IV. ENVIRONMENTAL CONSEQUENCES

A. Resources Not Addressed in Detail

1. Other Fish and Wildlife Resources

The Service considered other fish and wildlife resources, and concluded that the Alternative 1 will have no effect and Alternative 3 will have a minimal effect on these resources. Overall, watercraft access and watercraft operation in Florida's waters will likely have a positive, yet unquantified, effect on avifauna, other mammals, fish, and associated coastal habitats because of conservation measures, mitigating measures, monitoring and reporting, and means of effecting the least practicable adverse impact associated with a LOA. Thus, these resources will not be addressed in detail in this EIS.

2. Archeological, Historic, and Cultural Resources

There are no known archeological, historic, or cultural resources that would be affected by any action.

3. Air Quality

There are no known significant air quality issues that would be affected by any action.

4. Water Quality

There are no known significant water quality effects resulting from any action. While the action may affect the operation of watercraft, it does not propose to regulate the number of watercraft utilizing Florida's waters. Thus, these effects will not be addressed in detail in this EIS.

B. Alternatives Analysis

1. Assumptions

The alternatives analysis in this Chapter is predicated on several assumptions:

1) the best available science is used to evaluate all the alternatives equally;

2) best professional judgment is used where scientific information is lacking;

3) the alternatives analysis projects into the future for a period of five years (2003 to 2008), the specified period of the regulation, over the specified area of each alternative analyzed;

4) the negligible impact standard to meet the MMPA requirements is met if there is reasonable certainty that the authorized level of incidental take will not significantly increase the time needed for a stock to reach OSP (USFWS, see Appendix I);

5) the direct does and indirect effects analysis is limited to watercraft related incidental take, and will not include other human or natural causes of manatee mortality (*e.g.*, water control structures, red tide, cold stress, and the like), and it is assumed that these causes of mortality will remain at current rates;

6) based on the best available information, in the absence of additional manatee conservation efforts (*e.g.*, speed zones, manatee education, etc.) watercraft related incidental take throughout the State will continue to increase at a rate approximating 7.2 percent per year (USFWS 2000);

7) the analysis of watercraft related harassment to manatees (non-lethal effects) will apply equally to all alternatives as a measure of manatee mortality (*i.e.*, measuring mortality will provide a reasonable measure of the level of harm and harassment for the purposes of rulemaking, and a reduction in mortality will correlate to a reduction in manatee harm and harassment); and

8) the conservation of manatee habitat will be treated equally between manatee stocks, based on the relative amount of habitat affected, and taking into account the particular environmental conditions of a given specified area. Further, other factors (*e.g.*, food) is not known to be limited.

2. Socioeconomic Analysis Considerations

In order to understand the costs and benefits of this MMPA incidental take regulation, an economic analysis has been performed. Economic impact analysis involves the comparison of expected costs of each alternative against a "baseline," which typically reflects the regulatory requirements in existence prior to the rulemaking. The baseline being considered in this analysis assumes that the Service takes no additional regulatory actions to protect the manatee. In fact, manatee conservation efforts are already in existence, and currently impose costs on the regulated community. For example, permitting of watercraft access facilities is currently being affected due to consultations under section 7 of the ESA and the Settlement Agreement related to the SMC litigation. These restrictions are part of the baseline conditions that would exist with or without the incidental take rulemaking.

This economic analysis focuses on those activities potentially affected by the proposed alternatives, and thus those activities likely to result in incremental economic impacts. In order to measure the incremental impact of each alternative, the analysis considers the existing economic impacts of manatee conservation efforts for activities that would change under any of the alternatives. For example, because one of the alternatives may change the level of administrative requirements related to manatee conservation, the analysis considers the existing costs related to meeting these requirements. Conversely, the analysis does not consider the existing economic impacts for

activities having costs that are not expected to change under any of the alternatives. For example, the costs of activities related to regulating boater behavior on the water, including vessel registration, are not quantified.

The economic analysis compares the expected economic impacts under each alternative to the economic impacts occurring under existing conditions (baseline) to determine the incremental costs and benefits attributable to each alternative. An alternative that does not result in any changes from baseline economic conditions has an incremental economic impact of zero. Similarly, alternatives that require additional efforts (*e.g.*, additional administrative requirements) have incremental economic impacts.

This chapter discusses alternatives that, from an administrative perspective, represent the range of management alternatives. That is, this chapter summarizes the results for the economic analyses of Alternative 1 (No Action Alternative) and Alternative 3 (A Finding of Negligible Impact for the NW and USJ Stocks, and the Atlantic Stock with Mitigating Measures). Alternatives with less regulatory burden or impacts than Alternative 3 are not presented in this chapter. Appendix M presents the detailed economic analyses.

The baseline condition results in a reduction in land/house values, watercraft related development, and recreational uses, etc. in the SW Stock. If watercraft related incidental take is not reduced, and the SW Stock continues a projected decline in numbers of manatees, these socioeconomic conditions could continue into the foreseeable future, constituting a long-term commitment of resources. Additionally, there would continue to be liability/legal issues surrounding the continued unauthorized incidental, unintentional take of manatees in the SW Stock. Neither alternative considered in detail (1 and 3, but none of the alternatives within the book ends, either) mitigates these baseline economic reductions in the SW Stock.

C. Analysis of Effects

1. Alternative 1 (No Action) - No Incidental Take Authorized for the Florida Manatee in All Four Stocks

a. Impacts to Manatees

It is reasonable to expect, based on trends in manatee mortality carcass recovery data from 1992 to 2002, that watercraft related manatee mortality will continue to increase at 6.0 percent per year in the NW and USJ stocks, and at 9.5 percent per year in the Atlantic and SW stocks under the No Action Alternative, or averaging a rate of approximately 7.2 percent per year (USFWS 2000). Vessel registration in Florida is also expected to increase within the next five years, placing more boats in manatee-inhabited waters. As Florida's human population increases (Florida is projected to have the third largest human population in the U.S. by 2030), increased human/manatee interactions are expected to occur. This will adversely affect the health of manatees at the individual and population levels, through sublethal and lethal events. All of the life history parameters of manatees, including movement and foraging patterns, reproduction, and social interactions, will be affected. The frequency and magnitude of boat-manatee interactions, such as boat strikes and separation of calves from their mothers, are projected to increase with boat density.

In order to compare the effects of the alternatives on the Florida manatee population, the Service examined, by stock: historic manatee adult survival, historic and projected annual population rates, the probability of reaching OSP within 50 and 100 years, the probability of a greater than 10 percent increase in the time to reach OSP, the historic observed annual watercraft related mortality, and the levels of incidental take that resulted in a 95 probability that the time to achieve OSP would not be increased by more than 10 percent (**Table 6**).

Under historic conditions, we now know that the NW and USJ stocks are growing at a rate of 3.7 and 6.2 percent, respectively, while the Atlantic stock is growing at a rate of 1.0 percent and the SW stock is declining at a rate of 1.1 percent. For future conditions, the NW and USJ stocks are projected to grow at rates of 1.4 and 3.8 percent per year, respectively. The Atlantic and SW stock growth rates are projected to decrease, -6.8 percent and -14.9 percent, respectively. The differences between the historic and projected results are due to the projected trends in watercraft related mortality and changes in carrying capacity during the five-year period.

In the Proposed Rule, the Service presented a demographic Benchmark Methodology for assessing whether incidental take was negligible. This methodology qualitatively defined as a negligible impact standard a 95 percent probability that the time to achieve OSP would not increase by more than 10 percent as the negligible impact standard. We believed that, if the demographic benchmark was met, Florida manatees would be at or approaching OSP. Under the No Action Alternative, the Service anticipated positive growth in the USJ and NW stocks; however, using the Benchmark Methodology, projected watercraft related mortality (see Appendix I) exceeds the negligible impact standard in all four stocks. The rationale for our Benchmark Methodology was described in the Draft EIS:

> In reviewing existing guidance and previous rule-makings, we note that participants at the 1994 Potential Biological Removal (PBR) Workshop (Barlow *et al.* 1995) agreed that the term "insignificant" in the Zero Mortality Rate Goal for commercial fisheries (as stated in section 101(a)(2) of the MMPA) was relative to the biological significance of the incidental take. They further agreed that an "insignificant" level of mortality was a level that would have a "negligible" impact on a given marine mammal stock. In terms of stocks that are depleted (*i.e.*, population levels below OSP), it is generally accepted that the large majority of annual net productivity must be reserved for the recovery of the stock to its OSP level, and that only a small portion should be allocated for incidental take, so that human-related take does not significantly increase the time needed to reach OSP. Therefore, based on our interpretation of the MMPA, its implementing regulations, previous incidental take rulemakings, and the Service's current understanding of manatee population dynamics, the Service concluded that in order to determine that the allowable level of human-related incidental take would have a "negligible impact" we must be reasonably certain that the take would not significantly increase the time needed to achieve OSP.

