited the e-field trip site. Almost half of the students participating in the program signed on from Florida schools.

Manatee Decal Program

The official manatee decal program began during the June boat registration period in fiscal year 1992/1993, when the Florida Legislature authorized the Voluntary Contribution Campaign. The Legislature allowed a registrant who provides a voluntary contribution of $5 or more shall be given a sticker or emblem by the tax collector to display that signifies support for the Save the Manatee Trust Fund. Prior to this time, donations were received under the Manatee Donation Campaign and no decals were issued to show the donor's support. The Voluntary Contribution Campaign is a challenge between tax collector offices competing to see who can raise the most funds for manatees, based on the amount of money raised relative to the number of boats registered during a particular time period. Oceanaria facilities and foundations provide prize items and plaques to reward the participating counties. The program is now in its 15th year and current-year manatee decals are available at Florida county tax offices. The donations from the manatee decals support manatee research, rehabilitation, and educational programs.

During the early part of this program, the artwork used on the decals was designed by agency staff. After the first few decals were created, an artwork design competition was opened to wildlife artists around the state. This continued until 2002, when the contest for the artwork was limited to middle school students and, then, in 2005, was expanded to include both middle and high school students. The students are required to submit a short essay with their artwork, which adds an educational component to the contest. The artist with the winning design receives the number 00001 decal, framed, and additional decals from the series. The manatee decals bring in about $75,000 to the Save the Manatee Trust Fund each year.

Manatee Habitat Management

Manatee habitat consists of many components, including warm water during periods of cold weather, sufficient forage (marine and freshwater plants), and fresh water for drinking. Other, less understood habitat needs may include quiet places for resting, or calving areas where manatees can give birth successfully. Over time, these habitats in Florida have changed tremendously due to human influence. Dredging has both adversely affected seagrass habitat and created new waterways that allow manatees to access areas that were previously inaccessible; however, this has also exposed manatees to a variety of risks, including crushing and entrapment by water-control structures. Some historic springs have been lost and others have been modified in ways that prevent or deter manatee use (Laist and Reynolds 2005a). Exotic freshwater plants have provided new sources of forage while, on a statewide basis, there has been a reduction of marine seagrasses (Fonseca *et al.* 1998; Zieman 1982; and Smith 1993). Warm water from power plants has attracted manatees in great numbers during the winter and has altered the cold season historic distribution of the manatee population within Florida waters.

The challenge today is to manage and conserve the manatee population and its habitat in an already altered state. This habitat continues to change as the surrounding land is increasingly urbanized by Florida's growing human population. FWC has focused on issues such as seagrass protection, freshwater aquatic plant management, protection of natural springs, reduction of risks to manatees from water-control structures and navigational locks, and responses to long-term changes to manatee warm-water habitat (industrial and natural). Many of the FWC's efforts have been proactive through coordination with myriad agencies, stakeholders, working groups, and task forces. The FWC has focused on the habitat objectives of the federal Florida Manatee Recovery Plan, which included participation on the federal Habitat Working Group (HWG), the Warm-Water Task Force (WWTF), the Interagency Task Force for Water-Control Structures (ITFWCS), and the Comprehensive Everglades Restoration Plan (CERP) Interagency Manatee Task Force. The FWC maintains that this has been an effective means of minimizing impacts and achieving protection for manatee habitat. While the current recovery team will be disbanded, it eventually will be restructured. Several of the groups and task forces will continue their usual work as they are long-term groups independent of the recovery team. Many of the efforts of the other groups also will continue in some format. Provided below is a summary of the accomplishments related to habitat issues during the past 10 years.

Warm-Water Habitat

The future stability of the Florida manatee population depends on the availability of warm-water habitat. The West Indian manatee is living at the northern limit of its winter range in Florida, and is dependent on warm-water habitat to survive through the winter months. Historically, manatees probably used natural springs, passive warm-water sites, and the warm ambient waters in southern Florida to avoid cold-related stress and death through the winter (Laist and Reynolds 2005a). During the course of the last century, Florida's landscape has been altered significantly by human activities. Important natural springs have become inaccessible, spring flows are being reduced or disrupted, and dredging and canal construction have diverted water from the Everglades. Concurrently, with the alterations of existing manatee habitat, industries such as power plants began discharging their thermal effluent into ambient coastal waters, creating large areas of new warm-water habitat.

Manatee response to these changes has been varied. Natural springs characterized by adequate flows, accessibility, good sources of adjacent forage, and limited human disturbance continue to attract manatees in increasing numbers. Springs that have been dammed or otherwise blocked are minimally used or can no longer be used by manatees (*e.g.*, Rainbow Spring, Silver Spring, and the springs of the Oklawaha River). However, approximately two-thirds of the manatees counted on synoptic surveys now seek refuge during cold weather at power plant warm-water sites located throughout peninsular Florida (Warm-Water Task Force 2006). Although these industrial sites have provided safe, dependable warm-water habitat for over 60 years, future changes to the operation of these power plants are expected. Increasing competition from new power plants, more stringent environmental standards, and the development of new energy sources may make it unlikely that power companies will re-power their aging coastal plants or continue to operate them as consistently as in the past.

The loss or reduction in dependability of industrial warm-water habitat could have a devastating effect on regional manatee populations. In order to reduce the risk of a temporary loss of warm water at a power plant, manatee program staff has completed Manatee Power Plant Protection plans for 15 power plants. These plans are included in each plant's National Pollution Discharge Elimination System (NPDES) permit. The FWC is also working with the USFWS, the power industry, and other stakeholders to produce long-term solutions to this imminent dilemma, while creating contingency plans in case of an unexpected loss of a specific source of industrial warm-water.

Estuarine Submerged Aquatic Vegetation (Seagrass)

Historically, coastal development has resulted in the degradation of water quality and destruction of seagrasses—the manatee's primary food (Fonseca *et al.* 1998; Zieman 1982; Zieman and Zieman 1989). In some areas, such as Tampa Bay, management efforts by public and private organizations have resulted in improved water quality and the return of some seagrass resources (Fonseca *et al.* 1998). However, despite a variety of protective measures that have been implemented to protect seagrass, the cumulative seagrass resources of Florida continue to decline. Seagrass losses have not reached levels that threaten the overall available food resources of the current manatee population, but localized losses could affect and likely have affected manatee behavior, movement patterns, and distribution.

FWC currently is very active in mapping, monitoring, protecting and restoring Florida's seagrass resources. The manatee program has conducted several studies focusing on minimizing the effects of over-water structures (covered, elevated, and floating docks; piers; and boat lifts) on seagrasses. The results of these studies have assisted in developing recommendations that can be incorporated into state dock construction criteria. In addition, the manatee program is currently working with other agencies in evaluating nonregulatory approaches to minimize vessel prop scarring in seagrasses. The FWC will continue to be dedicated to conserving and restoring seagrass habitat so that loss of forage resources does not become a significant issue for manatees at either a local or regional level.

Springs

FWC has become extensively involved in issues related to Florida springs due to their importance as manatee habitat. Florida's natural springs provide freshwater habitat throughout the year, but it is their warm waters during the winter months that provide especially important habitat for manatees. Approximately 20% of the manatee population depends on natural spring systems for warm-water habitat. The springs currently used as warm-water habitat are becoming increasingly important due to the uncertain future of industrial warm-water outfalls. Springs that were historically used by manatees, but are seldom used now, may also become important winter habitat, especially if existing warm-water habitat is diminished. Owing to the pressing warm-water habitat issues facing manatees in Florida, the time for protecting Florida's springs is now. Springs are increasingly stressed by the demand for fresh water from Florida's growing human population. Minimum Flows and Levels (MFLs) are being established by regional water management districts to protect critical ecological functions of spring systems, and manatee use is being addressed for those identified as important to this species. Floridians also place other demands on natural springs, including recreational activities that may deter manatee use of springs during the winter. Human activities also increase nutrient loads to our groundwater that degrade water quality and clarity, affecting the diversity and abundance of freshwater vegetation that depends on both.

Manatee program staff has provided the water management districts with a hierarchal list of springs relative to their importance to manatees so the districts can consider manatee habitat when prioritizing the establishment of MFLs for spring systems. FWC provides information and expertise regarding historic, existing, and potential use of Florida's springs during the development of individual MFLs, ensuring protection for important warm-water habitat. FWC has also provided a staff member as a technical advisor to the Governor's Springs Task Force ensuring that manatees and manatee habitat are important considerations in the state's efforts to protect and restore Florida's springs.

Water-Control Structures and Navigational Locks

Structure-related mortality is the second greatest human-caused mortality factor for manatees. From 1974 through 2005, 184 manatee deaths were attributed to navigation locks (locks) or water-control structures (structures) operated by the State of Florida or the USACOE. FWC has taken an active role in coordinating a multi-agency task force that was officially assembled in 1994 to develop solutions for this serious problem. Members include the DEP, USFWS, USACOE, South Florida Water Management District (SFWMD), Southwest Florida Water Management District (SWFWMD), and Dade County's Department of Environmental Resource Management (DERM). The task force recognized that a number of actions were necessary to resolve this issue. Initially, an attempt to change the Standard Operating Procedures (SOP) at structures and locks was attempted as a solution to reduce structure-related deaths of manatees. Early on, these changes appeared to result in a decline of the number of structure-caused deaths; however, structure-related deaths increased significantly in the early 1990s.

Although changes in the SOPs of structures and locks may have helped reduce manatee deaths, other factors were also influencing manatee interactions with structures, and more needed to be done. The most important and effective measure has been the development of technology

that renders structures and locks "manatee-safe." Due to the ongoing efforts of the FWC and other agencies, we believe that we are witnessing the results of the technological advancements used to reduce structure-caused mortality. The most recent five-year average for manatee deaths at structures and locks is 2.6 manatee deaths per year, as opposed to 7.6 deaths per year during the preceding 15 years.

Aquatic Plant Management

Freshwater vegetation, both native and invasive, provides important manatee forage. Issues related to the effects of freshwater aquatic plant management upon manatees and their feeding habitat have also been of importance to habitat-directed activities. FWC has worked closely with DEP's Bureau of Invasive Plant Management and Division of Recreation and Parks, USFWS, USACOE, and the respective county governments to address balancing manatee foraging habitat concerns with those related to managing the adverse environmental effects of nonnative invasive aquatic plants.

Manatee program staff are members of the Crystal River and Blue Spring Interagency Working Groups. These working groups establish aquatic herbicide work plans that protect manatee habitat in these areas due to their importance as warm-water refuges.

USFWS Manatee Recovery Team

The USFWS constituted a new manatee recovery team that was in place from 2003 through August of 2007. This most recent recovery team consisted of a number of working groups and task forces that worked to further the goals of the existing manatee recovery plan. FWC staff served as co-chairs on two of these groups and as members on two others.

Warm-Water Task Force

The Warm-Water Task Force consists of governmental agencies, power industry representatives, and non-governmental organizations (NGOs) tasked with developing strategies to ensure safe and dependable warm-water refuges for manatees. The task force is charged with developing a conceptual long-term plan for warm-water refuges and a contingency plan in the event of a temporary or permanent cessation of warm-water at an industrial facility, protecting nonindustrial warm-water habitat, and identifying other sources of dependable warm-water habitat.

The task force has drafted a plan that addresses the future of warm-water habitat. This plan includes an assessment of threats, interim and long-range recommendations for regional warm-water networks, funding, research needs, and a plan of action. This task force has a long history and was in place prior to the most recent recovery plan and their work will continue.

Habitat Working Group

The FWC was the co-chair of the Habitat Working Group (HWG) and participated in a broad range of manatee habitat issues with its Manatee Recovery Team partners. The HWG was tasked with identifying threats to manatee habitat and developing strategies to reduce those threats. Habitat needs will be prioritized by factors limiting the manatee population in Florida,

including freshwater sources, foraging habitat, migration and travel corridors, resting and calving areas, and warm-water habitat.

Specific issues addressed by the HWG include defining warm-water and foraging-habitat carrying capacity, and assessing effects of reduced spring flow and changes in foraging areas. Focused efforts of the HWG include developing a habitat inventory checklist for identified natural and artificial warm-water refuges, estimating habitat carrying capacity based on winter warm-water refuge sites, and estimating foraging habitat available to regional manatee populations (also see Chapter 10, "Ongoing and Future Research").

Comprehensive Everglades Restoration Plan Task Force

The interagency task force addressed all aspects of the Comprehensive Everglades Restoration Plan (CERP) as they relate to the conservation of the Florida manatee (CERP Task Force Mission Statement). The CERP task force evaluated proposed changes to existing canal systems and the construction of new structures that are planned during the implementation of CERP. Twenty-eight CERP project plans were reviewed, and it was determined that 18 will directly affect manatees. The task force drafted recommended guidelines for manatee protection during CERP-related construction activities. These recommendations address activities such as culvert and water-control structure installation, potential thermal effects of Aquifer Storage and Recovery (ASR) wells, potential manatee entrapment in canal networks and in-water construction effects. This task force also conducted Manatee Habitat Evaluation Surveys in more than 100 miles of flood control canals in the Everglades and in the Everglades Agricultural Area currently accessible to manatees. This information was used to create a manatee accessibility map of the canals of central and south Florida and recommendations to eliminate access to areas of high risk to manatees.

Interagency Task Force for Water Control Structures

See "Water Control Structures and Navigational Locks" previously discussed in this section.

Other Management Efforts

Propeller Guards

One of the main hazards to manatees is the trauma caused by the impact of fast-moving watercraft. The force of a boat striking a manatee at planing speeds is sufficient to cause extensive internal injuries that all too often lead to death. Examination of FWC carcass salvage data indicates that 50% of all manatees struck by boats die from such "blunt" trauma. About 45% of this category of manatee deaths is due to propeller wounds, with the remaining 5% caused by a combination of these factors.

Since before 1993, the state's manatee program has responded to citizen and industry requests to institute the broad-scale use of propeller guards as a solution to the manatee-watercraft interaction problem. FWC staff has worked with inventors, citizens, marine outboard manufacturers, engineers, and the Boating Advisory Council to address this issue. FWC staff compiled information on various propeller guard designs and performance tests in an effort to

evaluate whether or not propeller guards could reduce manatee propeller wounds and death, not endanger people, and allow safe operation of watercraft equipped with these devices. Unfortunately, clear benefits to the operation of watercraft and protection of people are not apparent with many designs. Research sponsored by the state manatee management program (a $100,000 contract with ocean engineers at FIU and the University of Tennessee in 1998) showed that propeller guards are effective at stopping extensive cutting damage caused by propellers at low speeds. At high speeds, however, the resulting blunt trauma force appears to cancel out the benefits of the guards.

The FWC maintains that, if propeller guards or some propulsion mechanism other than the open propeller systems were to be used to prevent manatee injury, they could augment existing manatee protection mechanisms already in place, but would not be a substitute for manatee protection zones that regulate boat access and speed.

Manatee Forums

In July 2004, due to increased polarization on manatee issues and litigation, the FWC and USFWS initiated the "Manatee Forum" to bring together 22 stakeholders on manatee issues for productive dialogue and, ultimately, successful conflict resolution.

Figure 14. Manatee Forum membership

The Forum is usually held quarterly, for one to two days, and is facilitated by a contracted professional conflict resolution and facilitation firm that specializes in environmental issues. Some meetings have focused on specific topics such as habitat, boating, population dynamics, springs, or manatee forage. Once basic information about manatee issues was presented, the Forum began working on conflict resolution. The Forum has been a useful venue for stakeholders to express their concerns to each other and communicate directly to the management agencies, rather than through legislation or litigation. There has been open dialogue that gives participants insight into various perspectives about the issues and allows the agencies to clarify myths. One of the most important outcomes has been the interactive dialogue between scientists and stakeholders which has made manatee research more transparent and has

quelled many suspicions held by stakeholders relating to the science. However, the communication of scientific data and research results remains challenging, as Forum members have varying interpretations of the same research. The Forum has fostered better communication between the agencies and stakeholders, and is an ongoing process.

APPENDIX II

CASE SUMMARIES

Constitutional Authority

Cases listed under this heading primarily deal with issues concerning constitutional authority at the state or federal level.

Caribbean Conservation Corp. v. Fla. Fish & Wildlife Conservation Comm'n., Inc., 838 So. 2d 492 (Fla. 2003).

At the trial court level, it was decided that a portion of the power granted to the newly created Florida Fish and Wildlife Conservation Commission (FWC) was an unconstitutional delegation of legislative authority. In addition, the trial court believed that, prior to the merger creating the FWC, the Marine Fisheries Commission (MFC) had the constitutional authority to adopt rules relating to endangered marine life. The case was appealed to the 1st District Court of Appeals who determined that the delegation of power to FWC was indeed a constitutionally allowable grant of authority, but that the powers transferred from the MFC regarding endangered marine life were only incidental regulatory powers. This opinion was again appealed, this time to the Florida Supreme Court where the issues at hand were described in more detail.

Ultimately this case was a constitutional challenge of three statutes that the not-for-profit petitioners claimed usurped the constitutional authority of the newly created FWC. The first challenged statute, §20.331, stated that the provisions of Chapter 120 will apply to those parties whose substantial interests will be affected by any Commission action, including "Research and management responsibilities for marine species listed as endangered, threatened, or of special concern…." The second challenged statute stated that FWC has "full constitutional rulemaking authority over marine life, and listed species...except for…endangered or threatened marine species," which will be promulgated pursuant to Chapter 120, F.S., the Administrative Procedures Act (APA). The third set of challenged statutes essentially required FWC to follow the APA when promulgating rules relating to marine turtles and manatees. The court determined that the challenged statutes were constitutional, except for the sections regarding "species of special concern."

The court summarized that, when FWC was created in 1999 as a result of the November 1998 constitutional amendment, it was created based on the executive powers of the Game and Fresh Water Fish Commission and the Marine Fisheries Commission as those powers existed on March 1, 1998. According to the Florida Supreme Court's interpretation of the powers granted to FWC in Article IV §9, those powers include "the regulatory and executive powers of the state with respect to wild animal life and fresh water aquatic life," but only included some regulatory and executive powers with respect to marine life. The court determined that the powers that passed to the newly created FWC were the same as those powers held by the previous Marine Fisheries Commission, which included some power to regulate endangered and threatened marine life, but did not include the sole power to regulate them. The court found that, prior to the merger, the Department of Environmental Protection retained powers regarding endangered

and threatened marine life, such as manatees. While this case did not discuss this, the powers granted to DEP regarding endangered and threatened marine life merged with FWC at the time of its creation in 1999 but, because the power held by DEP was granted by the Legislature instead of granted in the Florida Constitution, then FWC's actions regarding endangered marine life, including manatees, is still considered legislative power, not constitutional, and therefore rules created under that power are subject to the APA, Chapter 120, and potential future actions by the Legislature.

Federal Authority

Cases listed under this heading primarily deal with issues concerning federal authority to protect manatees. Subject matter may include issues dealing with federal manatee protection areas (*i.e.*, refuges and sanctuaries), federal permitting, or other federal issues.

Fla. Marine Contractors, *et al.* v. Williams, 378 F. Supp. 2d 1353 (M.D. Fla. 2005).

The plaintiffs were landowners and marine contractors who argued that the Marine Mammal Protection Act, 16 U.S.C. §1361, did not apply to recreational docks built on the inland waterways of Florida. This section of the Endangered Species Act, in addition to prohibiting federal actions that are "likely to jeopardize the continued existence" of an endangered or threatened species, also requires consultation with the Fish and Wildlife Service if a federal action "may affect" such species. The act allows for incidental takings due to recreational activities, provided that the total take will only have a "negligible impact" on the species. The plaintiffs did not challenge the USFWS's findings that issuing these permits would have more then a "negligible impact" on the Florida manatee; instead they argued solely that the Act itself does not apply to residential docks.

The court disagreed, finding that the intentions of Congress were made clear through the language of the Act and the legislative history accompanying it. While the Plaintiffs argued that, because Congress did not specifically use the term "inland waters," and did not use the term "all" in the adopted phrase "in areas where manatees are found" meant that Congress only intended to protect some manatees. The court stated that there was no evidence to support this contention and that Congress' clear objective was to lessen the negative impact of man's activities, both commercial and recreational, on the life and habitat of marine mammals and therefore the Act applies to recreational docks built on inland waterways.

Fla. Keys Citizens Coalition, Inc. v. United States Army Corps., *et al.*, 374 F. Supp. 2d 1116 (SD Fla. Miami 2005).

