

**Final  
Statement of Estimated  
Regulatory Costs associated  
with a Water Reservation for  
the Biscayne Bay Coastal  
Wetlands CERP Phase 1  
Project**

April 16, 2013



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Statement of Estimated Regulatory Costs associated  
with a Water Reservation for the Biscayne Bay Coastal  
Wetlands CERP Phase 1 Project – Final

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Dear Mr. Miller:

We are pleased to submit the Statement of Estimated Regulatory Costs (SERC) associated with a Water Reservation for the Biscayne Bay Coastal Wetlands CERP Phase 1 Project. As required by Section 120.541, Florida Statutes (2012), "A statement of estimated regulatory costs shall include:

- (a) An economic analysis showing whether the rule directly or indirectly:
  1. Is likely to have an adverse impact on economic growth, private sector job creation or employment, or private sector investment in excess of \$1 million in the aggregate within 5 years after the implementation of the rule;
  2. Is likely to have an adverse impact on business competitiveness, including the ability of persons doing business in the state to compete with persons doing business in other states or domestic markets, productivity, or innovation in excess of \$1 million in the aggregate within 5 years after the implementation of the rule; or
  3. Is likely to increase regulatory costs, including any transactional costs, in excess of \$1 million in the aggregate within 5 years after the implementation of the rule.
- (b) A good faith estimate of the number of individuals and entities likely to be required to comply with the rule, together with a general description of the types of individuals likely to be affected by the rule.
- (c) A good faith estimate of the cost to the agency, and to any other state and local government entities, of implementing and enforcing the proposed rule, and any anticipated effect on state or local revenues.
- (d) A good faith estimate of the transactional costs likely to be incurred by individuals and entities, including local government entities, required to comply with the requirements of the rule. As used in this section, "transactional costs" are direct costs that are readily ascertainable based upon standard business practices, and include filing fees, the cost of obtaining a license, the cost of equipment required to be installed or used or procedures required to be employed in complying with the rule, additional operating costs incurred, the cost of monitoring and reporting, and any other costs necessary to comply with the rule.
- (e) An analysis of the impact on small businesses as defined by s. 288.703, and an analysis of the impact on small counties and small cities as defined in s. 120.52. The impact analysis for small businesses must include the basis for the agency's decision not to implement alternatives that would reduce adverse impacts on small businesses.

**South Florida Water Management District  
SERC associated with a Water Reservation for the BBCW CERP P1 Project**

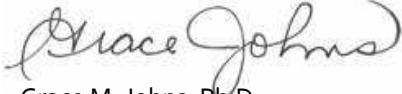
**April 16, 2013**

(f) Any additional information that the agency determines may be useful.”

This SERC addresses these requirements using the best available information.

Very truly yours,

*HAZEN AND SAWYER, P.C.*

A handwritten signature in cursive script that reads "Grace Johns".

Grace M. Johns, Ph.D.  
Senior Associate and Economist

*Enclosure*

c: *File No. 43124-000*

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Photo by National Park Service South Florida / Caribbean Network.

# Section 1: Proposed Rule and Potential Economic Effects

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## 1.1 Background

Biscayne Bay is a large, shallow sub-tropical estuarine lagoon about 35 miles long and up to 8 miles wide that lies along most of the Miami-Dade County Florida coastline and the northern Monroe County coastline, from Dumfoundling Bay in the north to the upper reaches of Key Largo to the south. The Bay is 275 square miles and is a seasonal or year-round home to rare, threatened and endangered species, including manatees and American crocodiles. Its watershed is about 830 square miles along the coast of Miami-Dade and northeastern Monroe counties.

Biscayne Bay is surrounded by the large and diverse metropolitan area of Greater Miami and Miami Beach. Biscayne Bay supports a variety of uses including recreation; commercial fishing; navigation; and shipping operations at the Port of Miami and the Miami River which is a tributary to the Bay. Most of the Bay south of Key Biscayne is Biscayne National Park, the largest marine park in the national park system. The Biscayne Bay Aquatic Preserve includes most of the Bay north of Biscayne National Park. The Florida Keys National Marine Sanctuary includes Card Sound and Barnes Sound at the southern end of Biscayne Bay. Parks surrounding the Bay are the Oleta River State Park, Bill Baggs Cape Florida State Park, Barnacle State Historic Site, and numerous local parks.

Human-induced changes to land uses and water flows in the Bay's watershed altered salinity patterns and water quality in the Bay and reduced freshwater flows to coastal wetlands. Prior to drainage and urban development, significant quantities of fresh water entered the Bay from wetland, river and creek flow and from groundwater seepage. These water regimes sustained a rich and varied coastal ecosystem that provided significant recreation and sustenance to residents and visitors.

Construction of the regional flood control system altered seasonal water flow patterns to the Bay. Since about 1910<sup>1</sup>, fresh water from the regional watershed has been collected and discharged through man-made canals into the Bay as needed to protect the region's urban and agricultural areas from flooding. Urban land development and ground water withdrawals contributed to the reduction in surface and ground water flows to the Bay. These changes to the Bay's water flow regime from a wetlands-dominated watershed to an urban-dominated watershed with controlled surface water canal discharge significantly increased the range and variability of salinity concentrations and increased the overall salinity of the nearshore areas. The result has been a reduction in the diversity and populations of native plant and animal species in and along the Bay. Many species that are integral to a diverse, healthy ecosystem and that benefit recreation, fishing and the economy are in decline.

The Biscayne Bay Coastal Wetlands (BBCW) Phase I Project is a component project of the Comprehensive Everglades Restoration Plan. The CERP is a 50/50 cost-shared project between the South Florida Water Management District (District) as local sponsor and the U.S. Army Corps of

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<sup>1</sup> The date was provided by Richard Alleman, Lead Environmental Scientist, South Florida Water Management District.

Engineers. In order to obtain the 50 percent federal funding needed for construction of the BBCW Phase I Project, the District must utilize its reservation or allocation authority to protect the water needed for the project in order to achieve the Project's intended benefits. The District has selected to use its water reservation authority and is developing a water reservation rule.

The District has proposed a rule that will create a Biscayne Bay Water Reservation to prevent water necessary for the BBCW Phase I project from being allocated for consumptive use. The reservation focuses on the nearshore zone in the central region of Biscayne Bay. The general location of the BBCW Phase I project is between Shoal Point and Turkey Point in Miami-Dade County, Florida. The nearshore habitat is a mix of hard and soft bottom areas covered by seagrass and macroalgal beds. The salinity in this area is largely a function of fresh water discharged from canals and the salinity varies throughout the year from about 10 through 40.

Establishment of this water reservation is needed for the BBCW Phase I Project to provide a more natural distribution of fresh water inflow to the nearshore zone of central Biscayne Bay. These inflows are expected to improve the quality of fresh and salt water wetlands and improve nearshore and saltwater wetland salinity regimes to support wildlife ecosystems and facilitate the re-establishment of species that were once common in this area.

## 1.2 Summary of the Proposed Rule

The South Florida Water Management District is proposing to adopt a water reservation for the area called the "Nearshore Central Biscayne Bay". This reservation is described in the proposed revisions to Chapter 40E-10, "Water Reservations". The "Nearshore Central Biscayne Bay" is defined as the area within Biscayne Bay up to 1,640 feet from the shoreline beginning south of Shoal Point extending southward to north of Turkey Point as depicted in Figure 1-1.

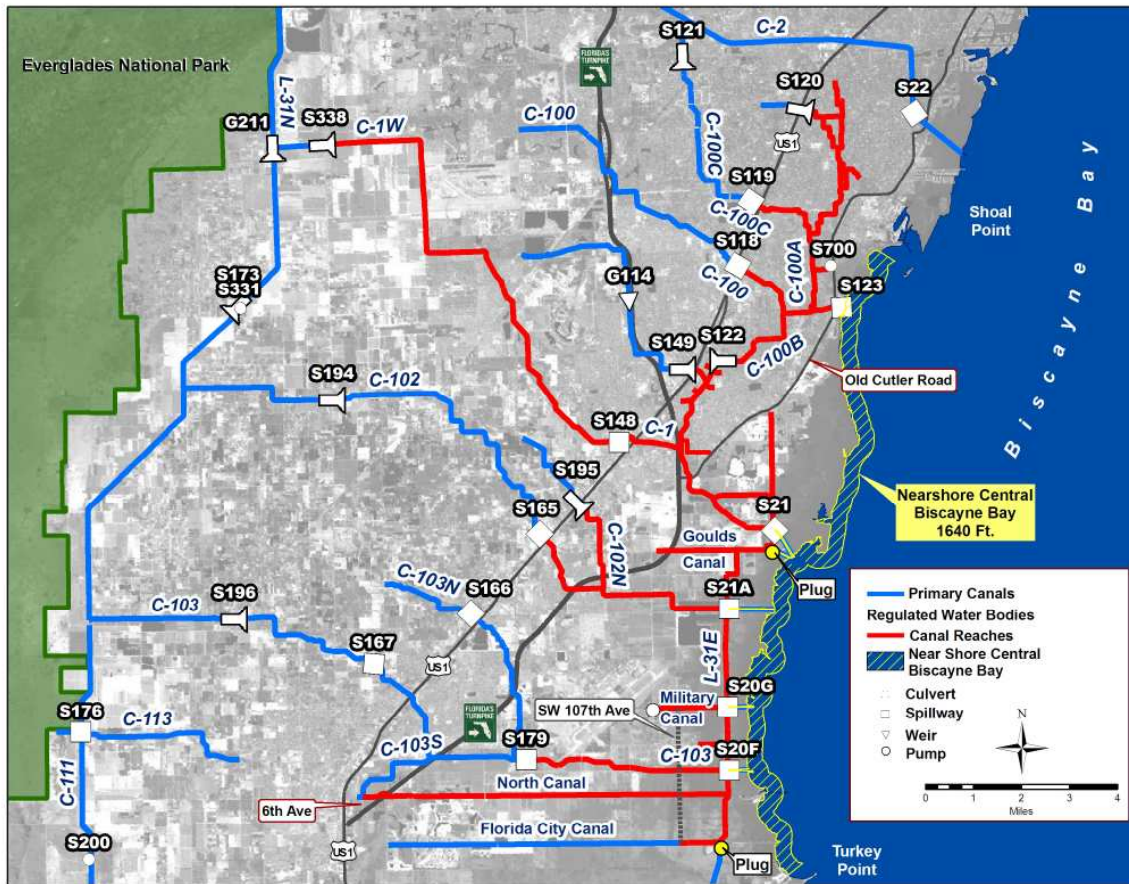
The District will reserve from allocation to a water use permit all surface water flowing through the canals depicted in red in Figure 1-1. Withdrawals of surface water will also not be permitted from facility intakes physically located within the surface water column of the "Nearshore Central Biscayne Bay". Existing legal uses of this water at the time of rule adoption will not be affected by the water reservation. For brevity, this document refers to the red-colored canals as "affected canals" that will be protected as part of the proposed rule.

Quantities of water allocated as of the rule adoption date where the use is subsequently terminated may be reallocated provided that the reallocation occurs upstream of the same coastal structure. A permit modification involving a use of canal water from an affected canal identified on Figure 1-1 authorized by a permit existing on the rule adoption date will not be affected by the water reservation if it does not increase the water allocation or change: (1) the water source; (2) the withdrawal location; or (3) the timing of use (i.e. changing the crop type could change the timing of use).

In short, no new surface water withdrawals from the affected canals will be permitted under the proposed rule except if the consumptive use permit applicant can demonstrate that water flows will be above the reserved quantities from the affected canals. In this case the excess flow could be permitted but only during the time periods when the flows are available in excess of the reserved quantities.

The water reservation was identified using scientifically reviewed data linking local hydrology to the needs of fish and wildlife. The proposed rule includes a statement that "Reservations contained in the section shall be reviewed in light of changed conditions or new information".

**Figure 1-1 Location of Canals and Water Bodies Affected By the Biscayne Bay Water Reservation**



**1.3 Potential Benefits of the Proposed Rule**

The BBCW CERP Phase 1 Project will change the management of freshwater flows to the Bay at three locations along the southern Bay shoreline and near shore area beginning at the Deering Estate in Miami and going south to the Biscayne National Park (BNP) Headquarters and Marina. The three locations are:

- (1) Deering Estate - The Deering Estate property which is an environmental, archeological and historical preserve in southeastern Miami-Dade County;
- (2) Cutler Wetlands - The wetlands in and near the Town of Cutler Bay and at Black Point Park; and,
- (3) L-31 East Flow Way - The stretch of Bay shoreline north of the S21A spillway to the BNP Marina.

The District calls this third area the “L-31E” because there is no incorporated city or town or other prominent landmark that can be referenced to identify the exact location and because the L-31E canal runs north to south in this area and is a major part of the project.

The BBCW CERP Phase 1 project is an ecosystem restoration project. The long-term success of ecosystem restoration is measured, in part, by the ability of native fish and wildlife to thrive in Biscayne Bay and its coastal habitats.

The BBCW CERP Phase I project is designed to re-direct surface water flows from canals at the point upstream of where freshwater is directly discharged into the Bay to the undeveloped land areas along the Bay where freshwater and saltwater wetlands would be improved or restored. This fresh water would eventually flow into the Bay at a rate and distribution that more closely mimics pre-drainage and pre-urban development conditions.

Using the project's infrastructure, the District will be able to re-direct, on average, about 59 percent of the water discharged currently in a point source manner from affected canals annually to the Bay's coastal wetlands to provide a more natural flow of freshwater through existing, but currently deteriorated, wetlands.<sup>2</sup> This activity will change the spatial distribution of freshwater inflows to the Bay's near shore habitats that will provide more favorable conditions, primarily lower salinity levels, for numerous plant and animal species. The District concludes that this change in the management of freshwater flows will improve wetland ecosystem functions and is expected to increase the diversity and population of fish and shellfish species.

The overall project objectives are listed below.<sup>3</sup>

- Re-establish productive nursery habitat along the shoreline;
- Re-distribute freshwater flow to minimize point source discharges and improve freshwater and estuarine habitat;
- Restore and improve the quantity, quality, timing and distribution of freshwater to the Bay, including Biscayne National Park;
- Restore near shore and tidal wetland salinity regimes;
- Contribute towards providing restoration compatible with recreation opportunities;
- Preserve and restore the spatial extent of natural coastal glades habitat; and,
- Re-establish connectivity between Biscayne Bay Coastal Wetlands, the C-111 Basin, the Model Land Basin. and adjacent basins.

The BBCW CERP Phase 1 Project will not substantially change the existing timing of runoff from the land area because water storage will be relatively small. Therefore, while the salinity range will be improved, the target salinity will only be achieved some of the time. However, the District concludes that the project will re-establish critical ecotones, improve estuarine areas, and increase the productivity of the existing

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<sup>2</sup> South Florida Water Management District, "Technical Document to Support a Water Reservation Rule for the Comprehensive Everglades Restoration Plan Biscayne Bay Coastal Wetlands Phase 1 Project", September 2012, page 14.

<sup>3</sup> U.S. Army Corps of Engineers, Jacksonville District and South Florida Water Management District, "Final Integrated Project Implementation Report and Environmental Impact Statement, Central and Southern Florida Project Comprehensive Everglades Restoration Plan, Biscayne Bay Coastal Wetlands Phase I", page 2-5, July 2011 – Revised March 2012.



freshwater wetlands on a total of 9,630 acres.<sup>4</sup> Of this acreage, the project will restore an estimated 284 acres of freshwater wetlands and 6,395 acres of saltwater wetlands for a total of 6,679 acres of restored wetlands. About 2,950 acres of the nearshore Bay waters will be restored.

The District and the Corps expect that the project will promote the reestablishment of additional species that were once common in this area of Biscayne Bay such as widgeon grass (*Ruppia maritima*), shoal grass (*Halodule wrightii*), and red drum (*Sciaenops ocellatus*).<sup>5</sup> While Florida prohibits the commercial sale of native red drum, it is a popular sport fish that is closely managed by the Florida Fish and Wildlife Conservation Commission. Fish species commercially harvested in Florida that are expected to be reestablished include the spotted sea trout, black mullet (*Mugil cephalus*), eastern oyster (*Crassostrea virginica*), and crevalle jack (*Caranx hippos*). An additional benefit of the oysters is that the reef structures they form provide refuge for hundreds of other species, including the juvenile stages of several fishes.<sup>6</sup>

The District expects that the improved nearshore conditions provided by the Project is likely to increase the populations of pink shrimp and blue crab which are commercial species landed in the county; the common snook which is a highly prized recreational fish; and the American crocodile which is Federally endangered. Pink shrimp is the third most valuable commercial marine landing in the county after spiny lobster and bait shrimp.

The District expects that the Project will increase the hydroperiod in the targeted freshwater wetlands from about 70 days per year to nearly 200 days per year that will improve the functioning of graminoid wetlands to provide critical habitat for prey fish and wading birds. The restored wetlands are expected to provide important food sources such as rainwater killifish (*Lucania parva*) for wading birds and predatory fish and improve the habitat for the endangered American crocodile, which requires mesohaline salinity conditions to maximize juvenile survival.

Recreational facilities are planned at the Project's wetlands to support biking, walking, bird watching, environmental interpretation, canoeing/kayaking, bank fishing, tent camping, and nature study. Proposed facilities include biking/walking trails, environmental displays, shelters, restrooms, parking, tent platforms, a pedestrian bridge, benches, bike racks, trash receptacles, a park security gate, trail signage, potable water, and a bird watching platform. The Corps and the District estimate that these facilities will create an additional 29,200 recreational visits per year.<sup>7</sup>

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<sup>4</sup> South Florida Water Management District, "Technical Document to Support a Water Reservation Rule for the Comprehensive Everglades Restoration Plan Biscayne Bay Coastal Wetlands Phase 1 Project", September 2012, pages 14 and 15.

<sup>5</sup> South Florida Water Management District, "Technical Document to Support a Water Reservation Rule for the Comprehensive Everglades Restoration Plan Biscayne Bay Coastal Wetlands Phase 1 Project", September 2012, page 14 and U.S. Army Corps of Engineers, Jacksonville District and South Florida Water Management District, "Final Integrated Project Implementation Report and Environmental Impact Statement, Central and Southern Florida Project Comprehensive Everglades Restoration Plan, Biscayne Bay Coastal Wetlands Phase I", page 3-22, July 2011 – Revised March 2012.

<sup>6</sup> Florida Fish and Wildlife Conservation Commission, Fish and Wildlife Research Institute website.

<sup>7</sup> U.S. Army Corps of Engineers, Jacksonville District and South Florida Water Management District, "Final Integrated Project Implementation Report and Environmental Impact Statement, Central and Southern Florida Project Comprehensive Everglades Restoration Plan, Biscayne Bay Coastal Wetlands Phase I", Appendix H, Recreation, page H-20 and 21, July 2011 – Revised March 2012.

The Corps approved this project for construction on September 19, 2012 stating in its Record of Decision that the Biscayne Bay Coastal Wetlands Phase I project is technically feasible, environmentally justified, cost effective, in accordance with environmental statutes, and in the public interest.

This approval will be used to obtain Congressional authorization for the Federal government's share of the project's capital cost through the passage of the next Water Resources Development Act (WRDA). The year of passage is not known but is estimated to be in 2014 at the earliest. Some of the project's components have already been constructed by the District and the District will seek cost share for these construction costs as part of the Comprehensive Everglades Restoration Plan.

Ecosystem services are the benefits that humans derive from the ecosystem and can be measured and reported in a monetary, cultural, or social context. They are what link people to the physical state of the ecosystem and their values depend on the ecosystem's existing environmental conditions. Ecosystem services are valued by people who live in or near the ecosystem and people who live far away. The ecosystem services to be provided by the BBCW CERP Phase 1 project are listed as follows.

#### Increased Recreational Opportunities and Quality

- Increased recreational opportunities provided by the Project's recreation plan including biking, walking, bird watching, environmental interpretation, canoeing/kayaking, bank fishing, tent camping, and nature study.
- Increased bird watching and large animal watching opportunities throughout the Bay area as the Project increases the habitat of native bird species and the American crocodile.
- Improved clarity and aesthetics of nearshore Bay waters in the vicinity of the Project that would be enjoyed by swimmers and boaters (motorized and non-motorized), snorkelers and divers, and that would improve aerial views.
- Increased recreational fishing success as the Project increases the population and diversity of sport fish species such as red drum and common snook.

#### Increased Commercial Fishing Success

- Increased commercial fishing harvest as the Project increases the populations of pink shrimp, blue crab, spotted sea trout, black mullet, and crevalle jack.

These are the ecosystem services, or benefits, provided by the Project. These ecosystem services have value to the people who benefit from them and these values can be measured in dollars. These values are evident from the fact that there are three major marinas in the immediate area including Black Point Marina; Biscayne National Park and Marina; and Herbert Hoover Marina at Homestead Bayfront Park.

Economic valuation tools can be used to quantify the dollar value of ecosystem services. Under the total economic value framework, the types of ecosystem service values are listed as follows.

- Use value – A person's maximum willingness-to-pay to use or enjoy an ecosystem service currently and in the future. Willingness-to-pay is equal to the amount of money the person spent to access and use/enjoy the service plus the maximum additional amount of money the person would have voluntarily spent if needed.

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- Value to economy – The contribution of the ecosystem’s services to resident income and tax revenue as tourists and residents spend money to birdwatch, fish, snorkel, dive and boat and as commercial fishers spend money to harvest fish and shellfish. Income includes wages, salaries, proprietor’s income, rents, profits, royalties and dividends and is the income before income and capital gains taxes are deducted. Tax revenue includes excise taxes, property taxes, fees, licenses, and sales taxes. Tax revenue is also referred to in this SERC as tax revenue to State and local governments because it is expected that most of these taxes would be collected by these entities. Resident income plus tax revenue (not including income taxes which are counted in income) is the relevant measure for the purpose of estimating the dollar value of benefits to the economy.
- Value to Consumers – Those who consume the commercially-caught fish and shellfish derive value from consumption as measured by a person’s maximum willingness-to-pay for this consumption.
- Non-use value – A person’s maximum willingness-to-pay to maintain the quantity and quality of the ecosystem service provided by the Project for the benefit of future generations, for the benefit of knowing that the ecosystem service exists or that the ecosystem is protected, or to retain an option to use the Bay in the future. This value is separate from the value of actual or future use by the individual.

These values can be added together to obtain the total economic value of the BBCW CERP Phase 1 Project. Each value represents a different benefit component of the project so there is no double-counting when adding these values together. The dollar value metrics associated with each of the ecosystem services identified above are summarized in Table 1.2. These values can be associated with existing generations and with future generations.

**Table 1.2  
Dollar Value Metrics for the Project’s Ecosystem Services**

Ecosystem Service	Dollar Value Metric
Increased recreational opportunities & quality – fishing, swimming, diving, snorkeling, picnicking, wildlife and Bay viewing, and motorized and non-motorized boating	Use Value Value to Economy
Increased commercial fishing success	Value to Consumers Value to Economy
Improvement of wildlife ecosystems, diversity & populations	Non-use Value

An estimate of the dollar value associated with the ecosystem services expected to be provided by the BBCW Phase I project was not provided in the BBCW Phase I Final Integrated PIR and EIS. The following conclusion regarding the value of recreation provided by the project is reprinted from this document as follows.<sup>8</sup>

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<sup>8</sup> U.S. Army Corps of Engineers, Jacksonville District and South Florida Water Management District, “Final Integrated Project Implementation Report (PIR) and Environmental Impact Statement (EIS), Central

“Biscayne Bay provides a unique and extensive natural resource-based recreational resource. The restoration of the ecosystem could potentially have important impacts on the value of outdoor recreation in the study area...These improvements can be expected to provide resource-based recreational opportunities compatible with the protection of the natural systems...However, precisely estimating the future value of recreation in the study area is problematic, and anticipating the incremental changes in value associated with restoration is even more challenging. There are four principal uncertainties that challenge forecasting the future quantity and quality of outdoor recreation under with- and without project conditions...the timing and character of the ecological changes that are expected to result from the alternative restoration plans...the marketing of tourism and study area related recreation...the degree to which recreational facilities and recreational access would be developed as part of a restoration plan...Finally, there are a variety of economic factors at the national level that can influence tourist and resident recreation demand. These factors include the health of the national economy, levels of disposable income, and the availability and costs of competing recreation opportunities.”

In 2004 and 2005 a study was conducted for the South Florida Water Management District and the Florida Inland Navigation District to estimate the uses and the current and historic economic contribution of Biscayne Bay to the local, regional and State economies.<sup>9</sup> This study is titled Biscayne Bay Economic Study which is referred to in this report as the BBES. The BBES used survey research, economic modeling and statistical analysis to estimate the economic contribution of Biscayne Bay to Miami-Dade County; to Southeast Florida and to Florida. The methods used to obtain the BBES results are described in the BBES Report and are summarized in Appendix A of this SERC.

The income, employment, tax revenue, and value of goods and services generated from Bay-related recreation; commercial fishing; Port of Miami shipping; and Miami River shipping were estimated. For recreation, the recreational uses and economic contribution were estimated based on the survey responses of 1,500 residents and visitors in Miami-Dade County.

A summary of the recreational and commercial fishing results in the BBES Report is provided below. Following this summary, a case study of the total economic value of hypothetical increases in ecosystem services from the BBCW CERP Phase 1 Project is provided where relevant results from the BBES and from another economic valuation of the Indian River Lagoon was used to convert these increases to dollar values. The intent is to demonstrate the historic importance of Biscayne Bay to recreation and commercial fishing and to estimate the potential benefit value of the Project.

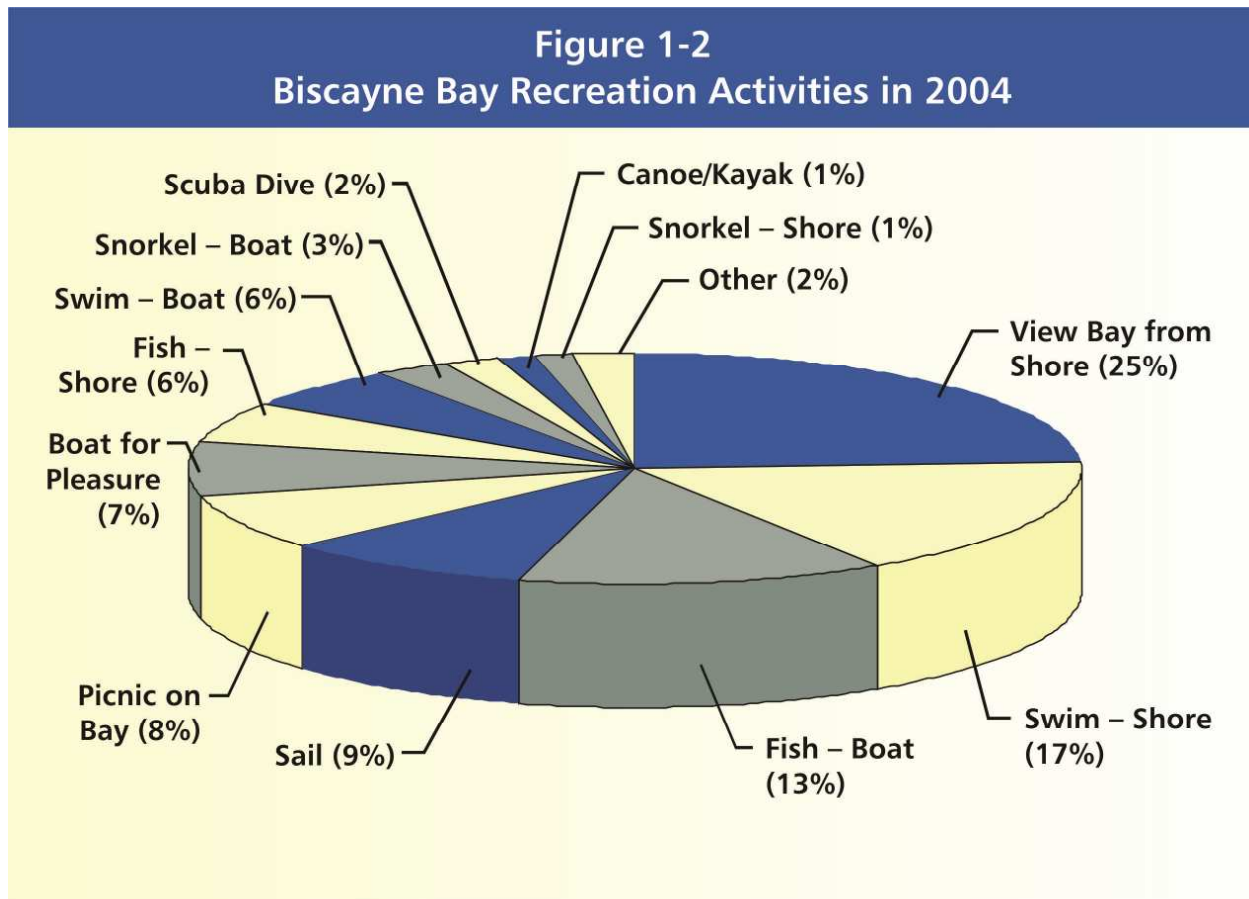
#### Recreational User Days on Biscayne Bay

Residents and visitors spent 65.5 million person-days participating in a wide-variety of recreation activities on Biscayne Bay in 2004. A person-day is one person participating in a primary recreation activity for all or part of one day. Of the many activities that may be enjoyed by a recreator during a day, only one

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and Southern Florida Project Comprehensive Everglades Restoration Plan, Biscayne Bay Coastal Wetlands Phase I”, Appendix G, Economic and Social Considerations, page G-22, July 2011.