Table 6. Calculated Manatee Survival and Growth Rates with 95 Percent Confidence Intervals, Projected Watercraft Related Mortality for the Four Manatee Stocks in Florida, Probability of Increase in Time to Achieve OSP, Probability to Achieve OSP (50 and 100 Years), Percent of Net Productivity Taken by Watercraft, and Projected Benchmark Methodology Negligible Impact Levels, by Stock (Langtimm *et al.* in review; Runge *et al.,* in review; USFWS 2001; Appendix I).

Parameter	NW	USJ	Atlantic	SW
Historic Adult Survival (1990-1999)	**95.6%** (94.3% to 96.9%)	**96.0%** (93.7% to 98.2%)	**93.6%** (92.3% to 94.9%)	**90.6%** (86.7% to 94.4%)
Historic Annual Population Growth Rate (1990-1999)	**3.7%** (1.6% to 5.6%)	**6.2%** (3.7% to 8.1%)	**1.0%** (-1.2% to 2.9%)	**-1.1%** (-5.4% to 2.4%)
Projected Annual Population Growth Rate (No Action)	**1.4%** (-1.8% to 3.8%)	**3.8%** (1.0% to 6.2%)	**-6.8%** (-9.4% to -4.5%)	**-14.9%** (-19.2% to -11.4%)
Probability that OSP will be met in 50 years at various levels of take	Take/yr p 0 99% 1 98% 2 96% 3 94%	Take/yr p 0 86% 1 87% 2 88% 3 89%	Take/yr p 0 23% 1 22% 2 23% 5 19%	Take/yr p 0 25% 1 24% 2 22% 5 19%
Probability that OSP will be met in 100 years at various levels of take	Take/yr p 0 99% 1 99% 2 99% 3 98%	Take/yr p 0 88% 1 90% 2 91% 3 92%	Take/yr p 0 59% 1 60% 2 60% 5 57%	Take/yr p 0 63% 1 62% 2 63% 5 58%
Probability that time to OSP not increased >10% under No Action relative to no take	62%	10%	100%	100%
Percent of Net Productivity Taken By Watercraft	21.9%	20.1%	72.5%	169%
Five Year Projected Watercraft Related Mortality	19	12	185	186
Five Year Projected Negligible Impact Level Benchmark Methodology (95% threshold)	<5	<5	<5	0

As stated previously, the negligible impact standard is that there is reasonable certainty that the authorized level of incidental take would not significantly increase the time needed to reach OSP. Determining the OSP level for a species or stock requires an understanding of the carrying capacity of the environment for that species or stock and the maximum net productivity level. These values are currently unknown for the Florida manatee; therefore, we can not directly assess the status of the population relative to OSP, or estimate the amount of time it may take for the population to reach OSP. Additionally, our regulations do not require a formal determination of OSP in order to make a negligible impact finding. Rather, one need only establish that the total take would not "significantly reduce the increase of that population" and would not prevent ultimate achievement of OSP (54 FR 40341).

> The Recovery Plan (USFWS 2001) developed quantifiable demographic benchmarks for determining when recovery has been achieved for purposes of the ESA. The demographic benchmarks were based on published estimates of survival, reproduction, and population growth rate. These benchmarks are:
>
> (1) statistical confidence (95 percent) that the average annual rate of adult manatee survival is 90 percent or greater;
>
> (2) statistical confidence that the average annual percentage of adult female manatees accompanied by first or second year calves in winter is 40 percent or greater; and
>
> (3) statistical confidence that the average annual rate of population growth is equal to or greater than zero.
>
> The Recovery Plan states that these benchmarks must be based on estimates from at least a 20-year data set. Twenty years was thought to encompass approximately two manatee generations, which was deemed to be a sufficient data set to ensure that estimated benchmark rates were reflective of genuine population trends as opposed to short-term fluctuations.
>
> Adult survival is the most influential factor determining manatee population dynamics (Eberhardt and O'Shea 1995, Marmontel *et al.* 1997, Langtimm *et al.* 1998). A 1 percent increase in adult survival rate results in a 1 percent increase in growth rate; no other life-history parameter has this strong an effect (Eberhardt and O'Shea 1995). While manatee population growth is less sensitive to changes in reproductive rates than adult survival rates (Eberhardt and O'Shea 1995, Marmontel *et al.* 1997), annual variation in reproductive rates might be greater than annual variation in survival rates, and may reflect demographic pressures not captured by survival rate, so the Manatee Population Status Working Group concluded that reproductive rates are another useful indicator of manatee population status. The population growth rate benchmark was selected to ensure the manatee population

> continues to increase toward OSP, regardless of any uncertainty regarding the relationship between the other two benchmarks and the overall population trend.

In summary, new data and additional analysis indicates uncertainty, resulting in the need for further evaluation. Observed watercraft mortality may prevent the NW and USJ stocks reaching OSP, however, the source of mortality is increasing the time to achieve OSP by more than 10 percent with a 95 percent probability. The Atlantic Stock is unlikely to achieve OSP under current management strategies.

b. Impacts to Manatee Habitat

In the State of Florida, there are an estimated 3.73 million acres of open water habitat in coastal and interior areas, of which an estimated 1.1 million acres are designated manatee critical habitat (FMRI and USFWS GIS data). There are also an estimated 2.25 million acres of seagrass habitat in the State, of which over 173,000 acres have been damaged by watercraft propeller "scarring." Almost 57,000 acres of known manatee aggregation habitat (85 percent located in the Atlantic and SW stocks) exists in the State. These are significant resources. The restoration, maintenance, and protection of the biological, chemical, and physical integrity of these aquatic ecosystems are essential for a healthy and stable Florida manatee population.

Under the No Action Alternative, the Service predicts that the long-term direct and indirect impacts to manatee habitat will become increasingly worse. Causal agents such as increased point and nonpoint source water pollution (with associated manatee health issues, turbidity related decreases in forage and forage quality, and potential competition or displacement of optimal forage by pollution-tolerant vegetation), and others. Degradation of manatee foraging habitat and aggregation areas at increasing magnitudes is predicted. It is also reasonable to assume that disruption of migratory movements resulting in the fragmentation and isolation of groups of manatees will result with increased watercraft use.

Under the No Action alternative, incidental take of manatees would not be authorized and no additional habitat protection associated with mitigating measures would be required. Statewide habitat protection efforts will continue to take place through separate conservation measures by the agencies (*e.g.*, additional speed zones, additional manatee protection areas, habitat restoration, and other conservation measures on a site-specific basis).

c. Socioeconomic Impacts

As no incidental take would be authorized under the No Action Alternative, this alternative would impose no incremental economic impacts. Under the No Action Alternative, the Service and other agencies would continue their existing activities related to manatee conservation efforts. The coordination of Corps permitting and Service review under Section 7 of the ESA, and related socioeconomic impacts, are expected to continue unchanged. The background leading to our finding that there is no incremental economic impact associated with the No Action Alternative is available in Appendix M.

2. Alternative 3 (Northwest, Upper St. Johns River, and Atlantic stocks)

    a. Impacts to Manatees

Finding that there is a negligible impact for these stocks requires anticipating that mitigating measures beyond those currently being implemented by Federal, State and local agencies will be developed and implemented. In the Atlantic Stock, mitigating measures would have to reverse the projected negative growth rate, representing a 97 percent reduction in the current level of watercraft related incidental take (see **Table 7** below).

Table 7. Comparison of the PBR, FEG and Benchmark Methodologies Showing the Percent Reduction of Five Year Projected Total Watercraft Related Manatee Mortality Needed in Order to Reach Negligible Impact.

Methodology (5-year projection)	USJ Stock	NW Stock	Atlantic Stock	SW Stock
PBR Methodology	75%	63%	85%	85%
FEG Methodology	58%	74%	97%	No Take
Benchmark Methodology	58%	74%	97%	No Take

The Service has identified five categories of mitigating measures that government agencies can implement to reduce and control watercraft related incidental take. These categories include:

(a) establishment of speed zones and protected areas to control watercraft speeds and/or restrict access to areas of importance to manatees;

(b) law enforcement to ensure compliance with restrictions established pursuant to the previously mentioned category;

(c) review of proposals to construct watercraft access facilities with a view toward minimizing the effects of such facilities on manatees and manatee habitat;

(d) education to improve public understanding of manatee conservation needs and enhance compliance with manatee protection measures; and

(e) other measures that are available or may become available over the period of this rule.

Specific conservation or mitigating measures were identified in comments received from the public, but most suggestions fell within the basic categories identified above.