Numerous citizen action groups challenged the federal agency decisions that led to the approval of a highway improvement project that would likely consist of expanding a two-lane highway to a four-lane highway on a 20.6 mile stretch of US-1 from Key Largo to the northern edge of Miami-Dade County. The plaintiffs argued that approval was given in violation of a requirement that a second environmental impact statement be prepared, that it was given despite an improper evaluation of the use in Everglades National Park, and it was given in violation of the Endangered Species Act. The court determined that the plaintiffs failed to prove any of their

claims and therefore all requested relief was denied. Specifically, the U.S. Fish and Wildlife Service issued an opinion on February 20, 2004, concluding that the proposed project would not likely "jeopardize the continued existence of the manatee and is not likely to adversely modify critical habitat." This conclusion, along with a conclusion by the National Oceanic and Atmospheric Administration's National Marine Fisheries Service that the project was not likely to adversely affect sea turtles or the smalltooth sawfish, was challenged by the citizen action groups as being issued based on incorrect or false conclusions. The court stated that the correct standard of review is whether or not the decisions of the U.S. Fish and Wildlife Service and the National Oceanic and Atmospheric Administration's National Marine Fisheries Service are arbitrary and capricious, and whether or not the U.S. Army Corps of Engineers' reliance on their recommendations was arbitrary and capricious. The court found that the plaintiffs failed to meet their burden of proof in either case.

Save the Manatee Club, Inc., *et al.*, v. Ballard, *et al.*, Civil No. 1:00CV00076 EGS/JMF, (U.S. Dist. Col. 2001).

The court approved a settlement agreement between the parties on January 5, 2001. The settlement agreement required the defendants, the U.S. Army Corps of Engineers (USACOE), and the U.S. Fish and Wildlife Service to pursue rulemaking to adopt Marine Mammal Protection Act incidental take regulations. The rulemaking was required to consider all permitting activities of the USACOE and all activities of the USFWS that potentially related to watercraft impacts on manatees. Any National Environmental Policy Act (NEPA) evaluation performed by the USFWS must consider the "direct, indirect, and cumulative effects of the overall Marine Mammal Protection Act regulations."

The settlement required the USFWS to submit, by April 2, 2001, a proposed rule for new manatee refuges and sanctuaries throughout Florida, taking into account the "needs of the manatee at an ecosystem level," and making sure to satisfy the biological requirements while looking forward towards manatee recovery, as defined by section 4 of the Endangered Species Act. The USFWS agreed to provide the other parties with a letter describing how they planned to implement an increase in the efforts of law enforcement that would be necessitated by manatee speed zones. In addition, the agreement required the USFWS to draft a revised Florida manatee recovery plan, one that allows for public review and comments prior to signature and includes objective and measurable criteria for determining whether or not the manatee may be reclassified to threatened from endangered.

The settlement provided for a number of different notice requirements, namely that the USACOE and the USFWS must send the plaintiffs and intervenors a copy of any letter in which a determination was made that a project "may affect" the manatee or "may affect but is not likely to adversely affect" the manatee. The same is required for final biological opinions issued by the USFWS dealing with manatees or their habitat.

In October of 2001, the plaintiffs filed a Formal Notice of Controversy with the Department of Justice, arguing that the USFWS violated the settlement agreement through the course of certain actions. On July 9, 2002, the court found that the USFWS had violated the agreement by not fulfilling the requirement to designate areas of manatee refuge and sanctuary

throughout Florida. The parties once again agreed to settle and on March 18, 2003, the court entered a (Proposed) Stipulated Order whereby the parties agreed to another set of conditions. The agreement included the requirement that the USFWS submit a proposed rule for designating additional manatee protection areas in three specific places, the Caloosahatchee River, the St. Johns River, and the Halifax/Tomoka River. In those areas the USFWS agreed, where possible, to place temporary speed signs to inform the public, and to place permanent signs soon after, as specified by the timetable in the settlement. The agreement states that the plaintiffs are entitled to an award of attorneys' fees and expenses to be agreed upon by the parties; otherwise the plaintiffs' pending motion for fees and costs will be heard. Finally, the parties all agreed to a number of dispute resolution measures in the event that the new agreement is breached.

The original agreement required the USFWS to prepare either an environmental assessment or an environmental impact statement in connection with its issuance of Marine Mammal Protection Act (MMPA) rules. The USFWS prepared an environmental impact statement (EIS) for rule-making for the incidental take of Florida manatees in small numbers resulting from watercraft operation and government programs. The EIS was completed in March of 2003 and is comprised of more than 500 pages of information. The EIS considered a number of possibilities, including the possibility that none of the "stocks" of manatees throughout Florida are candidates for negligible impact findings which would mean no incidental take could be allowed, all the way to the possibility that three of the stocks of manatees are potential candidates. Essentially the EIS did not have a solid conclusion regarding the way that negligible impact findings are calculated. The draft version of the EIS identified "Alternative 3" as the proposed action which would be a finding that incidental take could be permitted in three of the four stocks, with one of the three requiring mitigating measures. The final version of the EIS indicated that this proposed action is being reevaluated due to new scientific information and that any implementation of incidental take regulations will be analyzed through peer review. For the time being, the EIS states that the USFWS will continue to review permit applications under section 7 of the ESA on a case-by-case basis and that, where a requested permit is found to be reasonably certain to cause an incidental take of manatee, the USFWS will recommend denial. This process will continue until incidental take authorization is in place under the MMPA, something the USFWS was unable to identify within this EIS.

Environmental Coalition of Broward County, Inc. v. Myers, 831 F.2d 984 (11th Cir. 1987).

The S.A. Horvitz Testamentary Trust applied to the USACOE for a dredge-and-fill permit so that it could begin development for industrial marine and commercial purposes. The USACOE must comply with a number of regulations before a permit can be approved, including the Federal Clean Water Act, the Endangered Species Act, and certain public notice requirements. Compliance with the Endangered Species Act requires a biological opinion from the USFWS when the program or activity may affect a listed species. The USFWS' opinion said that the proposed project would "not jeopardize any endangered species in the area."

The court stated that, in its review of an agency determination, deference should be given to the agency's decision, especially when it incorporates a balancing process like the USACOE's "public interest" review required by their regulations. It is not required that a court find all of the data reviewed by the USACOE actually support the agency's decision, only that enough credible

evidence exists in the record to support its action. In this case the 11th Circuit affirmed the decision of the court below, finding that the evidence was sufficient to support the decision of the USACOE and that the USACOE did everything required of them by the Fish and Wildlife Coordination Act.

SAVE THE MANATEE CLUB v. FLORIDA FISH AND WILDLIFE CONSERVATION COMMISSION, 903 So.2d. 195 (Fla. 1st DCA 2005)

In a *per curiam* opinion, the First District Court of Appeal upheld two separate decisions by FWC relating to local manatee protection plans.

In the first decision, FWC issued a Declaratory Statement requested by the Save the Manatee Club (FWC Order 04-0017 dated August 6, 2004) holding that FWC's review and approval of county manatee protection plans was not "agency action" within the meaning of Chapter 120, Florida Statutes, and, therefore, FWC's review of the plans was not subject to a legal challenge before the Division of Administrative Hearings. FWC determined, and the District Court agreed, that manatee protection plans are plans and that anyone substantially impacted by implementation of the plans could make legal challenges at the appropriate time. In the second decision, FWC approved the Manatee Protection Plan submitted by Lee County, but rejected Save the Manatee Club's request to challenge this decision before the Division of Administrative Hearings because, again, FWC review of the Lee County plan was not "agency action" within the meaning of Chapter 120, F.S., so as to warrant an administrative appeal before the Division of Administrative Hearings.

State Authority: Manatee Protection Rule Challenges

Cases listed under this heading primarily deal with issues concerning state authority to establish manatee protection rules (*i.e.*, speed zones or safe havens) and related issues.

Wilkinson v. Fla. Fish & Wildlife Conservation Comm'n, 853 So. 2d 1088 (1st DCA Fla. 2003).

The plaintiff challenged an agency rule regarding speed zones in Lee County in place for manatee protection, but he challenged the rule at the trial court level. The decision was appealed to the 1st DCA who determined that, because FWC does not have constitutional authority over the manatee or other endangered marine life, this rule is subject to the administrative procedures of Chapter 120, F.S. While there are recognized exceptions to allow parties to bypass the administrative procedure process, the plaintiff failed to provide any reason why this case would qualify. He then argued that he would be unable to challenge the rule in question under Chapter 120 because he lacked standing. The court indicated that the plaintiff would likely have had Chapter 120 standing but refused to actually decide the issue since the question was not presented to the court below and therefore could not be properly alleged on appeal.

Save the Manatee Club, Inc., *et al.*, v. Egbert, CASE NO. 4:00CV17/RV, (U.S. N.D. Fla. 2001).

The U.S. Northern District of Florida entered an Order on November 7, 2001, adopting the settlement agreement between the plaintiffs and the Florida Fish and Wildlife Conservation Commission by incorporation. The order held that the agreement was fair, adequate, and reasonable, and reserved the right of the judge to enforce the consent decree.

The settlement agreement itself contained a number of clauses, including that the executive director of FWC at the time, Dr. Allan Egbert, would present and advocate the approval of the settlement agreement to the Commissioners at the April 19, 2001, public meeting. Additionally, as a result of a prior mediation, the staff drafted rule changes to regulate the speed and operation of motorboats in Brevard County. FWC agreed to draft a rule-making proposal using an analytical approach to address eight specific "hot spots" across the state and eight specific "safe havens" for manatee protection to be presented to the Commission in late 2001. The eight "hot spots" were identified as follows: (1) Lemon Bay in Charlotte County, (2) the Peace River in Charlotte County, (3) Alafia River in Hillsborough County, (4) Terra Ceia Bay in Manatee County, (5) the Halifax River from the Ponce de Leon inlet to the Dunlawton Bridge in Volusia County, (6) the "Jungle Trail" area in Indian River County, (7) the "Crossroads" area in Martin County, and (8) the confluence of the Loxahatchee River and the Intracoastal Waterway in Palm Beach County. The "safe havens" were identified as follows: (1) a portion of the Homosassa River-Blue Waters in Citrus County, (2) Warm Mineral Springs in Sarasota County, (3) a portion of Turtle Bay in Charlotte County, (4) the Vero Beach power plant discharge area in Indian River County, (5) Blue Lagoon in Dade County, (6) Sky Lakes in Dade County, (7) DeLeon Springs in Volusia County, and (8) Pansy Bayou in Sarasota County.

The term "safe haven" was described in the settlement to mean limited or no-entry zones; this could include motorboat-prohibited zones or idle speed zones. The settlement, in anticipation of the adoption of the above safe havens and hot spots, required a rule-making proposal to begin in 2002, once the above 16 zones were established, to create an additional six specific safe havens in the state.

The agreement called for a special study of the Caloosahatchee River and an enhancement of the educational and law enforcement activities in the area. It required FWC to evaluate the existing rules in certain areas of Lee, Duval, and Collier counties and included an agreement that FWC would enhance their public education and awareness campaigns to educate boaters about manatee safety. The settlement also required Save the Manatee Club, Inc., and the Florida Wildlife Federation to intervene on the side of FWC in any legal challenge made to any rule or policy pursued as a result of the agreement.

Update: As of June 2006 FWC completed all of its responsibilities under the settlement agreement.

McGill *et al.*, v. Fla. Fish & Wildlife Conservation Comm'n *et al.*, 2002 Fla. ENV LEXIS 64; 1 ER FALR 125, Case Nos. 01-2114RP, 01-2197RP, 01-2198RP, Final Order April 17, 2002.

Proposed amendments to FWC rule 68C-22.006 regulating manatee protection areas in Brevard County were challenged as being an invalid exercise of legislative authority. When a

rule is being challenged, the rule is not treated as presumptively valid or invalid. When a party with standing challenges the validity of a proposed rule it is the burden of the agency to prove by a preponderance of the evidence that the proposed rule, with respect to the issues raised by the petitioners, is not an invalid exercise of delegated legislative authority. Specifically in this case the petitioners argued that FWC has an obligation imposed upon them by statute to define the terms "frequent," "periodically," and "continuous," and FWC is required to quantify the term "necessary" to prove that a rule is necessary for the protection of manatees. DOAH disagreed with both of these arguments made by the petitioners, finding that FWC was not required to define or quantify any of these terms and that they can be determined through the agency's expertise.

DOAH dismissed the challenges against the agency's proposed rule changes, finding that FWC provided sufficient evidence of manatees being "frequently sighted" in the area and that the rule changes themselves were not vague, arbitrary, or capricious. The decision was appealed to the Fifth District Court of Appeals who affirmed DOAH's decision, but did so without publishing a written opinion. ***See***, **McGill *et al.* v. Fla. Fish & Wildlife Conservation Comm'n, *et al.*, 842 So.2d 190, (Fla. 5th DCA, 2003).**

McGill v. Fla. Fish & Wildlife Conservation Comm'n & Save the Manatee Club Inc., 2000 Fla. Div. Adm. Hear. LEXIS 5214 Case No. 99-5366RX, Final Order August 23, 2000.

Petitioner alleged that FWC Rule 68C-22.006 designating Brevard County speed zones, and the language on the signs implementing the speed zones, were exercises of an invalid delegation of legislative authority. The case outlined a number of biological and statistical facts about manatees that were relevant at the time of the challenge, including a discussion of the unsuccessful argument of the petitioner that watercraft mortality rates were more often attributed to collisions with very large craft than with smaller recreational vessels.

The petitioner alleged that the challenged rule only requires slow speed but the sign says, "Slow Speed-Minimum Wake" and that the addition of the term "minimum wake" reduces the speed to idle, instead of slow. There was some question in the testimony as to whether or not minimum wake comports with "slow speed," but ultimately the court found that the petitioner failed to show that having the term "minimum wake" on the speed zone signs was in any way inconsistent with the challenged rule. The court found that the challenged rule was not an invalid delegation of legislative authority, determining that the evidence demonstrated that manatees were frequently sighted in the area described in the rule and that the "slow speed" restrictions were necessary to protect manatees in that area from harmful collisions. The petitioner's rule challenge was dismissed.

State of Florida v. Gabriel, Case No. 96-3508MI A08, State of Florida County Court of the Fifteenth Judicial Circuit in and for Palm Beach County, 1996 Fla. ENV LEXIS 152; 96 ER FALR 168, May 29, 1996.

The defendant argued that 370.12(2)(n), F.S., was in direct conflict with the statutory authority provided in 370.12(2)(j). The court disagreed, finding that the Legislature's use of the word "regular" instead of "periodically" when discussing manatee sighting frequency did not alter the Legislature's intent. In addition, the defendant argued that DEP exceeded their statutory authority by regulating speedboats based on the warm-water months, or the seasons, arguing that this was an example of regulating speedboats "generally" instead of using their specific grant of power. The party also argued that the grant of power in 370.12(2)(n) was an improper delegation of legislative authority. The court disagreed, pointing out that the doctrine of nondelegation is well established but it does not eliminate all agency discretion. The court further found that, where an agency is following legislative purpose, then an invalid delegation of power will not be found.

Marine Indus. Ass'n v. Dep't of Envtl. Protection, 672 So. 2d 878 (4th DCA Fla. 1996).

In 1978, the Legislature passed the Florida Manatee Sanctuary Act which designated the entire state as a refuge and sanctuary for the manatee. The act also authorized DEP, in certain geographical regions of the state, to regulate the speed and operation of motorboats, and the construction of marine facilities in thirteen specific areas of the state. The Legislature later expanded this power to allow DEP to designate by rule other portions of the state "where manatees are frequently sighted..." as regions that could have motorboat regulations. As a result, DEP created a rule regulating boat speed in Broward County. This rule, in addition to the grant of power from the Legislature allowing the rule, was challenged as an unconstitutional delegation of legislative authority. The court held that the statute was constitutional and that the agency rule was a proper delegation of legislative authority. The court determined that, due to the limited number of manatees, only about 900 inhabiting the east coast of Florida, the term "frequently sighted" was quantifiable by the DEP through data collection and expert analysis. This case was an appeal of a DOAH order that affirmed the validity of the rule. ***See***, **MARINE INDUSTRIES ASSOCIATION OF SOUTH FLORIDA, INC. v. FLORIDA DEPT. OF ENV. PROTECTION and SAVE THE MANATEE CLUB, INC., Case No. 93-5932RX, STATE OF FLORIDA, DIVISION OF ADMINISTRATIVE HEARINGS, 1994 Fla. ENV LEXIS 98; 94 ER FALR 112, August 2, 1994, Final Order.**

BONITA BAY PROPERTIES, INC., *et al.* v. DEPT. OF ENV. PROTECTION, *et al.*, CASE NO. 95-2552RP, STATE OF FLORIDA, DIVISION OF ADMINISTRATIVE HEARINGS, 1995 Fla. Div. Adm. Hear. LEXIS 4699, December 12, 1995, Agency Final Order.

Petitioners challenged proposed Rule 62N-22.005, which was produced to regulate speed zones in Lee County, Florida, under the Manatee Sanctuary Act. The petitioners argued that the rule was an invalid exercise of delegated legislative authority. The administrative law judge (ALJ) agreed, finding that the DEP was unable to state with quantifiable certainty how many manatee sightings were constituted as "frequent." Further, the preponderance of the evidence showed that manatees do not frequent waters less than one meter deep and that 90% of North and South Estero Bay, where the proposed speed zones would be, had less than one meter of water. The ALJ determined that DEP had treated similar bodies of water in radically different ways and therefore the rule was arbitrary and capricious and an invalid exercise of delegated legislative

authority. In addition, the ALJ found that the prepared economic impact statement was substantially deficient.

VOLUSIA COUNTY, Petitioner, v. DEPT. OF ENV. PROTECTION; CITIZENS FOR RESPONSIBLE BOATING, INC., v. DEPT. OF ENV. PROTECTION, Final Order No. LW-94-064, Case Nos. DEP RFR 94-007; DEP RFR 94-009, FLORIDA LAND AND WATER ADJUDICATORY COMMISSION, 1994 Fla. ENV LEXIS 123; 94 ER FALR 139, September 27, 1994, Final Order.

A DEP rule, which was previously challenged and altered twice, was found to be within the agency's discretion and found to properly implement the requirements of §370.12, Florida Statutes, regarding manatee protection.

Citizens for Responsible Boating Inc., v. Dept. of Env. Protection, DOAH Case No. 93-5699RX, 1994 Fla. Div. Adm. Hear. LEXIS 5454; February 4, 1994, Agency Final Order.

Petitioners argued that DEP rules 16N-22.001, 16N-22.002 and 16N-22.0121 were invalid exercises of delegated legislative authority. The petitioner argued specifically that the Legislature restricted the regulation of motorboat speeds in the areas of Volusia County, that the areas affected by the rules were areas with very minimal manatee activity and that the rules created an "undue interference with the rights of boaters and water-skiers." DOAH disagreed with these claims, finding instead that the petitioner failed to meet its burden of proof. The testimony provided by the petitioner, that manatee sightings in the area were infrequent, was balanced against the fact that these were unscientific opinions provided by people making sightings from the poor vantage point of a fast-moving water vessel. DOAH found that, in applying the proper legal standard for an agency rule challenge, these rules were valid because they were reasonably related to the purpose of the enabling legislation and were not excessive, arbitrary, or capricious.

Citizens for Responsible Boating Inc., v. Dept. of Natural Resources *et al.*, DOAH Case No. 91-7635RX, 1992 Fla. Div. Adm. Hear. LEXIS 6309; February 24, 1992, Agency Final Order.

Petitioner challenged Rule 16N-22.012, regulating watercraft speed, saying it was an invalid exercise of delegated authority. The petitioner is an organization created to promote boating and water sports and to protect the boating public's access and use of Florida waters. This case primarily discussed the DNR economic impact statement (EIS), which was prepared as part of the rule adoption process. The petitioner argued that the notice of rule-making provided an inadequate two-sentence summary and that the EIS was not in conformity with the requirements of the statute because it was not timely and inadequately addressed the economic impact of the challenged rule. DOAH concluded that the petitioner failed to meet its burden on all counts. The final order indicated that the notice was adequate because any additional detail needed to describe the impacts of the rule were to be outlined in the EIS, and that the EIS itself was not deficient in any way and complied with the requirements of the statute. This was appealed to the 5th DCA who affirmed without issuing an opinion. See **Citizens for**

Responsible Boating Inc., v. Div. of Admin. Hear., Dept. of Natural Resources *et al.*, 612 So. 2d 731 (5th DCA Fla. 1993).