<sup>9</sup> Hazen and Sawyer in association with Planning and Economics Group, “Biscayne Bay Economic Study, Task 3 Report – Final Biscayne Bay Economic Baseline and Trend Report”, prepared for the South Florida Water Management District, April 2005.



"primary" activity per person is counted per day. The distribution of these person-days in 2004 by type of primary recreation activity is provided in Figure 1-2.

A tremendous diversity of recreational activities are enjoyed on the Bay and its shoreline including viewing the Bay while dining and shopping at the entertainment venues or playing at the many parks that surround the Bay (25 percent of person-days); swimming from shore (17 percent); fishing from a boat (13 percent); sailing (9 percent); picnicking (8 percent); and boating for pleasure (7 percent). The BBES did not generate a distribution of where these activities took place on the Bay. Using local knowledge of the area, it seems likely that fishing from a boat; boating for pleasure; canoeing/kayaking; and snorkeling/diving are the predominant recreation activities that take place in the Project's shoreline and nearshore area. Other activities would be picnicking, and viewing the Bay and wildlife from shore.

The information provided in the BBES Report was used to obtain an estimate of 69.8 million person-days of Bay-related recreation in 2011. Consistent with the methods used in the BBES Report, the 65.5 million person-days in 2004 that was estimated using survey research was adjusted by the annual trend in park attendance from 2004 to 2011 at Biscayne National Park, Oleta River State Park, Barnacle Historic State Park and Bill Baggs Cape Florida State Park. These parks are located along Biscayne Bay.

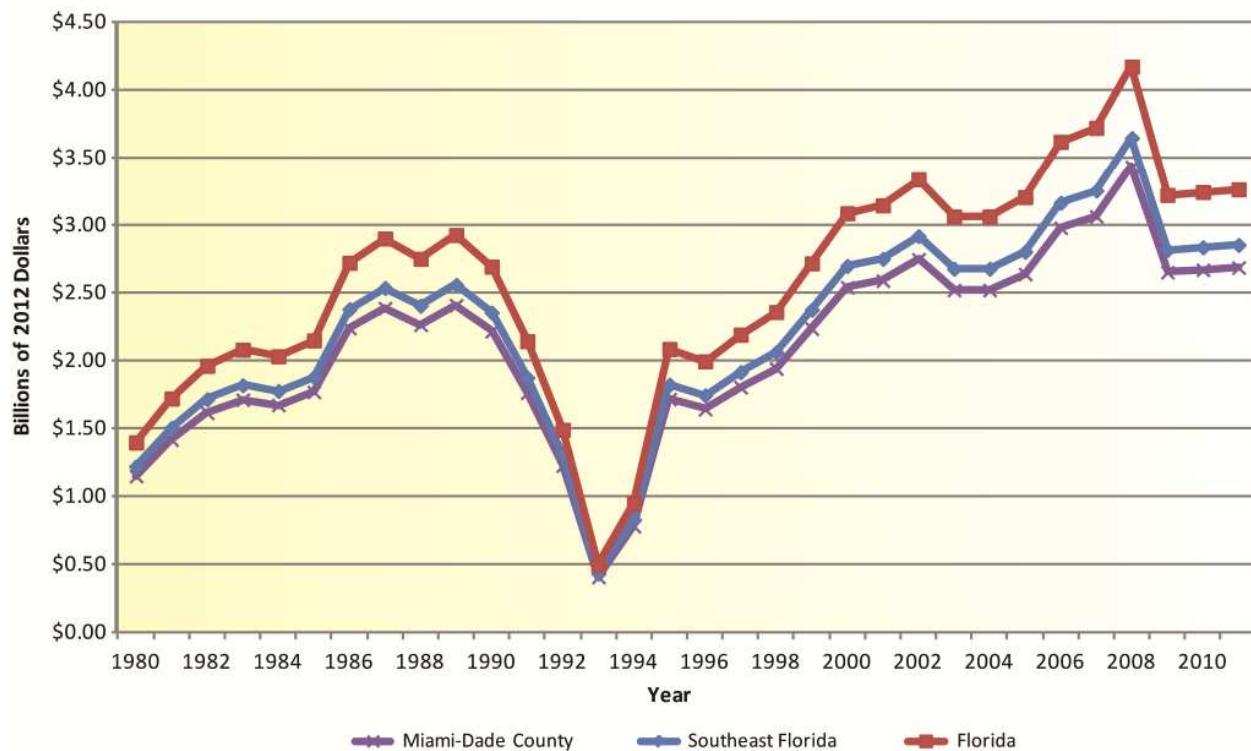
Economic Contribution of Biscayne Bay-Related Recreation

The BBES Report concluded that Biscayne Bay-related recreation generated \$2.1 billion of income to Miami-Dade County residents in 2004 through wages and salaries, proprietor's income, dividends, rents and profits. This value is \$2.5 billion in 2012 dollars. Income to residents represents 3.4 percent of all income received by county residents which demonstrates the significant contribution that Bay-related

recreation provides to the County's economy. Recreational uses of the Bay created 57,100 full and part time jobs and generated \$257 million in tax revenue in 2004 through excise taxes, property taxes, fees, licenses and sales taxes accruing to the State and local governments. These values are the direct, indirect and induced (multiplier) impacts as the recreational expenditures are used by the local businesses to pay the labor, equipment, supplies, capital cost, and the return on investment.

The BBES Report provides the annual income to Miami-Dade County; Southeast Florida and Florida from 1980 to 2004. Income for years prior to 2004 was adjusted based on the annual trend in park visitation at the four parks listed above. For this SERC, the annual income was calculated for 2005 through 2011 using this trend for the years 2005 through 2011. The annual income, in 2012 dollars, received by all Florida residents; the annual income received by all residents in Palm Beach, Broward, Miami-Dade and Monroe counties (southeast Florida); and the annual income received by all residents of Miami-Dade County from 1980 to 2011 due to Biscayne-Bay related recreation are provided in Figure 1-3.

**Figure 1-3**  
**Income to Residents Generated by Biscayne Bay**  
**Related Recreation, 1980 to 2011, in Billions of Dollars**



Recreational use intensity and its economic contribution grew steadily after 1980 and began to fall in 1990, perhaps due to the 1990-1991 U.S. recession. Recreation activity fell significantly in 1992 and 1993 after Category 4 Hurricane Andrew struck the county on August 24, 1992, compounding the impact of the recession. By 1995, Bay-related recreation use intensity and its economic contribution had completely recovered from the hurricane. By 2000, recreation activity and economic contribution had increased to just above their levels reached in 1989, the year prior to the U.S. recession. From 2000 to 2005, Biscayne Bay-related recreation was relatively flat. From 2006 to 2008 recreation increased significantly and then fell sharply in 2009, which is perhaps due to the Great Recession. In 2011, income to Miami-

Dade County residents from Bay-related recreation was estimated to be \$2.7 billion, or slightly more than it was in 2004 (\$2.5 billion in 2012 dollars).

#### Commercial Fishing and its Economic Contribution

According to the BBES Report, the contribution of Biscayne Bay to commercial fishing is two-fold. First, commercial fishing takes place in the Bay for the harvest of fish and shellfish, particularly pink shrimp. Second, Biscayne Bay and Florida Bay are very important grounds for the lifecycle of many fish species that are commercially harvested in Miami-Dade County. These species are ballyhoo, barracuda, goggle-eye, several grouper species (black, gag and red), grunts, hog snapper, several species of jack (almaco, crevalle, yellow), mullet, parrotfish, snapper (all species), white snapper, spiny lobster, live marine species, bait shrimp, pink shrimp and white shrimp. Both Biscayne Bay and Florida Bay are essential habitats for these species, so their values are attributable to both bays. These bays support commercial fisheries throughout southeast Florida. However, because the distribution of adult species that originate from Biscayne Bay has not been completely documented, only Miami-Dade county's harvest of Bay-dependent species was included in the BBES Report.

The BBES valued all fish, shellfish and live marine animal species that are known to spend at least part of their lifecycle in Biscayne Bay and were landed in Miami-Dade County. The total ex-vessel value<sup>10</sup> of these species was converted to the retail value which was then used to estimate economic contribution. Ex-vessel value is the price received by the commercial fisher. The retail value includes the ex-vessel to retail margin.

In 2002, the latest year available when the BBES was conducted, commercial fishermen landed 38 species of fish and shellfish and 165 species of live marine animals (for the tropical fish market) in Miami-Dade County. The most important species in terms of total ex-vessel value landed in 2002 were spiny lobster, bait shrimp, pink shrimp and live marine species including crabs, seahorses and snails. In 2011, all but live marine life were still the predominant species.

The number of live marine life landings in Miami-Dade County fell from 573,000 animals in 2002 to 510,000 animals in 2007 to 228,000 animals in 2010. Landings increased to 322,000 animals in 2011.<sup>11</sup> The value of live marine life landings mirrored these trends. According to the Florida Fish and Wildlife Conservation Commission and the NOAA Southeast Fisheries Science Center, the reason for this decline is not known. Possible explanations for the recent decline in landings from 2009 to 2010 are: (1) the winter of 2010 was particularly cold which reduced the number of trips taken to harvest marine life and may have increased the mortality of these species; and (2) the year 2010 was a re-qualifying year for obtaining the marine life endorsements needed to legally capture live marine animals.<sup>12</sup>

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<sup>10</sup> Ex-vessel price or value is the price received by fishermen for fish, shellfish and other aquatic plants and animals landed at the dock.

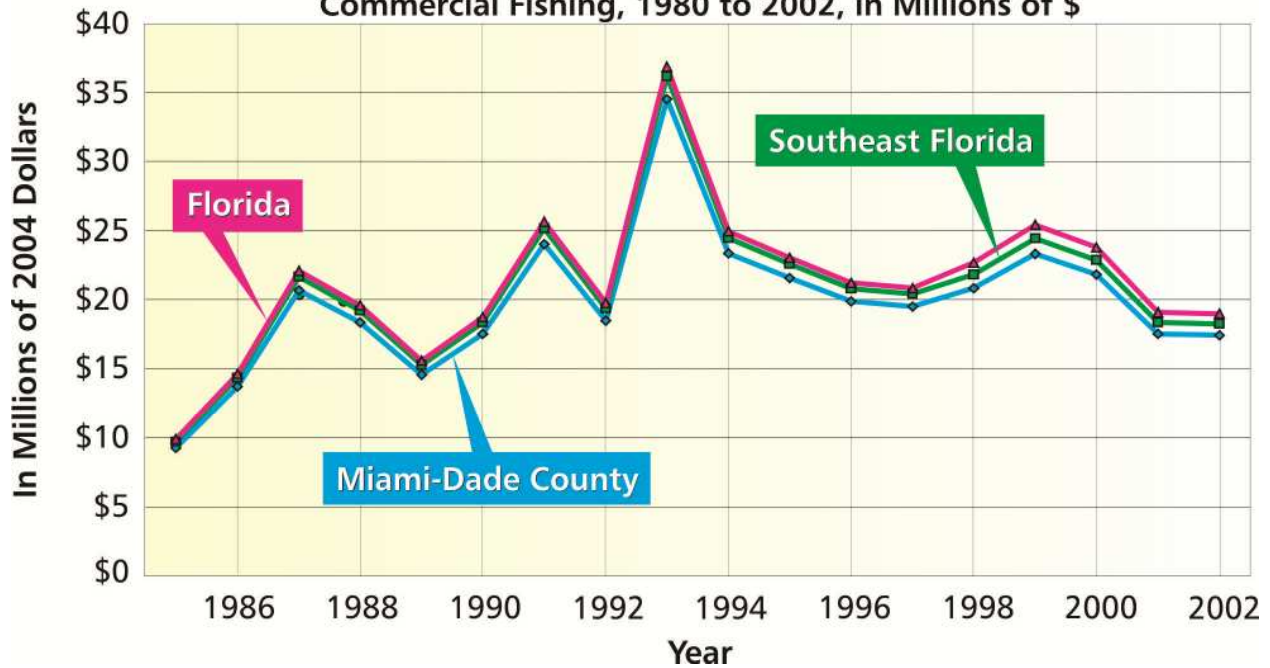
<sup>11</sup> All commercial landings reported in this document are from the Florida Fish and Wildlife Conservation Commission.

<sup>12</sup> From email correspondence with Steve Brown, Florida Fish and Wildlife Conservation Commission on February 19, 2013 and Steve Turner, NOAA Southeast Fisheries Science Center, February 20, 2013. A marine life tiered endorsement is required to harvest marine life species in quantities greater than the recreational bag limit or to sell marine life species as defined by Rule 68B-42.001, F.A.C.

The \$12 million retail value of the Bay-related commercial fishery landings in 2002 generated \$17 million in income to Miami-Dade county residents, 470 full and part time jobs and \$1.8 million in tax revenue to State and local governments. This income includes the multiplier effect as the revenue from the sale of marine landings is used to pay for labor, fuel, equipment, marketing and retail overhead, and the fishing vessel. This contribution is 0.03 percent of Miami-Dade County's economy.

The economic contribution of this Bay-related commercial fishing to Miami Dade County; southeast Florida; and Florida from 1985 to 2002 as measured by income to residents is provided in Figure 1-4. The value and economic contribution of the Bay-related commercial fishery increased significantly from 1985 to 2002. For example, in Miami-Dade County, resident income increased by \$9.3 million in 1985 to \$17.4 million in 2002.

**Figure 1-4**  
**Income to Residents Generated from Biscayne Bay-Related Commercial Fishing, 1980 to 2002, in Millions of \$**



Landings, value, and income peaked in 1993 which might be due to Hurricane Andrew's affect on species behavior. This Category 4 hurricane struck the county in August 1992. Overall, commercial fishing peaked in 1993 and was higher in 2002 than it was in 1985. However, the BBES found that the harvested value of species dependent on Biscayne Bay for survival and caught outside of the Bay declined significantly from 1993 to 2002.



#### 1.4 Hypothetical Benefit Values of BBCW CERP Phase 1 Project Using Scenario Analysis

No studies have been conducted that estimate the dollar value of benefits or quantify the benefits associated with the Biscayne Bay Coastal Wetlands CERP Phase 1 Project. However, it may be useful to assess the potential or hypothetical dollar value of benefits using the available information in order to demonstrate the magnitude of income, tax revenue, use value, and non-use value that could be generated from the project.<sup>13</sup>

To this end, economic value estimates provided in the BBES Report and a 2008 study of Florida's Indian River Lagoon<sup>14</sup> (IRL Study) were used to value potential changes in recreation person-days; non-use values; and the value of commercial fish landings due to the BBCW CERP Phase 1 Project.

Dollar values were estimated for two scenarios of hypothetical changes in ecosystem services generated by the Project. Both of these benefit scenarios are the "with" minus the "without" project impacts and are described in Table 1.3. The dollar values associated with these scenarios were estimated as described below. As indicated in the last row of this table, the calculations used to obtain the hypothetical increased retail value of commercial marine species landed are provided in Tables 1.4 and 1.5.

The only difference between the two scenarios is the two different values associated with the increased number of recreation person-days spent on Biscayne Bay due to the increased diversity and populations of wildlife throughout the Bay, and improved water clarity and visual aesthetics in the Project area.

Under Scenario 1, the increase is 1.17 million person-days and under Scenario 2, the increase is 292,000 person-days. These increases represent the difference between the number of recreation person-days on the Bay with and without the Project. As will be demonstrated below, the increase in this ecosystem service comprises most of the total economic value of the project. Because of the benefits assumptions and values used in this demonstration, increases in the values of the other ecosystem services are relatively small and contribute relatively little to the total value of benefits. Therefore, alternative values for these other ecosystem services were not used in Scenario 2.

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<sup>13</sup> Income includes wages, salaries, proprietor's income, rents, profits, royalties and dividends and is the income before income and capital gains taxes are deducted. Tax revenue includes excise taxes, property taxes, fees, licenses, and sales taxes. Tax revenue is also referred to in this SERC as tax revenue to State and local governments because it is expected that most of these taxes would be collected by these entities.

<sup>14</sup> Hazen and Sawyer, "Indian River Lagoon Economic Assessment and Analysis Update – Final Report", prepared for the Indian River Lagoon National Estuary Program in cooperation with the St. Johns River Water Management District and the South Florida Water Management District under Contract No. 24706, August 18, 2008.

**Table 1.3**  
**Two Scenarios of Hypothetical Changes in Ecosystem Services Generated**  
**By the BBCW CERP Phase 1 Project – With Versus Without the Project**

(These scenarios are for demonstration purposes & were estimated outside of an integrated ecological model.)

Ecosystem Service	Benefit Unit	Scenario 1 ("With" minus "without" Project)		Scenario 2 ("With" minus "without" Project)	
		Increase in No. of Benefit Units	Justification for Increase	Increase in No. of Benefit Units	Justification for Increase
Increased recreation opportunities from the Project's recreation facilities	Person-days, annual	29,200	Estimated by U.S. ACE and the District (a)	29,200	Same as Scenario 1
Increased recreation quality as Project increases wildlife populations & improves visual aesthetics (b)	Person-days, annual	1,169,233	Person-days of recreation activity on Biscayne Bay in 2011 (69,760,000) times % of Bay improved (1.68% = 2,950 acres / 176,000 acres).	292,318	Person-days increased by 1/4th of the percent of Bay improved (1,169,223/4)
Increase in non-use value from improved Bay ecosystem	% of Bay Improved	1.68%	About 2,950 acres of the Bay area are expected to be restored. Total surface area of the Bay is about 176,000 acres. (c)	1.68%	Same as Scenario 1
Increase in commercial fishery landings as Project improves fisheries habitat	Retail value of increased landings, annual	\$29,000	See Tables 1.4 and 1.5 for calculation	\$29,000	Same as Scenario 1

(a) U.S. Army Corps of Engineers, Jacksonville District and South Florida Water Management District, "Final Integrated Project Implementation Report and Environmental Impact Statement, Central and Southern Florida Project Comprehensive Everglades Restoration Plan, Biscayne Bay Coastal Wetlands Phase I", July 2011 - Revised March 2012, Appendix H, Recreation, page H-20 and 21.

(b) The only difference between Scenario 1 and 2 is that, under Scenario 1, the increase is 1.17 million person-days and, under Scenario 2, the increase is 292,318 person-days.

(c) South Florida Water Management District, "Technical Document to Support a Water Reservation Rule for the Comprehensive Everglades Restoration Plan Biscayne Bay Coastal Wetlands CERP Phase 1 Project", September 2012, pages 14 and 15.

**Table 1.4**  
**Commercial Marine Landings in Miami-Dade County of Species Likely to Increase in Number Due to the BBCW CERP Phase 1 Project**

Species	Year 2011		
	Weight in Pounds	Number of Fishing Trips Taken	Ex-vessel Value of Landings
Crevalle Jack	3,122	29	\$2,872
Spotted Seatrout	0	0	\$0
Black Mullet	492	3	\$359
Blue Crab	36,395	332	\$41,490
Pink Shrimp	244,254	434	\$505,606
<b>Total</b>	<b>284,263</b>	<b>798</b>	<b>\$550,327</b>

Source: Florida Fish and Wildlife Conservation Commission website.

**Table 1.5**  
**Estimated Hypothetical Retail Value of Increased Marine Landings Due to BBCW CERP Phase 1 Project**

Row No.	Item	Value
(1)	Affected Species Landed in Miami-Dade County in 2011 (a):	
(2)	Total pounds (from Table 1.4)	284,263
(3)	Total ex-vessel value, 2011 dollars (from Table 1.4)	\$550,327
(4)	Total estimated retail value, 2011 dollars (b)	\$1,711,518
(5)	Percent increase in retail value of landings due to project, 2011 dollars (based on % of Bay acres improved)	1.68%
(6)	Retail value of increased landings in 2011, 2011 dollars (c)	\$28,687
(7)	<b>Dollar value of increased landings in 2011, 2012 dollars (d)</b>	<b>\$29,217</b>

(a) Affected species are crevalle jack, spotted seatrout, black mullet, blue crab and pink shrimp. See Table 1.4 for data by species.

(b) Using a ratio of retail value to ex-vessel value of 3.11 from the BBES Report, page 4-10 (\$550,327 x 3.11).

(c) \$1,711,518 x 0.0168

(d) 2011 dollar value was adjusted to represent 2012 dollars using the GDP chained price index ratio of 1.1582 / 1.1373 = 1.018. From U.S. Office of Management and Budget website Table 10.1.

The methods by which the dollar values were calculated are provided as follows for each ecosystem service and type of value.

Use Value Associated with Increased Recreation Opportunities and Quality Due to the Project

The value that residents and visitors received from participating in recreation activities on Biscayne Bay is called "use value" and is the sum of their expenditures made to participate in the recreation activity plus their consumer surplus. Consumer surplus is the value they received from participating in the activity above the amount they actually paid to participate.

Expenditures. Use value is at least the expenditures made to participate in the activity, otherwise the person would not have participated. The Biscayne Bay user survey conducted for the BBES in 2004 asked respondents to state the amount of money they spent in Miami-Dade County for Bay-related goods and services on the last day that they used the Bay for each type of recreation activity. The types of goods and services include boat fuel; bait and tackle; boat and equipment rental; ramp, marina, park entrance and parking fees; lodging; food and beverages; auto gas and rental, and shopping/sundries. These survey results were used to estimate total expenditures by all residents and visitors who recreated on the Bay in 2004. These expenditures totaled \$2.66 billion as residents and visitors participated in the 65.5 million person-days of recreation activity on Biscayne Bay.<sup>15</sup> Using these numbers, the average expenditure per person-day of recreation was \$40.60 in 2004 dollars. This value is \$48.55 in 2012 dollars.<sup>16</sup>

If the Project's recreation facilities increase recreation on Biscayne Bay by 29,200 person-days per year, as estimated by the USACE and the District, then the additional Bay-related recreation expenditure is \$1.4 million per year or \$48.55 times 29,200. This result assumes that the 29,200 person-days is an increase in the total number of person-days spent recreating on or near the Bay relative to without the project and, therefore, does not displace recreation activities in other areas of the Bay.

An additional increase in the number of person-days of Bay-related recreation would be expected as residents and visitors enjoy the increased diversity and population of marine life, native birds and animals throughout the Bay; and the increased clarity and aesthetic quality of the nearshore Project area. The hypothetical 1.2 million person-day increase in Biscayne Bay-related recreation under Scenario 1 would generate \$56.8 million (\$48.55 times 1.2 million) in expenditures made in the County. This increase could be due to more people recreating on the Bay than without the project, and/or the same people recreating on the Bay more often per year than without the project. Bear in mind that the project may provide enough recreational benefits to keep people recreating on the Bay instead of going elsewhere for water-based recreation. Under Scenario 2, the 292,318 person-day increase would generate \$14.2 million in expenditures made in the County.

Consumer Surplus. The BBES did not estimate the consumer surplus associated with Bay-related recreation activities. The closest comparable study that might be used to infer this value is the Indian River Lagoon Economic Valuation Study prepared by the St. Johns River Water Management District and the South Florida Water Management District in 2008.<sup>17</sup> This study is herein referred to as the IRL Study. The approach used for this SERC is a benefit transfer method where the economic value of an ecosystem service is estimated using the results from similar studies that focused on a different location. The ecosystem service being valued by the study should be as similar as possible to the ecosystem service being valued. Any differences in the type and quality of the service and the population of the

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<sup>15</sup> From BBES Study, pages ES-2, 2-27 and 2-44.

<sup>16</sup> The factor used to convert 2004 dollars to 2012 dollars was 1.20 which is the ratio of the 2012 GDP Price Index to the 2004 GDP Price Index or 1.1582 / 0.9685 from U.S. Office of Management and Budget web site, Table 10.1.

<sup>17</sup> Hazen and Sawyer, "Indian River Lagoon Economic Assessment and Analysis Update" for the Indian River Lagoon National Estuary Program in cooperation with the St. Johns River Water Management District and the South Florida Water Management District, Final Report, August 18, 2008.

individuals whose values are estimated should be noted and adjustments made so that the values used are as representative as possible.

The Indian River Lagoon is located along Florida's east coast from Daytona Beach south to Jupiter. The surface water area of the lagoon is about 228,000 acres compared to about 176,000 surface water acres of Biscayne Bay. The values in this study's document represent the year 2007. Using the contingent valuation survey responses of 392 visitors and 1,000 residents in the five counties that surround the Indian River Lagoon, this project estimated the expenditures and consumer surplus associated with recreating on the Lagoon. The counties are Volusia, Brevard, Indian River, St. Lucie and Martin. Consumer surplus is the additional amount of money a person would have spent to participate in the recreation activity above what he or she actually spent. The methods used to estimate expenditures and consumer surplus are summarized in Appendix B of this SERC.

The recreation activities enjoyed on the Lagoon are very similar to those enjoyed on Biscayne Bay. The top five activities on the Lagoon, from highest to lowest number of person-days, are: (1) fin fishing; (2) swimming or wading; (3) power boating; (4) sunset cruising or viewing the Lagoon from shore while birdwatching, hiking, jogging or strolling; and (5) picnicking. By comparison, the top five recreation activities on Biscayne Bay are: (1) viewing the Bay from shore while birdwatching, hiking, jogging or strolling; (2) swimming from shore; (3) fishing from boat; (4) sailing from sailboat; and (5) picnicking.

Miami-Dade County is one of the largest metropolitan counties in Florida in terms of population and tourism while the five counties of the Indian River Lagoon are relatively small. For this reason, the annual number of recreational person-days on Biscayne Bay in 2004 is significantly larger than the person-days on the Indian River Lagoon in 2007, 65.5 million person-days versus 10.9 million person-days, respectively. While the northern portion of Biscayne Bay is much more populated and densely developed than any area along the Lagoon, the southern Bay is comparable to many areas of the Lagoon in terms of low human population density along the shore and the relative amount of undeveloped and protected land.