The direct effects of this alternative on manatee demographics is highly dependent on what really happens to boat related lethal and sublethal mortality numbers under LOAs (for example, see Appendix I, page 26):

> In the NW Stock, if this authorization succeeded in decreasing incidental take by 74 percent, it [the alternative] would have several positive effects: the growth rate over the next 20 years would increase, less of the net productivity would be allocated to incidental take, and the probability of increasing the time to reach OSP would decrease. However, the fraction of excess growth may still be high.
>
> In the USJ Stock, authorization of incidental take would have a negative effect, if it meant that take would increase over current levels. Implementation of mitigating measures would need to reduce projected watercraft related manatee mortality by 58 percent. If current regulation and enforcement of boat traffic, however, were held steady, it seems more likely that such authorization would be no different than the no action scenario. Note again, however, that the fraction of excess growth removed by incidental take (20.1 percent) is predicted to be high, as is the probability of a significant increase in the time to reach OSP.

The predicted effects of Alternative 3 on the Atlantic Stock are similarly dependent on the assumption that required mitigating measures are effective. While insufficient time has elapsed to evaluate their effectiveness, manatee protection measures recently implemented by the FWC and the Service may benefit the Atlantic Stock by maintaining the historic rates of incidental take in the Atlantic Stock from rising above currently observed levels. In order for the mitigating measures to be effective, a reduction of 97 percent of the projected five year watercraft related mortality would be required. This is particularly true for the newly enacted speed zones in Brevard County, which has historically been the area in the Atlantic Stock with the highest levels of watercraft related mortality. The speed zones recently enacted by FWC in Indian River County should mitigate another identified minor problem area in the Atlantic Stock.

Enhanced management capability could be realized if LOA holders monitoring and reporting conservation measures allow managers to react to successes and failures in a timely, accurate, and precise manner. Required mitigating measures would also need to effectively reverse projected growth rates and reduce watercraft related manatee mortality levels to negligible levels.

The Service projects, over a five-year period, that 15 percent of the Florida manatee population (NW and USJ stocks) will continue to grow at about 1.4 percent in the NW and 3.8 percent in the USJ stocks, although readers should be aware of the values at the low end of the 95 percent confidence intervals for these projections. The projected growth rate for 43 percent of the manatee population (Atlantic Stock) is negative, although the historic values are marginally positive. Implementation of Alternative 3 does not address and never proposed watercraft related incidental take of manatees in the decreasing SW Stock, which includes over 42 percent of all Florida manatees. Thus, the Service projects that population growth in this stock will continue to decline over the five-year specified period.

Vessel registration in Florida is also expected to increase within the next five years, placing more boats in manatee-inhabited waters. This should lead to increased human/manatee interactions, although in areas where manatee numbers are decreasing, any density-dependent effects of boat/manatee interactions may actually decrease. Increased numbers of watercraft should lead to continued altered year-round manatee movement and foraging patterns, calving, and other life history factors in the Atlantic and SW stocks.

In summary, the adverse impacts to manatees from Alternative 3 would be similar to the No Action Alternative, unless mitigating measures and LOAs do not significantly change projected trends.

Table 8. Summary of Effects on Manatees of Alternative 3 Compared to the No Action Alternative (adapted from Table 2, USFWS 2000).

	Alternative 1 (No Action)	Alternative 3 (NW, USJ, and Atlantic)
Percent of Statewide Population Subject to Authorized Incidental Take	None	58%
Growth Rate, by Stock	Projected NW: 1.4% (-1.8% to 3.8%) USJ: 3.8% (1.0% to 6.2%) Atlantic: -6.8% (-9.4% to -4.5%)	Projected (Historic + Mitigating Measures) NW: 3.7% (1.6% to 5.6%) USJ: 6.2% (3.7% to 8.1%) Atlantic: 1% (-1.2% to 2.9%)
Authorized Incidental Take	None	Take Authorized, mitigating measures already in place remain, and additional measures may be required
Required Monitoring and Reporting	None	May be required

b. Impacts to Manatee Habitat

The most obvious and significant threats to manatee habitat in the three stocks are 1) boat related degradation, such as propeller "scarring" of seagrass beds, turbidity, and point and nonpoint pollution and 2) anticipated decreases in warm water refuge carrying capacity through groundwater diversions and power plant shutdowns. However, the current evaluation considers only those habitat related impacts casually linked to watercraft related incidental take.

This alternative provides regulatory incentives for the implementation of mitigating measures that could avoid, minimize, or otherwise offset the impacts to manatee habitat described under the No Action Alternative. In the regions used by just two of the stocks identified in this alternative (NW and USJ), 968,000 acres of manatee open water habitat, including 622,560 acres of seagrass and 4,810 acres of manatee aggregation habitat, are protected. This includes 67,300 acres of manatee designated critical habitat. Alternative 3 would continue these extensive manatee habitat protection efforts in concert with other conservation efforts by the Federal, State, and local agencies.

Alternative 3 provides regulatory incentives for additional efforts, such as those addressing threats to water quality and quantity, and to seagrasses.

The disposal of possibly infectious waste from pets or humans associated with watercraft and watercraft access could be mitigated through waste control requirements. Hydrocarbon releases, including oil and other fuel, could be reduced through refueling or engine requirements. Sanctuaries and enforcement could limit damage to seagrass beds and changes in water quality detrimental to manatees.

Manatee habitat could receive habitat-related benefits with the implementation of Alternative 3, and manatee aggregation habitat and movement corridors could be monitored and reported in a timeframe that allows meaningful management responses.

c. Socioeconomic Impacts

Under Alternative 3, the Service could authorize incidental take of manatees in the NW, USJ and Atlantic stocks. Some or all of these stocks would require mitigating measures in order for the Service to be able to authorize incidental take. In addition, the Service would not authorize incidental take in the SW Stock, because of the decline in this stock.

This Alternative would have several types of incremental impacts.

- In the NW, USJ, and Atlantic stocks, the incremental impacts associated with this alternative would result from increased administrative activities associated with issuing LOAs.

- In one or more stock, the incremental impacts associated with this alternative would result from increased administrative activities associated with issuing LOAs, and increased permit concurrence in the Atlantic Stock. Under baseline conditions, the Service would be unable to concur with some watercraft access facility permit applications in one or more stocks. Due to the implementation of the mitigating measures expected under this alternative, the Service would be able to concur with some multi-slip permits for which it was otherwise unable to concur in the Atlantic Stock. As a result, some incremental, local and possibly regional economic benefits would be expected under this alternative.

- In the SW Stock, as no incidental take would be authorized, this alternative would impose no incremental impacts in the SW Stock. Under this alternative, the Service and other agencies would continue their existing activities related to manatee conservation efforts in this stock.

Specifically, Alternative 3 would result in the following types of incremental economic impacts.

- *Administrative Costs*: This category represents costs associated with agency administration efforts related to the LOAs process and associated mitigating measures.

- *Consumer Surplus Benefit*:[1] Based on a change in the Service's ability to recommend approval of permits under Alternative 3, the analysis considers economic activity associated with increased recreational boating opportunities that would result from increased access to the water.

- *Regional Economic Impact*:[2] Because this alternative would allow for the construction of additional marine access facilities, the analysis estimates secondary effects on the Florida economy that would result from increased expenditures in the marine industry. First, an increase in marine access points is likely to result in an increase in recreational boating activity. This increase in boating activity is likely to lead to increased demand for marine retail sales, such as boats, clothing, general marine merchandise, and other related goods and services. Second, lifting restrictions on the authorization and construction of such facilities as marinas and boat ramps is likely to result in additional demand for marine construction services.

The incremental economic impacts under Alternative 3 are summarized below. A detailed analysis of this alternative is presented in Appendix M.

Administrative Costs

- **Agency Administrative Efforts**. Under Alternative 3, some minimal incremental costs are expected to result from the administrative activities related to LOA application, review, and reporting requirements, and mitigating measures. The Service would experience somewhat higher costs, because they would be in charge of LOA issuance and annual review. While not quantified, these incremental administrative costs would be minimal.

Consumer Surplus Benefits

Under this alternative, the Service may be able to authorize additional construction of watercraft access facilities, such as marinas and boat ramps, beyond the levels currently permitted. This is expected to result in the following surplus benefits:

- **Marina Users**: Due to additional permit approvals, new marina construction is expected to result in additional watercraft facility access to meet projected demand.

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[1]Surplus is generally a measure of overall economic welfare and is conceptually based on the principle that some consumers benefit at current prices because they are able to purchase goods and services at a prices that is less than their total willingness to pay for the good. For example, boaters may incur consumer surplus benefits when boat ramps are less congested because their enjoyment of the boating experience increases.

[2]Regional economic impact estimates are independent from surplus estimates and cannot be added to obtain a single value.

This would result in an economic benefit of approximately $600,000 to $700,000 over the five-year period of the rule. This benefit would reduce negative surplus effects in the baseline by 12 percent.

- **Boat Ramp Users**: Due to an increased approval rate for permits for boat ramp construction, some boaters would incur surplus benefits associated with additional access. This benefit may range from zero to approximately $17.6 million over the five-year period. This benefit would reduce negative surplus effects in the baseline by up to 31 percent.