Note: Economic impact statements are no longer a part of the rule-making process. The current process is different; an agency is not required to, but is encouraged to, prepare a Statement of Estimated Regulatory Costs (SERC) as outlined in §120.54 and 120.541 of the Florida Statutes.

Ward v. Dept. of Natural Resources *et al*, DOAH Case No. 89-5661RX, 1990 Fla. Div. Adm. Hear. LEXIS 6208; January 5, 1990, Agency Final Order.

Petitioner challenged the proposed amendments to rule 16N-22.009 which would create a new zone of restriction on motorboats in a small area in Palm Beach County. The newly proposed zone would prohibit motorboats altogether in a spot directly adjacent to a power plant discharge canal. The small proposed zone would be created in a section of water within an existing larger zone that already requires idle speed. The petitioner argued that the rule was an invalid exercise of delegated legislative authority. DOAH determined that the petitioner lacked standing to even challenge the proposed amendment because he failed to show he would be substantially affected by the rule after adoption, failing to show that his injury was real and immediate. Petitioner did not live in an area abutting the proposed zone, his boat was not stored in the area, and he failed to establish that he brings his boat, which he uses for recreational purposes only, in the proposed zone on a regular basis.

Additionally, even if standing had been found, the petitioner was unable to prove that the rule was invalid. DOAH determined that the rule was reasonably related to the purpose of the enabling legislation and was not arbitrary or capricious. The petitioner also argued that the EIS prepared in relation to the proposed rule change was insufficient and did not adequately address agency costs or costs to those affected by the rule. DOAH did not agree that the EIS was inadequate, stating instead that an agency rule will not be found invalid just because an EIS is not as complete as it could possibly be. The petitioner's petition for determination of the invalidity of the proposed rule was dismissed.

State Authority: Manatee Protection Rule Citation Cases

Cases listed under this heading primarily deal with challenges made to citations that were issued for violations of state manatee protection zones. The issues in these cases are often similar to those raised during rule challenges (see previous section).

Tague v. Fla. Fish & Wildlife Conservation Comm'n, 154 Fed. Appx. 129 (11th Cir. 2005 Unpublished Opinion).

Tague was given a non-criminal citation by Officer Gier for violating the Florida Manatee Sanctuary Act (FMSA), §370.12(2). Tague was operating an amphibian seaplane for commercial purposes when Gier issued the citation. Tague alleged that his rights under the fourth and fourteenth amendment were violated. There was a question as to whether or not Taque's seaplane was a "vessel." The 11th Circuit determined that Florida law was not clearly

established on this issue and agreed with the district court that the law did not define vessel in such a way as to exempt a seaplane. The 11th Circuit further found that Officer Gier was entitled to qualified immunity because the citation occurred within the scope of Gier's discretionary authority as an FWC officer, and the citation was not a "violation of clearly established constitutional rights."

Fla. Fish & Wildlife Conservation Comm'n v. Wilkinson *et al.*, Case Nos. 00-8661MM, 00-9247MM, 01-3727MM, 01-6643MM, 01-6667MM, 01-6656MM, 01-6659MM, 01-6674MM, 02-0022MM, 01-10190MM, (Lee County, County Court of the 20th Circ. 2003) (Unpublished Opinion).

Each of the nine defendants in the above consolidated cases was issued at least one uniform boating citation for violations of FWC rule 68C-22.005, F.A.C., which was enacted to protect manatees from vessel collisions in Lee County waterways. As authorized by Florida Statute 370.12(2), the Florida Manatee Sanctuary Act, manatee speed zones may be enacted only where sightings of the animals are frequent and available scientific information indicates that they inhabit the area on a regular or periodic basis. The statute does not allow the general regulation of boat speeds which would unduly interfere with the rights of fisherman, boaters. and water skiers, and suggests that in areas where it would be consistent with manatee protection FWC may create limited lanes or corridors for reasonable motorboat speeds.

Judge Schoonover, serving as a county judge, found the defendants' expert witness on marine biology and manatees to be persuasive in determining that five of the zones regulated in Lee County extended beyond what FWC could regulate based on the available evidence. The court concluded that portions of rule 68C-22.005 were over broad, vague, and capricious, finding that the rule exceeded the authority granted by the legislature. Specifically, the court found that the "rights of boaters" provision in section 370.12(2), F.S., had been violated by the rule's failure to provide lanes or corridors for increased speed even though, as the court believed the defendant's expert showed, no harm to manatees would occur. As a result, portions of the rule sections addressing Matlacha Pass, Estero Bay, the southwest side of Pine Island, eastern San Carlos Bay and the mouth of the Caloosahatchee River (the Punta Rassa and Shell Creek area) were found to violate an unspecified provision of the Constitution and were held to be invalid. FWC appealed the ruling to circuit court where it was dismissed for a procedural error and the District Court of Appeal refused jurisdiction of the case.

Update: During the appeals process, the Lee County manatee protection rules continued to be legally enforced. Soon after the appeal was dismissed, the USFWS, in February of 2004, created emergency federal manatee protection rules for the areas affected by the Schoonover decision. Since then, the federal rules were made permanent and, in 2005, FWC completed the process of re-promulgating the state manatee protection rules for the areas affected by the Schoonover decision. These rules, virtually the same as the previous rules, are supported by more current data on manatee use, boating patterns, additional analyses, and were promulgated using the Local Rule Review Committee process. Currently these areas are regulated by rules created by both the USFWS and the FWC.

State v. Rawlins, 623 So. 2d 598 (5th DCA Fla. 1993).

Rawlins was cited on the Norris Dead River (off of the St. Johns River) for violating the manatee slow speed zone created by the DNR, the predecessor to DEP. Under the Florida Manatee Sanctuary Act, §370.12(2), F.S., the Legislature delegated authority to DNR to adopt regulatory rules under Chapter 120 dealing with motorboat traffic in areas where "manatee sightings are frequent." Rawlins argued that the rule he was cited under, and a number of other rules promulgated under this grant of power from the Legislature, were unconstitutionally vague. The trial court agreed. The 5th DCA, however, found that the lower court misapplied the "void for vagueness" doctrine, stating that a vague law is one which "fails to give adequate notice of what conduct is prohibited…." The 5th DCA determined that the rule in question was constitutional because "a person of common intelligence would not need to guess as to whether he ha[d] violated the boat speed regulations." In addition, the court upheld the lower court's position that Rawlins only had standing to challenge the rule that he was charged with violating, and not other rules or statutes that he was not charged with violating.

State Authority: Permits and Variances from Manatee Protection Rules

Cases listed under this heading primarily deal with issues concerning state authority to issue permits or variances from manatee protection rules and related issues.

SAVE THE MANATEE CLUB, INC., v. RADLER and FLA. FISH & WILDLIFE CONSERVATION COMM'N, 2002 Fla. ENV LEXIS 1; 1 ER FALR 27; Case No.: 02-0003, January 29, 2002, Final Order.

A petition for a variance from Brevard County manatee protection rules was granted by the agency by default. The agency has ninety days (90) within which to grant or deny a petition, after which time, if no action has been taken, the petition will be granted by default. Save the Manatee Club challenged the agency's action but did not dispute the factual or legal basis for the final order, did not dispute issues of material fact, and did not allege a right to challenge the final order under 120.569 or 120.57, Florida Statutes. The petition for formal hearing by the club was therefore denied.

State Authority: Manatee Protection Permit Cases

Cases listed under this heading primarily deal with issues concerning state authority to comment on, modify, or deny projects during the permitting process.

Deep Lagoon Boat Club, Ltd. v. Sheridan, 784 So. 2d 1140 (2d DCA Fla. 2001).

Deep Lagoon Boat Club, Ltd., applied for an environmental resource permit to allow a stormwater management system to be constructed for the marina. The challenging party, Ms. Sheridan, requested a formal hearing at DOAH and the administrative law judge (ALJ) found that Deep Lagoon failed to provide "reasonable assurance" that their proposal would not cause adverse secondary impacts to water quality and manatees, and therefore the permit should be denied. The primary issues in the case were not those of manatee or water quality regulations

but those of *res judicata*, collateral estoppel, and whether or not the DEP Secretary had the authority to overturn certain legal decisions of the ALJ.

The marina had previously been granted a permit to build the stormwater management system but, before the permit was utilized, it expired. Deep Lagoon argued that Ms. Sheridan was collaterally estopped from raising the issue about adverse secondary impacts because that issue had already been decided during the first permit process and therefore were *res judicata*, meaning it could not be re-addressed in the hearing. The ALJ determined that collateral estoppel and *res judicata* did not apply in this case because of changed circumstances, namely the environmental regulations had strengthened in the interim between the last permit being granted and the second one being applied for. The Secretary determined that, while he did not agree with the ALJ, due to changed statutory language, he did not have the power to overturn that determination. While the Secretary did have the power to overturn the ALJ's determination about whether or not Deep Lagoon failed to provide reasonable assurances that the project would not cause adverse impacts, he did not do so. Instead the Secretary agreed with the ALJ's substantive finding. The 2nd DCA upheld both of the positions taken by the Secretary regarding his power to only overturn certain aspects of the ALJ's decision if he so chooses.

Note: In a subsequent DOAH case decided a few years later, the Deep Lagoon Boat Club applied for a Consolidated Environmental Resource Permit and a Sovereign Submerged Lands Authorization in which Sheridan again opposed. This was submitted to DOAH and the ALJ recommended denial of the permits. This time, however, DEP determined that despite the recommendation of the ALJ, and in part due to determining that some of the findings were unsupported by the facts presented, the permits should be granted to allow the club to make changes to the marina. **Final Order No.: DEP04-0050; OGC CASE NO. 03-0274; DOAH CASE NO. 03-0540. Sheridan v. DEP & Deep Lagoon Boat Club, 2004 Fla. ENV LEXIS 151; 4 ER FALR 98 (Jan. 15, 2004).**

Southwest Fla. Water Mgmt. Dist. v. Save the Manatee Club, Inc., 773 So. 2d 594 (1st DCA Fla. 2000).

This case stands for the position that an agency can not create rules unless the agency is created under a specific grant of legislative power. In this case the Southwest Florida Water Management District applied for a permit to develop land in southwest Hillsborough County, which would include a connecting waterway between the canal and the bay. The Save the Manatee Club was concerned about the impact that any increased boat traffic would have on manatee and manatee habitat.

The permit was initially granted based on rule 40D-4.051 which established exemptions to the environmental resource permitting requirements. The exemptions were in place for certain types of developments that were approved before October 1, 1984. The 1st DCA determined that the challenged sections of rule 40D-4.051 were an invalid exercise of legislative authority because the power granted to the District in the Florida Statutes allowed for exemptions from the permitting requirements if "such exemptions and general permits do not allow significant adverse impacts to occur individually or cumulatively." p 600. The challenged rule created by the District allowed for exemptions based solely on a requesting party's prior approval of an

exemption instead of only allowing for exemptions after the District performed an analysis of the potential adverse impacts. Therefore, the court determined that the rule was an invalid exercise of legislative authority. Note: Other case law shows that broad and exclusive powers can be granted by the Legislature; they were just not found to have been granted in this case. *See* Fla. Pub. Telcoms. Ass'n v. City of Miami Beach, 321 F.3d 1046(11th Cir. 2003).

Metropolitan Dade County v. Coscan Florida, Inc., 609 So. 2d 644 (3d DCA Fla. 1992).

The Department of Environmental Regulation (DER) granted Coscan Florida, Inc., a dredge-and-fill permit to increase their marina from 99 to 346 boat slips. The permit was contingent on a review of the quality of water at the completion of each stage. Dade County challenged DER's decision to grant the permit. The 3rd DCA disagreed with the DOAH hearing officer's decision to uphold the permit because an incorrect legal standard was used to determine standards of water quality and the impact on manatees. The requirements for a dredge-and-fill permit included a showing, prior to the start of a project, that the proposal would meet water quality standards. The court found that the statute did not allow an agency to proceed without making such an analysis, despite the agreement between Coscan and DER that would allow for dismantling each individual project phase if a water quality problem was discovered.

Dade County also challenged the determination that the project would not adversely affect the local manatee population. The court agreed, finding that the hearing officer again used an incorrect legal standard. The court pointed out that the state and federal endangered species standards differ from each other and should not be treated as equivalent. The USFWS provided a report in 1987 (based on data collected two years prior to the project proposal) that stated the project would not jeopardize the "continued existence of the manatee." The hearing officer incorrectly relied on that report as persuasive evidence even though Florida law provides for greater manatee protection then the federal Endangered Species Act. The court found that the Florida standard was whether or not the project will adversely impact the endangered species or its habitat, and if so then the law is violated. The 3rd DCA reversed the hearing officer's decision and remanded the case for further findings using the correct legal standards.

Brown *et al.*, v. South Florida Water Management District, 2004 Fla. ENV LEXIS 113; 4 ER FALR 217, August 2, 2004, DOAH.

Permit challenge. Order recommends denying the environmental resource permit and approving the lease of sovereign submerged lands.

Dominick, *et al.*, v. Egland and Dep't. of Envtl. Protection, 2003 Fla. ENV LEXIS 46; 3 ER FLAR 107, January 9, 2003, Final Order.

This final order grants Mr. Egland a DEP environmental resource permit to allow the filling of an illegally dredged channel and the planting of mangrove trees. At some point, the mangrove slough between the formerly landlocked South Lake and Florida Bay was dredged by hand tools and further deepened by the boat props of those living on and around South Lake. Mr. Egland was issued a Cease and Desist Order from the USACOE, accusing him of the illegal dredging and directing him to restore the slough. There was debate in the DOAH hearing about

whether or not South Lake had been used by manatees prior to or only after the illegal dredging of the slough, but it was established that manatees do utilize the channel between Florida Bay and South Lake. Petitioners argued that the proposed filling of the slough could adversely affect manatees or their habitat. The ALJ heard testimony of more than 10 witnesses on this subject, including experts from FWC and DEP and ultimately concluded that Egland had "provided reasonable assurance that the proposed restoration project will not harm or adversely affect manatees or their habitats." DEP stated that, in order to reject this finding, the agency would have to rule that there was "no competent substantial evidence" in the record to support the ALJ's finding, and that in this case such a ruling was unwarranted. DEP granted the permit allowing the restoration project.

Note: The recommended order in this case contains numerous factual details, including the information that at one point the slough was illegally filled, by whom was never concluded, but the process actually trapped a manatee inside South Lake and the illegal concrete fill had to be broken up. *See* Case No. 01-1540, 2002 Fla. ENV LEXIS 293; 3 FALR 107, November 25, 2002.

Swire Properties, Inc., & City of Miami v. Board of Trustees of the Internal Improvement Trust Fund *et al.*, 2003 Fla. ENV LEXIS 36; 3 ER FALR 97, Final Order No. DEP03-0023, January 29, 2003.

DEP adopted the DOAH Administrative Law Judge's (ALJ) Recommended Order in its entirety, denying the petitioner's request to lease sovereign submerged lands and denying the request for an environmental resource permit. Much of the case dealt with issues related to the DEP rules for the Biscayne Bay Aquatic Preserve; manatee protection was only one of the issues involved in the case. DEP determined that the ALJ's finding that adverse impacts to manatees could result, even if the project would be in compliance with the Miami-Dade County Manatee Protection Plan, was supported by the evidence, namely the testimony of an environmental specialist with the Fish and Wildlife Conservation Commission.

Ross v. City of Tarpon Springs and Dep't. of Envtl. Protection, 2003 Fla. Div. Hear. LEXIS 993 June 11, 2003, Recommended Order.

DOAH issued a recommended order finding that DEP should grant the amended application for an environmental resources permit to the City of Tarpon Springs. The potential impacts on manatees were properly considered by DEP.

Rothenberger *et al.*, v. Southwest Fla. Water Management District and Dep't. of Transportation, 2003 Fla. Div. Admin. Hear. LEXIS 1033, Nov. 25, 2003.

Granting a permit to build the Pinellas Bayway Bridge replacement and surface water management system.

Kramer v. Fla. Dep't. of Envtl. Protection, 2002 Fla. ENV LEXIS 151; 2 ER FALR 225, DOAH Case No. 00-2873, Final Order No. DEP 02-0298, April 29, 2002.

Ms. Kramer applied for an environmental resource permit and authorization to use sovereign submerged lands to dredge a channel from the end of her dock. The ALJ determined that the proposed dredging would impact manatees and their habitat because the area contains seagrasses, mostly consisting of Johnson's seagrass, which is itself a threatened species under the federal Endangered Species Act. The testimony in the hearing included DEP and FWC staff observations of manatees feeding and resting in the area. The ALJ determined that under the "public interest test" the impact that the proposed project would have on seagrass and manatees was unacceptable and that Ms. Kramer failed to provide reasonable assurance that the dredging would not be contrary to the public interest under the test. DEP adopted the recommended order denying the requested permits.

MARINA SUITES ASSOCIATION, INC., v. SARASOTA BAY HOTEL, INC., and DEPT. OF ENV. PROTECTION , 2001 Fla. ENV LEXIS 64; 1 ER FALR 133; DOAH Case No. 00-2522, March 20, 2001, Final Order.

The Administrative Law Judge recommended that DEP grant a permit to expand and modify the existing marina, partially based on testimony by FWC that the impact on manatees and their habitat would be minimal.

Ms. Karen Bishop, RE: Binding Letter of Interpretation For Development of Regional Impact Status Bayside Marketplace DRI DCA File No. BLID-901-008, Final Order No. DCA01-BL-068, STATE OF FLORIDA DEPARTMENT OF COMMUNITY AFFAIRS, 2001 Fla. ENV LEXIS 110; 1 ER FALR 181, April 30, 2001, Final Order.

The Department of Community Affairs, as a result of the issuance of a permit for the marina by DEP, determined that the development would not have a significant impact on manatees or their habitat.

WARD v. SECRET OAKS OWNERS' ASSOCIATION and DEPT. OF ENV. PROTECTION; MARTIN and LINDA PARLATO, v. SECRET OAKS OWNERS' ASSOCIATION and DEPT. OF ENV. PROTECTION, DOAH Case Nos. 98-5190; 98-5290, STATE OF FLORIDA DEPT. OF ENV. PROTECTION, 2000 Fla. ENV LEXIS 50; 00 ER FALR 120, March 24, 2000, Final Order.

The DOAH ALJ found that the proposed project would not adversely impact manatees, but recommended denial of the permits for other reasons. DEP denied the "consent of use" permit but granted the "wetland resource permit" despite the ALJ's recommendation to deny it.

DEPARTMENT OF COMMUNITY AFFAIRS and COLLIER COUNTY AUDUBON SOCIETY, INC., and FLORIDA WILDLIFE FEDERATION v. COLLIER COUNTY and COLLIER COUNTY SCHOOL BOARD, Case No. 98-0324GM, 1999 Fla. Div. Adm. Hear. LEXIS 5055, March 19, 1999, Recommended Order.

Order recommending denial of plan amendments in Collier County. The analysis of the proposed amendments to the plan includes a discussion of manatee deaths in Collier County.

Flynn v. Dep't of Envtl Protection, Final Order No. DEP 98-0143; OGC CASE NO. 96-2787; DOAH CASE NO. 96-4737, 1998 Fla. ENV LEXIS 348; 2 ER FALR 251, February 13, 1998.

This final order adopts the findings of the ALJ, denying the requested permits. The ALJ's findings included a determination that the proposed project would have an adverse impact on manatees and their habitat.

CASTORO, *et al.* v. PALMER AND DEPT. OF ENV. PROTECTION, DOAH Case Nos. 96-0736, 95-5879, 1998 Fla. ENV LEXIS 303; 99 ER FALR 32, October 15, 1998, Final Order.

Permit challenge. Permit granted.

Miami Beach Rod & Reel Club Inc., v. Dep't of Env. Protection, DOAH Case No. 96-3708, STATE OF FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION, 1997 Fla. ENV LEXIS 69; 97 ER FALR 101, May 1, 1997, Final Order.

The Petitioner's request for an environmental resource permit and for authorization to use sovereign submerged lands in the Biscayne Bay Aquatic Preserve were denied due to a finding that the proposed project would have adverse impacts on manatee and seagrasses.