The annual consumer surplus from participating in recreation activities on the Indian River Lagoon is provided in Table 1.6 along with the method used to estimate the consumer surplus value per person-day for Biscayne Bay. The consumer surplus value to visitors from recreating on the Lagoon is \$10 per person-day of recreation. The consumer surplus value to residents is \$96 per person-day. This difference in consumer surplus is due to the fact that visitors spend more money to access the Bay for recreation than residents. Thus, while the IRL Study found that total use value of Lagoon-related recreation is \$175 per person-day for visitors and \$196 per person-day for residents, the larger Lagoon-related expenditures by visitors results in a lower consumer surplus value.

For consistency and as a lower bound estimate, these consumer surplus values for the Lagoon were used to estimate the consumer surplus for Biscayne Bay instead of taking the total Lagoon-related use values of \$174 and \$196 and deducting the average Bay-related expenditure per visitor and resident. The estimated consumer surplus value for Biscayne Bay was estimated by taking the weighted average of the \$10 and \$96 values with weights that are the proportion of total Bay-related recreation person-days spent by visitors (54%) and residents (46%). This results in a weighted average consumer surplus of \$49 per person-day of recreation in 2007 dollars or \$53 per person-day of recreation in 2012 dollars.

**Table 1.6**  
**Estimates of Annual Recreational Consumer Surplus Per Person-Day (a)**

Item	Value	Source
Consumer Surplus Per Person-Day, Annual:		
- By visitors, 2007 \$	\$10	Indian River Lagoon Economic Valuation, 2008, pages 2-15, 2-31, 3-4 and 3-5.
- By residents, 2007 \$	\$96	
Weighted average using resident and visitor proportions from BBES Study, 2007 dollars	\$49	Percent residents (46%) and visitors (54%) from Biscayne Bay Economic Study, 2005, page ES-4
<b>Weighted average in 2012 dollars</b>	<b>\$53</b>	GDP chained price index ratio of 1.1582/1.0646 = 1.089

(a) From Indian River Lagoon Economic Valuation Study Applied to Biscayne Bay Recreational Uses.

To obtain an estimate of the total consumer surplus associated with the increased number of person-days as the project provides recreation facilities, the \$53 was multiplied by the 29,200 person-days. This estimated consumer surplus is \$1.55 million per year. For the estimated consumer surplus as the Project improves recreation quality throughout the Bay, the 1.17 million person-day annual increase under Scenario 1 was multiplied by the \$53 per person-day to obtain a total consumer surplus of \$62.2 million per year. Under Scenario 2, the 292,300 person-day increase per year was multiplied by the \$53 per person-day to obtain a total consumer surplus of \$15.5 million per year.

These calculations of consumer surplus and those associated with the recreation expenditure estimates are provided in Table 1.7. The total value associated with the Project's recreation facilities is estimated to be \$2.97 million per year under both Scenarios. For the increased recreation quality throughout the Bay, the hypothetical total use value is \$119 million per year under Scenario 1 and \$30 million per year under Scenario 2.

**Table 1.7**  
**Hypothetical Annual Use Values of Biscayne Bay Recreation**  
**Generated from the BBCW CERP Phase 1 Project**

Item	Increased recreation opportunities from Project's recreation facilities		Increased recreation quality as Project increases frequency of animal sighting and improves visual aesthetics	
	Scenario 1	Scenario 2	Scenario 1	Scenario 2
<b>Expenditures</b>				
Per Person Per Day	\$48.55	\$48.55	\$48.55	\$48.55
Increase in Person-Days, annual	29,200	29,200	1,169,273	292,318
Increased Expenditures, annual	\$1,418,000	\$1,418,000	\$56,770,000	\$14,193,000
<b>Consumer Surplus</b>				
Per Person Per Day	\$53.16	\$53.16	\$53.16	\$53.16
Increase in Person-Days, annual	29,200	29,200	1,169,273	292,318
Increased Consumer Surplus, annual	\$1,552,000	\$1,552,000	\$62,155,000	\$15,539,000
<b>Total Use Value, Annual</b>	<b>\$2,970,000</b>	<b>\$2,970,000</b>	<b>\$118,925,000</b>	<b>\$29,732,000</b>

Resident Income and Tax Revenue Generated from the Project

Given the \$2.11 billion of income to Miami-Dade County residents and the \$257 million in tax revenue collected by State and local governments<sup>18</sup> from the 65.5 million person-days of Bay-related recreation in 2004, the average income and tax revenue per person-day of recreation is \$36.19 per year in 2004 dollars. This value is \$43.27 per person-day per year in 2012 dollars.

If the 29,200 additional recreation person-days per year from the Project's recreation facilities are not replacing other recreation days on Biscayne Bay, then the income and tax revenue that would be generated by this additional recreation activity is about \$1.26 million per year ( $\$43.27 \times 29,200$ ).

The hypothetical Bay-wide increase in the number of person-days of 1.17 million, would increase resident income and tax revenues by \$50.6 million per year under Scenario 1 ( $\$43.27 \times 1,169,233$ ) and \$12.6 million per year ( $\$43.27 \times 293,318$ ) under Scenario 2.

Increase in Non-Use Value of Biscayne Bay Due to the Project

The increase in non-use value from the BBCW CERP Phase 1 Project was estimated using the information in the BBES Report and the IRL Study Report. The BBES did not estimate non-use values of Biscayne Bay. However, the IRL Study estimated the non-use value of the Indian River Lagoon to all visitors to and all residents of the five counties of the Lagoon. The non-use value of the Lagoon was estimated under the Lagoon's environmental and ecosystem conditions as they existed in 2007 and as they would exist if the environmental and ecosystem conditions of the Lagoon were improved. This improvement was described to the survey respondents as follows:

*"This plan would remove harmful muck sediments from the bottom of the entire Lagoon system; restore and reconnect all wetlands; and manage additional freshwater and stormwater flows to protect the Lagoon. Maintenance of past environmental measures would also be conducted. The effect of this plan would be a significant increase in the amount and diversity of wildlife, such as fish, shellfish, birds, and mammals and increased water clarity throughout the Lagoon system."*

The increases in the annual non-use value per person from these improvements to the Lagoon were \$0.26 per person per year for visitors and \$0.71 per person per year for residents in 2007 dollars. These values are equal to the non-use value of the Indian River Lagoon under the improved environmental condition minus the non-use value of the Lagoon under the environmental conditions that existed in 2007. If these increases in non-use value were adjusted to reflect the relative size of the Bay versus the Lagoon, these values would be \$0.20 for visitors and \$0.55 for residents. These values were obtained by multiplying the \$0.26 and \$0.71 by the ratio of the surface water size of the Bay to the surface water size of the Lagoon (176,000 acres / 228,000 acres).

A weighted average of these two values was calculated using the percent of residents and visitors in Miami-Dade County who are residents (99%) and the percent who are visitors (1%). These proportions were calculated using the visitor data in the BBES Report (number of visitor-days divided by 365 days per year divided by 9.84 days per visit) and the 2004 resident population 18 years and over from the U.S.

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<sup>18</sup> Income to Miami-Dade County residents and tax revenue collected by the State and local governments are from the BBES Study, page ES-11.

Census (this was the population age group used in the IRL study). This weighted average is \$0.55 per person per year in 2007 dollars which is \$0.59 per person per year in 2012 dollars (using the GDP chained price index).

The \$0.59 per person per year was multiplied by the 2.58 million residents and visitors in 2012 and the percent of the Bay that will be improved (1.68%) to obtain an estimate of the increase in non-use value from the BBCW CERP Phase 1 Project. The 2012 residents and visitors were estimated using the 2012 population in Miami-Dade County who are at least 18 years old from the U.S. Census divided by 0.99 which is the proportion of residents and visitors who were residents in 2004 as estimated above. The hypothetical increase in non-use value is \$26,000 per year.

The present value of this annual non-use value over 30 years at 2 percent annual discount rate is \$582,000. This is a low-end estimate of non-use value because it includes only residents of and visitors to Miami-Dade County. The values to other Florida and U.S. residents are not included. For example, residents in neighboring Broward and Monroe counties likely value an improved Biscayne Bay even though they may never use the Bay for recreation. Also note that this is a hypothetical change in non-use value from the BBCW CERP Phase 1 Project and not the total non-use value of the Bay. The actual change in non-use value could be larger than that used in this demonstration.

#### Dollar Value of Benefits Related to Commercial Fishing

The BBCW CERP Phase 1 Project is expected to increase commercial fishing harvest in Miami-Dade County as the Project increases the populations of pink shrimp, blue crab, spotted sea trout, black mullet, and crevalle jack. Under Scenarios 1 and 2, the retail value of these commercial species is hypothetically expected to increase by \$29,000 per year as was estimated in Table 1.5. This retail value is expected to increase income and tax revenue and also provide benefits to the consumers from these species.

The BBES found that, in 2002, \$17 million in income to County residents was generated and \$1.8 million in tax revenue was collected by State and local governments from the \$12.2 million in retail value of Bay-related commercial fishery landings. This implies that the average income and tax revenue per dollar of retail value landed was \$1.54 in 2002 dollars.<sup>19</sup> This value is \$1.92 in 2012 dollars. This \$1.92 was multiplied by the \$29,000 per year of increased retail value to obtain an estimated \$56,000 of income and tax revenue generated from the Project.

The use value from consuming the fish species landed due to the Project is equal to the increased retail value of the species landed, which was hypothetically set at \$29,000 per year, plus the consumer surplus associated with this landed quantity. The consumer surplus value is not known and was not estimated here.

#### Summary of Benefit Values for the Hypothetical Increases in Ecosystem Services Provided by the Project

The estimated dollar values for each ecosystem service and type of value that was discussed above are provided in Table 1.8 for Scenario 1 benefit levels and Table 1.9 for Scenario 2 benefit levels. The only difference between the values in Table 1.8 and those in Table 1.9 are those associated with Column (3), "Increased recreation quality as Project increases wildlife populations & improves visual aesthetics". The total value of this benefit is \$169.5 million under Scenario 1 and \$42.4 million under Scenario 2. The total economic values of each scenario are provided in Table 1.10.

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<sup>19</sup> From BBES Study, page ES-11.



**Table 1.8**  
**Estimated Dollar Values of Hypothetical Increases in Ecosystem Services**  
**Generated by the BBCW CERP Phase 1 Project, Scenario 1 Benefits, 2012 Dollars**

Type of Annual Value	Increased recreation opportunities from the Project's recreation facilities	Increased recreation quality as Project increases wildlife populations & improves visual aesthetics	Increase in commercial fishery landings as Project improves fisheries habitat	Increase in non-use value from improved Bay ecosystem
(1)	(2)	(3)	(4)	(5)
Use Value Total:	\$2,970,000	\$118,925,000	\$29,000	
Expenditures	\$1,418,000	\$56,770,000	\$29,000	
Consumer Surplus	\$1,552,000	\$62,155,000	Not Available	
Income & Tax Revenue	\$1,264,000	\$50,599,000	\$56,000	
Non-Use Value to County residents & visitors				\$26,000
<b>Total for Ecosystem Service</b>	<b>\$4,234,000</b>	<b>\$169,524,000</b>	<b>\$85,000</b>	<b>\$26,000</b>

**Table 1.9**  
**Estimated Dollar Values of Hypothetical Increases in Ecosystem Services**  
**Generated by the BBCW CERP Phase 1 Project, Scenario 2 Benefits, 2012 Dollars**

Type of Annual Value	Increased recreation opportunities from the Project's recreation facilities	Increased recreation quality as Project increases wildlife populations & improves visual aesthetics	Increase in commercial fishery landings as Project improves fisheries habitat	Increase in non-use value from improved Bay ecosystem
(1)	(2)	(3)	(4)	(5)
Use Value Total:	\$2,970,000	\$29,732,000	\$29,000	
Expenditures	\$1,418,000	\$14,193,000	\$29,000	
Consumer Surplus	\$1,552,000	\$15,539,000	Not Available	
Income & Tax Revenue	\$1,264,000	\$12,650,000	\$56,000	
Non-Use Value to County residents & visitors				\$26,000
<b>Total for Ecosystem Service</b>	<b>\$4,234,000</b>	<b>\$42,382,000</b>	<b>\$85,000</b>	<b>\$26,000</b>

**Table 1.10**  
**Summary of Benefit Values of BBCW CERP Phase 1 Project Under Hypothetical Scenarios 1 and 2**  
**2012 dollars**

Ecosystem Service	Annual Benefit Values		Benefit Values Over 30 Years at 2% annual real discount rate	
	Scenario 1	Scenario 2	Scenario 1	Scenario 2
(1)	(2)	(3)	(4)	(5)
Increased recreation opportunities from the Project's recreation facilities	\$4,234,000	\$4,234,000	\$94,826,593	\$94,826,593
Increased recreation quality as Project increases wildlife populations & improves visual aesthetics	\$169,524,000	\$42,382,000	\$3,796,736,731	\$949,206,579
Increase in commercial fishery landings as Project improves fisheries habitat (a)	\$85,000	\$85,000	\$1,903,699	\$1,903,699
Increase in non-use value from improved Bay ecosystem (b)	\$26,000	\$26,000	\$582,308	\$582,308
<b>Total Economic Value</b>	<b>\$173,869,000</b>	<b>\$46,727,000</b>	<b>\$3,894,049,330</b>	<b>\$1,046,519,179</b>

(a) This is a low-end estimate of commercial fishery value because it does not include the consumer surplus associated with consuming the landed fish species.

(b) This is a low-end estimate of non-use value because it includes only residents of and visitors to Miami-Dade County. The values to other Florida and U.S. residents are not included. For example, residents in neighboring Broward and Monroe counties likely value an improved Biscayne Bay even though they may never use the Bay for recreation. Also note that this is a hypothetical change in non-use value from the BBCW CERP Phase 1 Project and not the total non-use value of the Bay. The actual change in non-use value could be larger than that used in this demonstration.

The total annual economic value of the benefits provided under Scenario 1 is \$173.9 million as provided in Table 1.10. If this value is realized each year over the next 30 years, then the present value of these benefits is \$3.89 billion. Under Scenario 2, where the person-days of increased recreation on Biscayne Bay is reduced by 75 percent, the total annual economic value of the benefits is \$46.7 million and the present value of these benefits over 30 years is \$1.05 billion.

This hypothetical case study demonstrates that the benefits of the BBCW CERP Phase 1 Project will increase income to County residents; increase tax revenues collected by State and local governments; increase the use value associated with Biscayne Bay-related recreation; and increase the non-use value associated with the ecosystems of Biscayne Bay. While there are no studies that have estimated increases in the number recreation person-days; increases in the retail value of commercial marine landings; or increases in non-use value, these two scenarios demonstrate the potential magnitude of the dollar value of benefits created by the Project.

## 1.5 Potential Costs of the Proposed Rule

As discussed in Section 4.0 of this SERC, the proposed rule is not expected to incur transactional costs unless a consumptive use permit applicant requests surface water quantities from the affected canals above the "target" level. For this request, the applicant will need to conduct a water budget evaluation to identify the amount of available surface water above the reserved quantities that may be withdrawn for

consumptive use. The proposed rule does not require any ground water modeling. The estimated transactional cost to prepare a water budget to a hypothetical applicant is \$4,500. This is a one-time cost that would be incurred during the permit application process. The number of applicants that may potentially pursue this type of surface water application is likely to be low. Given past applications history, only three water use permits for surface water withdrawals have been issued for withdrawals from the reservation's designated canal reaches.<sup>20</sup> The permitted uses are for landscape irrigation.

The proposed rule is not expected to incur costs to the District; or to any State or local government entity. The proposed rule does not place any new requirements or responsibilities on State and local governments. The proposed rule is not expected to reduce property values, local government property tax payments, or State sales tax revenues. The procedures that would be followed by the District under the proposed rule will be the same as those under current rule. The proposed rule is not expected to cause an increase in the District's cost nor will it require additional staff resources relative to current rule.

## 1.6 Potential Overall Economic Impact of the Proposed Rule

Economic impact is the change in income, employment and the value of goods and services produced as a result of the proposed Biscayne Bay Water Reservation rule. The magnitude of the economic impact will depend on the extent to which the benefits and costs of the proposed rule will affect the economy.

The benefit of this rule is that the water reservation will provide the water needed to achieve the objectives of the Biscayne Bay Coastal Wetlands CERP Phase 1 project as described in Section 1.3. These objectives are expected to improve and expand recreation opportunities on the Bay which is expected to increase recreation-related expenditures of Miami-Dade County residents and visitors as they increase participation in Bay-related recreation activities. These expenditures in turn will generate income and employment to residents of Miami-Dade County as well as residents in regions outside of the county. Tax revenues to State and local governments will also increase.

If the project increases the productivity of commercially harvested marine species such as fish and shellfish, then an increase in commercial fishery landings will also provide a positive economic impact (or benefit) as commercial fishers use the increased revenue as income and to pay fishing-related costs to other individuals and businesses.

Fifty percent of the capital cost of this project will be funded by the Federal government. Federal funding is an injection of new money into the local economy that will increase economic activity and generate positive economic impacts as the project is constructed. The District and the U.S. Army Corps of Engineers estimates that 607 employment-years and \$44.2 million in gross regional product (2007 dollars) will be generated in Miami-Dade County over the first 11 years after construction begins on the BBCW Phase I project.<sup>21</sup> One employment-year is one person working full time for one year. Gross Regional Product measures the value added by land, labor and capital in the production of goods and services within the County. It is the sum of wages, salaries, proprietor income, rents, profits, royalties, and

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<sup>20</sup> from the District's Regulatory Database

<sup>21</sup> U.S. Army Corps of Engineers, Jacksonville District and South Florida Water Management District, "Final Integrated Project Implementation Report and Environmental Impact Statement, Central and Southern Florida Project Comprehensive Everglades Restoration Plan, Biscayne Bay Coastal Wetlands Phase I", page Appendix G-69, July 2011 – Revised March 2012.

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dividends before taxes are deducted; and also includes all related taxes owed including income taxes, excise taxes, property taxes, fees, licenses, and sales taxes. Most of these benefits will be generated during the estimated four years of project construction. Some of these benefits have already been realized because portions of the project have already been constructed.

No reduction in economic activity in Miami-Dade County is expected as a result of the proposed rule. Therefore, no reductions in the production of goods and services are expected. The overall economic impact of the proposed rule is expected to be positive because the increased economic activity from the BBCW CERP Phase 1 Project's benefits are expected to be greater than the small transactional cost associated with the proposed rule.

## Section 2: Number of Individuals and Entities Required to Comply

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### 2.1 Information Provided in this Section

This Section provides estimates of the number of individuals and entities likely required to comply with the proposed water reservation rule and a general description of the types of individuals and entities likely to be affected by the rule. Section 2.2 provides a summary of these estimates and descriptions.

Section 2.3 describes the existing water use permittees and their permitted uses of water from the affected canals and from all water sources within one mile of the affected canals. This one mile area is used in this SERC to ensure that individuals and entities who might find it economical to access new permitted water quantities from the affected canals are identified and is herein referred to as the study area. Section 2.4 identifies those vacant land parcels in the study area that are not associated with a water use permit. The owners of these parcels might be affected by the proposed rule.

Section 2.5 describes the economy of the study area and Miami-Dade County and presents the demographic and economic trends in the county. This information demonstrates that the future economic contribution of the vacant land in the study area will be a small part of the Miami-Dade County economy in the foreseeable future whether or not the proposed rule is adopted.

### 2.2 Summary of Individuals and Entities Likely Required to Comply

Individuals and entities required to comply with the proposed rule are those that request new permitted water quantities from the affected canals identified in Section 1 of this SERC after the effective date of the rule. As of November 9, 2012, no applications are pending with the District for new water from the affected canals and no complete applications for water from these canals have been denied. Owners and renters of individual single-family houses and duplexes supplied with water from the affected canals currently or in the future under the No-Notice General Permit Rule (40E-2.061, F.A.C.) will not be affected by the proposed rule. The three existing permittees of water from the affected canals appear to have sufficient water supply for the permitted uses. Because these three permits are associated with irrigation of landscaping at two existing residential developments and at a government center, they are unlikely to request a permit modification that would be contrary to the proposed rule. Thus, there are no known individuals or entities that will likely be required to comply with the proposed rule.

The number of future applicants for new water quantities from the affected canals is not known. However, potential applicants for permitted water from any source were counted by identifying vacant land parcels within one mile of the affected canals (study area) that are not associated with a water use permit. Parcels in areas zoned residential or commercial that are less than one acre in size are not expected to be affected by the proposed rule because the small amount of water that might be needed by these areas would likely be supplied by a water utility. These parcels were not included in the evaluation.

From the available information, it appears that no more than about 649 individuals and entities might be required to comply with the proposed rule in the future. These individuals and entities own vacant land in areas zoned agricultural or industrial and/or own vacant land greater than one acre in areas zoned

residential or commercial within the study area and these parcels are not associated with a water use permit. Some of these individuals and entities own more than one vacant land parcel in the affected area.

It is not likely that this many individuals and entities will be affected by the proposed rule because future requests for permitted water quantities by these individuals and entities are expected to be from the Biscayne aquifer or they will obtain needed water from the Miami-Dade Water and Sewer Department. All but three of the 377 existing water use permits in the study area are permitted to withdraw groundwater quantities from the Biscayne Aquifer. Also, individuals and entities requesting permitted water withdrawals from an affected canal where new withdrawals are already restricted under other existing consumptive use rules will not be affected by the proposed rule.

### 2.3 Existing Water Use Permittees

Currently there are three water use permits for water withdrawals from the affected canals and water bodies. These permits are associated with businesses using water from the District's C-1 Canal to irrigate turf and landscape plants at two apartment complexes and at a government building. The total annual average daily permitted quantity on all three permits is 24,000 gallons per day to irrigate 19.3 acres. These permittees are potentially affected by the proposed rule if they request an increase in permitted quantities from this water source or if they wish to move their withdrawal point downstream of the same coastal structure. Given the current land uses associated with these three permits, these permittees are not likely to be affected by the proposed rule because they have sufficient permitted water quantities for turf and landscape plant irrigation.

By comparison there are 374 water use permits within the study area that allow the withdrawal of water from several sources other than the affected canals including the Biscayne Aquifer; on-site canals and lakes; other District canals; or the Upper Floridan Aquifer. These permits are held by 136 permittees who are individuals, businesses and water utilities. They are likely to have sufficient permitted quantities on their existing permits for the current and future uses of the associated land. If not, then they may request and could be granted, additional permitted water quantities from the Biscayne Aquifer as long as they meet all other permitting criteria for obtaining a water use permit. Thus, it is not likely that any existing permittees will be affected by the proposed rule.

These permits and the three permits using the affected canals are summarized in Table 2.1. The three permits are represented in the row corresponding to the "SFWMD Canal (C-1)".

Ninety-two percent of the 377 permits are for water quantities from the Biscayne Aquifer for all types of uses including agricultural irrigation, dewatering, golf course irrigation, industrial uses, landscape irrigation and public water supply. Of these permits, 87 percent are for agricultural or landscape irrigation.

For 29 permits, water from the District's canals or from the permittee's on-site canals or lakes are used for landscape irrigation. One public water supply permit is for the use of water from the Upper Floridan Aquifer.

The 169 landscape irrigation permits, which comprise 45 percent of all permits in the study area, are for the provision of water to irrigate turf and plants at parks, schools, residential developments and businesses. Of the 160 agricultural irrigation permits, which comprise 42 percent of all permits, at least 63 are associated with plant nursery irrigation and the rest are for irrigating avocados, vegetables, citrus, and tropical fruits.

The 22 industrial permits, which comprise 6 percent of all permits, provide water to the City of Homestead's electric power plant and the FP&L Cutler electric power plant for cooling. Other industrial uses of the permitted water include landfill maintenance, cement production, waste management, hospital cooling, and water supply at gas stations and dry cleaners. The public water supply permits, which comprise 4 percent of all permits, are associated with the local water utilities including Florida City and the City of Homestead and local residential developments and businesses. Four of the permits supply water for golf course irrigation.

**Table 2.1**  
**Summary of Water Use Permits Located Within the Study Area –**  
**Number of Permits Within One Mile of the Affected Canals**

Permitted Water Source	Agricultural Irrigation	Dewatering	Golf Course Irrigation	Industrial	Landscape Irrigation	Public Supply	Total	% by Water Source
Biscayne Aquifer	159	6	3	22	142	15	347	92%
On-site Canal(s) or Lake(s)	1	0	1	0	22	0	24	6%
SFWMD Canal (C-1)	0	0	0	0	3	0	3	1%
SFWMD Canal (C-2)	0	0	0	0	1	0	1	0.3%
SFWMD Canal (C-100)	0	0	0	0	1	0	1	0.3%
Upper Floridan Aquifer	0	0	0	0	0	1	1	0.3%
Total	160	6	4	22	169	16	377	100%
<b>% by Type of Water Use</b>	<b>42%</b>	<b>2%</b>	<b>1%</b>	<b>6%</b>	<b>45%</b>	<b>4%</b>	<b>100%</b>	

## 2.4 Applicants for New Permitted Water Quantities

As of March 13, 2013, there were no applications for new permitted water quantities from the affected canals pending with the District and no complete applications for water from these canals have been denied. Between November 15, 2012 and February 14, 2013, visual inspections of the District maintained canals have been made to identify possible non-permitted users of water from these canals. Any visible irrigation lines extending into the affected canals were further investigated to determine if water was actively being withdrawn. It was determined there are no known non-permitted users withdrawing from the affected canals. The North Canal is a non-District canal and was not inspected. Thus, there are no known individuals or entities that will be required to comply.

Given the available information, the number of future applications for permitted water quantities from the affected canals is not known. Owners of vacant land within the study area where the land is not already covered by a water use permit may request a water use permit in the future if the land will be developed for agricultural production, industrial activities, or multi-family residences. These land uses may require water for irrigating crops, lawns and landscapes or for industrial processes.

For vacant parcels in areas zoned residential or commercial that are less than one acre in size, it is likely that future water needs will be met by the local water utility or the Biscayne Aquifer. Also, new single-family homes and duplexes built on this vacant land will be able to irrigate their lawns using water from the affected canals under the No-Notice General Permit Rule (40E-2.061, F.A.C.).

The number of properties, property owners and acreages of vacant land in the study area not covered by a water use permit are summarized in Table 2.2. This table includes the information for all vacant land zoned as agricultural and industrial; and for vacant land greater than five acres zoned as residential and

commercial. The table also provides the information for parcels zoned in residential and commercial areas that are greater than 1 acre in size.

The locations of these properties are provided in Figure 2-1 where the residential and commercial properties greater than five acres are included and in Figure 2-2 where these properties greater than one acre are included.

**Table 2.2  
 Number of Properties, Owners and Acreages of Vacant Land in the Study Area with No Existing Water Use Permits (a)**

Map Symbol	Land Use Zone	More than 5 acre parcels in Residential and Commercial			More than 1 acre parcels in Residential and Commercial		
		No. of Properties	No. of Property Owners (b)	Number of Acres	No. of Properties	No. of Property Owners (b)	Number of Acres
	Agriculture	313	377	3,319	313	377	3,319
	Industrial	84	72	179	84	72	179
	Residential	63	36	995	202	134	1,315
	Commercial	16	15	123	75	66	246
	<b>Total</b>	<b>476</b>	<b>500</b>	<b>4,616</b>	<b>674</b>	<b>649</b>	<b>5,059</b>

(a) All properties located in areas zoned Agriculture or Industrial are included in this table. For properties located in areas zoned Residential or Commercial, the size of the properties counted are indicated in the table headings. The study area is within one mile of the affected canals.

(b) An owner of more than one property in any type of land use is counted only once. The count would be included in the order of the Land Use Zones listed in the table. For example, if a person owns two vacant land parcels in the study area with no associated water use permit and one is in an area zoned agricultural and the other is in an area zoned industrial, then the owner will be counted under the agricultural land use zone and not the industrial land use zone. This was done so that the same owner is counted only once.