Total consumer surplus benefits for both marina users and boat ramp users under Alternative 3 would be approximately $0.6 to $18.3 million over the five-year period of the rule. Alternative 3 would reduce negative surplus effects in the baseline by 12 to 30 percent.

Regional Economic Impacts

This alternative would also be likely to affect income and employment in various sectors of the marine industry and marine construction industry. Impacts to these sectors would, in turn, result in indirect effects on the broader economy.

- **Marine Goods & Services.** Additional authorization and construction of watercraft access facilities would lead to an increase in recreational boating activity, which would increase the demand for goods and services related to marine recreation. In year five of the rule, we estimate that this would lead to an economic benefit ranging from $0.4 to $10.6 million in the sales of marine related goods and services, and that this initial change in expenditures would lead to a positive regional economic impact ranging from $0.7 to $16.7 million. This positive regional economic impact would reduce negative baseline impacts by 15 to 35 percent in year five of the rule.

- **Marine Construction Industry.** An increase in the authorization and construction of watercraft access facilities would also lead to an increase in the revenues of the marine construction industry. We estimate that there would be a positive initial annual impact of $0.14 million on this sector, and a total positive regional economic impact of $0.25 million each year. This positive regional economic impact would reduce negative baseline regional impacts by 4 percent each year. The annual impact for this category is expected to be constant over the five-year period of the rule, thus annual impacts also represent year-five impacts.

Thus, Alternative 3 would lead to a positive regional economic impact of between $0.7 million and $16.7 million due to an increase in the revenues of the marine recreation industry and $0.3 million due to an increase in the revenue of the marine construction industry, for a total positive regional

economic impact of between $1 million and $17 million in year five of the rule.[3] Overall, the positive regional economic impact expected under Alternative 3 would reduce negative baseline regional impacts by 8 to 31 percent. Table 9 summarizes economic impacts of Alternative 3.

Additional breakdown of the economic impacts under this alternative is provided in Appendix L, which provides a year-by-year summary of nominal impacts by category and stock for the five-year period of the rule.

Table 9. Summary of Economic Impacts Under Alternative 3 (millions of 2001 dollars)

	NW	USJ	Atlantic	SW	Total
Administrative Costs[a]	Minimal incremental administrative costs associated with the issuance of LOA and mitigating measures. These costs have not been quantified, but are in addition to the baseline administrative costs totaling about $52 over the five-year period.				
Consumer Surplus Benefits *(Present Value Total)*					
Marina Users	$0	$0	$0.6 - $0.7	$0	$0.6 - $0.7
Boat Ramp Users	$0	$0	$0 - $17.6	$0	$0 - $17.6
Subtotal	**$0**	**$0**	**$0.6 - $18.3**	**$0**	**$0.6 - $18.3**
Positive Regional Economic Impacts[b] *(Year-Five Totals)*					
Marine Goods & Services	$0	$0	$0.7 - $16.7	$0	$0.7 - $16.7
Marine Construction	$0	$0	$0.3	$0	$0.3
Subtotal	**$0**	**$0**	**$1.0 - $17.0**	**$0**	**$1.0 - $17.0**

[a] Sufficient data does not exist to allow administrative costs to be reported by region.
[b] Regional economic impact estimates are independent from surplus estimates and cannot be added to obtain a single value.

D. Summary of Alternatives Analysis

Summary of Data

As Florida's human population increases, increased human/manatee interactions are projected to occur. This will adversely affect the health of manatees at the individual and population levels, through sublethal and lethal events. All life history parameters of manatees are affected. The frequency and magnitude of boat-manatee interactions are projected to increase with increasing boat density.

[3]Regional economic impact estimates are independent from surplus estimates and cannot be added to obtain a single value.

In order to compare the effects of the alternatives on the Florida manatee population, the Service examined, by stock: historic manatee adult survival, historic and projected annual population growth rates, the probability of reaching OSP (population benchmarks) within 50 and 100 years, the probability of greater than a 10 percent increase in the time to reach OSP, and the historic observed annual watercraft related mortality.

Table 6 and **Table 7** summarizes and compares manatee survival and growth rates. Under historic conditions, new data (see Appendix I) support the conclusion that the NW and USJ stocks grew (1990 to 1999) at a rate of 3.7 and 6.2 percent, respectively, while the Atlantic Stock grew (1990 to 1999) at a rate of 1.0 percent and the SW Stock declined (1990 to 1999) at a rate of 1.1 percent. For future conditions, the NW and USJ stocks are projected to grow at rates of 1.4 and 3.8 percent per year, respectively. The Atlantic and SW stock growth rates are projected to decrease, -6.8 percent and -14.9 percent, respectively. As described in Appendix I, the differences between the historic and projected results are due to the projected trends in watercraft related mortality and changes in carrying capacity during the five-year period. New data and additional analysis indicates uncertainty, resulting in the need for further evaluation. Observed watercraft mortality may prevent the NW and USJ stocks reaching OSP, however, the source of mortality is increasing the time to achieve OSP by more than 10 percent with a 95 percent probability. The Atlantic Stock is unlikely to achieve OSP under current management strategies. Further three negligible impact methodologies were assessed in all four stocks of manatees (see **Table 2,** Chapter II). This table presents the results of a comparison of observed watercraft mortality/year and the number of manatees which meet the three negligible thresholds for a five year period.

1. Additional Effects of the Proposed Action

    a. Unavoidable Adverse Effects

Alternative 1 - (No Action)

The most significant ecological unavoidable adverse effects associated with the No Action Alternative is the projected decline in growth rates in the Atlantic (-6.8 percent per year) and SW (-14.9 percent per year) stocks. These two stocks represent over 85 percent of the entire Florida manatee population. This decline in growth, if unchecked, could lead to an eventual decline in the manatee population over most of its current range in Florida. This represents an unavoidable adverse effect of the No Action Alternative. At the same time, efforts to conserve manatees continue (*e.g.,* manatee speed zones, refuges and sanctuaries, public outreach, and increased enforcement), as described in detail in Chapter III.

The Service is moving forward with the establishment of the Working Group On Watercraft Related Incident Take (WGWIT). This body, comprised of all effected parties, will become the consensus-building forum for reducing watercraft related incidental take of Florida manatees.

In addition, the Service is commited to continue to work with the State on the mediation process of all parties that have a stake in the ongoing conservation and future recovery of the manatee. This is an effort to build consensus on initiating efforts to protect the manatee and the economy of

Florida. Several meetings have been held; however, the group has identified several actions that have may not allow all parties to come together in a consensus.

Alternative 3 - (Northwest, Upper St. Johns River, and Atlantic stocks)

The most significant ecological unavoidable adverse effects associated with Alternative 3 is the negative finding for the SW Stock. The growth rate in the SW Stock is projected to decline by 14.9 percent per year. This stock represents approximately 42 percent of the entire Florida manatee population. Based on this negative finding, the Service cannot authorize the incidental take of manatees under the MMPA in this 12-county area. The Service will continue to work with other government agencies and affected parties in an effort to reduce watercraft related incidental in the SW Stock.

b. Mitigating Measures

The designation of any new manatee sanctuaries associated with authorizing incidental take would result in some waterbodies becoming no-entry areas, thus excluding the public from these areas. Establishment of any new manatee refuges would result in reduced speeds with the potential for seasonal and year-round restrictions. The increased enforcement of speed zones may result in the issuance of fines to boaters exceeding established speeds.

The mitigating measures will also likely affect local land-use decision making for the siting of watercraft access facilities. The intent of mitigating measures is to integrate the facility siting measures contained in any rule into county MPPs. Thus, close coordination between county MPPs and the incidental take mitigating measures will be required. Facility siting measures will be designed to minimize adverse effects on the development of properties with water access, and will not affect properties with no water access.

c. Cumulative Effects on Manatees

Cumulative effects are defined as "the impact on the environment which results from the incremental impact if the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such actions" (40 CFR 1508.7). Such actions can result over a period of time and are often difficult to predict.

In this EIS, the Service has taken a hard look at the first five-year increment of the planning period. This can limit the analysis of cumulative effects. Regarding "reasonably foreseeable future actions," the cumulative effects analysis addresses the same impact categories as covered for direct and indirect impacts in Chapter IV: impacts to manatees, impacts to manatee habitat, and socioeconomic impacts. In parts of the FEIS, several analyses address long time periods, such as calculations for the probability of reaching OSP in 50 and 100 years in **Table 6**. For Alternative 3, incidental take authorization may require the current conservation measures to stay in place and additional mitigating measures in NW, USJ, and Atlantic. Other parts of the EIS provide details of ongoing management actions by Federal, State, and local agencies, that would likely continue beyond the planning period. These are important components of this cumulative impact assessment (refer to Chapter III).