SAVE THE MANATEE CLUB, INC., and FRIENDS OF THE GREENWAY v. CITRUS RECREATIONAL MARINA, INC., and FLORIDA DEPT. OF ENV. PROTECTION, Respondents, DOAH Case No. 96-1723, 1997 Fla. ENV LEXIS 4; 97 ER FALR 31, February 5, 1997, Final Order.

Challenge to a request for a dredge-and-fill permit and a management and storage of surface waters permit. The ALJ recommended a denial for both permits citing a number of reasons including that there was a lack of reasonable assurances that no "unreasonable adverse impact" to the manatee was likely to occur from the use of powerboats at the proposed facility.

Ms. Virginia Wetherell, Secretary, Dep't of Env. Protection, 1997 Fla. ENV LEXIS 59; 97 ER FALR 086, April 10, 1997, Final Order.

The Secretary of DEP posed a question to the Attorney General regarding the Buckman navigation lock. For economic concerns and manatee protection, DEP modified the time schedule of the navigation lock between the St. John's River and Rodman Reservoir. Previously the lock was operated by the St. Johns River Water Management District but, in September of 1994, DEP took over. The district asked whether or not the change in lockage schedule required a district permit. The Secretary of DEP posed the question to the Attorney General who answered in the negative, finding that DEP is not required to obtain a permit from the district prior to altering the lockage schedule.

CROUTHERS v. J.B.'S FISH CAMP AND STATE OF FLORIDA, DEPT. OF ENV. PROTECTION; TYRE v. J.B.'S FISH CAMP AND STATE OF FLORIDA, DEPT. OF

ENV. PROTECTION, DOAH Case No. 97-0994, DOAH Case No. 97-1420, 1997 Fla. ENV LEXIS 133; 97 ER FALR 165, August 13, 1997, Final Order.

Consolidated cases challenging a proposed Dock Renovation Project. DEP adopted the ALJ's recommended order that the construction permit and variance request be granted, finding that the manatee protection conditions will be greater then those currently in place and will lessen the adverse water quality impact.

ROBERT E. VANWAGONER v. DEPT. OF TRANSPORTATION and DEPT OF ENV. PROTECTION; SAVE ANNA MARIA, INC., v. DEPT. OF TRANSPORTATION and DEPT. OF ENV. PROTECTION , DOAH Case Nos. 95-3621, 95-3622, DEPARTMENT OF ENVIRONMENTAL PROTECTION, 1996 Fla. ENV LEXIS 52; 96 ER FALR 78, May 14, 1996, Final Order.

Dredge and fill permit challenge. Permit denied.

BRENNAN v. JUPITER HILLS LIGHTHOUSE MARINA and DEPT. OF ENV. PROTECTION; MARIN v. JUPITER HILLS LIGHTHOUSE MARINA and DEPT. OF ENV. PROTECTION; D.L. LANDRETH v. JUPITER HILLS LIGHTHOUSE MARINA and DEPT. OF ENV. PROTECTION; WENDT v. JUPITER HILLS LIGHTHOUSE MARINA and DEPT. OF ENV. PROTECTION; FIELDER v. JUPITER HILLS LIGHTHOUSE MARINA and DEPT. OF ENV. PROTECTION; JOHNSON, JR., v. JUPITER HILLS LIGHTHOUSE MARINA and DEPT. OF ENV. PROTECTION, DOAH Case Nos. 95-0494; 95-0495; 95-0496; 95-0497; 95-0498; 95-0943, DEPT. OF ENV. PROTECTION, 1996 Fla. ENV LEXIS 198; 99 ER FALR 229, May 23, 1996, Final Order.

Permit challenge. Permit granted.

FLORIDA ELECTRIC POWER COORDINATING GROUP, INC., *et al.* v. SUWANNEE RIVER WATER MANAGEMENT DISTRICT, *et al.*; WARD and FLORIDA ENGINEERING SOCIETY, INC., v. SOUTH FLORIDA WATER MANAGEMENT DISTRICT; FLORIDA PHOSPHATE COUNCIL, INC. and FLORIDA ENGINEERING SOCIETY, INC v. SUWANNEE RIVER WATER MANAGEMENT DISTRICT, *et al.*; ST. JOE PAPER COMPANY, *et al.* v. SUWANNEE RIVER WATER MANAGEMENT DISTRICT, *et al.*, CASE NOS. 94-2722RU; 94-2930RP; 94-2935RP; 94-2936RP, STATE OF FLORIDA DIVISION OF ADMINISTRATIVE HEARINGS, 1995 Fla. ENV LEXIS 68; ER FALR 079, July 24, 1995, Final Order.

One of the many challenges in this case was to the South Florida Water Management District's general permit rule restricting the construction and expansion of boat docks. The challengers argued that this rule was too general and therefore an invalid exercise of delegated legislative authority. The ALJ disagreed, finding that, because of the frequency of manatees in the counties impacted by the rule, the district must be able to grant permits only on a case-by-case basis to insure that an individual or cumulative impact does not adversely affect manatees.

SUTTON v. HUBBARD and DEPT. OF ENV. PROTECTION, DOAH Case Nos. 93-1499, 93-6507, 94-6501, 1995 Fla. ENV LEXIS 64; 95 ER FALR 75, July 13, 1995, Final Order.

Challenge to application for construction of single-family dock and related retaining wall. Application granted.

Pond, Inc. v. Dep't of Envtl Protection, DOAH Case No. 93-6982, 1994 Fla. ENV LEXIS 142; 94 ER FALR 157, October 10, 1994, Final Order.

Permit challenge to the construction of a boat basin and access channel on the Indian River. ALJ recommended denial. DEP modified the order but ultimately followed the recommendation of the ALJ and denied the permit.

Altman v. Kavanaugh & Dep't. of Envtl. Regulation, DOAH Case No. 92-000886, 1992 Fla. Div. Adm. Hear. LEXIS 5991; July 27, 1992, Agency Final Order.

Kavanaugh's application for a dredge-and-fill permit and marina construction was granted by the Department of Environmental Regulation (DER). DER rejected the DOAH hearing officer's recommendation that the permit only be granted if the marina was exclusively used by sailboats. DER granted the permit, despite a finding from the hearing officer that there would be an adverse impact on manatees and manatee habitat, on the condition that the number of powerboats occupying the marina not exceed 10, unless Nassau County passes and implements a Manatee Protection Plan, at which time the permittee could apply for a modification of the permit.

Barringer v. Speer and State of Florida, Dept. of Env. Regulation, DOAH Case No. 91-2900, 1992 Fla. Div. Adm. Hear. LEXIS 5991, July 27, 1992, Agency Final Order.

DER agreed with the recommendation of DOAH and denied the petitioner's application for a marina on the St. Lucie River in Martin County. One of the deciding factors that DER referred to in its final order was that the petitioner failed to show that the project was not contrary to the public interest because they failed to provide reasonable assurance that the marina's operation would not have an adverse impact on manatees, their migratory patterns, or their habitat.

Note on Division of Administrative Hearings (DOAH) cases, Attorney General Opinions, and Binding Agency Letters:

There are a large number of these types of cases and opinions that involve manatees to different extents. Many of these are included in the entries listed in the preceding sections; however, all potentially applicable entries have not been included. Most of those cited deal with a permit application challenge in DOAH in which impacts on manatees or manatee habitat are discussed or mentioned. Many of the opinions that discussed manatees and manatee regulations more extensively have been summarized; however, a limited number of those that mention manatees but do not address them in detail are listed here solely for reference and example.

APPENDIX III

FLORIDA MARINE SANCTUARY ACT
SUMMARY OF SIGNIFICANT CHANGES (1978-2006)

Note that §370.12(2), F.S., existed prior to 1978 but it was not called the "Florida Manatee Sanctuary Act." Prior to 1978, the statute made it illegal to "*annoy, injure, molest or torture a manatee or sea cow by any instrument, process or procedure.*" The statute also addressed the requirements for obtaining a permit to capture a manatee and set the penalty for violating any part of this subsection as a second degree misdemeanor.

1978

- See Chapter 78-252, Laws of Florida.
- Subsection named the "Florida Manatee Sanctuary Act" and the State of Florida established as "a refuge and sanctuary for the manatee."
- Changes made to former paragraph (b), now paragraph (d), to expand and revise the list of actions that are illegal in regard to manatees and to change the penalty for a violation to a first degree misdemeanor. The revised paragraph read as follows:

  > *Except as may be authorized by the terms of a valid state permit issued pursuant to paragraph (c) or by terms of a valid federal permit, it shall be unlawful for any person at any time, by any means, or in any manner intentionally or negligently, to annoy, molest, harass, or disturb or attempt to molest, harass, or disturb any manatee; injure, harm, or attempt to injure or harm any manatee; capture, collect, or attempt to capture or collect any manatee; pursue, hunt, wound, kill, or attempt to pursue, hunt, wound, or kill any manatee; or possess, literally or constructively, any manatee or any part of any manatee….*

- Department of Natural Resources directed to initiate rule-making "*to protect manatees or sea cows from harmful collisions with motorboats…[by] regulating the operation and speed of motorboat traffic between the dates of November 15 and March 31 of each year…*" in identified portions of the following counties: Lee, Brevard, Indian River, St. Lucie, Palm Beach, Broward, Citrus, Volusia, and Hillsborough. The Department was also directed to initiate similar rule-making in the portion of the Indian River between the St. Lucie Inlet in Martin County and the Jupiter Inlet in Palm Beach County, excluding the main channel of the Atlantic Intracoastal Waterway. With the exception of the latter area, all of the identified areas were in close proximity to natural or artificial warm-water sites where manatees were known to aggregate during the winter months.
- Department of Natural Resources directed to adopt rules in other warm-water areas if "*any new power plant is constructed or other source of warm water discharge is discovered….*"

1982

- See Chapter 82-170, Laws of Florida.

- Rule-making areas expanded to include seasonal zones in more of Brevard County and additional areas in Sarasota and Collier counties. The sub-paragraph describing the area in Sarasota County included additional language regarding the legislative intent for this one area. This language, which was a precursor to paragraph (k) in the current (2006) version of the statute, stated:

  It is the intent of the Legislature…to allow the Department of Natural Resources to post and regulate boat speeds only where manatee sightings are frequent and it can be generally assumed that they inhabit these areas on a regular or continuous basis. It is not the intent of the Legislature to permit the Department of Natural Resources to post and regulate boat speeds generally in the above-described inlets, bays, and creeks, thereby interfering with the rights of fishermen, boaters, and water-skiers using the area for recreational or commercial purposes.

- Rule-making areas expanded to include seasonal zones in the Loxahatchee River in Palm Beach County and Martin County, and the Withlacoochee River in Citrus County and Levy County, with the seasonal window for the latter area set at March 1 through September 30, instead of November 15 through March 31. The sub-paragraphs describing these areas included additional language, which was also a precursor to paragraph (k) in the current (2006) version of the statute: *"A limited lane or corridor providing for reasonable motorboat speeds may be identified and designated within this area."*

1983

- See Chapter 83-81, Laws of Florida.
- Rule-making authority throughout the statute revised to remove the requirement for seasonal zones, with new language added stating that zones shall be adopted "*...only where manatee sightings are frequent and it can be generally assumed that they inhabit these areas on a regular or continuous basis."*
- Rule-making areas expanded to include more of Brevard County and additional areas in Manatee and Dade counties. The new zones in Brevard County were required to be in effect year-round. The sub-paragraph describing the area in Broward County was also revised to exclude a portion of the Port Everglades Inlet area for boating safety purposes.
- A new paragraph (j) added to describe legislative intent. This language was taken almost verbatim from portions of the sub-paragraphs that were added in 1982 dealing with the areas in Sarasota County and other counties; the main deviation from the earlier language was the addition of "*unduly*" in front of "*interfering*." The new language read as follows:

  It is the intent of the Legislature…to allow the Department of Natural Resources to post and regulate boat speeds only where manatee sightings are frequent and it can be generally assumed that they inhabit these areas on a regular or continuous basis. It is not the intent of the Legislature to permit the of department to post and regulate boat speeds generally in the above-described inlets, bays, rivers, creeks, thereby unduly interfering with the rights of fishermen, boaters, and water skiers using the areas for recreational and commercial purposes. Limited lanes or

corridors providing for reasonable motorboat speeds may be identified and designated within these areas.

- A new paragraph (n) added to provide the Department of Natural Resources with the authority to adopt zones in areas of the state that are not specifically identified in the statute. Addition of this sub-paragraph eliminated the need for the Legislature to amend the statute every time a new area was identified as needing additional manatee protection. The new language read as follows:

  The department may designate by rule other portions of state waters where manatees are frequently sighted and it can be assumed that manatees inhabit such waters periodically or continuously. Upon designation of such waters, the department shall adopt rules to regulate motorboat speed and operation which are necessary to protect manatees from harmful collisions with motorboats.

1984

- See Chapter 84-338, Laws of Florida.
- No changes were made in 1984 to the Manatee Sanctuary Act; however, a new subsection (5) was added to §370.12, F.S., to provide $250,000 each fiscal year from the Motorboat Revolving Trust Fund to fund the manatee and marine mammal protection and recovery effort and related activities.

1989

- See Chapter 89-168 and Chapter 89-314, Laws of Florida.
- Rule-making areas in paragraph (f) expanded to include the Tomoka River area in Volusia County.
- Changes also made to subsection (5) of §370.12, F.S., to revise how the manatee and marine mammal protection and recovery effort and related activities were funded. Instead of $250,000 each fiscal year from the Motorboat Revolving Trust Fund, the statute now provided that annual funding would be available from the Save the Manatee Trust Fund.

1990

- See Chapter 90-219, Laws of Florida.
- Rule-making authority in paragraph (f) expanded to direct the Department of Natural Resources to adopt rules "*regarding the expansion of existing, or construction of new, marine facilities and mooring or docking slips, by the addition or construction of five or more powerboat slips….*" Authority in paragraph (f) also expanded to include protecting manatees from harassment. The other change to this paragraph was to add "*based on available scientific information,*" in reference to areas where manatees can be generally assumed to inhabit.
- Rule-making authority in paragraph (g) regarding regulations in the portion of the Indian River between the St. Lucie Inlet in Martin County and the Jupiter Inlet in Palm Beach County revised to no longer exclude regulations in the main channel of the Atlantic Intracoastal Waterway.

- Rule-making authority in paragraph (i) regarding regulations in the vicinity of any new power plants or other sources of warm water revised to remove the requirement for seasonal zones, with new language added stating that zones shall be adopted *"...which shall remain in effect for a sufficient period of time, to protect the manatees or sea cows."*
- Rule-making authority in paragraph (n) expanded to include protecting manatees from harassment and protecting "*…manatee habitat, such as seagrass beds, within such waters from destruction by boats or other human activity.*"
- A new paragraph (o) added to provide the Department of Natural Resources with the authority to adopt safe haven zones. The new language read as follows:

  The department may designate, by rule, limited areas as a safe haven for manatees to rest, feed, reproduce, give birth, or nurse undisturbed by human activity. Access by motor boat to private residences, boat houses, and boat docks through these areas by residents, and their authorized guests, who must cross one of these areas to have water access to their property is permitted when the motorboat is operated at idle speed, no wake.
- A new paragraph (p) added to provide local governments with the authority to adopt zones to protect manatees, except in the Intracoastal Waterway or within 100 feet thereof, provided that the ordinance was reviewed and approved by the department. The new language read, in part, as follows:

  Except in the marked navigation channel of the Florida Intracoastal Waterway as defined in s. 327.02 and the area within 100 feet of such channel, a local government may regulate, by ordinance, motorboat speed and operation on waters within its jurisdiction where manatees are frequently sighted and can be generally assumed to inhabit periodically or continuously. However, such an ordinance may not take effect until it has been reviewed and approved by the department. …If local and state regulations are established for the same area, the more restrictive regulation shall prevail.

  Language was also included to describe a conflict-resolution process to use if the department and local government disagreed over the local regulations.
- A new paragraph (q) added to direct the Department of Natural Resources to evaluate the need for fenders to prevent crushing of manatees between large vessels (≥100 feet) and bulkheads or wharves, and directing the department to adopt rules requiring fenders in future construction and to implement a plan to retrofit existing facilities.

1991

- See Chapter 91-199, Laws of Florida.
- No changes were made in 1991 to the Manatee Sanctuary Act; however, changes were made to subsection (5) of §370.12, F.S., to require the Save the Manatee Trust Fund to fund, and the Department of Natural Resources to conduct, *"…an impartial scientific benchmark census of the manatee population in the state…for use in the evaluation and development of manatee protection measures.*" (This is the statutory language that requires the synoptic surveys to be flown.) The subsection was also revised to require that the Save the Manatee Trust Fund be used to reimburse facilities that rescue, rehabilitate, and release manatees for costs associated with rehabilitation, with an additional $0.50 per registered vessel provided

for this purpose from the Motorboat Revolving Trust Fund. Finally, the subsection was revised to require the Department of Natural Resources to submit an annual report each year enumerating expenses paid out of the Save the Manatee Trust Fund.

1993

Note that Chapter 93-213, Laws of Florida, transferred all existing authorities and actions of the Department of Natural Resources to the Department of Environmental Protection.

- See Chapter 93-83 and Chapter 93-254, Laws of Florida.
- New paragraphs (r) and (s) added to decriminalize certain violations of restricted areas established by the Manatee Sanctuary Act, or rules or ordinances adopted pursuant to the Act. Prior to this change, any violation was a second degree misdemeanor. After the change, violations of a posted speed limit became a civil infraction, to be charged on a uniform boating citation.

1999

Note that Chapter 99-245, Laws of Florida, created the Florida Fish and Wildlife Conservation Commission (FWC) and transferred all statutory authorities related to manatees from the Department of Environmental Protection to the FWC.

2000

- See Chapter 2000-197, Laws of Florida.
- No changes were made in 2000 to the Manatee Sanctuary Act; however, changes were made to subsection (4) of §370.12, F.S., such that the Save the Manatee Trust Fund was no longer the source of funding for reimbursing facilities that rescue, rehabilitate, and release manatees.

2002

- See Chapter 2002-264, Laws of Florida.
- Changes made to paragraph (b) to state that "*The protections extended to and authorized on behalf of the manatee by this act are independent of, and therefore are not contingent upon, its status as a state or federal listed species.*"
- A new paragraph (f) added to establish a Local Rule Review Committee (LRRC) process, which requires the FWC to seek the review of preliminary rule proposals by an LRRC whose members are chosen by the county or counties that would be affected by a preliminary rule proposal. The process requires the FWC to notify the affected counties no less than 60 days prior to publishing a Notice of Rule Development in the *Florida Administrative Weekly*. The LRRC must be comprised of 50% "*manatee advocates and other environmental advocates*" and 50% "*waterway users*." The LRRC has 60 days from the date of receipt of the preliminary rule proposal to submit a written report to the FWC containing comments and recommendations. The LRRC report must contain a majority opinion and minority opinion(s) if the majority opinion is not unanimous. FWC staff is required to prepare a written response to the LRRC report, and the FWC Commissioners are required to consider the LRRC report and the FWC staff response before approving publication of a Notice of Proposed Rulemaking in the *Florida Administrative Weekly*.

- Changes made to former paragraph (f), now paragraph (g), to authorize the FWC to provide permitting agencies with comments regarding the expansion of existing, or the construction of new, boating facilities. Prior to this change, the paragraph authorized the FWC to adopt rules regarding these issues.
- Changes made to the rule-making authority throughout the statute to standardize and revise the criteria related to where zones can be established, with the new language stating that zones shall be adopted only where manatee sightings are frequent and

  > *…the best available scientific information, as well as other available, relevant, and reliable information, which may include but is not limited to, manatee surveys, observations, available studies of food sources, and water depths, supports the conclusions that manatees inhabit these areas on a periodic* [or regular] *basis.*

- Changes also made to former paragraph (j), now paragraph (k), which describes the legislative intent, to incorporate the revised criteria mentioned above and to revise the language related to the provision of lanes or corridors. The revised language read as follows:

  > *It is not the intent of the Legislature to permit the commission to post and regulate boat speeds generally throughout the waters of the state, thereby unduly interfering with the rights of fishers, boaters, and water skiers using the areas for recreational and commercial purposes. The Legislature further intends that the commission may identify and designate limited lanes or corridors providing for reasonable motorboat speeds within waters of the state whenever such lanes and corridors are consistent with manatee protection.*
- A new paragraph (t) added to statutorily require the 13 counties identified in the "*Governor and Cabinet 1989 Policy Directive*" to develop manatee protection plans, and to authorize the FWC to establish rules identifying new "*substantial risk*" counties required to develop manatee protection plans and criteria for approval. The paragraph also requires counties to incorporate the boating facility siting element of the manatee protection plan into its local comprehensive plan and sets deadlines for completion.