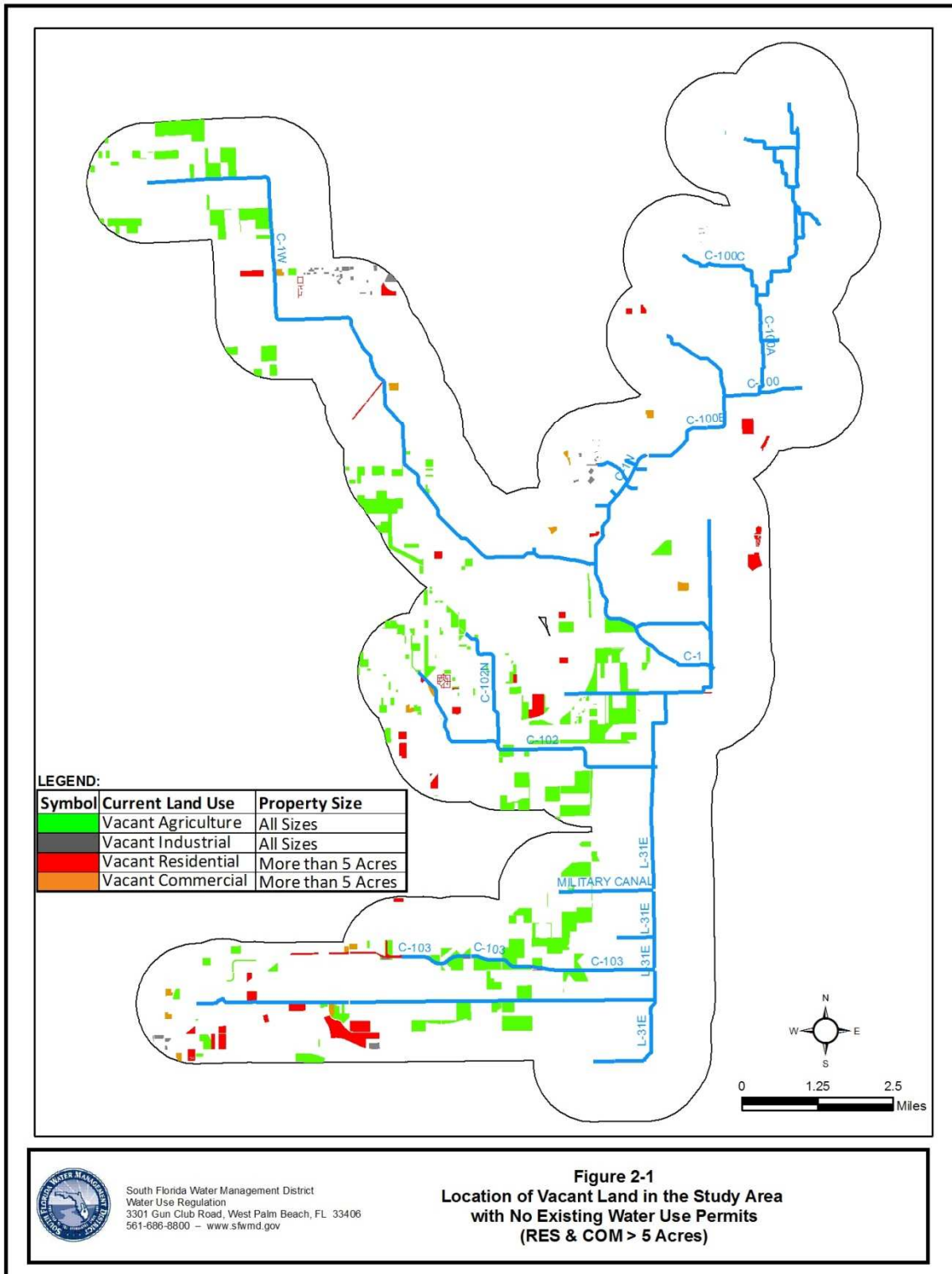
Source: South Florida Water Management District.

There are 476 vacant properties in the study area that are located in areas zoned as agricultural or industrial or are greater than five acres and zoned residential or commercial. These properties are owned by 500 individuals and entities and comprise 4,616 acres of vacant land. The average parcel size is 9.7 acres. This vacant land represents about 6.7 percent of all land in the study area (68,973 acres).

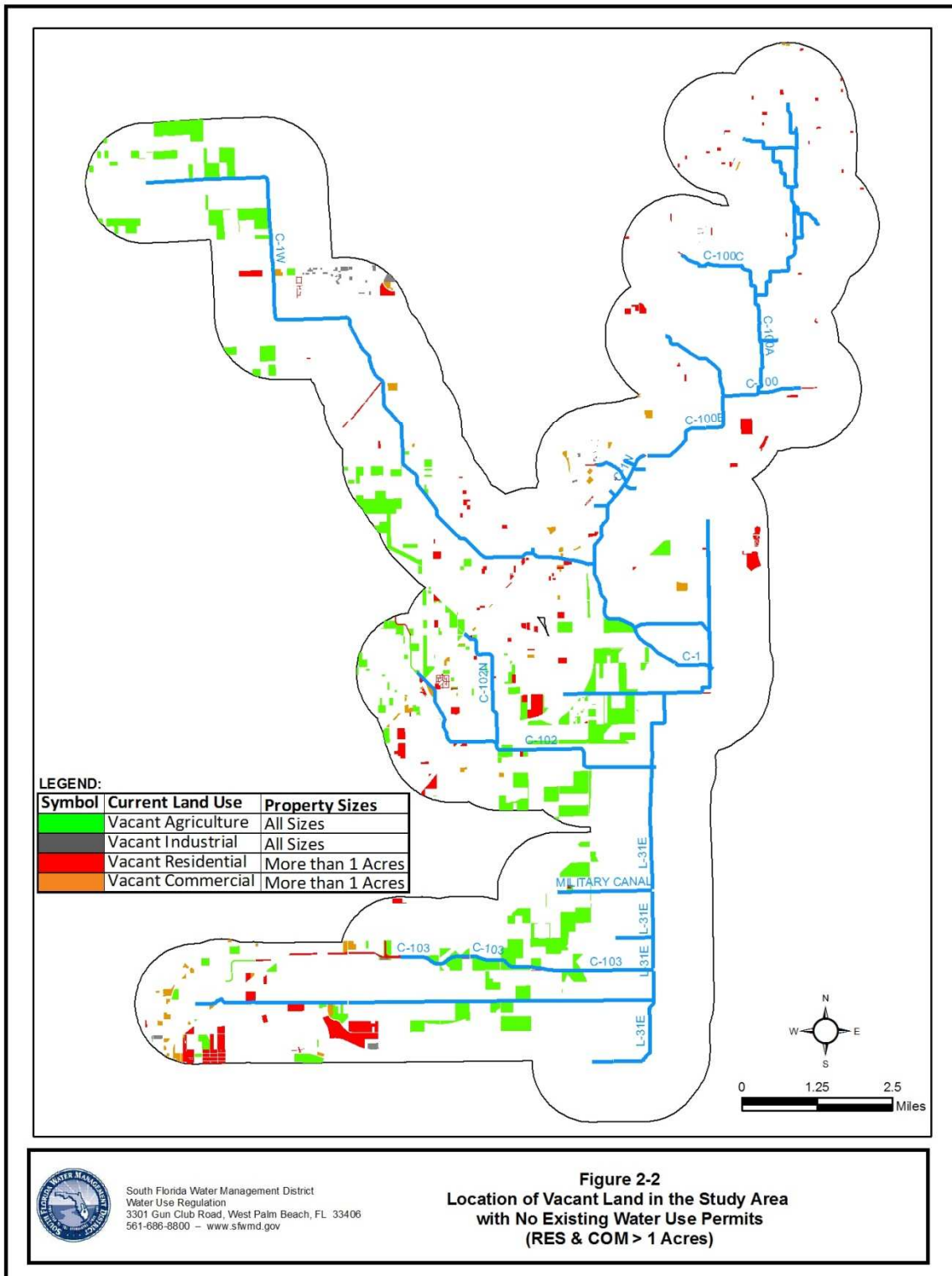
If all vacant parcels zoned residential and commercial greater than 1 acre are included, then there are 674 vacant properties owned by 649 people that comprise a total of 5,059 acres. The average parcel size is 7.5 acres per parcel. This vacant land represents about 7.3 percent of all land in the study area.

These individuals and entities that wish to obtain a permit for new water withdrawals from those affected canals that are not already restricted under current rule will be able to apply for a water use permit from the Biscayne Aquifer.





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 South Florida Water Management District  
 Water Use Regulation  
 3301 Gun Club Road, West Palm Beach, FL 33406  
 561-686-8800 – www.sfwmd.gov

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## 2.5 Economy of Miami-Dade County and the Study Area

The study area, which is the area within one mile of the affected canals, represents less than six percent of the Miami-Dade County economy. The study area extends from the northern to the southern part of the county along the affected canals. In examining the study area on an aerial map, it is apparent that the land uses located in the northern part of the study area are primarily residential homes with pockets of industrial and commercial land uses. The study area in the southern part is mostly rural with pockets of residential development. This sub-section presents a comparison between the economy of Miami-Dade County and the economy of the study area.

Total personal income collected by Miami-Dade County residents from all sources, including net earnings<sup>22</sup>, transfer payments<sup>23</sup>, dividends, interest and rent, was \$91.4 billion in 2010 and represents 13 percent of the total income in Florida.<sup>24</sup> Miami-Dade County has the largest economy of Florida's 67 counties in terms of total resident income.<sup>25</sup>

Employment and wages by industry sector in the county during the first quarter of 2012 are provided in Table 2.3. These data reflect all businesses in the county that are subject to Florida's Unemployment Insurance laws and do not include all of the jobs held in the county. These businesses employed a total of 1 million positions in a variety of industries and paid \$12 billion in wages during the first quarter of 2012.

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<sup>22</sup> Net earnings are total earnings (wages and salaries, proprietor's income) less contributions for government social insurance adjusted to place of residence

<sup>23</sup> Transfer payments include retirement payments, unemployment insurance compensation, supplemental security income payments, family assistance, general assistance payments, food stamp payments, and other assistance payments, including emergency assistance.

<sup>24</sup> U.S. Bureau of Economic Analysis, Regional Economic Profiles, [www.bea.gov](http://www.bea.gov).

<sup>25</sup> University of Florida Bureau of Economic and Business Research, Florida Statistical Abstract, 2011, pages 179 and 180, "Table 5.09 Personal Income: Total Amounts on a Place-of-Business Basis in the Counties of Florida, 2005 to 2009".

**Table 2.3**  
**Employment and Wages in Miami-Dade County, Florida During the First Quarter of 2012**  
**By Industry Type**

Industry Type	Reporting Units (a)	Total Wages	Average Monthly Number of Employees	Average Quarterly Wage per Employee	% of Total Average Monthly Number of Employees
(1)	(2)	(3)	(4)	(5)	(6)
Education and Health Services	9,966	\$2,502,936,531	225,688	\$11,090	22%
Retail Trade	12,609	\$941,491,412	130,758	\$7,200	13%
Professional and Business Services	18,589	\$1,794,612,449	124,717	\$14,389	12%
Leisure and Hospitality	6,767	\$801,088,849	118,359	\$6,768	11%
Financial Activities	9,114	\$1,342,472,555	66,281	\$20,254	6%
Wholesale Trade	9,831	\$967,340,078	64,057	\$15,101	6%
Public Administration	245	\$943,182,863	62,073	\$15,195	6%
Transportation and Warehousing	3,227	\$855,534,052	61,061	\$14,011	6%
Manufacturing	2,619	\$398,808,977	35,983	\$11,083	3%
Construction	5,002	\$328,109,276	29,406	\$11,158	3%
Information	1,477	\$323,147,424	17,290	\$18,690	2%
Agriculture, Forestry, Fishing and Hunting	432	\$55,775,816	9,511	\$5,865	1%
Utilities	49	\$82,518,892	2,853	\$28,920	0.28%
Mining, Quarrying, and Oil and Gas Extraction	42	\$6,031,488	350	\$17,233	0.03%
All Other Industries (b)	9,817	\$653,909,028	84,837	\$7,708	8%
<b>Total</b>	<b>89,786</b>	<b>\$11,996,959,690</b>	<b>1,033,226</b>	<b>\$11,611</b>	<b>100%</b>

(a) Reporting units are the number of employers subject to state Unemployment Insurance (UI) laws. The industry type is based on 2-digit NAICS codes.

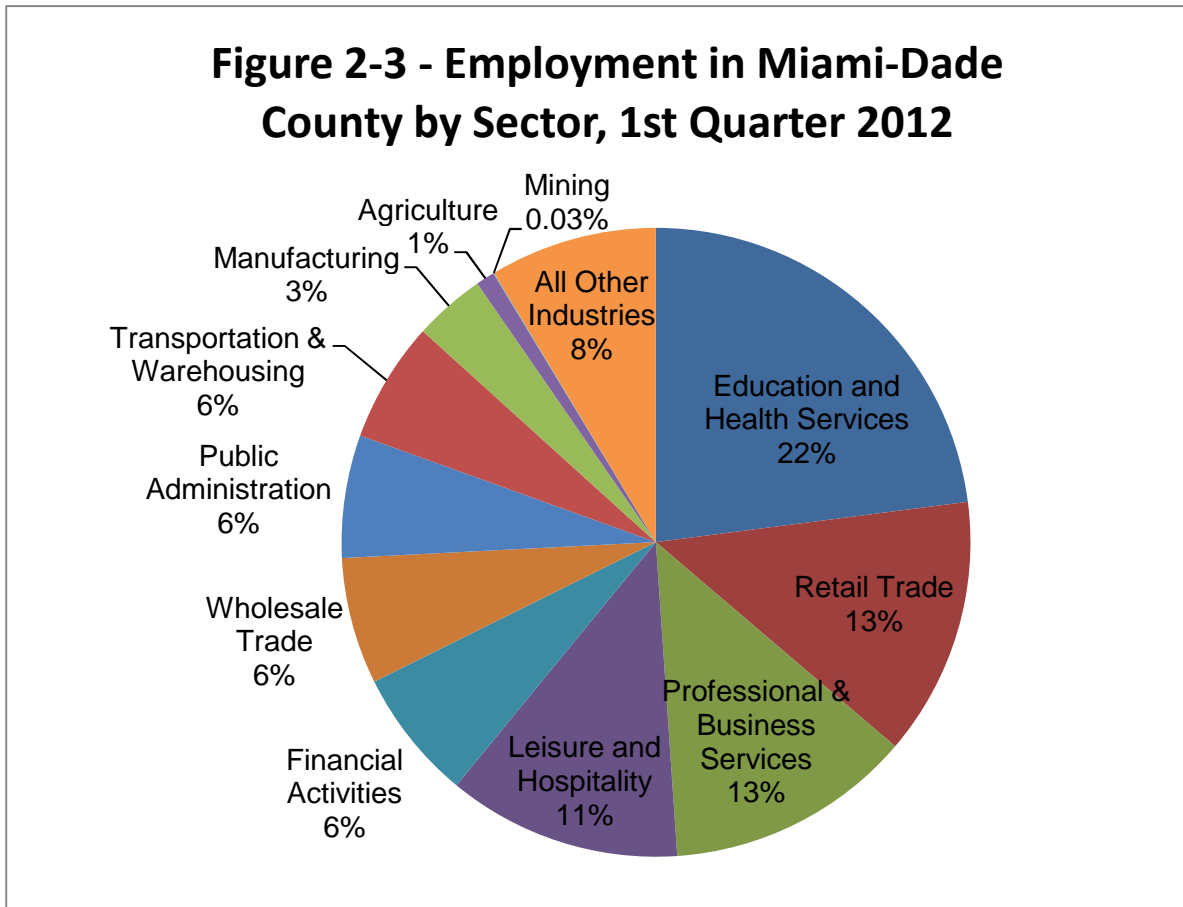
(b) All other industries include other services and unclassified.

Source: Florida Department of Economic Opportunity, Labor Market Statistics Center, Quarterly Census of Employment and Wages Program (QCEW). Released September 2012.

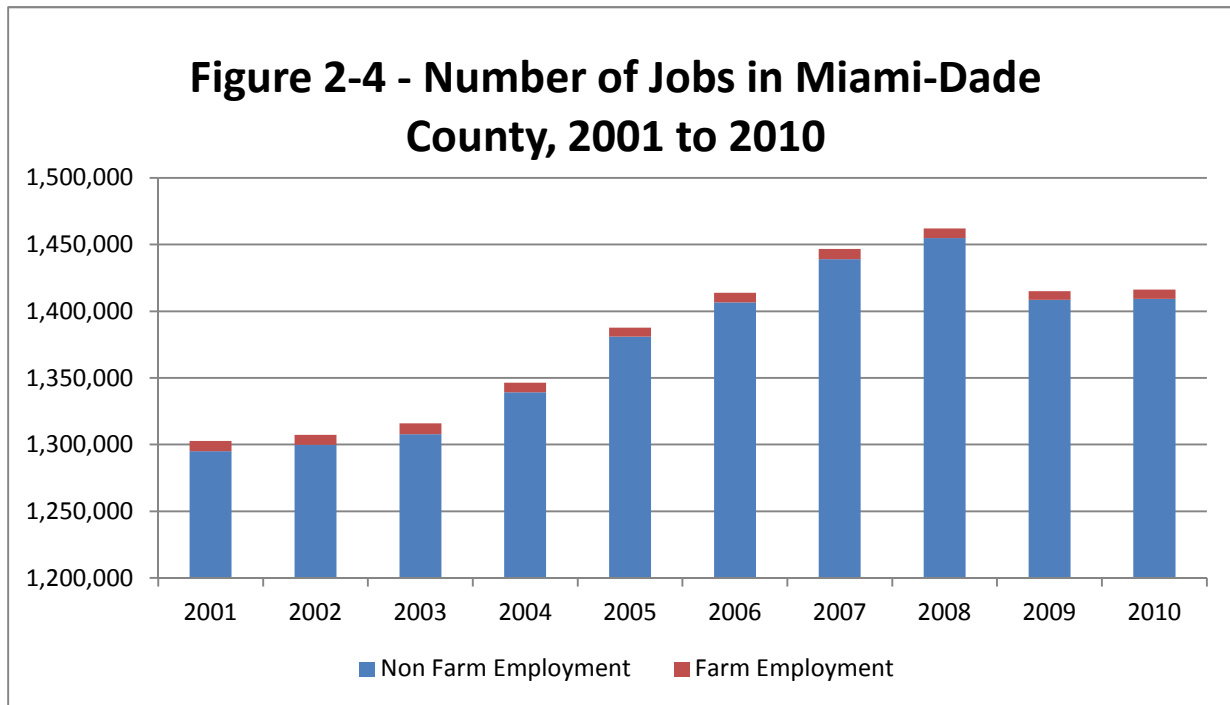
<http://www.floridajobs.org/labor-market-information/data-center/statistical-programs/quarterly-census-of-employment-and-wages>.

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The employment distribution in Miami-Dade County by industry sector is illustrated in Figure 2-3. The data used to create this pie chart is in Table 2.3. The top four industry sectors in terms of the number of people employed are Education and Health Services; Retail Trade; Professional and Business Services; and Leisure and Hospitality comprising 61 percent of the county's employment or almost 600,000 jobs. Wages earned in these four industries during the first quarter of 2012 totaled \$6 billion. These jobs reflect the county's strength in tourism, international trade; educational institutions; and health-related research and services.



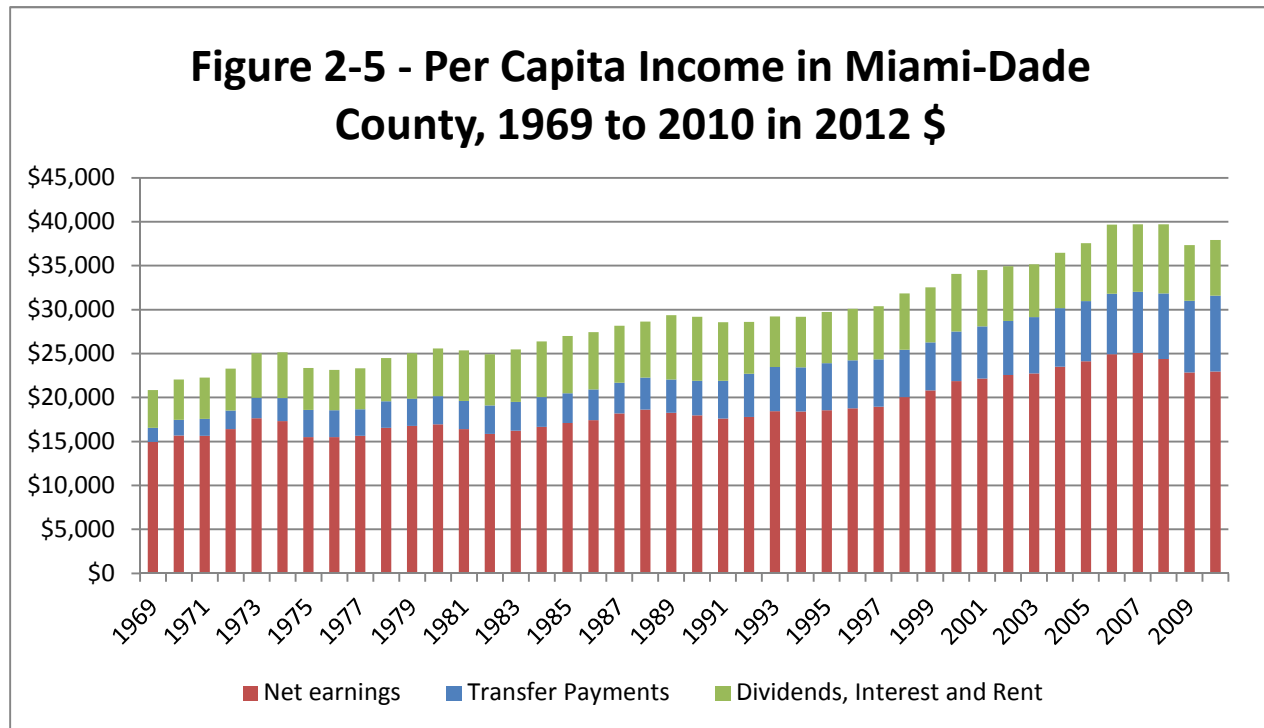
Employment by all businesses in Miami-Dade County from 2001 to 2010 is plotted in Figure 2-4. According to the U.S. Bureau of Economic Analysis, employment grew steadily from 1.30 million jobs in 2001 to its peak of 1.46 million jobs in 2008. In 2009 and 2010 there were 1.42 million jobs in the county which was a little higher than its 2006 level of 1.41 million jobs. While the county's farm industry provides unique and popular fruits and vegetables year-round, farm employment as a percent of total employment in the county ranged from 0.46 percent to 0.62 percent during the period. This employment data does not include the number of seasonal farm workers.



Historical per capita personal income from all sources in Miami-Dade County from 1969 to 2010 in 2012 dollars is plotted in Figure 2-5. Per capita personal income is total personal income in Miami-Dade County divided by the county's population and includes income to persons from all sources minus payments for government social insurance. These data are from the U.S. Bureau of Economic Analysis. Per capita income peaked from 2006 through 2008 at almost \$40,000 per person per year.<sup>26</sup> In 2009, income fell to \$37,336 per person. By 2010, income was \$37,928 per person which is slightly higher than its 2005 level of \$37,559. The Great Recession officially began in December 2007 and ended in June 2009. Since this time the economic recovery has been relatively slower than in past periods of economic expansion.<sup>27</sup>

<sup>26</sup> Per capita personal income in Miami-Dade County was \$39,662 in 2006; \$39,700 in 2007; and \$39,709 in 2008.

<sup>27</sup> National Bureau of Economic Research. See <http://www.nber.org/cycles/html>.



Wage and employment data by industry type are available by zip code from the Florida Department of Economic Opportunity, Labor Market Statistics Center. The most recent data represents the first quarter of 2012. The wages and employment during the first quarter of 2012 for those zip codes in the study area by industry type are provided in Table 2.4 with a comparison to the county data. The zip code boundaries are much larger than the study area so the data provided in Table 2.4 represent the area surrounding the study area in addition to the study area. Average monthly employment in these zip code areas was 57,547 jobs during the first quarter of 2012 which is about 6 percent of total employment in the county. Quarterly wages totalled \$576 million or about 6 percent of all wages paid by businesses in the county.

A comparison of the percent of total employment by industry found in Column (6) of Table 2.3 for Miami-Dade County and in Column (5) of Table 2.4 for the smaller study area zip codes shows that the industry ranking is different except for the large amount of employment in retail trade and in professional & business services in both areas. Most notably, agricultural crop production and support activities for agriculture as represented by the row labeled “agriculture, forestry, fishing and hunting” is a larger part of the economy in the study area zip codes than in the county, 11 percent versus 1 percent. This is because the zip codes that comprise the study area include a portion of The Redlands which is a very productive agricultural area in the southwestern county near the main entrance to Everglades National Park. This area is not part of the study area and will not be affected by the proposed rule.

For each industry type, employment in the study area as a percent of total county employment is provided in Column (6) of Table 2.4. The study area represents a large part of the county’s employment in agriculture (67 percent); utilities (36 percent); mining & quarrying (22 percent); and retail trade (15 percent). The relatively large percent of employment in the Utility Sector (36 percent) is because the zip code that includes part of the study area, 33035, also includes FPL’s Turkey Point Nuclear Power Plant. This plant is located outside of the study area. Operations at this plant will not be affected by the proposed rule.

**Table 2.4**  
**Wages and Employment During the First Quarter of 2012 for Zip Codes of the Study Area by Industry Type (a)**

Industry Type (b)	Total Wages	Average Monthly Number of Employees	Average Quarterly Wage per Employee	% of Total Monthly Number of Employees	% of County Employment
(1)	(2)	(3)	(4)	(5)	(6)
Education and Health Services	\$21,900,445	2,512	\$8,718	4.4%	1.1%
Retail Trade	\$136,979,375	20,105	\$6,813	34.9%	15.4%
Professional and Business Services	\$119,925,435	10,449	\$11,477	18.2%	8.4%
Leisure and Hospitality	\$5,093,824	411	\$12,394	0.7%	0.3%
Financial Activities	\$95,401,748	5,963	\$15,999	10.4%	9.0%
Wholesale Trade	\$32,116,411	2,526	\$12,714	4.4%	3.9%
Public Administration	\$12,712,453	901	\$14,109	1.6%	1.5%
Transportation and Warehousing	\$11,855,109	1,147	\$10,336	2.0%	1.9%
Manufacturing	\$31,154,682	2,499	\$12,467	4.3%	6.9%
Construction	\$22,716,844	2,629	\$8,641	4.6%	8.9%
Information	\$10,544,541	932	\$11,314	1.6%	5.4%
Agriculture, Forestry, Fishing and Hunting	\$35,180,863	6,370	\$5,523	11.1%	67.0%
Utilities	\$39,668,563	1,027	\$38,626	1.8%	36.0%
Mining, Quarrying and Oil & Gas Exploration	\$869,507	76	\$11,441	0.1%	21.7%
<b>Total</b>	<b>\$576,119,801</b>	<b>57,547</b>	<b>\$10,011</b>	<b>100.0%</b>	<b>5.6%</b>

(a) The area covered by the zip codes is much larger than the study area. The zip codes of the study area are 33030, 33032, 33033, 33034, 33035, 33039, 33156, 33157, 33158, 33170, 33177, 33189, 33190, and 33196.

(b) The industry type is based on the 2-digit NAICS codes.