We have discussed in detail major benefits and threats to the manatee in the EIS (Chapter III), as a result of Federal, State, local and private actions. Due to the incremental period (2003-2008) of this proposal, and the amount of data available from other Federal, State, and local agencies to assess the three impact categories, we believe that the analyses of direct and indirect impacts in Chapter IV covers to a large degree the functional analysis of a cumulative impact assessment, including the consideration of reasonably foreseeable future actions. Additionally, a number of potential impacts have been addressed in Chapter III, that essentially have been integrated seamlessly in Chapter IV as part of the 5-year incremental assessment. These other cumulatively-related impacts include: (1) threats due to the longevity of freshwater refugia; (2) threats to natural springs; (3) threats to seagrass; (4) designation of critical habitat, designation of manatee protection areas; (5) Federal and State wildlife refuge management; (6) Corps, USCG, and State of Florida water permit program activities; (7) Federal and State law enforcement; (8) local activities including the development of County MPPs; (9) habitat management; and (10) design and operation of water control structures. Refer to Chapter III, where these actions are described in detail. In future long-term Proposed Rulemaking, these factors will continue to be assessed with regard to cumulative effects

No Action Alternative

Vessel registration in Florida is expected to increase within the next five years, thus placing more boats in manatee-inhabited waters. From the analyses contained in this Final EIS, it is clear that a correlation exists between the number of boats and watercraft related manatee mortality. It is also clear that how boats operate on Florida's waters correlates to manatee watercraft related mortality. As Florida's human population increases, increased human/manatee interactions are expected to occur. As a result of increased numbers of watercraft, it is anticipated that an increase in mortality, injury and harassment will alter year-round manatee movement and foraging patterns, calving, and other life history parameters, unless ongoing manatee protection efforts, primarily by the Service, FWC, and local governments in Florida are able to stabilize and begin to reduce the current rate of increase (7.2 percent annual rate of increase Statewide) in the incidental, unintentional take of manatees due to government programs that regulate watercraft access and watercraft operation in Florida's waters. Therefore, the combination of the number of watercraft and how these watercraft operate will affect Florida's manatee population into the future.

Ongoing manatee conservation efforts, under the No Action Alternative or Alternative 3, will also significantly affect the long-term health and sustainability of Florida manatees. For example, numerous manatee protection measures are currently in place in all stocks and must remain in place, and additional mitigating measures must be implemented under Alternative 3. Speed zones and/or restricted access areas have been established in Duval, Volusia, Brevard, Indian River, St. Lucie, Martin, Palm Beach, Broward, and Miami-Dade counties in the Atlantic Stock. Also, the FWC has recently enacted new speed zones in Brevard and Indian River counties, and MPP have been approved by the FWC for Miami-Dade, Duval, Indian River and St. Lucie counties in the Atlantic Stock. Other MPP's are in the development stages (*e.g.*, Lee County). Whether additional MPP's will be approved during the next five years is uncertain.

The Service implemented Federal manatee protection areas at two sites in Brevard County, and established 13 additional manatee protection areas in Florida to further recovery of the Florida manatee and reduce watercraft related incidental take in November 2002. These ares are currently being posted. The Service has designated manatee protection areas in Brevard, Charlotte, Citrus, De Soto, Hillsborough, Lee, Pinellas, and Sarasota counties. Four of the sites are manatee sanctuaries (Blue Waters, Bartow Electric Generating Plant, Tampa Electric Company Big Bend, and Port Sutton), where all waterborne activities are prohibited throughout all or part of the year, with exceptions for adjoining property owners. The remaining nine sites are manatee refuges (Tampa Electric Big Bend, Port Sutton, Pansy Bayou, Little Sarasota Bay, Lemon Bay, Peace River, Shell Island, Haulover Canal, and Cocoa Beach), in which certain waterborne activities are prohibited or regulated for all or some portion of the year. The previously proposed and emergency-designated South Gandy Navigation Channel Manatee Refuge in Pinellas County has been withdrawn.

In addition to the areas already designated, the Service will be publishing a Proposed Rule to designate three areas in five Florida counties as Federal manatee protection areas. The Service agreed to submit to the Federal Register, by March 31, 2003, a Proposed Rule for the designation of additional manatee protection areas in the Caloosahatchee River, the St. Johns River, and the Halifax River/Tomoka River. The three locations proposed as refuges are located in Lee, Volusia, Duval, St. Johns and Clay counties. The Service also agreed to forward its final decision on these sites to the Federal Register by July 31, 2003.

The establishment of the WGWIT, as proposed, will focus available resources on further reducing watercraft related incidental take of Florida manatees. This working group of stakeholders will review the mitigating measures and recommend improvements in those measures. The cumulative effects of actions recommended by WGWIT should further reduce the incidental take of manatees due to watercraft collisions in all stocks of the Florida manatee.

Additionally, watercraft operator education and awareness are essential to achieving greater compliance within and understanding/recognition of manatee protection areas, as well as the general public's understanding of manatee conservation issues. Many manatee and habitat education programs and materials are produced and made available to school systems as well as the general public and user groups; however, such efforts need to be continually evaluated and updated. This information must be clear, consistent, concise, and readily available to the general public and target user groups. As such, Federal and State agencies should cooperatively develop uniform multi-media educational programs/curricula for the general public and schools, and ensure that these materials are provided to all watercraft operators utilizing Florida waters.

The success of manatee/habitat conservation efforts requires identification of target audiences and locations. At the local level, another important effort that will have cumulative positive effects on manatee conservation is the siting and construction of watercraft access facilities directed through local zoning, in the form of facility siting components of county MPPs, or through Federal and State permitting processes (see additional detailed discussion in Chapter III).

Development of MPPs is mandated by the Florida Manatee Sanctuary Act (Chapter 370.12, F.S.). Watercraft access facility siting plans, as components of comprehensive county MPPs, are excellent

tools for guiding long-term watercraft access facility development and anticipating and addressing the cumulative impacts of such facilities. By anticipating and planning for the future access needs at the countywide level, the cumulative effects on manatees and manatee habitat can be anticipated, minimized, and mitigated. It is the Service's view that this forward-looking approach is preferable to the more reactive approach or dealing with the effects of such facilities on a case-by-case basis. Under the Florida Manatee Sanctuary Act, 13 counties are mandated to develop MPPs by July 1, 2004. The FWC is to designate any other county wherein there exists a substantial risk to manatees by January 1, 2005, and those counties are to develop MPPs by July 1, 2006, within the five-year specified period (2003-2008) targeted in this EIS.

The cumulative effects of future actions on manatee habitat has also been factored into the Service's analysis of the effects of the alternatives. In the State of Florida, there is an estimated 3.73 million acres of open water habitat in coastal and interior areas, of which an estimated 1.1 million acres are designated manatee critical habitat (FMRI and Service GIS data). There are also an estimated 2.25 million acres of seagrass habitat in the State, of which over 173,000 acres have been damaged by watercraft prop scarring. Almost 57,000 acres of known manatee aggregation habitat (85 percent located in the Atlantic and SW stocks) exists in the State. These are significant Statewide resources essential for a healthy and stable Florida manatee population.

As discussed in Chapter III, one of the greatest threats to the continued existence of the Florida manatee is the stability and longevity of warm water refuges. Historically, the subtropical manatee relied on the warm temperate waters of south Florida and on natural warm water springs scattered throughout their range as buffers to the lethal effects of cold winter temperatures. The natural northern winter distribution limit for manatees was roughly the Caloosahatchee River on the Gulf coast and the St. Sebastian River on the Atlantic coast. With the advent of industrial plants and their associated warm-water discharges, manatees have expanded their winter range to include these sites as refuges from the cold. Today, the artificial warm water distribution limit is now Tampa Bay and Brevard County, with some manatees found at warm water sites as far north as southern Georgia.

Prior to the use of industrial, once-through cooling systems associated with the production of electricity and paper production in the 1940's and 1950's, Florida manatees relied upon natural, warm water springs and temperate, warm waters in south Florida as buffers against the cold. In the face of human disturbance at these natural sites, manatee use patterns were altered and industrial sites became a part of their wintering strategies. Today, a little less than two-thirds of the manatee population winters at industrial warm water sites.

In the past, Florida's landscape included innumerable springs that discharged warm water from the Florida aquifer and other sub surface sources of water. Human expansion into Florida, including early aboriginal colonization and European settlement, targeted these springs as sources of drinking water and food. Significant, initial manatee disturbance at the springs was probably related to manatee hunting. Other early human activities in the vicinity of the springs included fishing and boating and the use of wells within spring recharge areas.

Subsequent activities in the springs and respective recharge areas further altered these sites. Dams and boat facilities were built in the springs, spring runs, and adjoining waterbodies and industrial and

consumptive use of aquifer waters reduced flows. The introduction of pollutants (such as pesticides, herbicides, and human and animal waste) into the aquifer and spring waters eliminated and/or altered the make-up of aquatic communities within these areas. As a result, many springs dried up, others were made inaccessible to manatees, and important winter foraging sites disappeared. Continued use of aquifer waters, in the face of an increasing human population in Florida, continues to threaten the availability and suitability of spring waters to manatees.