2004

- See Chapter 2004-343, Laws of Florida.
- Changes made to paragraph (s) to provide a statutory exception for violating manatee protection measures in the event of emergency circumstances. The new language read as follows:

  > *A person may engage in any activity otherwise prohibited by this subsection or any rule or ordinance adopted pursuant to this subsection if the activity is reasonably necessary in order to prevent the loss of human life or a vessel in distress due to weather conditions or other reasonably unforeseen circumstances, or in order to render emergency assistance to persons or a vessel in distress.*
- A new paragraph (u) added to require that existing state manatee protection rules be given "*great weight in determining whether additional rules are necessary in a region where the measurable goals developed pursuant to s. 372.072 have been achieved*."

Note that Chapter 2002-264, Laws of Florida, created §372.072(6), F.S., and it was subsequently amended by Chapter 2004-343, Laws of Florida, to read as follows:

MEASURABLE BIOLOGICAL GOALS.--Measurable biological goals that define manatee recovery developed by the commission, working in conjunction with the United States Fish and Wildlife Service, shall be used by the commission in its development of management plans or work plans. In addition to other criteria, these measurable biological goals shall be used by the commission when evaluating existing and proposed protection rules, and in determining progress in achieving manatee recovery. Not later than July 1, 2005, the commission shall develop rules to define how measurable biological goals will be used by the commission when evaluating the need for additional manatee protection rules.

APPENDIX IV

CHAPTER 68C-22
FLORIDA MANATEE SANCTUARY ACT
(DEFINITIONS)

68C-22.002 Definitions.

When used in these rules, the following words shall have the indicated meanings unless the context clearly indicates otherwise:

(1) "Idle Speed" and "Idle Speed No Wake" may be used interchangeably and mean that a vessel must proceed at a speed no greater than that which will maintain steerageway and headway. At no time is any vessel required to proceed so slowly that the operator is unable to maintain control over the vessel or any other vessel or object that it has under tow.

(2) "Miles" means statute miles.

(3) "Motorboats prohibited zone" as used in Chapter 68C-22, F.A.C., is synonymous with the definition of the "no power-driven vessels" zone defined in paragraph 68D-23.103(2)(d), F.A.C., and means that all vessels equipped with any mechanical means of propulsion are prohibited from entering the marked area unless the mechanical means of propulsion is not in use and, if possible to do so, is tilted or raised out of the water.

(4) "Slow Speed" and "Slow Speed Minimum Wake" may be used interchangeably and mean that a vessel must be fully off plane and completely settled into the water. The vessel must then proceed at a speed which is reasonable and prudent under the prevailing circumstances so as to avoid the creation of an excessive wake or other hazardous condition which endangers or is likely to endanger other vessels or other persons using the waterway. Due to the different speeds at which vessels of different sizes and configurations may travel while in compliance with this definition, there is no specific numerical speed assigned to Slow Speed. A vessel that is:

(a) Operating on plane is not proceeding at this speed;

(b) In the process of coming off plane and settling into the water or coming up onto plane is not proceeding at this speed;

(c) Operating at a speed that creates an excessive wake or other hazardous condition which unreasonably or unnecessarily endangers other vessels or other persons using the waterway, or is likely to do so, is not proceeding at this speed;

(d) Completely off plane and which has fully settled into the water and is proceeding at a reasonable and prudent speed with little or no wake is proceeding at this speed.

(5) "Maximum 25 MPH Speed Zone" means a controlled area within which a vessel's speed made good over the bottom, measured in statute miles, shall not exceed 25 miles per hour. Although it is the intention of the Commission to allow those vessels capable of attaining a planing configuration at 25 MPH to do so, this speed limit shall not be construed as permitting the reckless or careless operation of a vessel, in violation of Section 327.33, F.S., or authorizing

any vessel to travel at an unsafe speed, in violation of navigation rule 6, as adopted pursuant to Section 327.33, F.S., by reason of:

(a) Having an elevated bow which restricts visibility, or

(b) Producing an excessive wake or other hazardous condition that endangers or is likely to endanger other vessels, other persons using the waterway, or natural resources of the state.

(6) "Maximum 30 MPH Speed Zone" means a controlled area within which a vessel's speed made good over the bottom, measured in statute miles, shall not exceed 30 miles per hour. Although it is the intention of the Commission to allow those vessels capable of attaining a planing configuration at 30 MPH to do so, this speed limit shall not be construed as permitting the reckless or careless operation of a vessel, in violation of Section 327.33, F.S., or authorizing any vessel to travel at an unsafe speed, in violation of navigation rule 6, as adopted pursuant to Section 327.33, F.S., by reason of:

(a) Having an elevated bow which restricts visibility, or

(b) Producing an excessive wake or other hazardous condition that endangers or is likely to endanger other vessels, other persons using the waterway, or natural resources of the state.

(7) "Maximum 35 MPH Speed Zone" means a controlled area within which a vessel's speed made good over the bottom, measured in statute miles, shall not exceed 35 miles per hour. Although it is the intention of the Commission to allow those vessels capable of attaining a planing configuration at 35 MPH to do so, this speed limit shall not be construed as permitting the reckless or careless operation of a vessel, in violation of Section 327.33, F.S., or authorizing any vessel to travel at an unsafe speed, in violation of navigation rule 6, as adopted pursuant to Section 327.33, F.S., by reason of:

(a) Having an elevated bow which restricts visibility, or

(b) Producing an excessive wake or other hazardous condition that endangers or is likely to endanger other vessels, other persons using the waterway, or natural resources of the state.

(8) "Shoreline" means the point where the water meets the land at any point in time.

(9) "General Contour of the Shoreline" means a line defined as the most waterward of the outside edge of emergent aquatic vegetation, if present, or a line of Mean Low Water as defined in Chapter 177, Part II, F.S., as approximated on NOAA nautical charts. Waters lying landward of this line are to be included up to the shoreline, as defined under subsection (8), above. Emergent aquatic vegetation shall include plants rooted in the ground that extend above the surface of the water.

(10) "Channel" means a navigation route that is marked by aids to navigation that have been authorized by permits issued by all required state and federal authorities.

(11) "No Entry Zone" or "No Entry Area" means a controlled area where all vessels and all persons, either in vessels or swimming, diving, wading, or fishing (except from an adjacent bank or bridge when using poles or lines which are not equipped with a fishing line retrieval mechanism, *e.g.*, a cane pole) are prohibited from entering.

(12) "Authorized Resident" means any person owning a fee or leasehold interest in real property or a boating facility immediately adjacent to a motorboats prohibited zone or a no entry zone.

(13) "Rights of Fishers, Boaters, and Water Skiers" (as they apply under Section 370.12(2)(k), F.S.), means that fishers, boaters, and water skiers have the right to use the waters of the State of Florida for recreational or commercial purposes in a manner consistent with all applicable federal, state and local laws and regulations. Such laws and regulations include, but are not limited to, those governing the operation and safety of vessels on the water to

promote public safety, environmental/natural resource protection, and/or responsible use of the waters of the State.

(14) "Undue Interference" with the rights of fishers, boaters, and water skiers (as it applies under Section 370.12(2)(k), F.S.) occurs:

(a) If the Commission regulates boat speeds generally throughout the waters of the state; or

(b) If the Commission establishes regulations that encompass a larger geographic area or time frame than is warranted; set speed limits that are more restrictive than are warranted; encompass an area where the Commission has not determined that restrictions are necessary to protect manatees or manatee habitat pursuant to paragraph 68C-22.001(2)(a), F.A.C.; or fail to provide limited lanes or corridors providing for reasonable motorboat speeds, as called for in paragraph 68C-22.001(2)(b), F.A.C.

(15) "Planing" means riding on or near the water's surface as a result of the hydrodynamic forces on a vessel's hull, sponsons, foils or other surfaces. A vessel is considered "on plane" when it is being operated at or above the speed necessary to keep the vessel planing.

(16) "Wake" means all changes in the vertical height of the water's surface caused by the passage of a vessel including, but not limited to, a vessel's bow wave, stern wave, and propeller wash.

(17) "Harassment" means any intentional or negligent act or omission which creates the likelihood of causing an injury to a manatee by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, breeding, feeding or sheltering. The intentional provision of any type of food to manatees not in captivity shall be considered harassment under this definition, unless authorized by a valid federal or state permit.

(18) "Maximum 20 MPH Speed Zone" means a controlled area within which a vessel's speed made good over the bottom, measured in statute miles, shall not exceed 20 miles per hour. Although it is the intention of the Commission to allow those vessels capable of attaining a planing configuration at 20 MPH to do so, this speed limit shall not be construed as permitting the reckless or careless operation of a vessel, in violation of Section 327.33, F.S., or authorizing any vessel to travel at an unsafe speed, in violation of navigation rule 6, as adopted pursuant to Section 327.33, F.S., by reason of:

(a) Having an elevated bow which restricts visibility, or

(b) Producing an excessive wake or other hazardous condition that endangers or is likely to endanger other vessels, other persons using the waterway, or natural resources of the state.

Specific Authority 370.12(2)(g)-(j), (l), (n), (o) FS. Law Implemented 370.12(2)(d), (g)-(l), (n), (o) FS. History–New 3-19-79, Amended 11-23-83, Formerly 16N-22.02, Amended 12-30-86, 12-24-90, 12-25-91, 6-16-93, 9-9-93, Formerly 16N-22.002, Amended 5-31-95, 6-25-96, 5-12-98, Formerly 62N-22.002, Amended 12-23-03.

APPENDIX V

MANATEE PROTECTION
RULE DEVELOPMENT PROCESS
SEPTEMBER 2006

The Florida Fish and Wildlife Conservation Commission (FWC) is required to follow the requirements of Chapter 120, Florida Statutes (F.S.), when performing rule making for manatee protection purposes. The Manatee Sanctuary Act (§370.12(2), F.S.) requires several steps in addition to the Chapter 120 process. Rules 68C-22.001 and 68C-22.002, Florida Administrative Code (F.A.C.), provide additional requirements and guidance. The basic steps in the process are described below.

Step 1: Identify the need to potentially initiate rule making

The request or direction to consider rule-making can come from a wide variety of sources. Parties external to FWC, including organizations and individuals, can informally request rule making or formally petition the FWC under 120.54, F.S. Rule-making can be authorized or required by the judiciary (courts or DOAH) or the Legislature. The FWC Commissioners can direct staff to begin the process, and staff can independently identify the need to consider rule making and seek approval to proceed.

Step 2: Assimilate/compile data and assess the need for rule-making

Staff determines what data are available and coordinates with other individuals (both internal and external) to compile data and make an initial assessment of the need to proceed further. If the FWC determines that the available data support the need to consider rule-making, the process continues. Otherwise, the process stops and the party that requested rule-making is notified. This step would normally require between two weeks and several months to complete. The FWC's authority to establish manatee protection zones (and the limitations on that authority) is provided in §370.12(2), F.S., and further clarified in rules 68C-22.001 and 68C-22.002, F.A.C.

Step 3: Notify the affected county government that a rule is being considered

Whenever the FWC considers proposing a manatee protection rule that would regulate the speed and operation of motorboats, 370.12(2)(f), F.S., requires FWC to notify the affected county (or counties). The county must be notified at least 60 days before the FWC files a Notice of Rule Development for publication in the *Florida Administrative Weekly* (FAW). The county is then required to form a local rule review committee (LRRC). The make-up of the LRRC and its charge are governed by §370.12(2)(f), F.S.

Step 4: Publish a Notice of Rule Development (NORD)

The Chapter 120 process requires that the FWC publish a NORD in the FAW before formally proposing to adopt or amend a rule through publication of a Notice of Proposed Rulemaking. A NORD is <u>not</u> required before noticing a proposed rule repeal. A NORD does not have to be published before the LRRC process can begin; it could be published any time after Step 3 (plus 60 days) and before Step 8 (publication of a Notice of Proposed Rulemaking).

NOTE: The FWC may hold rule development workshops; however, workshops are optional. If an affected person requests in writing that a workshop be held, the agency must hold one *unless the agency head explains in writing why a workshop is unnecessary*. Workshops must be noticed in the FAW at least 14 days before being held. If a workshop is held, it could take place before or after the proposed rule is submitted to the LRRC (See Step 5).

Step 5: Submit proposed rule and supporting data to LRRC

The FWC is required by §370.12(2)(f), F.S., to submit the proposed rule and supporting data to the LRRC for its use in reviewing the proposed rule. The LRRC then has 60 days to review the proposed rule and submit a written report to the FWC. The LRRC report must contain a majority opinion and may endorse the proposed rule or recommend changes. If the recommendations are not unanimous, the LRRC report must also contain a minority opinion.

Step 6: Review LRRC report and prepare staff response

FWC staff is required by §370.12(2)(f), F.S., to review the LRRC report (including minority opinions if applicable) and to provide a written response to the county and the FWC Commissioners. This step would normally require between two weeks and several months to complete, depending on the size and complexity of the LRRC report.

Step 7: Authorization to publish a Notice of Proposed Rulemaking

Following receipt of the LRRC report and the preparation of the staff response, FWC staff prepares a rule proposal for consideration by the FWC Commissioners. The Commissioners are required by §370.12(2)(f), F.S., to fully consider the LRRC report before authorizing the publication of a Notice of Proposed Rulemaking. The Commissioners make the decision to authorize publication of a proposal at a publicly noticed meeting. This typically occurs at one of the regularly scheduled FWC meetings that are held during the course of the year. As part of this process, FWC staff has to prepare an agenda package for the item. Agenda packages typically need to be ready six weeks before the meeting. If the Commissioners authorize rule-making, the process continues. Otherwise, the process stops and the party that requested rule-making is notified.

Step 8: Publish a Notice of Proposed Rulemaking

Publication of this notice in the FAW begins the formal Chapter 120 rule-making process. The notice must be published in the FAW at least 28 days before the rule is filed for adoption. The small business ombudsman of the Office of Tourism, Trade, and Economic Development must also be notified at least 28 days before. The Joint Administrative Procedures Committee (JAPC) must be notified at least 21 days before adoption and must also be provided with several other documents. The notice must also be mailed to all persons who, at least 14 days prior to such mailing, have made requests for advance notice.

NOTE: The small business ombudsman has 21 days after being notified of the proposed rule to offer regulatory alternatives. If alternatives are offered, the agency must adopt them if they would reduce the impacts on small businesses and they are feasible and consistent with the stated objectives of the proposed rule. Submittal of an alternative extends the time limit for filing the rule for adoption by 21 days. If all alternatives are not adopted, before adopting the proposed rule, the agency must file a detailed written statement with JAPC explaining the

reasons for rejecting the alternatives. The small business ombudsman must also be notified, no later than three days after JAPC notification.

Step 9: Accept public comments and conduct one or more public hearings

The Chapter 120 process requires that a public hearing be held if requested by any affected person within 21 days after publication of the Notice of Proposed Rulemaking. Final decisions on manatee protection rules are always made by the FWC Commissioners at a publicly noticed meeting, so at least one public hearing will always be held, even if one is not requested. FWC staff typically conducts an initial public hearing in the affected area within a month after the Notice of Proposed Rulemaking is published. The final public hearing is held by the FWC Commissioners, typically at one of the regularly scheduled FWC meetings that are held during the course of the year. The comment period lasts for 21 days after publication of the notice or through the date of the final public hearing, whichever is longer. As a result, the formal comment period is often open between two and four months. A rule cannot be filed for adoption until at least 14 days after the conclusion of the final public hearing.

Step 10: Review public comments and prepare final staff recommendations

FWC staff reviews comments received during the public comment period and then develops final staff recommendations for consideration by the FWC Commissioners at a publicly noticed meeting. Agenda packages for the meeting typically need to be ready four to five weeks before the meeting.

Step 11: Authorization to adopt rule

The FWC Commissioners decide whether to adopt a proposed rule (with or without changes) at the final public hearing (see Step 9). 370.12(2)(f), F.S., requires that the FWC Commissioners fully consider the initial LRRC report and any subsequently submitted reports from the LRRC before approving a rule for adoption. If the Commissioners decide not to adopt a proposed rule, the process stops and the party that requested rule-making is notified.

Step 12: Publish a Notice of Change (NOC)

The Chapter 120 process requires that a NOC be published if substantive changes are made to the originally published proposed rule. If no changes or only technical changes are made to the proposal, no NOC is needed; however, JAPC must be notified in writing at least seven days before the rule is filed for adoption. Substantive changes must be supported by the record of public hearings, must be in response to written material received on or before the date of the final public hearing, or must be in response to a proposed objection by JAPC. The NOC must be given to JAPC, provided by certified mail or actual delivery to any person who requests notification (in writing no later than 21 days after publication of the Notice of Proposed Rulemaking), and published in the FAW at least 21 days before the rule is filed for adoption.

Step 13: File the rule for adoption

Rules are considered "adopted" when they are filed with the Department of State and generally take effect 20 days after adoption. Rules may be filed for adoption no less than 28 days or more than 90 days after the Notice of Proposed Rulemaking is published in the FAW, unless one or more events occur that extend the 90-day limit. See §120.54, F.S., for events that extend the limit. Some of the more common events that extend the limit include: [1] if a NOC is published in the FAW prior to the expiration of the time to file the rule for adoption, the 90-day

limit is extended to 45 days after the NOC is published; [2] if a notice of public hearing is published in the FAW prior to the expiration of the time to file the rule for adoption, the filing deadline is extended to 45 days after adjournment of the final public hearing, 21 days after receipt of all material authorized to be submitted at the hearing, or 21 days after receipt of the transcript, whichever is latest; and [3] if an administrative challenge is filed against the proposed rule pursuant to 120.56, F.S., the 90-day period is tolled while the challenge is pending. Under no circumstances does an agency have less than 90 days to file a rule for adoption.

NOTE: If areas for which the FWC adopts regulations are also regulated by other governments and/or for other purposes besides manatee protection, the most restrictive regulation applies and is what is posted. Regardless of when an adopted rule officially takes effect, regulations cannot be enforced until the signs are posted.

APPENDIX VI

MANATEE PROTECTION RULE-MAKING BY COUNTY

Brevard County—Seasonal zones were adopted around the power plants in the Indian River in February 1979, in and around Turkey Creek in November 1983, and in Manatee Cove (in the Banana River) in November 1985. An emergency rule for the Banana River was adopted in September 1989 and incorporated into the permanent rule in November 1989. Zones addressing portions of the Indian River were adopted in August 1990, and zones covering a portion of the Mosquito Lagoon were adopted in July 1991. The zones in Brevard County appear in Rule 68C-22.006, F.A.C.

The speed zones in the southern portion of the Indian River were amended in July 1992. Amendments were made in September 1994 to establish speed zones in the Canaveral Barge Canal and amend the speed zones in Sykes Creek and the portions of the Banana and Indian rivers in the vicinity of the Barge Canal. Amendments were made in December 1998 to add seasonal safe haven zones (No Entry and Motorboats Prohibited) at the Reliant Corp. (formerly OUC) and FPL power plants. Significant amendments to zones throughout the county were adopted in June 2002. The amendments were approved by the FWC in May 2001 but rule adoption was delayed because of three administrative challenges that were filed in May/June 2001. The challenges were dismissed by DOAH in April 2002 and the DOAH order was affirmed by the Fifth District Court of Appeal in March 2003.

Broward County—Seasonal zones were adopted around the power plants in February 1979 and amended in November 1989. A countywide rule was adopted in May 1993. A small amendment to the zones in Hillsboro Inlet was made in November 1994. The zones in Broward County appear in Rule 68C-22.010, F.A.C.

Charlotte County—Zones for the Lemon Bay, Turtle Bay, and Peace River areas were adopted in November 2002. A small amendment to the zones in the Placida Harbor area of Lemon Bay was made in July 2006. The zones in Charlotte County appear in Rule 68C-22.015, F.A.C. The rule also includes zones in a portion of DeSoto County. A very small area off of the Myakka River is also regulated under the Sarasota County rule.