Source: Florida Department of Economic Opportunity - Labor Market Statistics Center. This employment and wage data is part of the statistics and wage data from the Quarterly Census of Employment and Wages (QCEW). QCEW summarizes industry employment and wage data for all employers covered by state Unemployment Insurance (UI) laws and federal workers covered by the Unemployment Compensation for Federal Employees (UCFE) program.

The Miami-Dade County Department of Sustainability, Planning, and Economic Enhancement summarized the county's current economic conditions and trends in its presentation report on March 16, 2012. Since the Great Recession began in December 2007, increases in County-wide tourism, taxable sales, and shipping activity from 2009 to 2011 were documented. The County found that from January 2010 to December 2011, non-farm payroll employment recovered 47 percent of the 93,000 payroll jobs lost from December 2007 to December 2009. The County's future economic outlook was forecast to be slow-to-moderate economic growth.



**SERC associated with a Water Reservation for the BBCW CERP P1 Project**

In summary, a significant amount of land within one mile of the affected canals (study area) is in residential and agricultural uses. The study area comprises less than 6 percent of the Miami-Dade County economy. The County's top four industry sectors in terms of the number of people employed are Education and Health Services; Retail Trade; Professional and Business Services; and Leisure and Hospitality comprising 61 percent of the county's employment or almost 600,000 jobs. These jobs reflect the County's strength in tourism, international trade; educational institutions; and health-related research and services. The County's 10-year historic economic activity peaked in 2008 and in 2010 the economy was comparable to the levels of economic activity that existed in 2005 and 2006. The County's economic outlook is forecast to be slow-to-moderate growth and the study area will likely follow the County's future economic trends.

## **Section 3: Cost to the District and to Any Other State and Local Government Entities**

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The proposed rule is not expected to incur costs to the District; or to any State or local government entity unless that entity requests additional permitted water quantities from the affected canals. In this case, the entity might incur transactional costs as described in Section 4.0 – Transactional Costs.

The proposed rule does not place any new requirements or responsibilities on State and local governments except if the entity applies for a water use permit for surface water from the affected canals. The proposed rule is not expected to reduce property values, local government property tax collections, or State sales tax revenues.

Discussions with District staff responsible for water use permitting and compliance in the Lower East Coast area find that the proposed rule is consistent with current requirements for reviewing water use permit applications and for enforcing water use permit compliance. The procedures that would be followed by the District under the proposed rule to evaluate whether a permit applicant's withdrawal will affect the water reservation will be the same as those under current rule. The proposed rule is not expected to cause an increase in the District's cost nor will it require additional staff resources relative to current rules.

## Section 4: Transactional Costs and Economic Impacts of Proposed Rule

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This Section discusses the transactional costs associated with the proposed rule and provides estimates of the economic impact of the proposed rule as required by Section 120.541, F.S.

### 4.1 Transactional Costs

As required under Section 120.541, F.S., this SERC includes a good faith estimate of the transactional costs likely to be incurred by individuals and entities, including local government entities, required to comply with the proposed rule. Florida Statutes defines transactional costs as “direct costs that are readily ascertainable based upon standard business practices, and include filing fees, the cost of obtaining a license, the cost of equipment required to be installed or used or procedures required to be employed in complying with the rule, additional operating costs incurred, the cost of monitoring and reporting, and any other costs necessary to comply with the rule.”

As discussed in this Section, the proposed rule is not expected to incur transactional costs unless an applicant requests water quantities from the affected canals above the “target” level flows (or above the reserved quantities). For this request, the applicant will need to conduct a water budget evaluation to identify the amount of available surface water above the reserved quantities that may be withdrawn for consumptive use. The proposed rule does not require any groundwater modeling. The estimated transactional cost of a water budget evaluation to a hypothetical applicant is \$4,500. This is a one-time cost that would be incurred during the permit application process. This cost is based on an average hourly billing rate for a hydrologist of \$150 per hour and an estimated 30 hours to complete the water budget analysis. The number of applicants that may potentially pursue this type of surface water application is likely to be low. Given past applications history, only three permits have been issued for surface water withdrawals from the reservation’s designated canal reaches.<sup>28</sup> These permits are for landscape irrigation purposes. The justification that only a water budget analysis would be required is discussed as follows.

The United States Army Corps of Engineer Research and Development Center’s Coastal and Hydraulics Laboratory in Vicksburg, Mississippi performed hydrologic modeling to determine quantities of freshwater flows needed to achieve targeted flows to Biscayne Bay and establish the water reservation. Modeling involved application of an existing hydrodynamic/salinity model that had been developed for a previous study of Biscayne Bay.<sup>29</sup>

A TABS-MDS finite element model applied extensively for studies of estuaries evaluated relationships between freshwater inflows to the Bay and the near-shore salinity concentrations and distributions of the

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<sup>28</sup> from the District’s Regulatory Database

<sup>29</sup> Brown, G.L., McAdory, R.T., Nail, G.H., Sarruff, M.W., Berger, R.C., and Granat, M.A., (2003). Development of Two-Dimensional Numerical Model of Hydrodynamic and Salinity for Biscayne Bay, Florida, Technical Report ERDC/CHL TR-03-10. U.S. Army Engineer Research and Development Center, Vicksburg, MS.

Coastal Wetlands project area.<sup>30</sup> Results from various simulations produced the ultimate estimate of approximately 517,000 acre-feet per year (ac-ft/yr) needed to meet the salinity target of about 20 in the Coastal Wetlands. Figure 21 of the Richardson report summarizes freshwater flow quantities from the primary contributing canals and associated creeks that will provide the targeted flows of 517,000 acre-feet per year. This target volume was modified slightly to 518,759 acre-feet per year in the document to support the rule and is based on the actual value given by the model simulation used during the plan formulation.

Hydrologic modeling similar to that performed to establish the flows needed to achieve the desired salinity regime in the nearshore Central Biscayne Bay coastal wetlands will not be needed to secure an allocation for withdrawals above the target volume from canals specified in the Rule. Instead a water budget analysis will need to be conducted to perform this demonstration. This analysis will need to demonstrate that the reserved waters shown in Figures 3-2 through 3-4 in 40E-10 F.A.C. are not diminished by an applicant's proposed withdrawals. The water budget analysis would include the same flow data period of record (1986-2011) for the affected canal(s) where the water withdrawal will occur along with the resulting flow exceedance curve incorporating the timing and volume associated with the proposed withdrawal. The proposed surface water withdrawal would shift this curve downward and a new volume probability curve would be created. The Applicant would successfully demonstrate compliance with the proposed water reservation if the proposed withdrawal does not reduce any part of the reserved water (only the area above the target flow which is not reserved may be reduced). Also, it should be noted that the proposed rule does not require any ground water modeling as part of an evaluation of potential above target level withdrawals.

While the number of individuals and entities who will apply to withdraw water above the "target level" flows is not known, it is not expected to be significant because the amount of water available is not expected to be large and would likely only be useful to those who can effectively store this water for use during the dry season such as by developing an aquifer storage and recovery (ASR) system. Perhaps only a few individuals and entities would ever consider applying because the water source may not be reliable.

No other persons or entities are expected to incur transactional costs associated with the proposed rule. Under existing consumptive use permitting rules, new withdrawals of water from some of the affected canals cannot be permitted. Therefore, the proposed rule will not affect the availability of permitted water from these canals and provides an additional level of protection to ensure that the water flows below the "target" quantity are not allocated to a water use permit. For the remaining affected canals, new water withdrawals from the Biscayne Aquifer in these areas can be permitted under the current rule and the proposed rule which provides an alternative water source for those individuals and entities who might request permitted surface water quantities from these affected canals in the future.

The cost of developing a Biscayne Aquifer well and installing the pumping system for groundwater withdrawals is about twice as high as the cost of installing a pumping system to withdraw water from a canal. The estimated cost to construct a ground water well and pumping system in the study area is about

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<sup>30</sup> Richardson, T, (2003). Memorandum to the Commander, U.S. Army Corps of Engineers District, Jacksonville. Memorandum for record that consists of a report detailing the findings of the preliminary scenario runs for the Biscayne Bay Coastal Wetlands Project. From Thomas Richardson, Director, Coastal and Hydraulics Laboratory, U.S. Army Engineer Research and Development Center, Vicksburg, MS, December 20, 2003.

\$40,000 for one Biscayne Aquifer well pumping 525 gallons per minute (gpm). This equates to about \$0.01 per 1,000 gallons (amortized over 20 years at 5 percent annual interest) which is an affordable and relatively low cost water source for agricultural and landscape irrigation in Florida. The estimated cost to construct a 525 gpm pumping system withdrawing water from a canal is about \$18,000 or \$0.005 per 1,000 gallons. These costs are itemized in Tables 4.1 and 4.2, respectively. At 525 gpm, the system can pump 0.76 million gallons of water per day. To provide an idea of how much agricultural land that could be irrigated, this amount of water is sufficient to irrigate about 2 acres of mangos and 15 acres of tomatoes during a dry year.

The benefits of using the Biscayne Aquifer include the ability to move pumps from one well to another to accommodate irrigation and the higher quality of the aquifer water for irrigation. The fact that 92 percent of the 377 water use permits in the study area are for withdrawals from the Biscayne Aquifer and there are only three permits for water from the affected canals indicates that obtaining water from the Biscayne Aquifer is usually preferable to obtaining water from the affected canals.

**Table 4.1**  
**Estimated Cost to Construct a 0.76 mgd Biscayne**  
**Aquifer Well and Pumping System in Miami-Dade**  
**County, 2012 \$**

<b>Item</b>	<b>Cost Estimate</b>
Well construction	\$9,000
Permitting	\$300
Mobilization	\$500
Pump / Motor	\$10,000
Column	\$1,200
Valves & fittings	\$2,500
Piping	\$1,100
Concrete slab	\$250
Electrical	\$3,500
Installation	\$7,420
General conditions	\$1,855
Contractor profit	\$1,855
<b>Total Cost</b>	<b>\$39,480</b>

*Source: In-house estimate using manufacturer / contractor quotes with design specifications as follows: 1 well at 525 gpm. Well casing diameter is 8 inches. Depth is 20 feet for casing and 20 feet for open hole. PVC casing construction. Screened / rock. Head required is 120 feet. Submersible pump and motor. Pump size is 25 hp / electric motor / turbine. Discharge piping is 6 inches. Piping to irrigation system is 100 feet.*

**Table 4.2**  
**Estimated Cost to Construct a 0.76 mgd Pump System at**  
**Canal in Miami-Dade County, 2012 \$**

<b>Item</b>	<b>Cost Estimate</b>
Canal intake	\$500
Pump / motor	\$3,800
Valves & fittings	\$2,000
Piping	\$900
Concrete slab	\$250
Electrical	\$3,500
Installation	\$4,400
General conditions	\$1,100
Contractor profit	\$1,100
<b>Total</b>	<b>\$17,550</b>

*Source: In-House estimate using manufacturer / contractor quotes and design specifications as follows: 525 gpm flow. One pump located on pad next to canal. Pump intake screened. 90 feet of head required. Pump type is centrifugal / self-priming / electric motor. 6-inch PVC for piping, valves & fittings. Piping to irrigation system is 100 feet.*

The water use permit applicant may be located in a water utility service area. In this case, it may be economically feasible for landscape irrigators and industrial users to purchase water from the local utility. Using the current water rate structure of the Miami-Dade Water and Sewer Department, a permittee using 15,000 gallons per month would pay about \$50 per month and a permittee using 1 million gallons per month would pay about \$5,000 per month for water service. The actual bill will depend on the meter size and if the permittee is a multi-family customer or a non-residential customer.

#### **4.2 Economic Impact of the Proposed Rule**

As required by Section 120.541, F.S., the SERC must provide an assessment of certain types of economic impacts that are expected from implementing the proposed rule. These impacts and the assessment of these impacts from the proposed rule are provided as follows.

Is the proposed rule likely to:

Have an adverse impact on economic growth, private sector job creation or employment, or private sector investment in excess of \$1 million in the aggregate within 5 years after the implementation of the rule?

NO;

Have an adverse impact on business competitiveness, including the ability of persons doing business in the state to compete with persons doing business in other states or domestic markets, productivity, or innovation in excess of \$1 million in the aggregate within 5 years after the implementation of the rule?

NO;

Increase regulatory costs, including any transactional costs, in excess of \$1 million in the aggregate within 5 years after the implementation of the rule? NO.

Justification for these conclusions is provided as follows.

**SERC associated with a Water Reservation for the BBCW CERP P1 Project**

The proposed rule is not expected to significantly increase costs to individuals and entities such that economic growth, employment and/or private sector investment would be negatively affected. On the contrary, the proposed rule is likely to increase income and employment in Miami-Dade County because the quality of the Bay ecosystem will improve after implementing the Biscayne Bay Coastal Wetlands Phase I Project. The expected ecosystem improvements will increase recreation opportunities and quality; and increase commercial fishing success as was described in Section 1.0 of this SERC.

The proposed rule will not have any adverse effect on business competitiveness, productivity or innovation. On the contrary, an improved Biscayne Bay ecosystem will improve the County's ability to attract more tourists to the area and to keep more residents recreating in the area and will maintain or improve its current status as a premier vacation destination.

The only potential regulatory costs associated with the proposed rule are those associated with applicants requesting withdrawals of water from the affected canals that are above the target level flows. The one-time cost associated with the additional hydrologic modeling is about \$4,500 per applicant. The number of future applicants for withdrawals of "above target level flows" from the affected canals is not known but it is not expected to be significant and will certainly not cause total regulatory costs to increase beyond \$1 million over five years. As discussed in Section 3 of this SERC, the proposed rule will not increase costs to the District because it is consistent with current requirements for reviewing water use permit applications and enforcing water use permit compliance. The proposed rule does not place any new requirements or responsibilities on State and local governments.

The future of the overall Miami-Dade County economy with or without the proposed rule will likely be a continuation of the employment gains of the recent few years as this area recovers from the Great Recession that began in December 2007 and ended in June 2009.<sup>31</sup> The Miami-Dade County Department of Sustainability, Planning, and Economic Enhancement summarized the county's current economic conditions and trends in its presentation report on March 16, 2012. Since the Great Recession ended in June 2009, County-wide tourism, taxable sales, and shipping activity increased each year from 2009 to 2011. The County found that from January 2010 to December 2011, non-farm payroll employment recovered 47 percent of the 93,000 payroll jobs lost from December 2007 to December 2009. The County's future economic outlook was forecast to be slow-to-moderate economic growth. This forecast is consistent with the Florida Department of Economic Opportunity's October 2011 projection that farm and non-farm employment in Miami-Dade County will increase an average annual 1.03 percent over the eight year period of 2011 to 2019, from 1,074,873 jobs in 2011 to 1,163,250 jobs in 2019.

To obtain a more recent picture of the status of the Great Recession's impact on short term economic growth, the monthly unemployment rates for the United States, Florida, and Miami-Dade County from January 2002 through December 2012 are plotted in Figure 4-1. The unemployment rate is not the only gauge of economic health and in practice a number of economic measures are used including and most importantly the U.S. Gross National Product. However, it is the unemployment rate that seems to provide most people with meaningful assessments of the economy at a glance.

The U.S. and Florida unemployment data are from the U.S. Bureau of Labor Statistics and the Miami-Dade County data are from the Florida Department of Economic Opportunity, Local Area Unemployment Statistics. These unemployment rates are not seasonally adjusted because this adjustment is not

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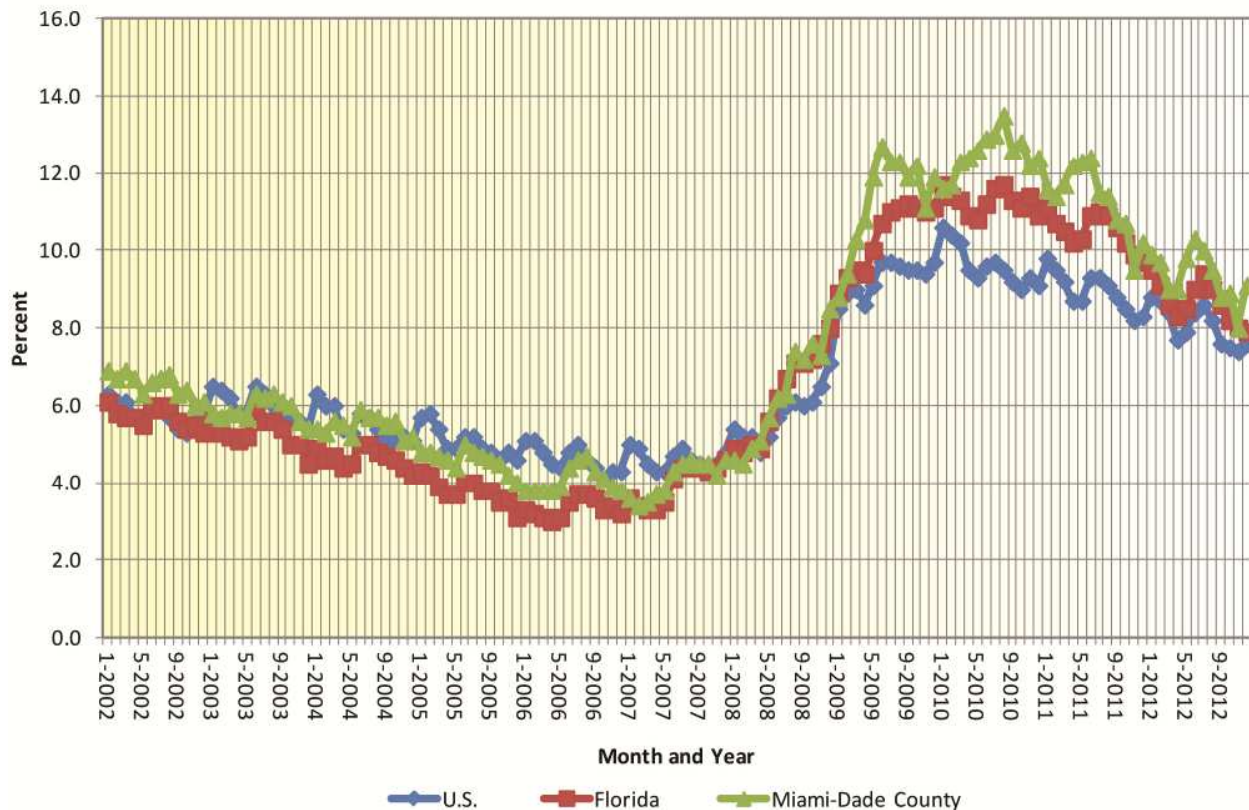
<sup>31</sup> According to the National Bureau of Economic Research, the Great Recession began in December 2007 and ended in June 2009 (<http://www.nber.org/cycles/cyclesmain.html>).

available for Miami-Dade County. Seasonal adjustment smooths out the 12-month seasonality of the unemployment rate so, as can be seen in Figure 4-1, there is an annual cyclical pattern in the data when it is not seasonally adjusted. This issue does not affect the ability to make inferences from the data plotted over many years.

The figure shows the steep rise in the unemployment rate beginning in late-2007 and its slow recovery that began in mid-2010. Florida's and Miami-Dade County's rates were usually lower than the U.S. rate prior to the Great Recession but were higher during the recession and the recovery. In the U.S., the unemployment rate peaked in January 2010 at 10.6 percent. In Florida and Miami-Dade County, the rate peaked in August 2010 at 11.7 percent and 13.5 percent, respectively. As of December 2012, the U.S. unemployment rate was 7.6 percent; the Florida unemployment rate was 7.9 percent; and the Miami-Dade County unemployment rate was 9.1 percent. These rates, while relatively high, are a significant improvement from the unemployment rates during the Great Recession.

In short, the proposed rule is not expected to hinder Miami-Dade County's economy and is likely to improve the economy as recreation and tourism increase as is expected from implementing the Biscayne Bay Coastal Wetlands Phase I Project.

**Figure 4-1**  
**U.S., Florida and Miami-Dade County Unemployment Rates - Jan 2002 to Dec 2012 - Not Seasonally Adjusted**





## Section 5: Impact on Small Businesses, Small Cities and Small Counties

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In accordance with Section 120.54 Florida Statutes, the District is required to consider the impact of its rules on small businesses, small cities, and small counties. Small business is defined in Section 288.703(1), Fla. Stat., as “an independently owned and operated business concern employing 200 or fewer permanent full-time employees and that, together with its affiliates, has a net worth of not more than \$5 million or any firm based in this state which has a Small Business Administration (SBA) 8(a) certification”.

Small city is defined in Section 120.52(18), Fla. Stat., as “any municipality that has an unincarcerated population of 10,000 or less according to the most recent decennial census”. A small county is defined in Section 120.52(19), Fla. Stat., as “any county that has an unincarcerated population of 75,000 or less according to the most recent decennial census”.

According to Section 120.54, Florida Statutes, “Whenever practicable, an agency shall tier its rules to reduce disproportionate impacts on small businesses, small cities or small counties to avoid regulating businesses, small counties or small cities that do not contribute significantly to the problem the rule is designed to address.”

The study area is located in Miami-Dade County. With a 2010 population of 2.5 million, the county is larger than Florida’s definition of a small county (75,000 people).<sup>32</sup> There are 12 small cities located in the county but none of them are expected to be affected by the proposed rule. These small cities are Bal Harbour; Bay Harbor Islands; Biscayne Park; El Portal; Golden Beach; Indian Creek Village; Islandia; Medley; North Bay; Surfside; Virginia Gardens; and West Miami.

The number of properties and property owners located within one mile of the affected canals (which has been defined as the study area) are provided in Table 5.1 which is a reprint of Table 2.2 in Section 2 of this SERC. Many of these property owners are likely to be small businesses.

Because the proposed rule is not expected to incur transactional costs on individuals and entities unless they apply for withdrawals from the affected canals above the reserved quantities, small businesses are not expected to be affected by the proposed rule. Small businesses continue to have the alternative of new water withdrawals from the Biscayne aquifer or potable water supplied by a local utility. In the event that a small business chooses to apply for withdrawals from the affected canals above the reserved quantity, then the estimated transactional cost is a one-time water budget analysis cost of about \$4,500. Because this water would likely need to be stored, this one-time cost is very small relative to the cost of developing the needed storage. For additional information regarding the transactional costs associated with the proposed rule, please refer to Section 4 of this SERC.

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<sup>32</sup> Florida Statistical Abstract, 2011 published by the University of Florida Bureau of Economic and Business Research, Gainesville, Florida.

**Table 5.1  
Number of Properties, Owners and Acreages of Vacant Land  
in the Study Area with No Existing Water Use Permits (a)**

Land Use Zone	More than 5 acre parcels in Residential and Commercial			More than 1 acre parcels in Residential and Commercial		
	No. of Properties	No. of Property Owners (b)	Number of Acres	No. of Properties	No. of Property Owners (b)	Number of Acres
Agriculture	313	377	3,319	313	377	3,319
Industrial	84	72	179	84	72	179
Residential	63	36	995	202	134	1,315
Commercial	16	15	123	75	66	246
<b>Total</b>	<b>476</b>	<b>500</b>	<b>4,616</b>	<b>674</b>	<b>649</b>	<b>5,059</b>

(a) All properties located in areas zoned Agriculture or Industrial are included in this table. For properties located in areas zoned Residential or Commercial, the size of the properties counted are indicated in the table headings. The study area is within one mile of the affected canals.

(b) An owner of more than one property in any type of land use is counted only once. The count would be included in the order of the Land Use Zones listed in the table. For example, if a person owns two vacant land parcels in the study area with no associated water use permit and one is in an area zoned agricultural and the other is in an area zoned industrial, then the owner will be counted under the agricultural land use zone and not the industrial land use zone. This was done so that the same owner is counted only once.

Source: South Florida Water Management District.

# Appendix A - Excerpts from Biscayne Bay Economic Study

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This Appendix A provides excerpts from the Biscayne Bay Economic Study<sup>33</sup> (BBES) that are relevant to the information provided in the SERC associated with Water Reservations for the Biscayne Bay Coastal Wetlands CERP Phase 1 Project.

## A.1 Biscayne Bay-Dependent Recreation in 2004

Biscayne Bay is used for a wide variety of recreational activities. The recreational activities are listed as follows:

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Recreation Activities on Biscayne Bay	
• Fishing	• Personal Watercraft Boating (jet skis, wave runners, etc.)
• Snorkeling	• Sailing
• Scuba Diving	• Canoeing / Kayaking
• Boating for Pleasure / Partying	• Viewing the Bay from Shore (including while dining, shopping, jogging, and strolling)
• Swimming	• Sunset Cruise
• Water-skiing	• Glass bottom boat tour
• Parasailing	• Picnicking on Biscayne Bay
• Wind surfing	• Kite sailing

Biscayne Bay is accessible through many parks, marinas, boat ramps and private docks. There is no system that counts persons entering the Bay or participating in activities on or near the Bay. Therefore, the use intensity and economic contribution of the Bay as is it used for recreation had to be estimated using survey research. Also, many people participate in multiple Bay-related recreation activities on the same day. The intent of this study was to count only one primary activity per person per day. These two issues were the greatest challenges in estimating the use intensity and economic contribution of Biscayne Bay and influenced the estimation methodology chosen as further described in this section.

In order to obtain a current snapshot of the recreational uses of Biscayne Bay and their economic importance to the study areas, four surveys were conducted. These surveys are listed below.

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<sup>33</sup> Hazen and Sawyer in association with Planning and Economics Group, "Biscayne Bay Economic Study, Task 3 Report – Final Biscayne Bay Economic Baseline and Trend Report", prepared for the South Florida Water Management District, April 2005.

## Appendix A – Excerpts from Biscayne Bay Economic Study

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- Biscayne Bay Users Survey – Residents
- Biscayne Bay Users Survey – Visitors
- General Resident Survey
- General Visitor Survey

The purposes of these surveys are to collect data on the recreational uses of Biscayne Bay and the expenditures associated with those uses. All questions address activities that have already taken place and expenditures that have already been incurred. The period of use and expenditures must have taken place within the past 12 months from the time the survey is completed. This information is necessary to estimate the 2004 recreational use of the Bay and the economic contribution of the Bay as it is used for recreation.

From the survey responses, the number of person-days of Biscayne Bay recreational use by activity for 2004 was estimated. The total itemized expenditures made by these recreators to participate in each activity in 2004 were also estimated using the survey responses. IMPLAN economic input-output models for Miami-Dade County, southeast Florida and Florida were used to convert the total itemized expenditures for 2004 into the direct, indirect and induced output, income, employment and tax revenues generated in these three geographic areas. The results are presented by type of business and by type of impact (direct, indirect or induced).

The Biscayne Bay User Survey and the General Visitor Survey were intercept surveys where survey researchers were stationed in areas where visitors and Bay users are likely to be. People who met the survey criteria were asked to participate in an interview at that time. The survey researcher asked the respondent questions from the survey instrument and wrote down the answers. Rife Market Research, Inc. of Miami was in charge of implementing this survey and providing the survey researchers. All of the survey researchers lived in Miami-Dade County and most were fluent in both English and Spanish.

At the beginning of each survey season, the survey researchers participated in a one-day training session for these intercept surveys. During the survey period, the completed surveys were reviewed as they came in to identify and correct any survey errors. For all surveys, the responses to each survey were then reviewed to assess the consistency of the responses. Special questions on the surveys, such as the number of days spent at the Bay access sites, and a comparison of answers among the questions were used to “clean” the survey data so that the responses reflect the uses and expenditures associated with the Bay by primary activity. Six of the surveys were excluded from the analyses because inconsistencies could not be resolved. Overall, the completed surveys were of high quality in terms of the consistency of responses among the questions.