Today, manatees use Blue Spring, De Leon Springs, Silver Glen Spring, Salt Springs, and other spring areas in the Upper St. Johns River. On Florida's northwest coast, manatees primarily winter in the Kings Bay spring complex in Crystal River, at Homosassa Spring, in Manatee Springs, Fanning Springs, Weeki Wachee Spring, and at other lesser springs. Springs in southwest Florida include Sulphur Spring in Tampa Bay and Warm Mineral Springs in Charlotte Harbor. There are currently no known spring areas in southeast Florida used by manatees.

Due to continued adverse cumulative effects, the State, through its water management district offices, is setting minimum flow and level (MFL) standards for waterbodies throughout the State. These waterbodies include springs, including sites used by manatees. The SJRWMD is currently preparing an MFL for Blue Spring (the MFL is based on manatee use of the spring run); this is the only site used by manatees where an MFL is being prepared. Other significant wintering sites are not being addressed, although the water management district offices have been encouraged to prioritize these areas.

The Service and its Habitat Working Group recovery partners are involved in MFL working groups, are reviewing spring management plans, and are revising the habitat criteria described in the Recovery Plan.

Finally, technological advances in manatee conservation such as propeller guards have been used in limited circumstances to reduce the threat of manatee death or injury. Other technologies have been discussed or proposed; however, none have yet been demonstrated to be effective or practical. The FWC has recently funded additional research into various types of technological measures to reduce watercraft related take of manatees, and any such measures that are demonstrated by this research to be effective and practicable to implement during the next five years will be considered along with the mitigating measures described above. This would occur through future review and renewal of agency LOAs under any rule.

Essentially, the cumulative effects information has been factored into the analysis of direct and indirect effect in this chapter.

Cumulative Affects of Alternative 1 - No Action

Cumulatively, Alternative 1 - No Action is expected to have mixed effects on the Florida manatee population. A determination and supporting documentation would increase the public's knowledge and awareness of the manatee ecology, threats to the manatee, and the need to continue ongoing conservation measures and focus on additional manatee conservation measures that reduce the current level of watercraft related incidental take. The Service finds that the ongoing manatee

conservation efforts described above, as well as future conservation measures, can reduce levels of incidental take in all stocks of the Florida manatee.

Cumulative Affects of Alternative 3- NW, USJ and Atlantic Stock

Cumulatively, Alternative 3 is expected to have mixed effects on the sustainability of the majority (an estimated 58 percent) of the Florida manatee population in the NW, USJ and Atlantic stocks over the five-year specified period of a rule. The rule would increase the public's knowledge and awareness of the manatee ecology, threats to the manatee, and the need to focus on additional manatee conservation measures that reduce the current level of watercraft related incidental take. Implementation of mitigating measures in areas of inadequate protection is expected to decrease manatee watercraft related mortality and result in an increase in adult survival. Without the implementation of mitigating measures as would be possible under the Alternative 3, watercraft related incidental take of manatees is expected to increase steadily.

The Service finds that the ongoing manatee conservation efforts described above, coupled with the significant mitigating measures that may be implemented before incidental take can be authorized, potentially could reduce levels of incidental take. The potential benefits of Alternative 3 are similarly dependent on the assumption that required mitigating measures are effective. Additionally, the implementation of mitigating measures, coupled with the monitoring and reporting required in LOAs, will assist in tracking population trends in the Atlantic, NW and USJ stocks, in order to make timely management decisions and needed adjustments in the future.

Enhanced management capability would result from this alternative where LOA holders would be required to monitor and report on an annual basis. This would enhance manager's ability to recognize and respond to successes or failures brought about by conservation measures.

Under this alternative, watercraft related incidental take of manatees in the SW Stock is expected to increase annually, based on a rate throughout the State of approximately 72 percent per year. Thus, the Service anticipates that population growth in this stock may continue to decline (at a rate of -14.9 percent per year) if no additional mitigating measures are implemented, and the SW Stock will decrease in size over the five-year specified period.

Southwest Stock

The discussion of cumulative effects under the "no action" alternative also applies to the SW Stock under this alternative.

The SW Stock continues to decline. The average annual number of manatee mortalities attributed to watercraft during the past five years (1997 to 2002) was 34.2, compared to 19.0 for the previous five-year period (1992 to 1996), and the number of manatees killed by watercraft increased at a rate of 7.3 percent per year between 1976 and 2002, which is a likely cause of the stable to declining population trend. Further, given the susceptibility of this stock to naturally occurring mortality events such as red tide and Saharan sand wind-driven events, it is possible that this Stock is less capable than other stocks of sustaining itself in the face of high levels of human-related take.

Numerous manatee protection measures are currently in place within the SW Stock. Speed zones and/or restricted access areas have been established in portions of Hillsborough, Pinellas, Manatee, Sarasota, Charlotte, Lee, and Collier counties. The Service recently enacted Federal manatee protection areas at sites in Hillsborough, Pinellas, Sarasota, Charlotte, Desoto, and Lee counties, and the FWC has recently enacted new speed zones in Hillsborough, Manatee, Sarasota, Charlotte, and Desoto counties. A MPP has been approved by the FWC for Collier County. A MPP has been drafted for Lee County and is currently under review. The Service believes that manatee protection measures recently implemented by the FWC and the Service for the SW Stock will help to begin to reduce the rate of increase in the number of watercraft related mortalities.

In considering where additional mitigating measures need to be implemented, the Service has examined mortality trends within this stock in an attempt to focus conservation measures in those areas with continuing histories of high levels of watercraft-related incidental take. The analysis conducted by Flamm (2002) identified one primary manatee mortality concentration area within the SW Stock (*i.e.,* the Charlotte, Lee, Collier County area). Additionally, review of mortality statistics indicate that the number of manatees killed by watercraft in the greater Tampa Bay area (Hillsborough, Pinellas, Manatee, and Sarasota counties) has increased rapidly in recent years. For the period between 1992 and 1996 an average of 4.6 manatees were killed by watercraft in the greater Tampa Bay area each year, whereas an average of 9.2 manatees per year were killed by watercraft between 1997 and 2002. The Service believes that in order to reduce incidental take to a level that would have a negligible impact on the manatee, conservation measures must be focused in these areas of the SW Stock.

Within the greater Tampa Bay area, substantial efforts have been made to improve manatee protection by local governments, and recently by the FWC and us; however, large areas of these bays that are of importance to manatees remain unprotected. The Service understands that the FWC will begin to prepare a rulemaking proposal for Tampa Bay in the near future. It is our view that implementation of additional protection measures in Tampa Bay, Old Tampa Bay, and Hillsborough Bay are appropriate and necessary conservation measures to reduce watercraft related incidental take within the SW Stock.

Within the Charlotte-Lee-Collier County area, the recent enactment of speed zones on Lemon Bay and the Peace River by the FWC and the Service will improve manatee protection in these areas. Additionally, the FWC has completed a study of the Caloosahatchee River, which may lead to recommendations for improving manatee protection in this area. Further, the Service will propose additional refuges on the Caloosahatchee River. Additionally, the FWC will conduct a broader study of the existing speed zone rules in Lee County, and a study of the waters of the Ten Thousand Islands NWR area of Collier County, which may lead to recommendations for addressing our concerns regarding the waters near Bokeelia Point, the Ten-mile Canal, Mullock Creek, and Chokoloskee Bay. Finally, the NPS intends to address manatee protection measures within Everglades National Park as part of their General Management Plan process. Again, the Service believes that implementation of additional protection measures in the above-identified waterbodies are appropriate and necessary conservation measures to reduce the cumulative effects of future actions affecting the overall health and sustainability of the SW Stock.

Cumulative Effects on Manatee Habitat

No Action Alternative

Under the No Action Alternative, the Service believes the long-term direct and indirect impacts to manatee habitat include increased aquatic pollution from point and nonpoint sources associated with increased human population and associated numbers of watercraft. In addition, it is anticipated that disruption of manatee foraging habitat, food base, and aggregation areas will result from increased pollution, watercraft propeller scarring, and wave action. Unless additional efforts are focused on the conservation of Florida manatee habitat, the Service believes there could be a disruption of migratory movements resulting in the fragmentation and isolation of groups of manatees over time.

Alternative 3

Cumulatively, Alternative 3 would provide additional opportunities to protect manatee habitat, in concert with other conservation efforts by the Federal, State, and local agencies (as discussed in Chapters IIC. and III.D. above). For example, there will be additional benefits to habitat through the implementation of mitigating measures necessary to meet the negligible impact standard in the Atlantic Stock. It is anticipated that the implementation of mitigating measures in the Atlantic Stock will help reduce the disruption of foraging habitat, food base, migratory movement corridors and aggregating areas as a result of reduced seagrass prop-scarring, erosion of habitat due to wave action, and overall regulation of boat speeds. It is possible that mitigating measures may reverse the projected growth rate decline in the Atlantic Stock, as well.