Citrus County—Seasonal zones were adopted for the Kings Bay area and a portion of the Homosassa River in February 1979. The zones were amended in February 1981 and in November 1985. Seasonal zones were adopted in portions of the Withlacoochee River in November 1985 (including in Levy County). A countywide rule was adopted in January 1992. The zones on the upper Homosassa River were amended in October 2002 to add seasonal safe haven zones (No Entry) in the Blue Waters area. The zones in Citrus County appear in Rule 68C-22.011, F.A.C. The 1992 rule action also revised the zones in Levy County and designated zones in a small portion of Hernando County.

Clay County—See Duval County. There are zones in the northern section of the county, including Doctors Lake, under the Duval County rule.

Collier County—Speed zones were adopted in the Faka Union Canal area in November 1983 and amended in December 1987. A countywide rule was adopted in August 1990. Significant amendments to the rule were adopted in June 1997. The zones in Collier County appear in Rule 68C-22.023, F.A.C.

DeSoto County—See Charlotte County. There are zones in the Peace River portion of the county under the Charlotte County rule.

Duval County—A countywide rule was adopted in December 1992 and a minor amendment made in May 1993. Significant amendments were made to the zones throughout the county in July 2000. The zones in Duval County appear in Rule 68C-22.027, F.A.C. The 2000 rule action also designated zones in the northern portions of Clay and St. Johns counties (in the St. Johns River area).

Flagler County—See Volusia County. There are zones in a very small section of the southern portion of the county under the Volusia County rule.

Hernando County—See Citrus County. There are zones in a very small section of the northern portion of the county under the Citrus County rule.

Hillsborough County—Seasonal zones were adopted in the vicinity of the Alafia River in February 1979 and around the Tampa Electric Company power plant in Apollo Beach in December 1986. The zones on the Alafia River were amended in November 2002. The zones at Apollo Beach were amended in December 2004 and zones were added in Old Tampa Bay and the Little Manatee River. The zones in Hillsborough County appear in Rule 68C-22.013, F.A.C.

Indian River County—Seasonal zones were adopted around the power plant in Vero Beach in February 1979. Speed zones for the Sebastian River area were adopted in August 1990 and amended in October 1991. A countywide rule was adopted in July 1992. The zones in the Jungle Trail Narrows area were amended in November 2002 and a seasonal safe haven zone (No Entry) was added at the Vero Beach power plant. The zones in Indian River County appear in Rule 68C-22.007, F.A.C.

Lake County—See Volusia County. There are zones in the St. Johns River portion of the county under the Volusia County rule.

Lee County—Seasonal zones were adopted in the Orange and Caloosahatchee rivers around the power plant in February 1979. Speed zones addressing the portion of the Caloosahatchee River downstream of the power plant were adopted in November 1989. A countywide rule was adopted in November 1999. The speed zones in the Mullock Creek area in southern Lee County were amended in June 2001. Amendments were adopted in August 2005 to add zones in San Carlos Bay and amend or re-promulgate zones in other areas, including in the lower Caloosahatchee River, adjacent to Sanibel Island, and in Hendry Creek and Hell Peckney Bay. The zones in Lee County appear in Rule 68C-22.005, F.A.C.

Levy County—See Citrus County. There are zones in a small section of the county in the Withlacoochee River area under the Citrus County rule.

Manatee County—Zones for the Terra Ceia Bay area were adopted in November 2002. A countywide rule was adopted in December 2004. The zones in Manatee County appear in Rule 68C-22.014, F.A.C.

Martin County—A seasonal zone was adopted in February 1979 for all waters outside of the Intracoastal Waterway channel from the St. Lucie Inlet to the Jupiter Inlet in Palm Beach County. Seasonal zones were adopted for the Loxahatchee River in November 1983. A countywide rule was adopted in December 1990. The zones in Martin County appear in Rule 68C-22.024, F.A.C.

Miami-Dade County—A speed zone was adopted in the Black Creek area in November 1983. A countywide rule was adopted in December 1991. The zones in Miami-Dade County appear in Rule 68C-22.025, F.A.C.

Palm Beach County—Seasonal zones were adopted around the Riviera Beach power plant in February 1979 and amended in January 1990. A seasonal zone was also adopted in February 1979 for all waters outside of the Intracoastal Waterway channel from the St. Lucie Inlet in Martin County to the Jupiter Inlet. Seasonal zones were adopted for the Loxahatchee River in November 1983. A countywide rule was adopted in December 1990. Additional speed zones were added to the Jupiter Sound and Lake Worth Creek areas by emergency rules in December 1990 and January 1991, respectively, and incorporated into the existing rule in February 1991, along with an additional zone in the southern portion of the county. The zones in Lake Worth Creek and the southern portion of the county were amended again in June 1993. The zones in Palm Beach County appear in Rule 68C-22.009, F.A.C.

Pinellas County—Zones in Old Tampa Bay north of Courtney Campbell Causeway were adopted in December 2004. The zones in Pinellas County appear in Rule 68C-22.016, F.A.C.

Putnam County—See Volusia County. There are zones in a small section of the county in the Lake George area under the Volusia County rule.

St. Johns County—See Duval County. There are zones in a small section of the northern portion of the county in the St. Johns River area under the Duval County rule.

St. Lucie County—Seasonal zones were adopted around the power plant in Ft. Pierce in February 1979. A countywide rule was adopted in July 1994. The zones in St. Lucie County appear in Rule 68C-22.008, F.A.C.

Sarasota County—A Caution Zone was adopted in the Venice Inlet area in November 1983. A countywide rule was adopted in January 1992. The zone in the City Island area of Sarasota Bay was amended in November 2002 and a seasonal safe haven zone (No Entry) was added in the Warm Mineral Springs/Salt Creek area. The zones in Sarasota County appear in Rule 68C-22.026, F.A.C. The 1992 rule action also designated zones in small portions of Manatee and Charlotte counties. Since 2004 the zone in Manatee County (in the Buttonwood Harbor area of Sarasota Bay) has also been included under the Manatee County rule.

Seminole County—See Volusia County. There are zones in a small section of the county in the Lake Monroe area under the Volusia County rule.

Volusia County—Seasonal zones were adopted for the area around Blue Spring in the St. Johns River in February 1979 and amended in November 1989. The 1989 amendments also added year-round zones in the Tomoka River area. An emergency rule for a portion of the St. Johns River was adopted in March 1991. A countywide rule was adopted in July 1991. Amendments to some of the zones were adopted in June 1994. The zones in Volusia County appear in Rule 68C-22.012, F.A.C. The 1991 rule action also designated zones in portions of Putnam, Lake, Seminole, and Flagler counties.

APPENDIX VII

ATTACHMENT K
OF THE GOVERNOR AND CABINET
1989 POLICY DIRECTIVE
MANATEE PROTECTION PLAN GUIDELINES

Area-specific manatee protection plans need to be developed by all counties in which manatees regularly occur to ensure the long-range protection of the species and its habitat. The objectives of manatee protection plans are: to reduce the number of boat-related manatee mortalities; to achieve an optimal sustainable manatee population (the goal of the Marine Mammal Protection Act); to protect manatee habitat; to promote boating safety; and to increase public awareness of the need to protect manatees and their environment. These plans will address manatee-human interactions, land use (including boat facility siting), and the protection of suitable habitat (including water quality, thermal refugia, freshwater sources, and grass beds). The information needed to prepare manatee protection plans will include manatee studies, habitat assessments, and, if available, boating studies to evaluate boater use patterns and activities. Boat facility siting elements are necessary components of area-specific manatee protection plans. Boat facility siting must address marinas with wet slips and dry storage, and boat ramps. The objectives of boat facility siting plans are: to determine appropriate dock densities for particular areas; and to develop criteria for designating special use areas (i.e.; for water skiing, jet-skiing, and commercial fishing).

Necessary components of a manatee protection plan are:

- *An information base;*
- *Location and capacity of all marina facilities (including dry storage) in the county (proposed and existing);*
- *Location of all boat ramps in the county (proposed and existing);*
- *Boating activity patterns, including travel routes and major destination areas;*
- *Manatee sighting information for the county;*
- *Manatee mortality for the county;*
- *Any aquatic preserves; Outstanding Florida Waters, or other refuge/reserve information;*
- *Port facility information;*
- *Location of significant habitat resources, such as grass beds, warm-water discharges and freshwater sources;*
- *Location of manatee protection and boating safety speed zones in the county (proposed and existing);*
- *Location of manatee information displays; and*
- *Other relevant data as determined by the Department of Natural Resources.*

Recommendations—with an Accompanying Implementation Schedule—to Increase Manatee Protection in the County:

- *Boating expansion criteria;*
- *Identification of recommended areas for water-related activities requiring high boat speeds, such as water skiing, boat races and certain types of commercial fishing;*
- *A plan for marking navigation channels in currently unmarked waterways used by manatees;*
- *New or expanded speed zones, refuges or sanctuaries for the regulation of boat speeds in critical manatee areas;*
- *Installation of manatee educational displays at all boating facilities;*
- *Development and dissemination of a pamphlet to county boaters describing manatee protection and boating safety speed zones in the area, and recommendations for boaters on how to avoid hitting manatees;*
- *Inclusion of manatee and marine habitat educational material in the county school board's elementary, middle school, and high school curricula;*
- *Development of appropriate aquatic plant control methods in manatee areas;*
- *Identification of land acquisition projects to increase refuges, reserves, and preserves for manatee protection; and*
- *Other actions as specified by the Department of Natural Resources.*

APPENDIX VIII

FLORIDA FISH AND WILDLIFE CONSERVATION COMMISSION (FWC)
BUREAU OF PROTECTED SPECIES MANAGEMENT (BPSM)
BOAT FACILITY SITING GUIDE
AUGUST 2000

DEFINITION

A boat facility siting plan can be defined as a Commission-approved, county-wide plan for the development of boat facilities (docks, piers, dry storage areas, marinas and boat ramps) which specifies preferred locations for boat facility development based on an evaluation of natural resources, manatee protection needs, and recreation and economic demands. The boat facility siting plan is one component of the Manatee Protection Plan (MPP). It should include, but is not limited to, the following:

1. An inventory of existing boat facilities and natural resources;
2. An evaluation of boat use and traffic patterns;
3. Criteria on which proposed sites will be screened;
4. A list and map of preferred locations, unacceptable locations, and locations which are acceptable with specific conditions;
5. Appropriate dock densities; and
6. Boat facility siting policies including a policy for the expansion of existing boat facilities.

The main goal of the resulting boat facility siting criteria will be to minimize the amount of interaction between manatees and boats. Part of this goal is also to evaluate impacts of boat facility developments on manatee habitats. The resulting criteria should be based on certain baseline information general to all Florida waterways and then tailored to fit the specifics of each county. While the primary concern of BPSM is manatee protection, we recognize that counties will need to consider recreational uses, economic factors and other marine and coastal resource needs. Much of the analysis of water-dependent facilities required by this boat facility siting plan will aid other county planning efforts.

INFORMATION TO BE ASSESSED

The following information should be collected in order to select areas appropriate for boat facility development.

1. The boating activity study should provide a detailed overview of boat traffic patterns for the county waterways. It should describe traffic routes (points of origin and destination), the volume and types of boats, seasonal variations of boating patterns, and the types and distribution of boating activities. It should also include inventories of marina facilities, boat ramps and port facilities. Boating studies will vary from county to county depending on the nature of each county's waterways and how they are used locally.

2. Manatee use patterns of county waters should be studied so that when evaluating locations for further water-dependent development, impacts to manatees and their habitats can be minimized. With the assistance of FWC, each county should determine sites of preferred

manatee use and aggregation. The location of travel corridors, freshwater outfalls and warm water refuges should be determined. Seasonal variations of use patterns should be described and mortality information should be analyzed. Most of this information is available from FWC, USFWS and various other entities depending on the county. Manatee use information should be compared and overlaid with the boating patters information in order to understand how boats and manatees currently interact. Then problem areas can be identified and measures can be developed that will minimize and eliminate problems.

3. Habitat inventories should be done for the location of seagrass beds, freshwater, submerged vegetation, shellfish areas, existing water depths, and water circulation patterns. This information will give details about habitat quality and location, as well as insight into manatee usage of these areas. Some of this information may already exist for some counties and may only need to be checked and updated.

4. Specially-designated areas should be identified, such as Outstanding Florida Waters, aquatic preserves, federal, state and local parks, sanctuaries and research reserves, wildlife refuges, and any other lands set aside for preservation and open space. Some of these areas are not available for boating facility development or have certain restrictions. The process of identifying the locations of these areas will narrow down areas that will need to be screened for potential boat facility development.

5. Existing upland zoning appropriate for marina and boat facility development should be located and displayed on maps. Counties need to consider whether future land use zoning changes will be allowed to change the location of acceptable boat facility sites. If changes will be allowed, counties need to determine and specify how the areas will be evaluated for such changes. Criteria will need to be developed for these changes. Counties may choose not to allow zoning changes that would alter locations where boating facilities may be sited once the MPP is approved. By collecting this information, counties will reduce the number of sites that need detailed evaluation and can direct their efforts toward sited that are available for development of boat facilities. This process should minimize the amount of areas that will need to be studied in depth.

6. An inventory of the location of existing multi-family residential docking facilities should be shown on maps of the county waters. The Department of Environmental Protection's (DEP) Division of State Lands issues submerged land leases for residential docking facilities and marinas. The division defines multi-slip docks as moorings of three or more vessels. The DEP requires permits for dock construction on both private and sovereign submerged lands. Counties should also consider developing a threshold for residential multi-slip dock densities. Some of the more urban counties may have already reached their threshold in many areas because all available lands have already been developed.

7. The location of all existing marinas and boating facilities should be determined and exhibited on maps. A table for existing marinas should be compiled that will show the number of slips (both wet and dry), a break down of boat types (power vs. sail) and sizes, the percent occupancy (and any seasonal variations), the distance to the nearest inlet, the proximity of existing speed zones and the distance to popular boating destinations. Also, it should be noted if there are any plans for expansion of the current facilities. Much of this information is often obtained in conjunction with the boating study.

8. An inventory of all the boat ramps in the county should be conducted and the locations should be depicted on a map. Information concerning each ramp should be collected such as the number of ramps, the amount of parking (on and off site), and the number of boats launched (with seasonal and weekday/weekend use variations identified). The ramp's proximity to inlets, the ICW and popular boating destinations should be determined. Again, this information should be available from the boating study.

9. An inventory and map showing the locations of port facilities, freight terminals, fuel and transient docks, and boat yards should also be completed for each county. A description of the activities occurring at each of the different types of facilities should be provided. This will be useful when developing criteria for each type of facility that will guarantee appropriate protection for manatees and their habitats. Our office is developing a proposed rule that will address wharf bumpers and fenders. (Please request an update from our office on the status of this rule.)

10. For all of the inventoried information described in points 1-9 above, the information should be exhibited on maps. This will facilitate the spatial analysis that is needed for evaluating areas for boat facility development. For ease of analysis, similar scale maps should be used so that information can be overlaid. The use of a Geographic Information System (GIS), if available, will enhance the mapping process. All of the inventoried information should be considered before choosing a particular scale, especially if GIS is unavailable. Maps for the final boat facility component of the MPP will need to be legible and easy to interpret so that the process of evaluation can be clearly understood.

EVALUATION OF DATA

Once all the information above is compiled, the focus of the detailed analysis can be narrowed by removing lands that are unavailable for boating facilities. Examples may be public wildlife refuges, or areas with conflicting upland land use zoning. The remaining areas will be the focus of the boat facility siting plan.

Next, a search should be made for areas where manatee use patterns and boat use patterns overlap. Areas should be identified where boat use patterns show minimal overlap with manatee use patterns and these should be examined further to evaluate them as preferred marina site locations. It should be determined whether boating activities and facilities located in these areas will affect manatees and their habitats in a negative way and to what degree, if any. Through this evaluation, it can be decided whether these areas would be the preferred locations for boating facilities.

In locations where boat/manatee use patterns converge significantly, an assessment should be made of the degree of overlap. Once identified, these locations should be scrutinized carefully to determine if additional boat facilities will significantly impact manatees. The siting plan should specify areas where different types of facilities would be allowed. Additionally, the type of facility proposed (ramp, dry storage, marina, etc.) may be restricted by physical, environmental or operational factors - or by land use. In creating the specific criteria for each area, the local baseline information should be used. The criteria should be customized for each area and be written to allow the size or type of facility that would be best in the area (if allowed at all). For example, certain sized marinas may be allowed in areas with moderate manatee use if seagrasses are not present, dredging is not required, appropriate speed zones are in place and boat slips are limited in number. In areas where seagrasses are present but manatee usage is low,

dry storage or ramp facilities may be more appropriate. Counties should consider whether to assign density thresholds for specific areas. For example, several counties have used the 1:100' ratio of power boat slips to amount of linear shoreline owned for areas deemed as essential manatee habitat.

Some general factors to consider in selecting marina and boat facility sites include:

- proximity to inlets and/or the ICW,
- existing water depths adequate for clearance beneath vessels,
- presence of seagrass beds, and/or shellfish harvesting areas (Class 11 waters),
- proximity to popular boating destinations,
- amount of manatee use, and
- distances of boat/manatee use pattern overlap.

Criteria should also be developed for marina expansions. Some areas may not warrant expansion. Some expansion might be considered under specific circumstances. The expansion of existing facilities in some areas may also be the preference over new boat facility development. The percent occupancy of marinas in the adjacent area should be considered when evaluating requests for marina expansions. While demand for boat slips must be addressed by county officials, existing marinas should be used to their fullest capacity before expansions and new marinas are permitted.

Some general criteria to be considered for siting of marina facilities are:

- Expansion of existing facilities may be preferred over new facilities if environmentally sound;
- There should be no impact to seagrass;
- Mitigation for seagrass destruction should not be allowed;
- Areas with adequate depth and good flushing which require no new dredging are preferable;
- Locations near inlets and popular boating destinations are preferable;
- Piling construction is preferred over dredge and fill techniques;
- Marinas should not be sited in essential manatee habitats; and
- Marinas should not be situated in areas with high manatee mortality occurrence.

There are also some special considerations for port and associated facilities. Port facilities, freight terminals, fuel and transient docks, and boat yards should require wharf fenders on all new facilities located in manatee habitat areas and require retro-fitting of existing facilities on an established time table if these facilities do not provide adequate clearance through an open-face pier design. Prop guards for tug boats and other large vessels regularly using manatee inhabited waters should be considered once an operationally functional and efficient design is developed. Expansion of port facilities or the development of new facilities should not impact seagrass beds.

The boat facility siting plan should describe the process and discuss the criteria used to evaluate and identify where and how boating facilities would be allowed. It should be clear why certain areas were determined to be unavailable for boating facilities. The whole process of screening and layering mapped resources and areas using specific criteria should be clearly stated in this boat facility siting plan.

APPENDIX IX

SUMMARY OF COUNTY MANATEE PROTECTION PLAN DEVELOPMENT

Provided below is a brief description of manatee protection plan development by county:

Brevard County: Brevard County's MPP was approved by the FWC in February 2003. Efforts to develop the MPP began with a boating activity study in 1990, with funding from the state. The state also funded a staff position at the county from 1993-1996 to assist in the MPP development. A committee of stakeholders met regularly from December 1993 to February 1996 to discuss an early draft plan. In late 2002 and early 2003, Brevard County and the FWC coordinated closely on revisions to the MPP that was eventually approved.

Broward County: In April 1992, the Board of County Commissioners adopted the Broward County Manatee Protection and Boating Safety Plan that addressed all elements of an MPP except boat facility siting. It was submitted to DEP in May 1992 but was not approved because of the lack of boat facility siting recommendations. To facilitate MPP development, the FWC awarded grants to Broward County in March 2001 (education initiatives) and June 2004 (manatee aerial survey efforts). Beginning in the fall of 2003, the county began collecting data and information for the development of a boat facility siting plan. FWC provided funding for a boat traffic study in 2005. In June 2006, the county passed a plan and sent it to the state in July. The FWC could not approve the plan. The county revised the plan with input from a stakeholder group and the FWC and USFWS. In June 2007, a revised version of the plan was passed by the Board of County Commissioners. FWC expects to receive the plan to review in early August 2007.

Citrus County: In September 1991, the Citrus MPP became the first state-approved MPP. It was the first county plan adopted as an element of the county comprehensive plan. A boat study was conducted on the Crystal and Homossassa rivers in 1987-1988. Citrus County revised its plan in 1997 as part of the comprehensive plan review process. Another comprehensive plan review cycle was completed in 2004 but resulted in no changes to the MPP.