### **A.1.1 Biscayne Bay Users Intercept Survey**

Of the four surveys, the Biscayne Bay Users Intercept Survey of residents and visitors collects the most information needed to estimate the current uses and economic contribution of the Bay. The intercept survey was conducted over two seasons, the winter/spring season and the summer season. This was done for two reasons: (1) to capture any differences in the uses of the Bay from season to season, and (2) to have sufficient time to make any necessary adjustments in survey research effort at the interview

## Appendix A – Excerpts from Biscayne Bay Economic Study

sites to obtain a representative sample. The winter survey was conducted from February 29, 2004 through May 4, 2004. The summer survey was conducted from July 1, 2004 through August 27, 2004. There are two survey instruments for this survey: one for residents and one for visitors. Residents are those who live in Miami-Dade County and visitors are those who do not live in Miami-Dade County. Although there is a separate survey instrument for residents and visitors, most of the questions are the same. For visitors, their origin, purpose of visit, mode of travel, length of trip and number of years that they have been visiting Miami-Dade County are elicited. For residents, their residence zip code, length of residence in the county, and whether they own a registered boat in the county are solicited.

The questions common to both surveys solicit information on recreational uses of the Bay, person-days of use in the past 12 months by primary activity, and expenditures on the last day spent in each activity on the Bay.

The number of completed Biscayne Bay User surveys is provided in Table A-1. There were 608 completed resident surveys and 309 completed visitor surveys. The resident completed survey goal was higher than the visitor completed survey goal because of the belief that resident participation in recreation on Biscayne Bay is more intensive and diverse, so the available project budget was allocated accordingly.

**Table A-1**  
**Number of Completed Biscayne Bay User Intercept Surveys**

Survey Type	Winter Survey	Summer Survey	Total
	Feb. 29 to May 4, 2004	July 1 to August 27, 2004	
Residents	304	304	608
Visitors	151	158	309

All public access points to the Bay were included as an interview site. In addition, some private marinas and clubs allowed researchers access to private areas to survey Bay users. The number of interviews desired at each site for residents and visitors was based on a study of Miami-Dade County residents regarding their past use of the Bay<sup>34</sup> and observations of the survey researchers and project team members. The percent of eligible persons who agreed to be interviewed among all sites was 35 percent or one out of three people. This response rate and the distribution of completed surveys among the sites provide a representative sample of Biscayne Bay recreational users at a given point in time.

### **A.1.2 General Visitor Intercept Survey**

The purpose of the General Visitor Intercept Survey is to collect information needed to estimate the proportion of all visitors who use Biscayne Bay for recreation. This is needed to infer the Bay-related

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<sup>34</sup> "Measuring the Perception and Awareness of Biscayne Bay Among Miami-Dade Residents", prepared by Behavioral Science Research for The Trust for Public Land, Coral Gables, Florida, June 17, 2002, pages 14 and 15.

## Appendix A – Excerpts from Biscayne Bay Economic Study

recreational user days and expenditure responses of visitors from the Biscayne Bay Users Survey to the population of visitors in Miami-Dade County. A visitor is a non-resident of Miami-Dade County and, in the case of seasonal residents, has not lived in the county for six months or more. General visitors who did not use the Bay in the past 12 months were asked why they did not use the Bay.

The General Visitor Survey was conducted during the same two time periods as the Biscayne Bay User Survey. The number of completed General Visitor surveys is provided in Table A-2. There were 488 completed General Visitor surveys.

**Table A-2**  
**Number of Completed General Visitor Intercept Surveys**

<b>Survey Type</b>	<b>Winter Survey Feb. 29 to May 4, 2004</b>	<b>Summer Survey July 1 to August 27, 2004</b>	<b>Total</b>
General Visitor Survey	238	250	488

In order to obtain a representative sample of general visitors, the primary sites where visitors were likely to be identified and site permissions were obtained. Because a variety of visitors who participate in all types of activities are concentrated at the Miami International Airport, this site was chosen as the key location for the General Visitor Survey. The survey researchers were instructed to obtain about one-half of their completed surveys from the airport and the rest from a variety of popular visitor venues including South Beach and Bayside Marketplace.

Of the 488 completed surveys, 62 percent were completed at the Miami International Airport and 38 percent were completed at other visitor venues in the county. The overall survey response rate was 31 percent which is expected to provide a representative sample of all visitors to Miami-Dade County.

A person was administered the General Visitor Survey if he/she was a visitor to Miami-Dade County, was leaving the county before noon the next day and agreed to be interviewed. The survey researchers were instructed not to complete this survey for anyone who had also just completed a Biscayne Bay User Survey in order to avoid sampling bias toward those who use the Bay.

### **A.1.3 General Resident Survey**

The purpose of the General Resident Survey is to gather information to estimate the following parameters:

1. Percent of all Miami-Dade County residents who used the Bay for recreation in the past 12 months by type of recreation activity;
2. For residents who have not used the Bay in the past 12 months, the reasons why these residents did not use the Bay; and,

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3. Socioeconomic characteristics of the Miami-Dade County resident population disaggregated by those who used the Bay in the past 12 months and those who did not use the Bay in the past 12 months.

The General Resident Survey was a mail survey to a sample of households in Miami-Dade County. The survey questions were designed to be answered for all members of the household. The names and mailing addresses of all residents in Miami-Dade County were obtained from InfoUSA, Inc. This company collects the names and addresses of residents from a variety of sources, including telephone listings, government records and mailing lists, and sells this information to the public. A sample of 2,000 residents was selected from this population. The sample was stratified based on zip code to account for differences in travel time to the Bay and socioeconomic characteristics. Samples were chosen based on the percent of all residents who live in each zip code.

The cover letter, survey instrument and attachments were provided in English and Spanish. The resident was asked to fill out either survey. A no postage necessary business reply envelope was also included in the survey package.

The 2,000 surveys were mailed to residents from May 5<sup>th</sup> through May 10<sup>th</sup>, 2004. A total of 92 completed surveys were received and 168 were returned undeliverable for a response rate of 5.0 percent. The completed surveys represent 240 residents. Such a low response rate calls into question the extent to which the information in the completed surveys represents the population of residents.<sup>35</sup>

The most important statistics needed from this survey are the proportions of county residents who used the Bay for recreation in the past 12 months by type of activity in order to infer the results of the Biscayne Bay Users Survey to the population of residents. Each statistic is a simple yes or no answer. Therefore, the 92 completed surveys can be used to estimate the proportion of county residents who used the Bay in the past 12 months by activity as long as the respondents who completed these surveys represent the county resident population.

To assess the extent to which the survey responses represent the population of county residents, the distributions of survey respondents and the resident population with respect to three characteristics were compared. Two of the characteristics are expected to affect recreational uses of the Bay. These are (1) household location relative to the Bay and (2) household income. Ethnicity was also compared because of the ethnic diversity of the population. If the survey respondents as a group do not represent the population of residents for characteristics that may affect recreational use of the Bay, then the survey responses are weighted by the population distribution of the characteristic that most influences recreational use of the Bay.

To test the extent to which the sample represents the county resident population, the proportions of respondents by geographic area of the county were compared to the proportions of all county residents

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<sup>35</sup> Response rates to mail surveys are typically low. However, they are useful for collecting needed information when the budget does not allow for a general resident intercept survey.

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who live in each area. Location is hypothesized to affect the intensity of Bay use because those living in the western part of the county would have to travel longer to reach the Bay than those in the east.

The results for location are presented in Table A-3.

**Table A-3**  
**Location of Respondents and Residents in Miami-Dade County**

Location	% of Completed Surveys	% of County Population
East	45%	36%
West	55%	64%
Total	100%	100%
Northeast	24%	19%
Southeast	21%	18%
Northwest	9%	25%
Southwest	47%	38%
Total	100%	100%

*Note: The coordinates for NE, SE, NW and SW are as follows: The east/west delineation is Interstate 95 and then, going south, SR 836 to NW 27th Avenue to US 1. The north/south delineation is Interstate 195 that turns into SR 112 and then turns into SR 948.*

For both the eastern county and the western county, the completed surveys are reasonably representative of the county population: 45 percent of the survey respondents came from residents who live in the eastern part of the county while 36 percent of all residents actually live in the eastern part of the county. Likewise, 55 percent of the survey respondents live in the western part of the county while 64 percent of all residents live in the western part of the county. In evaluating the quadrants, northeast, southeast, northwest, and southwest, the northwest is underrepresented in the sample.

The proportion of residents in the county who used the Bay in the past 12 months was calculated from the 92 completed surveys. The proportion was also calculated for the northeast, southeast, northwest, and southwest areas of the county. The results are presented in Table A-4.

**Table A-4**  
**Proportion of Miami-Dade County Resident Respondents Who Participated in Recreation Activities on Biscayne Bay in Past 12 Months, Overall and By Location**

Location	Number of Yeses	Total Respondents at Location	Percent of Respondents Who Said Yes
Northeast	11	22	50%
Southeast	11	19	58%
Northwest	4	8	50%
Southwest	24	43	56%
Total or Overall Average	50	92	54%



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Overall, 54 percent of the Miami-Dade County residents surveyed used the Bay for recreation at least once in the past 12 months. The percentages are similar for all four location quadrants, ranging from 50 percent to 58 percent. The percentages by activity were used in this study.

The median household income of the survey respondents is \$55,000 while the median household income of the county population is \$38,000. The ethnicity of the respondents was compared to that of the resident population. The survey respondent is more likely to be non-Hispanic white than a resident randomly chosen from the general population. Non-Hispanic black residents are underrepresented in the sample.

Thus, while the sample appears to be representative of the population in terms of location, it is not representative in terms of income or ethnicity. Thus, the survey responses should be weighted either by income or by ethnicity. Because income typically plays a larger role in recreation activity than ethnicity, the sample was weighted so that the answers represent the population in terms of income. It turns out that the percent participation by activity is similar for all or most of the activities when the responses are weighted by income or by ethnicity or not weighted at all.

### **A.1.4 Biscayne Bay-Related Recreational Uses and Expenditures and Economic Contribution Associated With Visitors – Overall Methodology**

The methods used to estimate Bay-related recreational uses and expenditures by visitors and the economic contribution of these uses are summarized as follows.

Estimate the number of person-trips of all visitors to Miami-Dade County in 2004 using the Capacity Utilization Model, the responses to the General Visitor Survey, and other available data. The number of hotel/motel rooms in Miami-Dade County as of August 2004 is from the Florida Department of Business and Professional Regulation database. The county's monthly hotel/motel occupancy rate from August 2003 to July 2004 is from the Greater Miami Convention and Visitors Bureau. The model also requires estimates of average party size for those using hotel and motel accommodations, the average trip length in nights for those staying in hotels/motels, and the proportion of visitors who stay in hotels/motels. This information was obtained from the General Visitor Survey responses.

The equation for the Capacity Utilization Model is as follows.

$$\begin{aligned} & \text{Total Number of Person-Trips by All Visitors to the County During a Season} = \\ & \text{(Average Daily Hotel/Motel Occupancy Rate} \times \text{Number of Hotel/Motel Rooms} \times \\ & \text{183 Days in the Season} \times \text{Average Persons per Room for those Using Hotels/Motels)} \\ & \text{divided by} \\ & \text{Average Trip Length in Nights for those staying in Hotels/Motels} \\ & \text{divided by} \\ & \text{Proportion of Visitors who stay at Hotels/Motels} \end{aligned}$$

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The equation is used for each of the two seasons: summer and winter. Summer is from June to November and winter is from December to May.

Estimate the number of person-trips spent by visitors who used the Bay for recreation using (1) above and responses to the General Visitor Survey.

Estimate the total number of person-days Bay-using visitors spent visiting the county in 2004 using information from (2) above and responses to the Biscayne Bay User Survey.

Estimate the proportion of person-days Bay-using visitors spent in each Bay-related recreation activity in 2004 from the responses to the Biscayne Bay Users Survey.

Estimate the number of person-days spent in each recreation activity using (3) and (4) above.

Calculate the average itemized expenditures per person-day by recreation activity from responses to the Biscayne Bay Users Survey.

Estimate the total 2004 itemized expenditures by recreation activity using (5) and (6) above.

Estimate the 2004 expenditures for big-ticket items purchased and used while recreating on the Bay such as boats, boat repair and maintenance, and equipment using the Biscayne Bay User Survey responses and allocate the expenditures to days when the item is used on the Bay.

Use the IMPLAN regional economic input-output model to estimate the direct, indirect and induced output, income, employment and tax revenues generated by these Bay-related expenditures (Items (7) and (8) above).

Quality control the data and results at each step by assessing the consistency of the survey responses among the survey questions and by comparing the results to available data from other sources.

Section 2.0 of the BBES report describes the results of each step in the list above.

### **A.1.5 Biscayne Bay-Related Recreational Uses and Expenditures of Residents and Economic Contribution – Overall Methodology**

The methods used to estimate Bay-related recreational uses and expenditures by residents and the economic contribution of these uses are summarized as follows.

1. Estimate the percent of Miami-Dade County residents who used Biscayne Bay for recreation in 2004 in total and by activity using the results of the General Resident Survey.
2. Estimate the number of person-days residents spent participating in Biscayne Bay-related recreation using the results from (1) above; the resident population older than 14 years from the

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U.S. Census; and the responses to the Biscayne Bay User Survey regarding the number of days spent in each activity over the past 12 months.

3. Calculate the average itemized expenditures per person-day by recreation activity from responses to the Biscayne Bay Users Survey.
4. Estimate the total itemized expenditures by recreation activity using (2) and (3) above.
5. Estimate the 2004 expenditures for big-ticket items purchased and used while recreating on the Bay such as boat purchases, boat repair and maintenance, and equipment using the Biscayne Bay User Survey responses. Allocate the expenditures to days when the item is used on the Bay.
6. Use the IMPLAN regional economic input-output model to estimate the direct, indirect and induced output, income, employment and taxes generated by these Bay-related expenditures (Items (4) and (5) above).
7. Quality control the data and results at each step by assessing the consistency of the survey responses among the survey questions and by comparing the results to available data from other sources.

Section 2.0 of the BBES report describes the results of each step in the list above.

### **A.1.6 Resident and Visitor Recreational Uses and Economic Contribution of Recreational Expenditures**

This section summarizes the results of the visitor and resident analyses of the recreational uses of Biscayne Bay and the economic contribution of recreational expenditures as described previously in this Appendix and in the BBES report.

**Recreational Uses of Biscayne Bay.** The total number of person-days Miami-Dade County residents and visitors participated in Biscayne Bay-related recreation is provided in Table A-5. In 2004, residents and visitors spent 65 million person-days participating in recreation activities on Biscayne Bay (column (2) under All Activities Residents and Visitors). On an average day, 179,000 people participated in recreation activities on the Bay. Of this amount, 82,000 people were county residents and 98,000 were county visitors. These residents represented 4.6 percent of the county's resident population older than 14 years<sup>36</sup> and the visitors represented 45 percent of the county's visitor population. Overall, nine percent of the residents and visitors in the county, on an average day, participated in Biscayne Bay-related recreation in 2004.

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<sup>36</sup> The resident population used to infer the survey results to the population included residents older than 14 years.

**Table A-5**  
**Evaluation of Resident and Visitor Person-days**  
**Spent Recreating on Biscayne Bay, 2004**

<b>Type of Participant</b>	<b>No. of Person-days Spent in Bay Recreation</b>	<b>Average no. of persons using Bay per day</b>	<b>Number of Persons in Population (a)</b>	<b>% of County</b>
(1)	(2)	(3) = (2) / 365 days per year	(4)	(5) = (3) / (4)
<b>All Activities</b>				
Residents	29,799,000	81,641	1,788,985	4.6%
Visitors	35,668,000	97,721	217,781	44.9%
Residents and Visitors	<b>65,467,000</b>	<b>179,362</b>	<b>2,006,766</b>	<b>8.9%</b>
<b>All Activities Except Viewing Bay from Shore</b>				
Residents	24,531,000	67,208	1,788,985	3.8%
Visitors	25,078,000	68,707	217,781	31.5%
Residents and Visitors	<b>49,609,000</b>	<b>135,915</b>	<b>2,006,766</b>	<b>6.8%</b>

(a) For residents, population is population in Miami-Dade County over 14 years of age. For visitors, population is number of visitor person-days in 2004 (all visitors) divided by 365 days per year.

For all recreation activities except Viewing the Bay from Shore while dining, shopping, jogging or strolling, 50 million person-days were spent participating in recreation activities on Biscayne Bay. On an average day, 136,000 people participated in recreation activities on the Bay other than Viewing the Bay from Shore. Of this amount 67,000 people were county residents and 69,000 were county visitors. These residents represented 3.8 percent of the county's resident population older than 14 years and the visitors represented 32 percent of the county's visitor population. This means that on an average day, 3.8 percent of the county's residents are recreating on the Bay and 32 percent of the county's visitors are recreating on the Bay. Overall, about seven percent of the residents and visitors in the county, on an average day, participated in Biscayne Bay-related recreation other than viewing the Bay from shore in 2004. In practice, recreation on the Bay varies significantly from day to day so there are days when a greater number of people are using the Bay and days when fewer people are using the Bay.

An itemization of the recreational uses of Biscayne Bay by Miami-Dade County residents and visitors is provided in Table A-6. Of the 65.5 million person-days residents and visitors participated in Biscayne Bay-related recreation, 15.9 million person-days were spent viewing the Bay from the shore while dining, shopping, jogging or strolling comprising 25 percent of the estimated person-days. The next most predominant activities were swimming from shore with 10.9 million person-days, fishing from a boat with 8.7 million person-days and sailing with 6.0 million person-days.

The survey researchers were instructed that the category "Sailing" is any activity conducted on a sail boat. Thus, all other categories that have the word "boat" in them are power boats. As with all of the activities, the respondent was to provide the primary activity conducted that day. Thus, it is possible that some respondents said snorkeling from a boat if that is what they did all day even if it was from a sailboat. However, most of the sailing is expected to be under the category "sailing".

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Of the least predominant activities, residents and visitors spent 26,000 person-days parasailing, 145,000 person-days windsurfing, 215,000 person-days water-skiing, and 250,000 person-days kite sailing. Because the number of people interviewed who participated in these activities is relatively small, these estimates of user-days are not likely to be as accurate as the estimates for the other more predominant activities. Errors in estimating these values are not expected to affect the estimates of economic contribution because the number of person-days is relatively small. However, a conclusion can be made that Biscayne Bay appears to be a popular location for these activities.

The 6,000 person-days spent touring the Bay via a glass bottom boat is the rounding of 2,500 person-days for visitors and 2,500 person-days for residents to 3,000 person-days each and is considered to be accurate as it was based on information from the only glass bottom boat concessionaire in the county. This concessionaire provided information that was used to estimate 5,000 person-days spent on glass bottom boats.

**Table A-6  
Number of Person-Days Spent Participating in Biscayne Bay-Related Activities, 2004**

Primary Activity (a)	Visitors to Miami-Dade County	Residents of Miami-Dade County	Total
(1)	(2)	(3)	(4) = (2) + (3)
Fishing – From Shore	505,000	3,349,000	3,854,000
Fishing – From Boat	5,139,000	3,541,000	8,680,000
Snorkeling - From Shore	293,000	606,000	899,000
Snorkeling - From Boat	835,000	992,000	1,827,000
Scuba Diving	500,000	736,000	1,236,000
Swimming - From Shore	6,198,000	4,742,000	10,940,000
Swimming - From Boat	1,646,000	2,121,000	3,767,000
Boating for Pleasure/Partying	2,668,000	2,151,000	4,819,000
Water-skiing	28,000	187,000	215,000
Parasailing	19,000	7,000	26,000
Windsurfing	8,000	137,000	145,000
Kite Sailing	17,000	233,000	250,000
Personal Watercraft (jet skis, etc.)	114,000	249,000	363,000
Sailing	3,986,000	2,054,000	6,040,000
Canoeing / Kayaking	239,000	725,000	964,000
Viewing Bay from Shore	10,591,000	5,265,000	15,856,000
Sunset Cruise	333,000	143,000	476,000
Glass Bottom Boat Tour	3,000	3,000	6,000
Picnicking on Biscayne Bay	2,547,000	2,558,000	5,105,000
<b>Total</b>	<b>35,668,000</b>	<b>29,799,000</b>	<b>65,467,000</b>

(a) A person-day is one person participating in an activity for all or a portion of a day. A person-day is attributed to an activity only if it was the “primary” activity that day. Sailing is any activity conducted on a sail boat.

**A.1.7 Economic Contribution of Biscayne Bay From Resident and Visitor Expenditures Associated with Bay Use**

A summary of the economic contribution of Biscayne Bay as residents and visitors spent money to use the Bay in 2004 is provided in Table A-7 with a comparison to the rest of the economies in Tables A-8 and A-9.

In Miami-Dade County, Bay-related recreation expenditures generated \$3.8 billion in output, \$2.1 billion in income, 57,100 jobs and \$257 million in tax revenues in 2004. This economic contribution represents 4.4 percent of the county's gross sales, 3.4 percent of the county's personal income and 4.4 percent of the county's employment.

In the southeast Florida counties of Palm Beach, Broward, Miami-Dade and Monroe, Bay-related recreation expenditures generated \$4.0 billion in output, \$2.2 billion in income, 58,800 jobs and \$272 million in tax revenues in 2004. This economic contribution represents 1.8 percent of the area's gross sales, 1.3 percent of the area's personal income and 2.0 percent of the area's employment.

In Florida, Bay-related recreation expenditures generated \$4.6 billion in output, \$2.6 billion in income, 65,300 jobs and \$305 million in tax revenues in 2004. This economic contribution represents 0.7 percent of the State's gross sales, 0.5 percent of the State's personal income and 0.7 percent of the State's employment.

**Table A-7  
Economic Contribution of Biscayne Bay-Related Expenditures  
By Residents and Visitors to Miami-Dade County, 2004 (a)**

<b>Study Area</b>	<b>Output (b)</b>	<b>Income (c)</b>	<b>Employment (d)</b>	<b>Tax Revenue (e)</b>
Miami-Dade County	\$3,789,000,000	\$2,112,000,000	57,100	\$257,000,000
Southeast Florida	\$3,992,000,000	\$2,243,000,000	58,800	\$272,000,000
Florida	\$4,567,000,000	\$2,565,000,000	65,300	\$305,000,000

<sup>a</sup> Includes direct, indirect and induced effects.

<sup>b</sup> Output is defined as the value of additional goods and services produced in the study area due to the Bay-related recreation expenditures.

<sup>c</sup> Income is the sum of wages, salaries, proprietor's income, profits, rents, royalties and dividends due to the Bay-related recreation expenditures.

<sup>d</sup> Employment includes the number of full-time and part-time jobs created due to the Bay-related recreation expenditures.

<sup>e</sup> Tax revenue is the sum of the excise taxes, property taxes, fees, licenses, and sales taxes collected due to the Bay-related recreation expenditures. It excludes taxes on profit and income.

**Table A-8  
Economy of Study Areas, 2004**

<b>Study Area</b>	<b>Gross Sales</b>	<b>Personal Income</b>	<b>Employment</b>
Miami-Dade County	\$85,245,887,000	\$62,037,209,000	1,293,315
Southeast Florida	\$222,040,661,966	\$171,714,743,000	2,923,679
Florida	\$642,280,422,229	\$496,706,399,000	9,185,622

Source: Gross Sales are from the University of Florida Bureau of Economic and Business Research based on data from the Florida Department of Revenue and represent 2003. Income and employment data are from U.S. Department of Commerce, Bureau of Economic Analysis, Regional Economic Information System web site and represent 2002. These are the most recent years for which data are available. Employment is number full-time and part-time jobs. Personal income is the income received by persons from all sources and is the sum of wage and salary disbursements, supplements to wages and salaries, proprietor's income, rental income, personal dividend income, personal interest income, personal current transfer receipts, less contributions for government social insurance.

**Table A-9  
Economic Contribution as Biscayne Bay is Used for Recreation By Residents and Visitors  
As Percent of Study Area Economies, 2004**

<b>Study Area</b>	<b>Gross Sales (a)</b>	<b>Personal Income</b>	<b>Employment</b>
Miami-Dade County	4.4%	3.4%	4.4%
Southeast Florida	1.8%	1.3%	2.0%
Florida	0.7%	0.5%	0.7%

(a) The IMPLAN model provides the value of the additional goods and services produced in the study area due to the Bay-related recreational expenditures. The gross sales values represent the total sales in the county.

The resident and visitor expenditures associated with Bay-related recreation were compared to Miami-Dade County's gross sales in Table A-10. For example, Bay-related recreation expenditures at food stores of all types represent 10 percent of the county's gross sales in this industry. Bay-related recreation expenditures at restaurants and drinking places represent 17 percent of the county's gross sales in this industry. The \$2.9 billion in all Bay-related recreation expenditures represents three percent of the county's gross sales in 2004. These expenditures were used to estimate the economic contribution reported in this Chapter.

**Table A-10**  
**Comparison of Bay-Related Recreation Expenditures With Miami-Dade County Gross Sales**

<b>Industry Type</b>	<b>County Gross Sales</b>	<b>Bay-Related Recreation Expenditures</b>	<b>% of County Gross Sales</b>
Food Stores, all types	\$5,410,000,000	\$543,000,000	10%
Restaurants and Drinking Places	\$3,551,000,000	\$591,000,000	17%
General Merchandise Stores and Gift Shops	\$7,744,000,000	\$421,637,259	5%
Filling and Service Stations and Marinas	\$1,306,000,000	\$227,000,000	17%
Hotels and Motels	\$1,549,000,000	\$344,000,000	22%
Admissions (Entrance Fees to Parks and Events)	\$460,000,000	\$43,000,000	9%
All Industries	\$85,246,000,000	\$2,896,000,000	3%

Gross sales are from the Bureau of Economic and Business Research at the University of Florida, Gainesville and represent the year 2003, the most recent year available.

## **A.2 Biscayne Bay-Dependent Recreation - Historic**

The methodology chosen to estimate the historic uses and economic contribution was based on the types of available data and information. No studies exist that have attempted to estimate the historic uses and economic contribution in terms of person-days and the output, income, employment and tax revenues generated. The Bay is accessible through many parks, marinas, boat ramps and private docks. There is no system of counting persons entering the Bay or participating in activities on or near the Bay. Actual or estimated attendance is available for only four parks surrounding the Bay. Attendance is the number of persons entering the park. These parks are Biscayne National Park, Barnacle Historic State Park, Oleta River State Park and Cape Florida State Park.

Historic data regarding the number of person-days spent in each Bay-dependent recreation activity is not available. Instead, the 2004 estimates of person-days by activity were trended backward through 1980 based on the trend in the total attendance at Biscayne National Park, Barnacle Historic State Park, Oleta River State Park and Cape Florida State Park. While attendance at these parks represents only a portion of all the activities taking place throughout the Bay, they are the most representative of trends in usage available.

Attendance at Biscayne National Park is estimated by the National Park Service. The method used to estimate attendance at Biscayne National Park changed after 1991. The change was the change in the parameter values used to estimate visitation from boat trailer counts at Homestead Bayfront Park, Black Point Park and Matheson Hammock Park. Because the National Park Service was unable to provide the parameter values used prior to 1992, it is not possible to assess the impact of the change mathematically.



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Because the trend in attendance at Biscayne National Park mirrors the trends for Barnacle Historic State Park, Oleta River State Park and Cape Florida State Park, it was assumed that the attendance trend for Biscayne National Park is representative of the true attendance trend.

The total number of persons entering these four parks from 1983 through 2003 is provided in Table A-11. Attendance at Biscayne National Park from 1979 to 1982 is also provided. The annual percentage changes in total attendance at all four parks from 1983 through 2003 and at Biscayne National Park from 1980 to 1982 are provided in Column (7) of Table A-11. These percentage changes were used to infer historic recreational uses and economic contribution of Biscayne Bay. Because 2004 data were not available, 2003 person-days was set equal to 2004 person-days. Then the number of person-days in an activity in 2002 is equal to the number in 2003 divided by the quantity one plus the growth rate from 2002 to 2003. This method was used to estimate the number of person-days each year by activity.