Compared to the No Action Alternative, 74 percent of open water habitat, 46 percent of designated critical habitat, 92 percent of seagrass, and 61 percent of manatee aggregation habitat in Florida would be reviewed annually (*e.g.,* habitat quality and quantity) through the receipt of LOA monitoring reports. This monitoring and reporting requirement would assist the agencies in tracking the health of manatee habitat over time.

Although not subject to this rulemaking timeframe, the cumulative effects of the loss of artificial and natural warm water refuges in a longer time frame could greatly reduce the winter carrying capacity of habitats north of the St. Sebastian River on the Atlantic coast and the Caloosahatchee River on the Gulf coast in the future. Additionally, as part of this MMPA rulemaking, the Service solicited expert opinions of the members of the Warm Water Task Force regarding current and future carrying capacity of the habitat. This is the first attempt to estimate the carrying capacity for manatees and will need considerable review and may need additional research. The availability of warm water refuges is uncertain if minimum flows and levels are not established for the natural springs on which many manatees depend, and as deregulation of the power industry in Florida occurs. In the absence of these sources of warm water, manatees are vulnerable to cold temperatures and can die from both hypothermia and prolonged exposure to cold. Based upon recent synoptic survey data, just under two-thirds of the population of Florida manatees rely on industrial sites, which are now made up almost entirely of power plants (FWC unpublished data). At this time, there is a great deal of uncertainty regarding future carrying capacity due to uncertainty regarding the fate of the power plants and spring flows over the next 3 to 25 years. This uncertainty is a factor that must be

addressed because if the carrying capacity is minimized from that currently available it will directly impact the population growth rate, which in turns impacts the negligible finding and the amount of take a population can sustain. Failure to confront the carrying capacity change issue now will likely lead to manatee growth rates and population demographics that would encourage socioeconomic trends (*i.e.,* new boat access points) that may have to be dramatically changed, with little advance notice, within 25 years as the population declines because it is not supported by the habitat.

Overall, industrial warm water refuges have been a benefit to manatees in as much as they have: (1) reduced the frequency of cold-related deaths by providing reliable sources of warm water during the winter; (2) reduced the incidence of juvenile, cold-weather related mortality in south Florida; and (3) provided additional winter refuges and foraging sites which supplant heavily-stressed wintering sites in south Florida. While these sites have clearly benefitted the species, they also pose a significant risk. For example, during periods of extreme cold, some power plants are unable to provide sufficient water warm to meet the manatees' physiological needs. Plants are also vulnerable to winter shutdowns due to equipment failures and needed maintenance and, in the long-term, have a limited life span. Older power plants are less cost-effective to operate, and market economics will increasingly play a more significant role in the plants' operating schedules (USFWS 2000).

Long-term alterations to both natural and industrial warm water refuges will significantly affect the manatee's ability to tolerate and withstand the cold. In the absence of stable, long-term sources of warm water and winter habitat, large numbers of manatees may succumb to the cold. Given the magnitude of the problem, the outright loss of these numbers of animals could significantly affect recovery efforts. The power industry and wildlife managers and researchers are currently working together to secure the manatee's winter habitat. As part of efforts to recover the manatee, a multiagency Warm Water Task Force is now investigating strategies to protect these sites, including their spatial arrangement and long-term management.

Finally, the cumulative effects of anthropogenic effects of long-term coastal development is of concern for sustaining healthy manatee habitat. Natural wintering sites have been affected by human activities (USFWS 2000). Winter habitat in south Florida has been altered (*e.g.,* shoreline areas have been rip-rapped and bulkheaded, sources of warm water have been diverted and/or capped, foraging and resting sites have been eliminated, etc.). Nutrient loading *(e.g.,* nitrates) from residential and agricultural sources has promoted the growth of alga and clouded water columns, thus reducing available winter forage in these sites. Seagrass habitat important to manatee feeding is affected by human activities. Dredge and fill activities, polluted runoff, propeller scarring, and other actions have resulted in the loss of vegetated areas. In Tampa Bay, for example, it is estimated that more than 80 percent of the seagrass community has been destroyed by human activity (Lewis 1986). Efforts are in place and are being made to protect, enhance, and restore the manatee's aquatic environment. There are many existing Federal, State, and local government regulations in place to minimize the effects of human activities on manatees and their habitat (*e.g.*, CWA, Rivers and Harbors Act, ESA, FWCA, CZMA, etc.). Even though efforts are being made to improve this environment and to maintain those resources that are vital to the manatee, the long-term, cumulative effects of anthropogenic activities on manatee habitat are beginning to weigh more heavily in manatee conservation decision making, particularly given that Florida's human population is projected to double in the next 30 years with the majority of new residents occupying the coastal areas.

Cumulative Effects on the Agency Programs

U.S. Army Corps of Engineers

As discussed throughout this EIS, the Corps section 10/404 permit program is the overarching Federal authorization required for the construction of docks, marinas and boat ramps in Florida. As such, any other Federal or State program (Service, NPS, NOAA, State Grants funded by the Service's Federal Aid Program) that permits water-related activities are required to obtain a Corps permit to conduct activities that may affect manatees in the waters of Florida. Therefore, an assessment of the Corps' permitting program provides be a thorough analysis of the actions occurring within the State.

Through the Corps' permit review processes, the potential adverse effects to manatees or manatee habitat are identified, and if necessary permits can be specifically conditioned to avoid the adverse impacts, or where appropriate, denied. Typical permit conditions include limitations on the number of slips, and avoidance or minimization of impacts to sea grasses and other habitat features. Additionally, standard manatee construction conditions have been developed that are utilized by the Corps (as well as State regulatory agencies) to minimize the direct effects of watercraft access facilities on manatees and manatee habitat. These conditions include education of construction personnel regarding manatee awareness; control of construction-related vessel speeds; use of construction equipment such as siltation barriers that avoid manatee entrapment; stand-off distances from manatees sighted in construction area; and manatee awareness signage. These standard conditions and other conditions developed through the permit review process have been effective in minimizing the direct effects of watercraft access facilities and their construction on manatees and manatee habitat.

In addition to the Corps' process, the Service must formally consult under the ESA on any Federal action that may affect a listed species or designated critical habitat, as outlined in the Director' memorandum of January 22, 2003. The Service will review and comment on Corps permit applications for watercraft access facilities on a case-by-case basis to determine whether construction and/or use of a particular facility are reasonably certain to directly or indirectly result in the incidental, unintentional take of manatees and will not jeopardize the species or adversely modify the critical habitat. During our case-by-case site-specific evaluation of each project, we determine if the proposed action will adversely affect the manatee by evaluating specific measures and ensuring they are in place in order to reduce incidental take to an unlikely to occur level. These three prerequisites are that (1) adequate speed zones exist in the area; (2) signage of these zones is adequate; and (3) speed zone enforcement in the area will be sufficient to prevent a watercraft collision with a manatee from occurring as a result of the project. In cases where the Service concludes that adequate manatee protection measures are in place and incidental take is not reasonably certain to occur, the Service will not recommend the permit application be denied. The Corps determines whether these permits will ultimately be issued based on their Public Interest Review process for the section 10/404 Regulatory Program.

When the Service concludes that incidental take of manatees is likely to result because the necessary measures are not in place to reduce incidental take to an unlikely to occur level, the Service will not be able to authorize the incidental take of manatees through the ESA section 7 consultation process, and will recommend that the permit application be denied in order to prevent unauthorized take of manatees to occur. It is, therefore, likely that some watercraft access related facilities will not be permitted and constructed.

Additionally, due to the negative finding of negligible impact under the MMPA in the SW Stock, the Service will review and comment on Corps permit applications for watercraft access facilities on a case-by-case basis to determine whether construction and/or use of a particular facility is reasonably certain to directly or indirectly result in the incidental, unintentional take of manatees in the SW Stock. When the Service concludes that a "may likely to adversely affect" on a permit application, and that incidental take of manatees is likely to result, the Service will not be able to authorize the incidental take of manatees through the ESA section 7 consultation process, and will recommend that the permit application be denied in order to prevent unauthorized take of manatees to occur. It is, therefore, likely that some watercraft access related facilities in the SW Stock will not be permitted and constructed in the SW Stock, regardless of the outcome of any action..

The Service believes that the watercraft access permit review process in the SW Stock will almost certainly change during the next five years. The Service intends to frequently revisit the designations of reaches as "adequate"/"inadequate" (see Appendix O) to insure they are reflective of manatee distribution, mortality, and demographic data, as well as changes in ongoing manatee protection programs. If additional manatee protection programs reduce the incidental take of manatees associated with new watercraft access facilities in reaches in the SW Stock, the number of Service recommended permit application denials will likely decline. Conversely, if data indicate an increase in the rate of incidental take of manatees in the SW Stock and a decline in the overall health of the manatee population continues in this stock, the number of Service recommended permit denials may increase.