Clay County: Although Clay County was not designated as one of the 13 "key" counties for manatees in the State of Florida, the county has opted to be proactive in developing an MPP to provide additional protection for manatees. In 2002, Clay County received grant funding to finalize an MPP. After coordination at the state and local levels, the Clay County MPP was approved by the FWC in June 2006.

Collier County: The Collier County MPP was approved in July 1995. The first draft of the Collier MPP was produced in August of 1991. Data collection efforts included a boat facility inventory and a boat traffic study, both completed in 1993 and used to develop the final plan.

Duval County: The MPP was approved by DEP in June 1999. A state-funded boating activity study was completed in 1993. An early draft was submitted to the state in 1995 but was

not approved. Efforts to finalize the MPP began again in March 1999, resulting in approval a few months later. The plan was revised in 2006 and approved by the FWC in November 2006.

Indian River County: The Indian River MPP received FWC approval in November 2000. A state-funded boat traffic study was completed in 1993. The Indian River County MPP was amended in 2002 and 2004 with approval by FWC.

Lee County: Lee County began its MPP development in 1995 and the MPP was approved by the FWC in August 2004. A boat study was funded by the state in 1998. A marina inventory was completed in 2001.

Levy County: After a legislative change moving the Citrus County northern boundary to the middle of the Withlacoochee River, instead of its north shore, which was conditioned upon the adoption of a Levy County MPP, a Levy County MPP was developed for the Withlacoochee River. The MPP was approved in 1995 and provides the same protection measures that existed in the Citrus County MPP.

Martin County: The FWC approved the MPP in June 2002**.** A boating activity study was completed in 1996. In 2000, FWC funded production of Martin County's final MPP, including a boat facility siting component.

Miami-Dade County: The Dade County MPP was approved by the state in December 1995. An initial draft was developed by county staff in 1992 and was revised by a citizens' advisory committee before the final draft was submitted to the state for approval. A boat study funded by the county was completed in 1990 and used to develop both the speed zone rule and the MPP.

Palm Beach County: For many years, the county struggled with how to develop a county MPP, as it would require coordination between 33 municipalities, making it difficult to accomplish. A state-funded boating activity study was completed in 1994. A boat facility siting study was completed in 1995, and a seagrass inventory in 1997. The county began actively working on the MPP again after the 2002 legislation passed. In order to work toward getting an approved MPP, the county contracted out the work on completing the MPP. The Palm Beach County Board of County Commissioners approved a final draft MPP in June 2006, and submitted the MPP to the FWC in July 2006 for review. The county's plan could not be approved by the FWC; however, the agency offered to revise the document so that it would receive state and federal approval. The FWC worked since January 2007 on those revision with the input of various stakeholders and in coordination with the USFWS. A revised version of the county MPP was sent to the county on July 12, 2007.

Sarasota County: The Sarasota County MPP was approved in January 2004. Sarasota County volunteered to be identified as a "key" county in 1989. The FWC provided funding in 2000-2003 to the county to develop their MPP. The county coordinated the development of the plan with all the coastal cities to facilitate countywide implementation.

St. Lucie County: Beginning in 1991, St. Lucie County began actively working on the framework for their MPP. The state assisted the county in 1996 by funding a boating activity

study. In 2000, FWC contracted with St. Lucie County to develop a boat facility siting plan, the final component of the MPP. The MPP received state approval in March 2002.

Volusia County: To assist in MPP development in Volusia County, the FWC (then DEP/DNR) funded a boating study (1994-1995) and a temporary MPP position (1993-1996). Volusia County hired the Florida Conflict Resolution Consortium in May 1997 to assist in working the MPP through the local level and eventually to assist with remaining issues delaying state approval. During the development of the MPP, the county chose to divide the MPP into two phases. Phase I included recommendations for enforcement, habitat protection, education and awareness, research, governmental coordination, and implementation, and was approved by the FWC in February 2001. Phase II of the MPP, the boat facility siting element, was approved by the FWC in October 2005.

APPENDIX X

AUTHORITY REFERENCES FOR FWC MARINE SPECIES IMPACT REVIEWS

There are many different statutes and rules that relate to the FWC's role as a commenting agency to the regulatory agencies. The regulatory agencies include all of the water management districts and the Department of Environmental Protection. The references discussed below are the majority of the considerations of the permit related rules and statutes that relate to manatee concerns.

Coordination with Regulatory Agencies

The following references outline the authority and procedures under which FWC provides comments to the regulatory agencies.

"Comments submitted by the commission to a permitting agency for applications for permits, licenses, or authorizations impacting the commission's jurisdiction must be based on credible, factual scientific data, and must be received by the permitting agency within the time specified by applicable statutes or rules, or within 30 days, whichever is shorter. Comments provided by the commission are not binding on any permitting agency. Comments by the commission shall be considered for consistency with the Florida Coastal Management Program and ss. 373.428 and 380.23. Should a permitting agency use the commission's comments as a condition of denial, approval, or modification of a proposed permit, license, or authorization, any party to an administrative proceeding involving such proposed action may require the commission to join as a party in determining the validity of the condition. In any action where the commission is joined as a party, the commission shall only bear the actual cost of defending the validity of the credible, factual scientific data used as a basis for its comments." *Section 20.331(7) F. S.*

"At least 60 days prior to consideration by the governing board pursuant to Section 373.456(1) F.S. of its surface water improvement and management plan, a water management district shall transmit its proposed plan to the department, the Department of Agriculture and Consumer Services, the Fish and Wildlife Conservation Commission, the Department of Community Affairs, and local governments." *Section 373.455(1) F.S. Part IV F.S.*

"…the District will provide a copy of all notices of applications….to the Florida Game and Fresh Water Fish Commission for review and comment. In addition, the District staff may solicit comments from the…Commission…to assist in the assessment of potential impacts to wildlife and their habitats, particularly with regard to listed species." *Introduction, Basis of Review for Environmental Resource Permit Applications South Florida Water Management District, August 2000.*

Environmental Resource Permitting

The Environmental Resource Program is authorized under Section 373.414, F. S., Part IV, and regulates activities that may adversely affect the environment in, on, or over surface waters or wetlands. Rules specific to these authorities are written by the water management districts, which are followed by the Department of Environmental Protection, depending upon the project location. The specific rule citations are as follows: Northwest Florida Water Management District (40A, F.A.C.), Suwannee River Water Management District (40B, F.A.C.), St. Johns River Water Management District (40C, F.A.C.), Southwest Florida Water Management District (40D, F.A.C.), South Florida Water Management District (40E, F.A.C.).

The Environmental Resource Permits address adverse impacts to fish and wildlife, and threatened and endangered species, and their habitats, including impacts that may occur secondarily as a result of a project being constructed or impacts that may accumulate due to permitting multiple projects with similar impacts. These impacts are referred to as secondary and cumulative impacts, and applicants must provide reasonable assurance that these impacts are minimized or eliminated. Modifications, mitigation, or restrictions to permits may be required as "practicable" in order to provide reasonable assurance.

Further guidance for evaluating projects is outlined in guidance documents produced by the regulatory agencies and adopted by reference into their rule. For the St. Johns Water Management District, this document is referred to as the Applicant Handbook. For the South Florida Water Management District, this document is referred to as the Basis of Review. For example, the Basis of Review for Environmental Resource Permit Applications, South Florida Water Management District, August 2000, was adopted by reference in Rule 40E-4.091(1)(a).

Adverse Impacts

"In determining whether an activity, which is in, on, or over surface waters or wetlands…is not contrary to the public interest or is clearly in the public interest, the governing board or the department shall consider and balance the following criteria…whether the activity will adversely affect the conservation of fish and wildlife, including endangered or threatened species, or their habitats…" *Section 373.414(1)(a)(2) F.S.*

"In order to obtain a standard, individual, or conceptual approval permit under this chapter or Chapter 40C-40, F.A.C., an applicant must provide reasonable assurance that the construction, alteration, operation, maintenance, removal or abandonment of a surface water management system….Will not adversely impact the value of functions provided to fish and wildlife and listed species by wetlands and other surface waters." *Rule 40C-4.301(1)(d), F.A.C.*

"If such an activity significantly degrades or is located within an Outstanding Florida Water, that the regulated activity will be clearly in the public interest." *Rule 40C-4.302(1), F.A.C.*

Secondary Impacts

"An applicant shall provide reasonable assurance that the secondary impacts from construction, alteration, and intended or reasonably expected uses of a proposed system will not

cause violations of water quality standards or adverse impacts to the functions of wetlands or other surface waters, as described in subsection 4.2.2. Impacts such as boat traffic generated by a proposed dock, boat ramp or dry dock facility, which causes an increased threat of collision with manatees..." *Chapter 4.2.7.(a) Basis of Review for Environmental Resource Permit Applications South Florida Water Management District, August 2000.*

Cumulative Impacts

"The department and the governing board shall take into account cumulative impacts on water resources and manage those resources in a manner to ensure their sustainability." *Section 373.016(2), F.S.*

"The governing board or the department, in deciding whether to grant or deny a permit for an activity regulated under this part shall consider the cumulative impacts upon surface water and wetlands…" *Section 373.414(8)(2), F.S.*

"The cumulative impact evaluation is conducted using an assumption that reasonably expected future applications with like impacts will be sought, thus necessitating equitable distribution of acceptable impacts among future applications." *Chapter 4.2.8. Basis of Review for Environmental Resource Permit Applications South Florida Water Management District, August 2000.*

"Cumulative impacts are considered unacceptable when the proposed system, considered in conjunction with the past, present, and future activities…would then result in…significant adverse impacts to functions of wetlands or other surface waters…within the same drainage basin when considering the basin as a whole." *Chapter 4.2.8.1 Basis of Review for Environmental Resource Permit Applications South Florida Water Management District, August 2000.*

Reasonable Assurance

"...an applicant must provide reasonable assurances that a regulated activity will not impact the values of wetland and other surface water functions so as to cause adverse impacts to: (a) the abundance…of fish, wildlife and listed species; and (b) the habitat of fish, wildlife and listed species. *Chapter 4.2.2. Basis of Review for Environmental Resource Permit Applications South Florida Water Management District, August 2000.*

Practicable Modifications

"…The term "modification" shall not be construed as including the alternative of not implementing the system in some form, nor shall it be construed as requiring a project that is significantly different in type or function. A proposed modification which is not technically capable of being done, is not economically viable, or which adversely affects public safety through the endangerment of lives or property is not considered "practicable." A proposed modification need not remove all economic value of the property in order to be considered not "practicable." Conversely, a modification need not provide the highest and best use of the property to be "practicable." In determining whether a proposed modification is practicable, consideration shall also be given to the cost of the modification compared to the environmental

benefit it achieves." *Chapter 4.2.1.1 Basis of Review for Environmental Resource Permit Applications South Florida Water Management District, August 2000.*

Sovereign Submerged Lands

Statutes and rules that govern sovereign submerged lands also consider impacts to threatened and endangered species (Section 53,F.S.). Rules also govern water-ependent activities, as discussed below.

Water Dependent Activities

"Activities on sovereignty lands shall be limited to water dependent activities only unless the board determines that it is in the public interest to allow an exception as determined by a case by case evaluation. Public projects which are primarily intended to provide access to and use of the waterfront may be permitted to contain minor uses which are not water dependent if:

1. Located in areas along seawalls or other nonnatural shorelines;

2. Located outside of aquatic preserves or class II waters; and

3. The non-water dependent uses are incidental to the basic purpose of the project, and constitute only minor nearshore encroachments on sovereign lands." *Section 18-21.004(1)(f), F.A.C.*

Commonly Asked Questions for Permit Reviews

The following represent a list of commonly asked questions during the FWC review of permit applications. Because all projects are unique, it is difficult to anticipate which questions will be asked for any given project, but the following list provides an indication of what applicants should expect for typical projects. The requested information is needed for FWC to develop final recommendations for the permitting agencies.

- Please provide a full description of the project including drawings, site plans, and a clear map of the project location. This information was not included in the application we received.

- Please provide bathymetry information for the project site, including all mooring areas, turning basins and ingress/egress pathways.

- Are there pipes and/or culverts (existing or proposed) that are submerged or partially submerged, accessible to manatees during any tidal phase, and larger than eight inches in diameter but smaller than eight feet in diameter at the site?

- Please provide the number of existing wet and dry slips, if any. Is there an existing boat ramp at the project site? Are there any structures that are currently used for launching vessels at the site?

- What is the number of linear feet of shoreline owned or controlled by the applicant at this project location?

- Is new shoreline being created that will allow for boating facilities (docks, ramps, lifts, dry storage or exempt docks)?

- Is submerged aquatic vegetation (SAV) located in the project vicinity, and will it be impacted by the proposal? If SAV is expected to be impacted, please provide a recent survey conducted between May and October for all mooring areas, turning basins and ingress/egress pathways.

- Is the project located on sovereign submerged lands? Will approval by the Board of Trustees be required?

- Will there be any intensive or temporary mooring uses such as visitor slips, time-sharing condominiums, restaurants, hotels, water taxis, rental boats, tour boats or cruise boats?

- Is blasting proposed as a method of demolition/dredging? If so, please provide information regarding the use of explosives and how potential impacts to fish and wildlife resources, and their habitats, will be offset.

APPENDIX XI

BACKGROUND INFORMATION FOR MANDATORY BOATER EDUCATION

Summary of Issue

Current Florida law found in Section 327.395, Florida Statutes, requires persons 21 years of age and younger to carry proof of completion of a boating safety course when operating boats with 10 horsepower motors or more. Since its enactment in 1996, the number of operators within the affected age group who were involved in reportable boating accidents has declined from greater than 21% in 1995 to 14% in both 2004 and 2005.

Unfortunately, Florida's fatal boating accidents have been claiming increasing numbers of lives each year. Both the U.S. Coast Guard and other states have released information or reports that show a correlation between increased boating safety education, especially among older operator age groups, and lower accident and fatality rates.

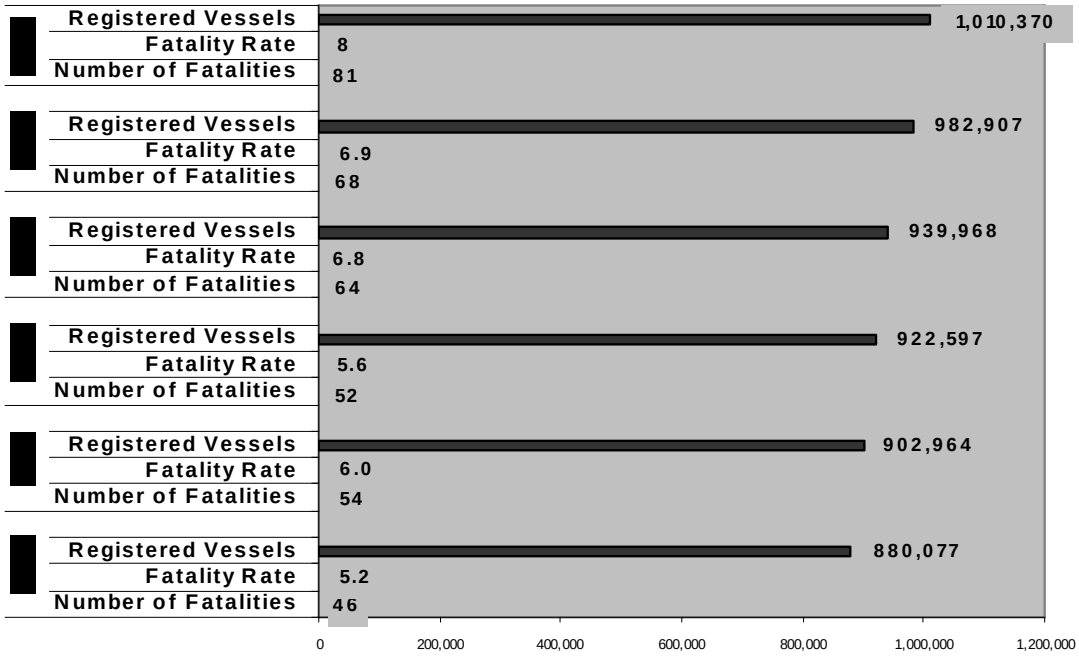
During their April 2006 meeting, Florida's Boating Advisory Council (BAC) was presented facts about Florida's boating fatality statistics, reports on boater education effectiveness, and the need to reverse the boating fatality trend in our state. With a goal of reducing boating accidents, injuries, and fatalities while improving basic boating knowledge among Florida's boating population, the BAC voted to recommend that the FWC pursue legislation to require boating safety education for all boat operators using a quick phase-in method.

This proposal is a result of the BAC recommendation and informal discussions of the issue with appropriate stakeholders. As presented, by the year 2018, this legislation will require boat operators of all ages to take a boating safety course and obtain proof of course completion in order to operate a boat with 10 horsepower or more. The initial affected group would be operators 25 and under in 2008 and would increase in five-year increments annually through 2018.

Florida's Current Boating Safety Situation

One benchmark upon which boating safety efforts are measured, both at the national and state level, is the annual number of recreational boating fatalities. Boating fatalities reported in Florida during 2005 were at the highest number in the previous 10-year period (81 fatalities). Although most other states have been experiencing declining fatality numbers for the past several years, Florida's fatality trend continues to rise. Florida's boating fatality trends are depicted in the following graph:

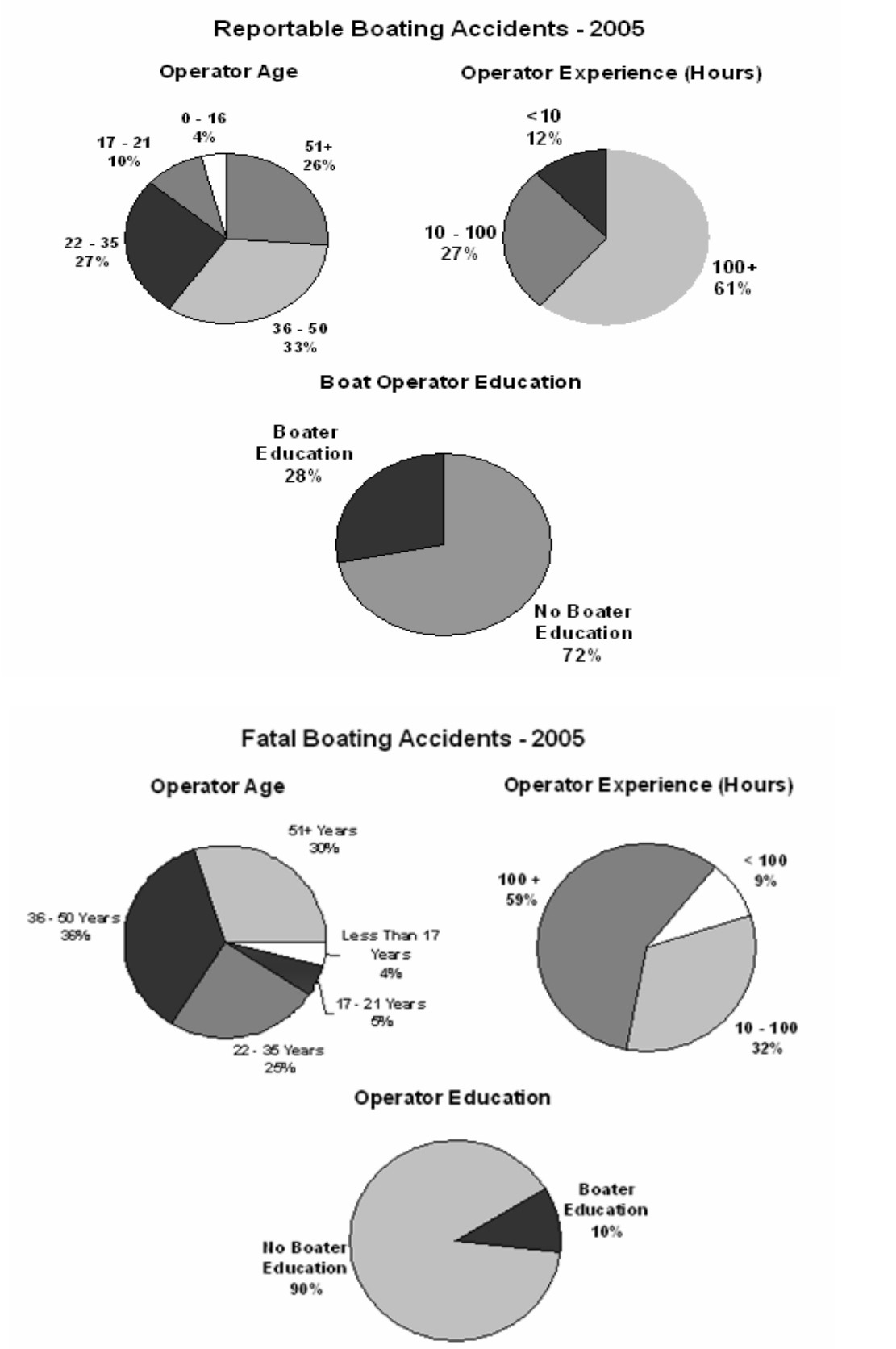
Table 37. 2000 to 2005 Florida boating fatalities.