The historic economic contribution of Bay-related recreation was estimated in the same manner. The 2004 estimates of direct, indirect and induced output, income, employment and tax revenue were used as the starting points from which the percent changes in recreation activity at the four parks were applied to obtain estimates for the years 1980 through 2002. The 2003 values were set equal to the 2004 values.

Parasailing, windsurfing and kite sailing were combined into one category. During the 1980's, windsurfing was a popular Bay activity in Florida and California while currently, parasailing and kite sailing are popular. The number of person-days spent on glass bottom boats is assumed to be zero from 1980 to 1983. In 1984, the glass bottom boat concession in Biscayne National Park opened so the number of person-days is positive beginning with this year. Other trends were also considered. They were rejected because they fail to pick up the impact of Hurricane Andrew on Bay-related recreation activities.

**Table A-11**  
**Attendance At State and National Parks Along Biscayne Bay**  
**Attendance is Number of Persons Entering the Park**

<b>Year</b>	<b>Biscayne National Park</b>	<b>Barnacle Historic State Park</b>	<b>Oleta River State Park</b>	<b>Cape Florida State Park</b>	<b>Total</b>	<b>Annual % Change (a)</b>
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1979	202,938	NA	NA	NA	NA	
1980	248,071	NA	NA	NA	NA	22%
1981	305,502	NA	NA	NA	NA	23%
1982	348,219	NA	NA	NA	NA	14%
1983	369,082	7,293	4,840	724,810	1,106,025	6%
1984	340,567	5,941	6,749	727,272	1,080,529	-2%
1985	460,921	7,545	3,069	671,271	1,142,806	6%
1986	578,013	6,875	55,724	805,611	1,446,223	27%
1987	607,968	7,895	179,943	745,728	1,541,534	7%
1988	531,036	14,047	195,281	721,482	1,461,846	-5%
1989	589,957	8,554	257,787	698,756	1,555,054	6%
1990	573,376	18,769	216,551	622,470	1,431,166	-8%
1991	488,134	16,003	151,938	483,310	1,139,385	-20%
1992	307,512	12,012	124,543	348,893	792,960	-30%
1993	19,950	4,711	141,770	99,346	265,777	-66%
1994	25,147	6,247	131,396	342,861	505,651	90%
1995	584,519	15,014	117,978	391,211	1,108,722	119%
1996	338,603	20,930	153,244	548,071	1,060,848	-4%
1997	392,069	23,237	177,282	572,432	1,165,020	10%
1998	403,239	19,212	215,721	615,598	1,253,770	8%
1999	442,585	18,466	291,301	691,515	1,443,867	15%
2000	393,151	26,736	345,221	874,837	1,639,945	14%
2001	489,343	25,824	352,082	804,166	1,671,415	2%
2002	513,397	27,680	345,916	886,455	1,773,448	6%
2003	490,031	25,208	269,097	842,937	1,627,273	-8%

Source: Florida Park Service, Department of Environmental Protection, Tallahassee, Florida. Biscayne National Park visits were estimated by the National Park Service.

(a) From 1980 to 1983, the percent change in Biscayne National Park visitor days was used. From 1984 to 2003, the percent change in visitor days at all four parks was used.

### A.3 Biscayne Bay-Related Commercial Fishing

The contribution of Biscayne Bay to commercial fishing is two-fold. First, commercial fishing takes place in the Bay for the harvest of fish and shellfish, particularly pink shrimp. Second, Biscayne Bay and Florida Bay are very important grounds for the lifecycle of many fish species that are commercially harvested in Miami-Dade County.<sup>37</sup> These species are ballyhoo, barracuda, goggle-eye, several grouper species (black, gag and red), grunts, hog snapper, several species of jack (almaco, crevalle, yellow), mullet, parrotfish, snapper (all species), white snapper, spiny lobster, live marine life, bait shrimp, pink shrimp and white shrimp. Both Biscayne Bay and Florida Bay are essential habitats for these species, so their values are attributable to both bays. These bays support commercial fisheries throughout southeast Florida. However, because the distribution of adult species that originate from Biscayne Bay has not been completely documented, only the harvest of Bay-dependent species in Miami-Dade County is included in the economic contribution reported in this study.

The total ex-vessel<sup>38</sup> value of Biscayne Bay-dependent fish species landed in Miami-Dade County was obtained from 1985 through 2002. The total ex-vessel value of fish harvested in Biscayne Bay was obtained from 1986 to 2002. These are the years for which data were available. The methods used to estimate the economic contribution of the fish caught in Biscayne Bay and the economic contribution of species dependent on the Bay are described as follows.

**Fish Harvested in Biscayne Bay.** The total annual ex-vessel value of commercial fish harvested in Biscayne Bay was used as input to the IMPLAN Regional Economic Input Output Model representing Miami-Dade County, southeast Florida and Florida. The model provided the direct, indirect and induced output, income, employment and tax revenues generated in these areas as a result of commercial fish harvests from Biscayne Bay. This method was implemented for each year from 1986 through 2002. The total annual pounds and ex-vessel value of commercial fish harvested from Biscayne Bay are provided in Table A-12. The large increases in landings and value after 1995 are due to the growth in blue crab and pink shrimp harvests.

**Harvested Fish Species Dependent on Biscayne Bay.** The historic ex-vessel value of commercial fish, shellfish and marine life landings in Miami-Dade County for species dependent on Biscayne Bay in 2004 dollars are presented in Table A-13. The IMPLAN model was also used to estimate the economic contribution of Biscayne Bay-dependent species landed in Miami-Dade County net of these species caught in Biscayne Bay. As with the economic contribution of fish harvested in Biscayne Bay, three IMPLAN models were used, each representing one of the three study areas: Miami-Dade County, southeast Florida and Florida. The annual value of Bay-dependent fish harvested in the ocean and landed in Miami-Dade County was input into three IMPLAN models to obtain estimates of their economic contribution to the county, to Southeast Florida and to Florida. This method was implemented for each year from 1985 through 2002.

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<sup>37</sup> Telephone conversation with Jerald Ault, Ph.D., Associate Professor, Division of Marine Biology and Fisheries, University of Miami, Rosenstiel School of Marine and Atmospheric Science, Miami, Florida.

<sup>38</sup> Ex-vessel value means the value of the fish at dockside (just off the boat).

## Appendix A – Excerpts from Biscayne Bay Economic Study

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The economic data used to construct the IMPLAN economic input-output model was as follows. For the years 1986 through 1997, the IMPLAN model represents 1995 conditions. For the years 1998 through 2002, the IMPLAN model represents 2000 conditions.

Miami-Dade County commercially harvested fishery species that are dependent on Biscayne Bay itemized by location caught is provided in Table A-14.

**Other Commercial Fishery Benefits of Biscayne Bay.** Biscayne Bay-related commercial fishing generates additional benefits beyond the ex-vessel values of marine landings. The capital expenditures associated with vessel purchases and refurbishments generate additional economic contributions. The value added from the marketing and retailing of marine landings also generates economic contributions. Annual estimates of these values were input into the IMPLAN economic input-output model to obtain estimates of these contributions.

Section 4.0 of the BBES Report provides additional detail regarding the methods and results of estimating the economic contribution of Biscayne Bay-dependent commercial fishing to Miami-Dade County, southeast Florida and Florida.

**Table A-12**  
**Commercial Landings and Value of Fish Caught in Biscayne Bay, 1986 to 2002**

Year	Landings in Pounds, Fish and Shellfish			Ex-vessel Value Fish and Shellfish, nominal dollars	Number of Sponges	Total Ex-vessel Value, All Species	
	Fish	Shellfish	Total			Nominal Dollars	2004 dollars
1986	36,300	3,288	39,588	\$34,062	0	\$34,062	\$51,267
1987	66,308	4,911	71,219	\$82,232	0	\$82,232	\$120,620
1988	46,384	4,357	50,741	\$36,756	0	\$36,756	\$52,270
1989	25,594	10,854	36,448	\$49,625	76,629	\$135,312	\$185,230
1990	21,863	23,312	45,175	\$93,939	53,016	\$155,311	\$204,991
1991	19,605	39,232	58,837	\$163,400	24,478	\$191,990	\$244,235
1992	19,444	54,316	73,760	\$136,345	385	\$136,780	\$169,733
1993	20,732	73,831	94,563	\$232,866	0	\$232,866	\$282,558
1994	10,776	86,137	96,913	\$173,230	0	\$173,230	\$205,773
1995	11,187	136,321	147,508	\$385,346	0	\$385,346	\$448,302
1996	36,394	232,895	269,289	\$1,080,769	0	\$1,080,769	\$1,233,653
1997	34,297	545,245	579,542	\$1,492,876	0	\$1,492,876	\$1,674,820
1998	29,898	513,067	542,965	\$1,364,864	117,634	\$1,459,459	\$1,617,699
1999	31,717	747,440	779,157	\$1,598,965	108,359	\$1,681,380	\$1,839,535
2000	49,026	986,362	1,035,388	\$2,158,938	119,197	\$2,254,674	\$2,417,912
2001	25,336	710,773	736,109	\$1,848,510	60,577	\$1,899,325	\$1,990,264
2002	16,634	734,894	751,528	\$1,972,284	10,469	\$1,983,499	\$2,042,347

Source: Landings and value data for 1997 to 1999 and landings data for 1986 through 1996 from Ault, Jerald S., Steven G. Smith, Geoffrey A. Meester, Jiangang Luo, and James A. Bohnsack, "Site Characterization for Biscayne National Park: Assessment of Fisheries Resources and Habitats, NOAA Technical Memorandum NMFS-SEFSE-468, National Oceanic and Atmospheric Administration, US Department of Commerce, Miami Florida, October 2001, pages 45 and 46. Landings and value data for 2000 through 2002 from Doug Harper, Fisheries Biologist, National Oceanic and Atmospheric Administration, Southeast Fisheries Science Center, Miami, Florida. Ex-vessel value per pound from National Marine Fisheries Service web site.

**Table A-13**  
**Historic Ex-Vessel Value of Commercial Fish, Shellfish and Marine Life Landings**  
**in Miami-Dade County for Species Dependent on Biscayne Bay**  
**Real Value in 2004 Dollars**

<b>Year</b>	<b>Fish and Shellfish</b>	<b>Marine Life</b>	<b>Total</b>
1985	\$2,355,017	\$0	\$2,355,017
1986	\$3,461,568	\$0	\$3,461,568
1987	\$5,217,902	\$0	\$5,217,902
1988	\$4,639,115	\$0	\$4,639,115
1989	\$3,573,228	\$0	\$3,573,228
1990	\$3,654,912	\$705,353	\$4,360,264
1991	\$5,292,633	\$757,022	\$6,049,655
1992	\$3,821,567	\$802,463	\$4,624,030
1993	\$7,753,511	\$803,092	\$8,556,603
1994	\$5,065,180	\$779,791	\$5,844,970
1995	\$4,670,601	\$639,483	\$5,310,084
1996	\$4,069,938	\$444,132	\$4,514,070
1997	\$4,334,357	\$421,969	\$4,756,326
1998	\$4,147,286	\$232,409	\$4,379,695
1999	\$4,771,881	\$167,033	\$4,938,914
2000	\$4,154,904	\$261,897	\$4,416,800
2001	\$3,369,029	\$257,109	\$3,626,139
2002	\$3,448,091	\$255,620	\$3,703,710

*Source: Rick Beaver, Fisheries and Wildlife Biologist, Florida Marine Research Institute, Florida Fish and Wildlife Conservation Commission, December 2003.*

**Table A-14**  
**Ex-vessel Value of Commercial Fish, Shellfish and Marine Life Landings in Miami-Dade County for Species Dependent on or Caught in Biscayne Bay Itemized By Location of Catch**

Year	Species Dependent on Biscayne Bay and Caught Outside of Bay		Species Caught In Bay	
	nominal dollars	2004 dollars	nominal dollars	2004 dollars
(1)	(2)	(3)	(4)	(5)
1986	\$2,277,738	\$3,428,275	\$34,062	\$51,267
1987	\$3,496,236	\$5,128,387	\$82,232	\$120,620
1988	\$3,238,548	\$4,605,514	\$36,756	\$52,270
1989	\$2,570,291	\$3,518,483	\$135,312	\$185,230
1990	\$3,216,989	\$4,246,030	\$155,311	\$204,991
1991	\$4,596,400	\$5,847,188	\$191,990	\$244,235
1992	\$3,646,653	\$4,525,192	\$136,780	\$169,733
1993	\$6,988,651	\$8,480,006	\$232,866	\$282,558
1994	\$4,815,273	\$5,719,870	\$173,230	\$205,773
1995	\$4,317,706	\$5,023,116	\$385,346	\$448,302
1996	\$3,337,043	\$3,809,095	\$1,080,769	\$1,233,653
1997	\$2,920,940	\$3,276,928	\$1,492,876	\$1,674,820
1998	\$2,775,334	\$3,076,246	\$1,459,459	\$1,617,699
1999	\$3,123,863	\$3,417,701	\$1,681,380	\$1,839,535
2000	\$2,334,502	\$2,503,519	\$2,254,674	\$2,417,912
2001	\$1,870,188	\$1,959,732	\$1,899,325	\$1,990,264
2002	\$1,830,924	\$1,885,245	\$1,983,499	\$2,042,347

# Appendix B – Excerpts from Indian River Lagoon Economic Assessment and Analysis Update

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This Appendix B provides excerpts from the Indian River Lagoon Economic Assessment and Analysis Update<sup>39</sup> (IRL Study) that are relevant to the information provided in the SERC associated with Water Reservations for the Biscayne Bay Coastal Wetlands CERP Phase 1 Project.

The purpose of this study was to update the economic values of the Indian River Lagoon that were estimated in 1995. The study area for this project is the Indian River Lagoon, including Mosquito Lagoon and Banana River Lagoon, and associated tributaries including but not limited to the St. Lucie River Estuary, St. Sebastian River, Turkey Creek, Crane Creek, Moore's Creek, and the inlets of Ponce de Leon Inlet, Port Canaveral Inlet, Sebastian Inlet, Ft. Pierce Inlet, St. Lucie Inlet, and Jupiter Inlet. The residents surrounding the Indian River Lagoon are located in the counties of Volusia, Brevard, Indian River, St. Lucie and Martin.

The recreational activities that take place on the Lagoon are:

- Recreational fishing – Fin fish; Shrimp netting; Shell fishing (clamming, oysters, crabs)
- Hunting – Water fowl (duck) hunting
- Power Boating – waterskiing, tubing, cruising
- Sailing/board sailing
- Kayaking and canoeing
- Swimming and Wading
- Wildlife Viewing: Bird watching; Photography
- Sightseeing: Ecotourism; Guided tours/cruises; Touring refuges, preserves, and parks

This appendix summarizes the methods used to estimate recreational consumer surplus and non-use value associated with the Indian River Lagoon to visitors and residents of the five Indian River Lagoon counties. Additional detail and results are provided in the IRL Study report. Surveys of visitors and

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<sup>39</sup> Hazen and Sawyer, "Indian River Lagoon Economic Assessment and Analysis Update", Contract No. 24706, Prepared for the Indian River Lagoon National Estuary Program in cooperation with the St. Johns River Water Management District and the South Florida Water Management District, Final Report, August 18, 2008.



residents in the Indian River Lagoon counties and supplemental information were used to estimate the following measures of value during the year 2007.

- (1) Recreational uses of the Indian River Lagoon by visitors and residents in each county as measured in terms of the number of person-days by primary recreation activity participated in that day.
- (2) Expenditures by visitors and residents as they used the Lagoon for recreation. Expenditures measure part of the value that recreators place on the Lagoon and they contribute to the economy of the IRL counties.
- (3) Consumer surplus of the Lagoon to visitors and residents who used the Lagoon in the past 12 months as measured in terms of their willingness to pay per trip to recreate on the Lagoon above what they spent to recreate on the Lagoon. The sum of this value and the expenditures per trip to recreate on the Lagoon equals the total use value of the Lagoon per trip. This total use value is the maximum amount of money a resident would be willing to pay to recreate on the Lagoon. Two consumer surplus values were estimated: (a) To finance a program that would maintain the Lagoon in its existing environmental condition; and (b) To finance a program that would improve the Lagoon's environmental condition.
- (4) Non-use value to all residents and visitors in the five IRL counties. Non Use Value, also called passive use value, is a term used to characterize the value that people place on a resource for the benefits it provides to a person other than from his or her direct use of that resource. Examples include human uses that are difficult to quantify such as the potential for future discoveries in medicine; or from knowing that the resource can be used by others; or by knowing that future generations will be able to benefit from the resource in known ways or in ways not yet identified. In this study, two non use values were estimated. They are the maximum value of a one-time tax that would be put into a trust fund to: (1) maintain the environmental quality of the Indian River Lagoon in its existing condition and (2) to improve the environmental quality of the Indian River Lagoon.

This Appendix B summarizes the methods used to estimate these values for visitors and residents as follows.

### **B.1 Visitors**

To estimate the value of the Indian River Lagoon to visitors of the five county area and the economic impact to these counties as their visitors use the Lagoon for recreation, an intercept survey of visitors was conducted from December 17, 2007 to February 9, 2008. Visitors are defined as those who do not live inside the county where the interview is being conducted for more than six months per year. The interview sites were chosen to capture a random sample of all visitors to the five counties, regardless of whether or not they participate in activities on the Lagoon.

### B.1.1 General Survey Design

The survey was designed to collect information on the recreational uses of the Indian River Lagoon and the associated visitor expenditures, visitor use values and visitor non-use values. Contingent valuation methods were used to estimate use and non-use values.

The visitor survey asked questions to solicit the following information.

- (1) The proportion of all visitors who used the Indian River Lagoon for recreation in the past 12 months.
- (2) For visitors who did not use the Lagoon for recreation in the past 12 months the following information was collected during the survey.
  - (a) Their non-use value of the Lagoon in its existing condition and their non-use value of the Lagoon in an improved condition as measured by their willingness to pay a one-time tax that would be used in programs that protect the Lagoon in its existing condition or improved condition, respectively.
  - (b) Their socioeconomic characteristics of these visitors such as age, sex, household income and the like.
- (3) For visitors who did use the Lagoon for recreation in the past 12 months, the following information was collected during their survey.
  - (a) The number of days they participated in each recreation activity on the Lagoon in the past 12 months and the counties where they participated in Lagoon-related recreation. Care was taken to make sure that only one activity was counted per day. For days when respondents participated in more than one activity, only the predominant activity was counted.
  - (b) Their itemized expenditures to participate in each type of recreation activity during the most recent day and the county where they spent the money.
  - (c) Their use value of the Lagoon in its existing condition and their use value in an improved condition as measured by their willingness to pay in terms of higher trip costs.
  - (d) Their non-use value of the Lagoon in its existing condition and their non-use value of the Lagoon in an improved condition as measured by their willingness to pay a one-time tax that would be used in programs that protect the Lagoon in its existing condition or improved condition, respectively.
  - (e) Their socioeconomic characteristics such as age, sex, household income and the like.

Only those visitors who were leaving the county within the next 24 hours were surveyed so that their answers reflect what they already did and spent over the past 12 months and not on what they intend to do or spend.

## Appendix B – Excerpts from Indian River Lagoon Economic Study

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An estimate of the total number of person-days visitors spent in each of the five counties was used to infer the results of the visitor survey to all visitors in each county. This number of person-days was estimated for each county using the Capacity Utilization Model, the responses to specific questions of the visitor survey, and secondary data collected from the counties as described in this Section.

Perceptive Market Research of Gainesville, Florida conducted the visitor survey by hiring and supervising the survey researchers and collecting and quality controlling the completed surveys. This firm conducted the visitor surveys during the 1995 economic valuation of the Indian River Lagoon. The survey researchers were stationed in areas where visitors were likely to be. People who met the survey criteria were asked to participate in an in-person interview at that time. The survey researcher asked the respondent questions from the survey instrument and wrote down the answers. The sites represented a sample of areas where visitors participating in a variety of activities on the Lagoon and off the Lagoon would be intercepted.

A total of 392 completed surveys were obtained over the five county area. The response rate of the visitor survey is the percent of qualifying visitors who agreed to complete the survey. The response rate over all of the survey sites was 49 percent which is a very good response rate. Language was a problem with only 28 of the 808 potential respondents (416 refusals plus 392 completed interviews). These completed surveys are sufficient to make meaningful inferences to the population of visitors in the five county area. The number of completed surveys for the individual counties may not be sufficient to make meaningful inferences using county specific data. In most instances, measurements using the survey data from all five counties were used when estimating uses and expenditures.

At the county level, 60 completed interviews were obtained for Volusia County and the response rate was 67 percent. Brevard County is represented by 102 completed interviews at a response rate of 40 percent. The other three counties, Indian River, St. Lucie and Martin, are represented by 71 to 80 completed surveys each that were obtained with a 50 percent response rate.

### **B.1.2 Estimating Recreation Uses, Expenditures and Economic Contribution**

The methods used to estimate the Indian River Lagoon-related recreational uses and expenditures by visitors and the economic contribution of these uses are summarized as follows.

1. Estimate the number of person-trips of all visitors to the five IRL counties in 2007 using the Capacity Utilization Model, the responses to the Visitor Survey, and other available data.
2. Estimate the number of person-trips spent by visitors who used the Lagoon for recreation in 2007 using (1) above and responses to the Visitor Survey.
3. Estimate the total number of person-days Lagoon-using visitors spent visiting the counties in 2007 using information from (2) above and responses to the Visitor Survey.
4. Estimate the proportion of person-days Lagoon-using visitors spent in each Lagoon-related recreation activity in 2007 from the responses to the Visitor Survey.
5. Estimate the number of person-days spent in each recreation activity using (3) and (4) above.

6. Calculate the average itemized expenditures per person-day by recreation activity from responses to the Visitor Survey.
7. Estimate the total 2007 itemized expenditures by recreation activity using (5) and (6) above.
8. Use the IMPLAN regional economic input-output model to estimate the direct, indirect and induced output, income, employment and tax revenues generated by these Lagoon-related expenditures (Item (7) above).
9. Quality control the data and results at each step by assessing the consistency of the survey responses among the survey questions and by comparing the results to available data from other sources.

Section 2.0 of the IRL Study report describes the results of each step in the list above.

### **B.1.3 Consumer Surplus and Non-Use Value of the Indian River Lagoon in its Existing Condition**

The visitor survey included contingent valuation questions to estimate the consumer and non-use value that visitors place on the Indian River Lagoon in its existing condition. Consumer surplus is the maximum amount of money that visitors who use the Lagoon for recreation would be willing to pay to keep the Lagoon in its existing condition net of the recreation-related expenditures.

Non-use value is a term used to characterize the value that people place on a resource for the benefits it provides to a person other than from his or her direct use of that resource. Examples include human uses that are difficult to quantify such as the potential for future discoveries in medicine; or from knowing that the resource can be used by others; or by knowing that future generations will be able to benefit from the resource in known ways or in ways not yet identified. Many terms have been used to describe non-use value including bequest value, existence value, look-existence value, intrinsic value, inherent value, passive use value, and stewardship value. The term passive-use value was popularized in the 1989 U.S. Appellate Court decision, *Ohio v. Department of Interior*, which mandated that such values be included in a natural resource damage assessment to the extent that they can be reliably measured. Passive use or non use values are typically measured using contingent valuation techniques and involve survey research.

The survey instrument set up a situation where the survey respondent was asked to value the Indian River Lagoon. This situation is as follows and is from the survey instrument.

The Indian River Lagoon is an Estuary of National Significance and one of twenty-eight (28) national estuary programs in the U.S. The Indian River Lagoon National Estuary Program is working toward the goals of attaining and maintaining the water and sediment quality needed to support a healthy seagrass-based ecosystem, endangered and threatened species, fisheries and recreation in the Lagoon.

Since the Lagoon's inception as a national estuary in 1991, the participating members of the National Estuary Program have eliminated effluent discharges to the Lagoon from more than 20 wastewater treatment facilities; reconnected over 27,500 acres of salt marshes and wetlands to the Lagoon for

## Appendix B – Excerpts from Indian River Lagoon Economic Study

fisheries and wildlife habitat; prevented over a million pounds of sediments and pollutants from entering the Lagoon; and are working to keep unwanted freshwater discharges from the St. Johns River and surrounding lands from being drained into the Lagoon.

Financed by State and Federal grants, the St. Johns River and South Florida Water Management Districts and local governments through local taxes and storm water assessment fees these actions have worked towards protecting and conserving the environmental quality of the Indian River Lagoon over the past 17 years.

### PLAN 1 – MAINTAIN ENVIRONMENTAL QUALITY OF THE INDIAN RIVER LAGOON

Continued funding is needed to maintain this environmental quality at existing levels. Funding is needed to pay for environmental monitoring and research; environmental habitat restoration projects; law enforcement as related to protecting the Lagoon's resources and wildlife; Lagoon maintenance due to recreational uses; and actions that limit new storm water flows and prevent new wastewater flows from entering the Lagoon as the regional economy grows. These activities would be conducted by the members of the Indian River Lagoon National Estuary Program which is supported by the U.S. Environmental Protection Agency and administered locally by the St. Johns River Water Management District.

**Now** I would like to ask you two questions about your support for these actions that maintain the quality of the Indian River Lagoon in its current condition.

**Q16.** Over the past 12 months, how many trips have you made to visit the Indian River Lagoon for recreation?

\_\_\_\_\_ (number of trips in past year)

**Q17.** First, consider your total trip costs for your last trip, or this trip, to visit the Indian River Lagoon, including travel expenses, hotel and campsite fees, food and drink, and all other expenses. Using the amounts listed on the **BLUE PAYMENT CARD NUMBER** \_\_\_\_\_ (*Insert #. Rotate the 2 payment cards so that half of the surveys have each one.*), please indicate the maximum amount of money you would be willing to pay in additional trip cost for each future trip to this area when you use the Lagoon where that money would be used to maintain the Indian River Lagoon in its existing condition.

Please keep in mind that the added cost will be used to make sure that the water, sediment and ecosystem qualities of the Lagoon will be maintained in their current conditions. Also, keep in mind that instead of using the Lagoon, you could have gone to other places for recreation or spent this money on other things.

\$\_\_\_\_\_ (Record Dollar Amount.)

The respondent may provide an amount that is larger than what is on the Payment Card or an amount that is not on the Payment Card as long as the respondent reviews the Payment Card first.

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**Q18.** In addition to this additional cost per trip that you just indicated, please indicate the maximum amount of money you would be willing to pay in a one-time tax that would be put into a trust fund to maintain the quality of the Indian River Lagoon in its existing condition forever into the future. You would pay this tax regardless of whether or not you visited the Indian River Lagoon in the future. Please choose an amount listed on the **BLUE PAYMENT CARD NUMBER** \_\_\_\_\_ (*Insert #. Rotate the 2 payment cards so that half of the surveys have each one.*)

\$\_\_\_\_\_ (Record Dollar Amount.)

The respondent may provide an amount that is larger than what is on the Payment Card or an amount that is not on the Payment Card as long as the respondent reviews the Payment Card first.

If respondent indicates a \$0 value for both of Questions 17 and 18, ask Question 19.

**Q19.** Please refer to **Section 5 of the WHITE CARD** and indicate the number that best describes your reason for not wanting to fund this maintenance program.

1. I am not interested in maintaining the water, sediment and ecosystem quality of the Indian River Lagoon.
2. Not enough information to form a decision.
3. I believe the money will be misused.
4. I am opposed to any new taxes.
5. The quality of the Indian River Lagoon does not need to be maintained.
6. Other, please specify: \_\_\_\_\_

The answers to question 17 were used to estimate consumer surplus and the answers to question 18 were used to estimate non-use value. Only visitors who used the Lagoon in the past 12 months were asked for their use value. All visitors were asked for their non-use value.