We are also obligated to monitor the cumulative effects of single family docks on the manatee in all stocks using best available science. To facilitate this monitoring process, we review quarterly reports from the Corps and the DEP on permits issued for watercraft access projects, including single family docks. If we determine at any time that the cumulative effect from numerous single family docks in a particular location is adversely affecting manatees, we will implement appropriate conservation measures necessary to rectify the situation.

As discussed in Chapter II**,** above, following is an assessment of the cumulative effects of future Corps permitting, by stock, as it relates to watercraft related incidental take of manatees and the overall health of the Florida manatee population.

Northwest Stock

The Service anticipates that any adverse cumulative effects of watercraft related permitting by the Corps (and any concurrent State authorization) in the NW Stock could be reduced by implementing any necessary conservation and/or mitigating measures. When we proposed the MMPA rule and

Draft EIS, we believed the manatee growth rate was approximately 5 percent, however, new information now indicates that the manatee growth rate in the NW Stock approximates 3.7 percent per year, adult survival exceeds 95.6 percent and females with first or second-year calves exceeds 42 percent.

Upper St. Johns River Stock

The Service anticipates that any adverse cumulative effects of watercraft related permitting by the Corps (and any concurrent State authorization) in the USJ Stock could be reduced by implementing any necessary conservation and mitigating measures. Based on an analysis of the demographic benchmarks in the USJ Stock, the manatee growth rate has not changed and is exceeding 6 percent, adult survival exceeds 96 percent, and females with first and second-year calves is 41 percent.

Atlantic Stock

The Service anticipates that any adverse cumulative effects of watercraft related permitting by the Corps (and any concurrent State authorization) in the Atlantic Stock could be reduced by implementing any necessary mitigating measures. When we proposed the MMPA rule and Draft EIS, we believed the manatee growth rate in the Atlantic population was approximately 3.2 percent, however, new information now indicates that the manatee growth rate in the Atlantic Stock approximates 1.0 percent per year, adult survival now exceeds 90 percent and females with first or second-year calves exceed 42 percent. The population growth rate in the Atlantic Stock is currently currently1.0; however, the lower confidence interval for this parameter is currently-1.2 percent, a decline.

Southwest Stock

Based on an analysis of the demographic benchmarks in the SW Stock, adult survival has not changed from the proposal and is currently 90.6 percent, indicating little to no growth. The lower confidence interval for adult survival is 86.7 percent, an indication of negative growth. The annual population growth rate was not scientifically established at the proposal stage, however, new information indicates that this the population growth rate for this stock is -1.1 percent, an indication of negative growth. The percentage of females with calves is still unknown. Because of these data, the Service projects that at the current rate in the annual increase in watercraft related manatee mortality (7.2 percent) the SW Stock will gradually decline in numbers over the next five years, unless measures are taken to rectify the trend.

Cumulative Effects on the Review of Corps Single-Family or Multi-slip Dock Permit Applications

In all of the stocks, the dock/multi-slip review process will remain unchanged. To facilitate this review process, the Service will receive monitoring reports on the status and number of permits issued for all watercraft access projects, including single-family docks. This information will be provided in accordance with the monitoring and reporting requirements contained in LOAs and will assist the Service in analyzing the cumulative effects of these permit actions.

Marine Mammal Protection Act - Florida Manatees

Following is a summation of Corps watercraft access related permitting activity from 1988 to September 2002 for 32 counties with recorded watercraft related mortality in Florida. A detailed discussion of Corps watercraft access related permitting for this period is found in Appendix M.

During this four-year nine-month period, an estimated 27,082 boat slips were permitted in this 32-county area, including residential, commercial, marinas, and State Programmatic General Permit (SPGP) boat slips. The average number of boat slips permitted per year was 5,110.

Prior to the filing of the lawsuit in January 2000 (*Save the Manatee Club* v. *Ballard et. al.*), between 1998 and 1999, an average of 18 new of expanded marinas were permitted in the four manatee regions each year, adding and average of 710 dock slips per year. From 1989 to 1999, permits issued under the SPGP were estimated to account for about 3,600 dock slips per year, and Corps residential permits accounted for approximately 1,500 dock slips per year. For all permit types, prior to the law suit, it is estimated that approximately 7,000 dock slips were permitted annually in the affected counties.

As discussed earlier, the Corps section 10/404 permit program is the primary Federal authorization required for the construction of docks, marinas and boat ramps in Florida. In the 2001 to 2002 time period, which was after the lawsuit and subsequent revision of the permit process, an average of 1,580 multi-slip dock slips was permitted each year, and 1,640 single-family dock slips were permitted each year for a total of 3,220 slips permitted in the affected counties each year on average.

In addition to the Corps' process, the Service must formally consult under the ESA on any Federal action that may affect a listed species or designated critical habitat, except when the Service concurs, in writing through the informal consultation process, that a proposed action "is not likely to adversely affect" listed species or designated critical habitat. The Service will review and comment on Corps permit applications for watercraft access facilities on a case-by-case basis to determine whether construction and/or use of a particular facility is reasonably certain to directly or indirectly result in the incidental, unintentional take of manatees and will not jeopardize the species or adversely modify the critical habitat. We are also obligated to monitor the cumulative effects of single-family docks on the manatee in all reaches using best available science. To facilitate this monitoring process, we review quarterly reports from the Corps and the DEP on permits issued for watercraft access projects, including single family docks. If we determine at any time that the cumulative effect from numerous single-family docks in a particular location is adversely affecting manatees, we will implement appropriate conservation measures necessary to rectify the situation.

Therefore, the Service finds that there are no cumulative effects of the Corps' permit process for single-family or multi-slip docks to the manatees that are not currently being addressed. We also conclude that any cumulative effects of the Corps' Regulatory Program will be reduced over the five-year specified period of any rule because of the additional mitigating measures that will be implemented. Indirect effects of any rule highlight the need to reduce watercraft related incidental take of manatees in areas where there is minimal growth rate, as well as providing additional incentives to do so.

U. S. Coast Guard

The USCG's primary responsibility since its creation in 1790 is law enforcement under section 14 U.S.C. 89(a), which specifically gives USCG officers and petty officers the authority to make inspections, searches, seizures, and arrests for violations of laws of the U.S. USCG law enforcement efforts include Living Marine Resources Law Enforcement, Drug Interdiction, Alien Migrant Interdiction Operations, and General Law Enforcement. As a lead Federal agency for at-sea-enforcement of national fisheries and marine resource laws and international treaties, the USCG conducts a number of at-sea enforcement activities which benefits fisheries, important marine habitats, and protection of threatened and endangered species, including the Florida manatee.

The USCG is involved in permitting marine events (*e.g.*, high speed races and parades and other events) in Florida waters inhabited by manatees, making their involvement essential in the conservation of the Florida manatee. The Service reviews approximately 30 events annually in Florida. The USCG ensures that measures are in place to minimize impacts to manatees. We believe that cumulative effects are also addressed by these types of actions during the review of events. For example during one parade, the USCG under 33 CFR 100.734 establishes a one day "Idle Speed, No Wake " zone for all watercraft operating within and immediately adjacent to the event. The USCG typically also provides cutters, patrol boats, and helicopters to assist in speed zone enforcement at these events.

The publication of a rule would allow the Service to authorize the incidental, unintentional take of manatees for these types of activities in those geographic areas specified in the rule, subject to the issuance of a LOA to the USCG.

Cumulative Effects on the Human Population

The cumulative adverse effects on the human population from implementing an action is primarily limited to areas where incidental take authorization cannot be granted. As an example, during 2001, a total of 3,625 new boat slips were permitted in Florida (USFWS, unpublished data). Between January 1 and June 30, 2002, an additional 1,408 boat slips were permitted, of which an estimated 2,809 slips (56 percent) were located in the SW Stock.

Any cumulative socioeconomic effects are expected to occur in areas where incidental take cannot be authorized, such as the SW Stock or any stock with a negative finding, which results in the denial of Corps permits. At that time, as discussed earlier, the Service will re-evaluate whether incidental take regulations could be published for the SW Stock, thereby significantly reducing these socioeconomic impacts.

d. Short-Term Use Versus Long-Term Productivity

In the short-term, the SW Stock would be adversely affected without the benefit of incidental take authorization, since watercraft related incidental take of manatees currently exceed negligible impact levels. It is expected that as additional manatee data in the SW Stock are collected and analyzed, the Service will re-evaluate this determination. In the long-term, beyond the five-year specified

period of this rulemaking, subsequent manatee Statewide incidental take authorization under the MMPA could become an important tool to assist in the potential downlisting and recovery of the Florida manatee. Productivity in the environment and reduction in watercraft related incidental take of manatees should be enhanced in the long-term, leading to a sustainable manatee population for the continued enjoyment of Florida's residents.