It is apparent that boating fatalities in Florida are rising at a rate much greater than the rate of growth of registered boats. In fact, fatalities rose 76.1% between 2000 and 2005, while the boat registration increase during this period was 14.8%.

The people involved in boating accidents and fatalities are not primarily young, inexperienced boat operators. Boat operators involved in boating accidents are most often older adults (36 years of age and older), have more than 100 hours of boat operation experience, and have no formal boating safety education. This fact is even more evident in Florida's boating accidents involving at least one fatality. The statistics show that simply having more hours of boating "experience" does not equate to reduced risk of having an accident.

The graphs on the following page depict ages, experience levels, and formal boating safety education for operators involved in both boating accidents in general and those resulting in at least one fatality during 2005.


Reportable Boating Accidents - 2005
Operator Age
0 - 16 4%
17 - 21 10%
51+ 26%
22 - 35 27%
36 - 50 33%
Operator Experience (Hours)
<10 12%
10 - 100 27%
100+ 61%
Boat Operator Education
Boater Education 28%
No Boater Education 72%
Fatal Boating Accidents - 2005
Operator Age
51+ Years 30%
36 - 50 Years 36%
Less Than 17 Years 4%
17 - 21 Years 5%
22 - 35 Years 25%
Operator Experience (Hours)
100 + 59%
< 100 9%
10 - 100 32%
Operator Education
Boater Education 10%
No Boater Education 90%

Boater Opinions

Several surveys of recreational boaters have indicated consistent support for requiring all boat operators to be educated. Supporting survey data is as follows:

1998 Florida Boater Safety and Education Review. This survey was conducted by the Survey Research Laboratory of Florida State University under contract with the Florida Department of Environmental Protection's Division of Law Enforcement. There were 1,057 eligible respondents representing a cross-section of Florida's registered boat owner population who participated in the survey (41% response rate). When asked to identify how important boating safety education was to them, 95.4% of the respondents indicated that it was important to them.

2002 National Recreational Boating Survey. This survey was conducted by the Strategic Research Group under contract with the U.S. Coast Guard's Office of Boating Safety. This national survey sampled boat owners around the nation, including over 500 individuals from Florida. Of the responding boat owners, 73.8% said that people who operate boats should be required to pass a test to demonstrate their knowledge of boating laws.

2005-06 Florida Boating Safety Awareness Campaign Surveys. Surveys were conducted to solicit registered boat owners in Broward, Lee, Miami-Dade, and Monroe counties to respond via the Internet to a series of questions as part of ongoing boating safety awareness campaigns. Over 680 responses were received. Although these surveys were not intended to address public opinion on boating safety education issues, one open-ended question offered respondents a forum through which they could identify any changes they would most like to see regarding boating regulations in their area. This was not a multiple choice question, but respondents were required to generate an answer and type it in. In the Lee County survey, 203 responses were received to this question. The leading desired change dealt with speed zones (52%). The second leading desired change was a requirement for boating safety education for boat operators (21%). In the Broward, Miami-Dade, and Monroe survey, boating safety education and increased law enforcement tied for the most desired changes (24% each). In another question, respondents to both surveys identified inadequate boating safety education as one of the leading safety issues that concern them while boating (from 30.5% to 37%).

2006 Florida Recreational Boating Survey. The FWC's Boating and Waterways Section is currently finalizing a survey document that will be sent to a random sampling of registered boat owners throughout Florida. Boat owner attitudes about boater education, among other topics, will be available when the survey results have been tabulated. The data is anticipated to be complete in late August.

Florida's Manatee Forum. During a recent meeting, this group of stakeholders representing boating and environmental interests voted to support boating safety education. Boating courses approved in Florida are required to contain components relating to protection of our resources such as seagrass beds and manatees. These courses teach boaters to avoid shallow seagrass areas and to properly respond when they inadvertently venture into these sensitive areas.

Additionally, attendees are taught to recognize indications of manatees in an area and the need to subsequently slow down.

Education Effectiveness

Boating safety education requirements vary considerably around the nation. The following provides an overview of boating safety education requirements for the states and territories:

- All ages by a certain date—six states/territories (AL, CT, OR, WA, DC, and NJ)
- All ages PWC only—two states (ID and NY)
- Born-after date (all different dates)—18 states/territories (AR, DE, KS, LA, MD, MS, MO, NV, NH, NM, PA, OH, TN, VT, WV, WI, USVI, PR)
- PWC children education (all different ages)—seven states (IA, MN, NC, RI, UT, VA, MA)
- Education of children (all different ages)—13 states (CO, FL, GA, IL, IN, KY, MI, MT, NE, ND, OK, SC, TX)
- No education requirement—10 states/territories (NMI, GU, AS, SD, WY, ME, HI, AK, AZ, CA)

Florida's current boater education law places a requirement for education on those persons 21 years of age and younger. Since its enactment in 1996, the number of operators within the affected age group involved in reportable boating accidents has gradually declined from greater than 21% in 1995 to 14% in both 2004 and 2005. While this decrease provides some evidence of the effectiveness of boating safety education, 86% of Florida's boating accidents reported in 2005 involved operators who were 22 and older. Over half (59%) were 36 and older (our critical target audience). The limited "reach" of our current law is unlikely to extend basic boating safety education to a broad segment of our target audience, especially those who remain exempted while under 22 and those who begin operating a boat when 22 or older.

Based on recent research published by the U.S. Coast Guard in a draft report titled "*A Comparative Analysis of Recreational Boating Policies: Quick Phase-In Education vs. Other Educational Policies*," states with requirements for all boat operators, regardless of age, to be properly educated over a short period of time have experienced significant and sustained reductions in boating fatalities. Two states with a quick phase-in of education for all boaters (Alabama and Connecticut) were contrasted with their bordering states and the rest of the nation.

The research established that states which have elected to implement a quick phase-in education requirement have shown a greater improvement in their fatal accident rate (number of fatal accidents per 100,000 registered vessels) when compared to the rest of the United States. The research further predicts states which implement quick phase-in requirements could first expect normal fluctuations in the fatal accident rate. After the quick phase-in period, the fatal accident rate would decline for a few years before leveling off at a value that is approximately

25% lower. Based on Florida's 2005 fatal accident data, this may translate into as many as 20 lives saved annually.

Requests for Change to Current Law

The FWC has observed a continuing trend relating to public demand for increased requirements for boater education and/or operator licensing requirements for many years. Staff frequently responds to public email and telephone inquiries about Florida's lack of education/licensing requirements for the entire boating population. Although boat operator licensing and boater education are often used synonymously by the public, this issue being brought for consideration only addresses the need for improved boating safety education.

During their April 2006 meeting in Tallahassee, Florida's Boating Advisory Council (BAC) formally recommended the FWC pursue legislation requiring boat operators of all ages to take an education course through a three- to five-year phase-in process. Member Kitty Higgins, National Transportation Safety Board (NTSB), presented the NTSB's listing of boater education as one of its "Most Wanted Transportation Safety Improvements for 2006." Further evidence was presented to the Council showing that quick phase-in of boater education for all boat operators in other states has resulted in significant and sustained decreases in boating deaths. The Council passed a recommendation for a boating safety education requirement for all boat operators to be phased-in within three to five years, starting with the oldest age-groups and working down.

The FWC recommendation places great value on the Council's desire to see a quick phase-in of boating safety education for Florida's boat operators. A review of a similar boater education requirement currently in effect in Oregon, coupled with informal discussions with various stakeholders having significant boating interests in Florida, led to a proposal that upholds the spirit of the Council's recommendation while blending in issues brought forth by stakeholders.

The FWC recommends a somewhat slower phase-in period in an order of increasing age. Based on stakeholder comments and a combination of both fiduciary and staffing issues, a phase-in period encompassing five-year increasing age increments appears to be a more viable alternative to the 10-year decreasing age increments (or more) proposed by the Council. This would lead to boating safety education reaching all boat operators within eleven years, as indicated in the following chart:

Year	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
Age	≤ 25	≤ 30	≤ 35	≤ 40	≤ 45	≤ 50	≤ 55	≤ 60	≤ 65	≤ 70	71 +

FWC Fiscal Impact

The annual number of Florida Boater Education Identification Cards issued is anticipated to rise dramatically with the passage of this legislation. It costs FWC approximately $1.20 to purchase and process each ID card (including equipment, cards, supplies, and OPS salaries) at the current rate of 20,000 cards issued each year.

Florida currently has approximately 1,000,000 registered boats, the vast majority of which are owned by a person over 21 years of age. Previous surveys of boat owners indicate that the average recreational boat in Florida is operated by approximately 2.5 people, which leads one to conclude that there may be up to 2,500,000 individual boat operators for the registered boat fleet. It is estimated that up to 10% of vessel operators have already taken a qualifying boating safety course, which leaves an estimated 2,250,000 boat operators who would need to take a course or equivalency exam and obtain a Florida Boating Safety Education Identification Card should this legislation become law.

If phase-in were to occur over the proposed 11-year period, an average of approximately 205,000 additional ID cards would be issued annually. After that point, the number of cards issued is anticipated to drop dramatically. This would result in an estimated additional expense to the FWC of $246,000 per year for the 11-year phase-in period for the processing and distribution of Boating Safety Education Identification Cards. There is a provision in the current law for the FWC to charge up to $2 for each card, and it is anticipated that the FWC would take advantage of this provision to defer any additional costs related to this effort.

In addition to the processing and distribution of the identification cards, there would be additional costs associated with an anticipated large demand for the home-study boating safety course books. As an estimate, if 75% of those taking an approved course each year choose to take the home-study course, the FWC would incur an estimated additional cost of $92,000 for the course books. The 75% figure is purely an estimate, and the actual number may vary greatly due to other course offering options via the Internet and classroom.

APPENDIX XII

REVIEW OF SELECTED LITERATURE ON THE ECONOMIC IMPACTS OF MANATEE CONSERVATION

The following is a literature review of five economic studies that attempted to address some aspects of the economics of manatee conservation. The staff economist for FWC reviewed the selected studies and provided an overview of the purpose of each study, the results, and possible shortcomings or limitations. As the most recent of these economic studies was completed in 2002, some caution should be used in generalizing from their findings.

1. Bendel and Bell, "An Estimation of the Total Willingness to Pay by Floridians to Protect the Endangered West Indian Manatee through Donations." 1995. (Dollar values in this study are for 1993.)

The authors of this study attempt to answer the question, "How much is the public willing to pay to cover all the costs associated with protecting the manatee?" While this valuation may serve as a proxy for the manatee's resource value, it clearly underestimates the manatee's value, but does convey to policy-makers the importance Floridians place on the animal's protection and preservation.

The authors employed a contingent valuation (stated preference) methodology and administered a two-stage random-digit dial cluster sample telephone survey to 952 eligible adult full-time residents of Florida between November 1992 and April 1993 with a response rate of 61%. As a result of their finding, Bendel and Bell recommend that efforts to protect the West Indian manatee population be estimated at a minimum of $2.6 billion (asset value in 1993 dollars).

This protection value should not be confused with the value of the manatee, since it represents a revenue flow rather than a consumer surplus measure (Bendel and Bell). Additionally, the asset value placed upon the protection of the manatee in this study does not reflect the tourist sector value placed upon the protection of the resource as related to use or non-use by tourists.

This study uses dollar values from more than 10 years ago, and the values assessed were underestimated because the study omits the tourist sector.

2. Bell, Frederick W., "An Economic Analysis of the Impact of Current and Projected Development Patterns on the Natural Resources of Collier and Lee Counties, Florida." 2002.

This study assesses the economic "use" value of natural resources in Collier and Lee counties, Florida. (Option value, existence value, and bequest value were not measured.)

The primary purpose of the study was to determine the role of natural resources in facilitating economic growth in Collier County and Lee County, Florida. It addresses the level of environmental quality as measured by the comprehensiveness of state environmental regulations, the extent of state regulations that protect habitats and wildlife, state *per capita*

expenditures for environmental quality, and the scope of state power plant siting regulations and associated environmental impact assessments.

To embrace a conservative estimate, Bell restricts his estimate to use-value for the Florida manatee, provides an estimate of $12.60 per household, and further restricts his valuation to Collier and Lee counties. Using the $12.60 per household (non-market value per household) and a discount rate of 3% in 1999 provides the following results:

COUNTY	**HOUSEHOLDS**	**ANNUAL USE-VALUE**	**CAPITALIZED VALUE**
Collier	89,380	$1.13 million	$37.5 million
Lee	173,944	$2.19 million	$73.1 million
TOTAL	**263,324**	**$3.32 million**	**$110.6 million**

In 1999, Florida had 6,045,271 households, meaning that the use-value was a little more than $76 million for that year. Because the manatee is a renewable resource, such a value is likely to flow into perpetuity. Thus, the capitalized use-value of the population of manatees is more than $1.5 billion, based upon Florida's resident human population. However, it should be noted that visitors were not included in the valuation and they may place a greater use-value on manatees than do Florida residents (Bell, p. 28).

The study is limited because it uses dollar values from 1999 and focuses only on Collier and Lee counties. Additionally, the valuation was limited to use-value and visitors were not included in that valuation. Option value, existence value, and bequest value, in addition to use-value, are essential components for a comprehensive benefits review.

3. Fishkind and Associates. "Economic Impacts of the Manatee Sanctuary Act." 1993.

This study has four basic functions:

- Review the types of economic impacts of the Manatee Sanctuary Act.
- Calculate the total costs and benefits resulting from the Manatee Sanctuary Act.
- Compare the results of the calculations and estimate the level of net economic impact.
- Identify any mitigating measures, if needed.

Brevard, Volusia, Duval, and Seminole counties are the focus of this economic analysis, which measures the net effect of the Manatee Sanctuary Act on economic activity. The term "net" is emphasized since almost every event affecting economic conditions has both positive and negative impacts. An evaluation of this law's economic impact would require a review of both costs and benefits and, thus, a complete economic impact study to compare a relative measure of benefits with a measure of costs.

The Fishkind study estimates that the creation of speed and access regulations under the Manatee Sanctuary Act will result in a loss of approximately 71 jobs in Volusia County and 792 permanent jobs in Florida. Combining the total direct and indirect output and wages with the cost of the public value of boating, the value of the total estimated cost is approximately $8.7 million in Volusia and more than $100 million for the state of Florida (p. 19).

The estimates for output, employment, and wages resulting from the protection of the manatee population are based solely on the premise that some level of tourism employment will be maintained. These estimates do not indicate that output, employment, and wages will increase by a stated amount, only that they will be preserved.

The Fishkind study estimates that the value placed on the protection of manatees for the four-county area is an average of $30 per adult person. Thus, the benefit of the public value of manatee protection is estimated at $9 million in Volusia County and $37 million for the entire state. The total estimated benefits are just over $341 million for Florida (p. 20).

Based on the costs and benefits for the entire state, Fishkind and Associates have estimated that the imposition of speed limit regulations has a net positive benefit of more than $240 million annually. This net benefit is primarily driven by the public value of preserving the manatee. The sum of employment lost in all of the counties with speed limit regulations is estimated at 792 jobs. From the estimate of economic impact, it is reasonable to conclude that speed limit measures for the preservation of manatees provide greater benefits than costs on a statewide basis (p. 20).

The study was produced in 1993 and benefits are predicated on the types of manatee protection in place at that time, rather than the current regulatory conditions. The Fishkind study is not clear about the types or the extent of manatee protection that the authors considered. The study does not clearly state if protection refers simply to the establishment of speed zones or whether implementation and enforcement efforts are included. The study does not state whether residents are reporting a willingness to pay for manatee protection for a specific region or for the entire manatee population in Florida. The dynamics of an increasing and changing population may well warrant updating this work.

4. Thomas, Michael and Nick Stratis. Compensating Variation for Recreational Policy: A Random Utility Approach to Boating in Florida. 1995. *Marine Resource Economics*, Volume 17, 2002.

The authors apply a random utility model to measure the effects of the manatee speed zones in Lee County, Florida.

Some recreational boaters and marine industry groups have criticized these speed limits on the grounds that they bring about longer, more costly boat trips. Speed limits, they say, preclude activities like water skiing, making recreational boating a less enjoyable activity. These criticisms are sometimes accompanied by predictions of fewer trips and reduced demand for boats and related services, such as those provided by marinas.

From a regulatory position, agencies may find estimates of potential costs and benefits useful when attempting to better understand the economic implications of management actions.

This study assesses the changes of distribution in recreational boating activity caused by the imposition of speed zones. While the Florida manatee speed zone program addresses all forms of recreational boating activity, this study required a more focused perspective. The model focuses on recreational boating, as distinct from recreational fishing trips made by boat.

The model assumes that boaters start their recreational experience when they leave the launch point in their boats. Unlike anglers, who would likely consider travel from the launch point to the preferred fishing site as an expense, the recreational boater is assumed to consider the entire boating trip as part of the purchased recreational service. Additionally, unlike a participation model that assumes the first choice is one of boating participation, the model assumes that individuals have already made the participation decision and now face choices between potential substitute experiences offered by different launch point site combinations.

The model estimates the probability of selecting launch points and destinations, before and after the imposition of speed zones, using data from survey respondents who identified themselves as general boaters.

Thomas and Stratis estimate a compensating variation of $8.03 for boaters. This figure represents the minimum dollar value amount per trip necessary to compensate a boater for reducing the number of choices of boating areas from 37 to 19. It may also be interpreted as the amount that a boater must receive to compensate for the quality change introduced by the imposition of the speed zone. To calculate the total annual loss for the typical boater, one must know the average number of trips taken annually by boaters. The survey revealed boaters took an average of 52.8 trips in 1996, producing an annual estimated loss of $423.94 per boater. The model demonstrates some redistribution of recreational boating trips. Based on the survey results, the most popular launch points in the absence of the speed zones are the Pine Island Sound locations, San Carlos Bay, the upper Caloosahatchee River, and the Gulf of Mexico. With the zones in place, all the Pine Island destinations and North and South Estero Bay lose some share of total trips. North Matlacha Pass, San Carlos Bay, and both upper and lower reaches of the Caloosahatchee River gain shares. The model-predicted relocation of sites and redistribution of boating effort is consistent with the proposed location of the speed zones, indicating the result of the cost imposed upon boaters.

The initial research is from a 1995 study; however, it produces an estimate of the costs of the speed zones in Lee County and its results provide regulatory officials with an indication of the costs of the rule to boaters that may still be useful.

5. Statement of Estimated Regulatory Costs. Proposed Amendments to 68C-22.006, F.A.C.; Brevard County Manatee Protection Rule. FWC 2002.

As part of the rule development process to amend the Brevard County manatee protection rule, §68C-22.006, F.A.C., the FWC collected and analyzed data to assess the economic issues related to the proposed rule amendments.

Everyone operating a boat in the areas to be regulated by the rule would be required to comply with it and thus potentially could be affected. Information was collected from boat

owners, marinas, water-related businesses in Brevard County, commercial fishermen, professional guides, boat charter companies, and real estate agents.

From the information collected, a computer model was developed to help predict changes in boat traffic that could occur if the speed zones were adopted. From this data, the computer model predicted changes based on the proposed amendments to the rule.

As a result of historical data (which showed no evidence of significant negative economic impacts following the promulgation of rules in other counties), an evaluation of all survey data, model predictions, and public comments, FWC concluded that the amendments to the Brevard County manatee protection rule would not have significant economic impact on area boaters, boating-related businesses, or the overall economy of Brevard County.

While some individual businesses nearest the more restrictive zones may be affected, and some redistribution of trips is possible, there is no clear indication that boating activity would decline significantly.