Of the 392 visitors surveyed, 134 visitors used the Indian River Lagoon for recreation during the past 12 months. When answering Question 17, some of the respondents were given Payment Card Number 1 for reference and the rest were given Payment Card Number 2 for reference. Each card has a list of values from \$0 to a maximum number for the respondents to refer to when answering the question.

Payment Card Number 1 has the following values on it:

PLEASE SELECT ONE AMOUNT FROM THE FOLLOWING LIST THAT REFLECTS THE MAXIMUM AMOUNT YOU WOULD PAY.

\$0	\$5	\$10	\$15	\$20	\$25	\$30	\$35	\$40	\$45	\$50	\$55
\$60	\$65	\$70	\$75	\$80	\$85	\$90	\$95	\$100	\$105	\$110	\$115
\$120	\$125	\$130	\$135	\$140	\$145	\$150	\$155	\$160	\$165	\$170	\$175

## Appendix B – Excerpts from Indian River Lagoon Economic Study

\$180	\$185	\$190	\$195	\$200	\$205	\$210	\$215	\$220	\$225	\$230	\$235
\$240	\$245	\$250	\$255	\$260	\$265	\$270	\$275	\$280	\$285	\$290	\$295
\$300	\$305	\$310	\$315	\$320	\$325	\$330	\$335	\$340	\$345	MORE THAN \$350	

Payment Card Number 2 has the following values on it:

PLEASE SELECT ONE AMOUNT FROM THE FOLLOWING LIST THAT REFLECTS THE MAXIMUM AMOUNT YOU WOULD PAY.

\$0	\$5	\$10	\$15	\$20	\$25	\$30	\$35	\$40	\$45	\$50	\$55
\$60	\$65	\$70	\$75	\$80	\$85	\$90	\$95	\$100	\$105	\$110	\$115
\$120	\$125	\$130	\$135	\$140	\$145	\$150	\$155	\$160	\$165	\$170	\$175
\$180	\$185	\$190	\$195	\$200	\$205	\$210	MORE THAN \$210				

The purpose of using two different payment cards is to correct for a potential bias of a respondent who chooses a value from the card based on the number of values on the card and the maximum value on the card as described below.

The average consumer surplus provided by the 97 visitors who were given Payment Card 1 was \$19.54 per person-trip to recreate on the Indian River Lagoon as it is maintained in its existing condition. The average consumer surplus provided by the 37 visitors who were given Payment Card 2 was \$13.78 per person-trip. A t-test at the alpha equals 0.05 level found that there is no statistically significant difference between the averages of the two samples.

The straight average of the consumer surplus values of all 134 respondents is \$17.95 per person-trip. To correct for any bias associated with the actual numbers that are on the payment card, the weighted average consumer surplus was calculated based on a 50/50 split between the number of visitors who received Payment Card 1 and Payment Card 2. This consumer surplus is **\$16.66 per person-trip** using the calculation  $\$19.54 \times 0.50 + \$13.78 \times 0.50$ . This is the value used to estimate the total use value of the Lagoon to visitors in 2007.

The same payment card was provided to respondents to answer the non-use value question number 18. The average non-use value of the 97 visitors who were given Payment Card 1 was \$29.74 as a one-time tax per visitor to maintain the Lagoon in its existing condition. The average non-use value of the 37 visitors who were given Payment Card 2 was \$43.24 as a one-time tax per visitor. A t-test at the alpha equals 0.05 level found that there is no statistically significant difference between the averages of the two samples.

The straight average of the non-use values of all 134 respondents is \$33.47 per visitor as a one-time tax. To correct for any bias associated with the actual numbers that are on the payment card, the weighted average use value was calculated based on a 50/50 split between the number of visitors who received Payment Card 1 and Payment Card 2. This non-use value is **\$36.49 as a one-time tax per visitor** using the calculation  $\$29.74 \times 0.50 + \$43.24 \times 0.50$ . This is the value used to estimate the total non-use value of the Lagoon to visitors who used the Lagoon for recreation in 2007.

## Appendix B – Excerpts from Indian River Lagoon Economic Study

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The 258 visitor respondents who did not participate in recreation on the Indian River Lagoon over the past 12 months were asked questions to infer their non-use values to maintain the Lagoon in its existing condition. The average non-use value of the 109 visitors who were given Payment Card 1 was \$17.98 as a one-time tax per visitor to maintain the Lagoon in its existing condition. The average non-use value of the 149 visitors who were given Payment Card 2 was \$8.15 as a one-time tax per visitor. The straight average of the use values of all 258 respondents is \$12.31 per visitor as a one-time tax. A t-test at the alpha equals 0.05 level found that there is a statistically significant difference between the averages of the two samples.

To correct for any bias associated with the actual numbers that are on the payment card, the weighted average non-use value was calculated based on a 50/50 split between the number of visitors who received Payment Card 1 and Payment Card 2. This non-use value is **\$13.07 as a one-time tax per visitor** using the calculation  $\$17.98 \times 0.50 + \$8.15 \times 0.50$ . This is the value used to estimate the total non-use value of the Lagoon to visitors who did not use the Lagoon for recreation in 2007.

Of the 134 visitors who recreated on the Indian River Lagoon in the past 12 months, 33 respondents, or 25 percent, said they were not willing to pay any amount of additional money per trip to maintain the Lagoon in its existing condition. When asked about their non-use value, 27 respondents, or 20 percent, were not willing to pay any amount of money in a one-time tax. Of the 258 visitor respondents who did not participate in recreation on the Indian River Lagoon, 97 respondents, or 38 percent, said they were not willing to pay any amount of money to maintain the Lagoon in its existing condition.

The reasons given by these respondents for not contributing to the maintenance of the Indian River Lagoon are provided in Table B-1. Very few of these respondents said \$0 because they are protesting the way the question is asked or they do not trust the implementing agency (Reasons 2, 3 and 4). Therefore, the responses taken together represent these visitors' use and non-use values. All \$0 responses were used to estimate average consumer surplus and non-use values.



**Table B-1**  
**Reasons for Not Wanting to Fund this**  
**Indian River Lagoon Maintenance Program**

<b>Reason</b>	<b>Consumer Surplus or Non-Use Value of Recreating Visitors</b>	<b>Non-Use Value of Non-Recreating Visitors</b>
1. I am not interested in maintaining the water, sediment and ecosystem quality of the Indian River Lagoon.	13	49
2. Not enough information to form a decision.	3	11
3. I believe the money will be misused.	1	7
4. I am opposed to any new taxes.	3	14
5. The quality of the Indian River Lagoon does not need to be maintained.	0	2
6 Other reason – I cannot afford it.	1	3
No Answer	2	11
<b>Total</b>	<b>23</b>	<b>97</b>

To estimate the consumer surplus associated with maintaining the Lagoon in its existing condition to all visitors who recreated on the Indian River Lagoon in 2007, the annual number of visitor-trips to use the Lagoon for recreation was multiplied by the average annual consumer surplus per trip of \$16.66. These calculations and results for each county and for all five counties are provided in Table B-2. The annual recreational consumer surplus to maintain the Indian River Lagoon in its existing condition is estimated to be \$32 million in 2007 dollars.

**Table B-2**  
**Estimated Consumer Surplus Associated with Maintaining the Lagoon**  
**In its Existing Condition to Visitors Who Recreate on the Indian River Lagoon – 2007**

<b>Item</b>	<b>Volusia County</b>	<b>Brevard County</b>	<b>Indian River County</b>
Annual Number of Visitor-Trips to Use Lagoon for Recreation in 2007 (From Table 2.6)	441,995	945,308	183,684
Annual Consumer Surplus per Trip to Maintain Lagoon in 2007	\$16.66	\$16.66	\$16.66
Total Annual Visitor Consumer Surplus to Maintain Lagoon in 2007	\$7,364,000	\$15,749,000	\$3,060,000
<b>Item</b>	<b>St. Lucie County</b>	<b>Martin County</b>	<b>Total All Counties</b>
Annual Number of Visitor-Trips to Use Lagoon for Recreation in 2007 (From Table 2.6)	231,017	94,413	1,896,418
Annual Consumer Surplus per Visitor-Trip to Maintain Lagoon in 2007	\$16.66	\$16.66	\$16.66
Total Annual Visitor Consumer Surplus to Maintain Lagoon in 2007	\$3,849,000	\$1,573,000	\$31,594,000

The estimated non-use value associated with maintaining the Lagoon in its existing condition to visitors who recreated on the Lagoon was calculated as presented in Table B-3. The 523,959 visitors who recreated on the Lagoon in 2007 was multiplied by the one-time tax per visitor to maintain the Lagoon in its existing condition of \$36.49. The result is a total one-time tax of \$19.1 million which was multiplied by the two percent discount rate to obtain the total annual visitor non-use value in all five counties of \$382,000.

The two percent discount rate represents the time value of money and excludes risk, uncertainty, and inflation which are included in market interest rates. The best available estimate of the current time value of money is the current yield on 30-year U.S. Government bonds which was 4.4 percent per year as of April, 2008 minus the forecasted 2008 inflation rate as provided by the U.S. White House Office of Management and Budget which was 2.4 percent. The net is 2.0 percent per year.

**Table B-3**  
**Estimated Non-Use Value Associated with Maintaining the Lagoon**  
**In its Existing Condition to Visitors Who Recreate on the Indian River Lagoon – 2007**

<b>Item</b>	<b>Volusia County</b>	<b>Brevard County</b>	<b>Indian River County</b>
Number of Visitors Who Recreated on Lagoon in 2007 <sup>(a)</sup>	122,118	261,178	50,750
Maximum one-time tax to maintain Lagoon per visitor who used Lagoon in 2007	\$36.49	\$36.49	\$36.49
Total Annual Visitor Non-Use Value to Maintain Lagoon in 2007 - Visitors Who Used Lagoon in 2007	\$89,000	\$191,000	\$37,000
<b>Total One Time Tax</b>	<b>\$4,456,000</b>	<b>\$9,531,000</b>	<b>\$1,852,000</b>
<b>Item</b>	<b>St. Lucie County</b>	<b>Martin County</b>	<b>Total All Counties</b>
Number of Visitors Who Recreated on Lagoon in 2007 (a)	63,828	26,085	523,959
Maximum one-time tax to maintain IRL per visitor who used Lagoon in 2007	\$36.49	\$36.49	\$36.49
Total Annual Visitor Non-Use Value to Maintain Lagoon in 2007 - Visitors Who Used Lagoon in 2007	\$47,000	\$19,000	\$382,000
<b>Total One Time Tax</b>	<b>\$2,329,000</b>	<b>\$952,000</b>	<b>\$19,121,000</b>

<sup>(a)</sup> 2007 Visitor Trips when Lagoon used for recreation divided by average number of trips per visitor in 2007 (3.62 trips) when Lagoon used for recreation.

The estimated non-use value associated with maintaining the Lagoon in its existing condition to visitors who do not recreate on the Lagoon was calculated as presented in Table B-4. The 1.855 million visitors who did not recreate on the Lagoon in 2007 was multiplied by the one-time tax per visitor to maintain the Lagoon in its existing condition of \$13.07. The result is a total one-time tax of \$24.25 million which was multiplied by the two percent discount rate to obtain \$485,000 as the total annual visitor non-use value to visitors in all five counties who do not use the Lagoon for recreation.

**Table B-4**  
**Estimated Non-Use Value Associated with Maintaining the Lagoon**  
**In its Existing Condition to Visitors Who Do Not Recreate**  
**On the Indian River Lagoon – 2007**

<b>Item</b>	<b>Volusia County</b>	<b>Brevard County</b>	<b>Indian River County</b>
Annual Number of Visitor-Trips by Those Who Did not Use Lagoon in 2007	3,346,532	1,197,390	224,503
Number of Visitors Who Did Not Recreate on Lagoon in 2007 <sup>(a)</sup>	1,139,548	407,731	76,447
Maximum one-time tax to maintain Lagoon per visitor who did not use Lagoon in 2007	\$13.07	\$13.07	\$13.07
Total Annual Visitor Non-Use Value to Maintain Lagoon in 2007 - Visitors Who Did Not Use Lagoon in 2007	\$298,000	\$107,000	\$20,000
Total One Time Tax	\$14,892,000	\$5,328,000	\$999,000
<b>Item</b>	<b>St. Lucie County</b>	<b>Martin County</b>	<b>Total All Counties</b>
Annual Number of Visitor-Trips by Those Who Did not Use Lagoon in 2007	470,920	210,284	5,449,629
Number of Visitors Who Did Not Recreate on Lagoon in 2007 (a)	160,356	71,605	1,855,686
Maximum one- time tax to maintain Lagoon per visitor who did not use Lagoon in 2007	\$13.07	\$13.07	\$13.07
Total Annual Visitor Non-Use Value to Maintain Lagoon in 2007 - Visitors Who Did Not Use Lagoon in 2007	\$42,000	\$19,000	\$485,000
Total One Time Tax	\$2,096,000	\$936,000	\$24,250,000

<sup>(a)</sup> 2007 Visitor Trips when Lagoon not used for recreation divided by average number of trips per visitor in 2007 (2.94 trips) when Lagoon not used for recreation.

A summary of the annual visitor expenditures, recreational use and non-use values associated with maintaining the Indian River Lagoon in its existing condition is provided in Table B-5. For all five counties of the Indian River Lagoon system, total visitor expenditures in 2007 was \$532 million, the visitor recreational use value was \$31.8 million and the visitor non-use value was \$890,000. Thus, the total 2007 value of the Indian River Lagoon to visitors of the five Lagoon counties, Volusia, Brevard, Indian River, St. Lucie and Martin was \$565 million.

**Table B-5  
Summary of Annual Visitor Expenditures, Consumer Surplus and Non-Use Values  
Associated with Maintaining the Lagoon in its Existing Condition – 2007**

<b>Item</b>	<b>Volusia County</b>	<b>Brevard County</b>	<b>Indian River County</b>
Visitor Expenditures to Use Lagoon for Recreation in 2007	\$169,000,000	\$207,000,000	\$96,000,000
Visitor Consumer Surplus in 2007	\$7,400,000	\$15,800,000	\$3,100,000
Visitor Non-Use Value in 2007	\$400,000	\$300,000	\$60,000
Total Visitor Expenditures, Consumer Surplus and Non-Use Value in 2007	\$176,800,000	\$223,100,000	\$99,160,000

<b>Item</b>	<b>St. Lucie County</b>	<b>Martin County</b>	<b>Total All Counties</b>
Visitor Expenditures to Use Lagoon for Recreation in 2007	\$35,000,000	\$25,000,000	\$532,000,000
Visitor Consumer Surplus in 2007	\$3,900,000	\$1,600,000	\$31,800,000
Visitor Non-Use Value in 2007	\$90,000	\$40,000	\$890,000
Total Visitor Expenditures, Consumer Surplus and Non-Use Value in 2007	\$38,990,000	\$26,640,000	\$564,690,000

**B.1.4 Consumer Surplus and Non-Use Value of Improving the Environmental Quality of the Indian River Lagoon**

The visitor survey also included contingent valuation questions to estimate the consumer surplus and non-use value that visitors place on the Indian River Lagoon in an improved condition. The questions were identical to those presented in the previous section except that the description of the improvement program was as follows.

**PLAN 2 – IMPROVE ENVIRONMENTAL QUALITY OF THE INDIAN RIVER LAGOON**

Now I am going to describe a different plan that will improve the water, sediment and ecosystem qualities of the Indian River Lagoon. This plan would be implemented instead of the previous plan I just described to you. Please consider only this plan and forget about the plan and taxes we just discussed.

This plan would be financed by Federal and State grants and appropriations, and through local taxes and would be implemented by the Indian River Lagoon National Estuary Program which is administered by the St. Johns River Water Management District. However, sufficient funding must be raised to pay for this plan.

The actions to improve the water, sediment and ecosystem qualities of the Indian River Lagoon above existing levels include removing accumulated harmful muck sediments from the bottom of the Lagoon throughout the Indian River Lagoon system; restoring and reconnecting additional wetlands such that all the wetlands are restored and functioning as wildlife and fisheries habitat; diverting additional unwanted freshwater flows away from the Lagoon; and treating additional storm water discharges from future and existing development in the watershed. Maintenance of past environmental investments in the Lagoon would also be conducted.

The visible effect of these actions would be a significant increase in the amount and diversity of wildlife, including fish, shellfish, birds, and mammals and increased water clarity throughout the Lagoon system.

**Now** I would like to ask you two questions about your support for these actions that improve the quality of the Indian River Lagoon above its current condition.

Questions that were similar to Questions 17 and 18 provided in the previous Section were used to estimate consumer surplus and non-use values associated with an improved Lagoon. Only visitors who used the Lagoon in the past 12 months were asked for their consumer surplus value. All visitors were asked for their non-use value. If the respondent gave the same values for Plan 2, the improved condition, and Plan 1, the existing condition, the respondent was asked the following question.

**Q21.** Why is the dollar amount you indicated you would pay to improve the environmental quality of the Indian River Lagoon less than or equal to the dollar amount you would pay to maintain the environmental quality of the Lagoon

Of the 392 visitors surveyed, 134 visitors used the Indian River Lagoon for recreation during the past 12 months. Of these 134 visitors, 29 gave the same value to maintain and improve the Lagoon and 4 gave a lower value to improve the Lagoon than they gave to maintain it. Of the 258 visitor respondents who did not participate in recreation on the Indian River Lagoon over the past 12 months, 119 gave the same value to maintain and improve the Lagoon and 5 gave a lower value to improve the Lagoon than they gave to maintain it.

## Appendix B – Excerpts from Indian River Lagoon Economic Study

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The primary reasons given by the group that provided the same values is that the respondent either could not afford to spend more money and/or the respondent did not think the Lagoon needed to be improved and/or that improving the Lagoon is not the tourist's responsibility. The primary reasons given by the group that provided a lower value to improve the Lagoon are that the Lagoon did not need to be improved and that the money would be wasted on improvements. In any event, these respondents understood that the two programs should be considered independently when considering willingness to pay.

The same payment card method was used as described in the previous Section. Under this method, two different payment cards were rotated among respondents to correct for a potential bias of a respondent who chooses a value from the card based on the number of values on the card and the maximum value on the card as described below.

The average consumer provided by the 97 visitors who were given Payment Card 1 was \$26.24 per person-trip to recreate on the Indian River Lagoon under the improved environmental condition. The average consumer surplus provided by the 37 visitors who were given Payment Card 2 was \$18.11 per person-trip. The straight average of the consumer surplus values of all 134 respondents is \$23.99 per person-trip. To correct for any bias associated with the actual numbers that are on the payment card, the weighted average consumer surplus was calculated based on a 50/50 split between the number of visitors who received Payment Card 1 and Payment Card 2. This consumer surplus value is **\$22.17 per person-trip** using the calculation  $\$26.24 \times 0.50 + \$18.11 \times 0.50$ . This is the value used to estimate the total consumer surplus associated with recreating on the Lagoon to visitors in 2007.

The same payment card was provided to respondents to answer the non use value question. The average non-use value of the 97 visitors who were given Payment Card 1 was \$49.59 as a one-time tax per visitor to improve the environmental conditions of the Lagoon. The average non-use value of the 37 visitors who were given Payment Card 2 was \$78.24 as a one-time tax per visitor. The straight average of the non-use values of all 134 respondents is \$57.50 per visitor as a one-time tax. To correct for any bias associated with the actual numbers that are on the payment card, the weighted average use value was calculated based on a 50/50 split between the number of visitors who received Payment Card 1 and Payment Card 2. This non-use value is **\$63.92 as a one-time tax per visitor** using the calculation  $\$49.59 \times 0.50 + \$78.24 \times 0.50$ . This is the value used to estimate the total non-use value of the Lagoon to visitors who used the Lagoon for recreation in 2007.

The 258 visitor respondents who did not participate in recreation on the Indian River Lagoon over the past 12 months were asked questions to infer their non-use values to improve the environmental conditions of the Lagoon. The average non-use value of the 109 visitors who were given Payment Card 1 was \$28.94 as a one-time tax per visitor to improve the environmental quality of the Lagoon. The average non-use value of the 149 visitors who were given Payment Card 2 was \$15.15 as a one-time tax per visitor. The straight average of the use values of all 258 respondents is \$20.98 per visitor as a one-time tax. To correct for any bias associated with the actual numbers that are on the payment card, the weighted average use value was calculated based on a 50/50 split between the number of visitors who received Payment Card 1 and Payment Card 2. This non-use value is **\$22.05 as a one-time tax per visitor** using the calculation  $\$28.94 \times 0.50 + \$15.15 \times 0.50$ . This is the value used to estimate the total non-use value of the Lagoon to visitors who did not use the Lagoon for recreation in 2007.

## Appendix B – Excerpts from Indian River Lagoon Economic Study

Of the 134 visitors who recreated on the Indian River Lagoon in the past 12 months, 15 respondents, or 11 percent, said they were not willing to pay any amount of additional money either per trip or in a one-time tax to improve the environmental quality of the Lagoon. Of the 258 visitor respondents who did not participate in recreation on the Indian River Lagoon, 74 respondents, or 30 percent, said they were not willing to pay any amount of money to improve the environmental quality of the Lagoon.

The reasons given by these respondents for not contributing to the environmental improvement of the Indian River Lagoon are provided in Table B-6. Very few of these respondents said \$0 because they are protesting the way the question is asked or they do not trust the implementing agency (Reasons 2, 3 and 4). Therefore, the responses taken together represent these visitors' consumer surplus and non-use values. All \$0 responses were used to estimate average consumer surplus and non-use values.

**Table B-6**  
**Reasons for Not Wanting to Fund this Indian River Lagoon Improvement Program**

Reason	Consumer Surplus or Non-Use Values of Recreating Visitors	Non-Use Value of Non-Recreating Visitors
1. I am not interested in improving the water, sediment and ecosystem quality of the Indian River Lagoon.	8	33
2. Not enough information to form a decision.	4	5
3. I believe the money will be misused.	0	3
4. I am opposed to any new taxes.	2	8
5. The quality of the Indian River Lagoon does not need to be improved.	0	0
6. Other reason – I cannot afford it.	1	2
No Answer	0	23
<b>Total</b>	<b>15</b>	<b>74</b>

To estimate the consumer surplus associated with improving the environmental quality of the Lagoon to all visitors who recreated on the Indian River Lagoon in 2007, the 1.896 million visitor-trips to use the Lagoon for recreation in 2007 was multiplied by the average annual use value per trip of \$22.17 to obtain the estimated consumer surplus of \$42 million. These calculations and results for each county and for all five counties are provided in Table B-7.



**Table B-7**  
**Estimated Consumer Surplus Associated with Improving the Environmental Quality**  
**Of the Indian River Lagoon to Visitors Who Recreate on the Lagoon – 2007**

<b>Item</b>	<b>Volusia County</b>	<b>Brevard County</b>	<b>Indian River County</b>
Annual Number of Visitor-Trips to Use Lagoon for Recreation in 2007	441,995	945,308	183,684
Annual Consumer Surplus per Visitor-Trip to Improve Lagoon in 2007	\$22.17	\$22.17	\$22.17
Total Annual Visitor Consumer Surplus to Improve Lagoon in 2007	\$9,800,000	\$20,960,000	\$4,073,000
<b>Item</b>	<b>St. Lucie County</b>	<b>Martin County</b>	<b>Total All Counties</b>
Annual Number of Visitor-Trips to Use Lagoon for Recreation in 2007	231,017	94,413	1,896,418
Annual Consumer Surplus per Visitor-Trip to Improve Lagoon in 2007	\$22.17	\$22.17	\$22.17
Total Annual Visitor Consumer Surplus to Improve Lagoon in 2007	\$5,122,000	\$2,093,000	\$42,049,000

The estimated non-use value associated with improving the environmental quality of the Lagoon to visitors who recreated on the Lagoon was calculated as presented in Table B-8. The 523,959 visitors who recreated on the Lagoon in 2007 was multiplied by the one-time tax per visitor to improve the environmental quality of the Lagoon of \$63.92. The result is a total one-time tax of \$33 million which was multiplied by the two percent discount rate to obtain the annual visitor non-use value of those who use the Lagoon for recreation. The two percent discount rate represents the time value of money and excludes risk, uncertainty, and inflation which are included in market interest rates. The best available estimate of the current time value of money is the current yield on 30-year U.S. Government bonds which was 4.4 percent per year as of April, 2008 minus the forecasted 2008 inflation rate as provided by the U.S. White House Office of Management and Budget which was 2.4 percent. The net is 2.0 percent per year. For all five counties, the 2007 annual visitor non-use value associated with improving the environmental quality of the Lagoon by those who use the Lagoon for recreation is \$670,000.

**Table B-8**  
**Estimated Non-Use Value Associated with Improving the Environmental Quality**  
**Of the Indian River Lagoon to Visitors Who Recreate on the Indian River Lagoon– 2007**

<b>Item</b>	<b>Volusia County</b>	<b>Brevard County</b>	<b>Indian River County</b>
Number of Visitors Who Recreated on Lagoon in 2007 (a)	122,118	261,178	50,750
Maximum one-time tax to improve Lagoon per visitor who used Lagoon in 2007	\$63.92	\$63.92	\$63.92
Total Annual Visitor Non-Use Value to improve Lagoon in 2007 - Visitors Who Used Lagoon in 2007	\$156,000	\$334,000	\$65,000
<b>Total One Time Tax</b>	<b>\$7,805,000</b>	<b>\$16,693,000</b>	<b>\$3,244,000</b>
<b>Item</b>	<b>St. Lucie County</b>	<b>Martin County</b>	<b>Total All Counties</b>
Number of Visitors Who Recreated on Lagoon in 2007 <sup>(a)</sup>	63,828	26,085	523,959
Maximum one-time tax to improve Lagoon per visitor who used Lagoon in 2007	\$63.92	\$63.92	\$63.92
Total Annual Visitor Non-Use Value to Improve Lagoon in 2007 - Visitors Who Used Lagoon in 2007	\$82,000	\$33,000	\$670,000
<b>Total One Time Tax</b>	<b>\$4,080,000</b>	<b>\$1,667,000</b>	<b>\$33,489,000</b>

<sup>(a)</sup> 2007 Visitor Trips when Lagoon used for recreation divided by average number of trips per visitor in 2007 (3.62 trips) when Lagoon used for recreation.

The estimated non-use value associated with improving the environmental quality of the Lagoon to visitors who do not recreate on the Lagoon was calculated as presented in Table B-9. The 1.856 visitors who did not recreate on the Lagoon in 2007 was multiplied by the one-time tax per visitor to improve the environmental quality of the Lagoon of \$22.05. The result is a total one-time tax of \$40.9 million which was multiplied by the two percent discount rate to obtain the annual non-use value. For all five counties, the 2007 annual non-use value to visitors who do not use the Lagoon for recreation is \$818,000.

**Table B-9**  
**Estimated Non-Use Value Associated with Improving the Environmental Quality**  
**Of the Indian River Lagoon to Visitors Who Do Not Recreate on the Lagoon– 2007**

<b>Item</b>	<b>Volusia County</b>	<b>Brevard County</b>	<b>Indian River County</b>
Annual Number of Visitor-Trips by Those Who Did not Use Lagoon in 2007	3,346,532	1,197,390	224,503
Number of Visitors Who Did Not Recreate on Lagoon in 2007 <sup>(a)</sup>	1,139,548	407,731	76,447
Maximum one-time tax to improve Lagoon per visitor who did not use Lagoon in 2007	\$22.05	\$22.05	\$22.05
Total Annual Visitor Non-Use Value to Improve Lagoon in 2007 - Visitors Who Did Not Use Lagoon in 2007	\$502,000	\$180,000	\$34,000
Total One Time Tax	\$25,123,000	\$8,989,000	\$1,685,000
<b>Item</b>	<b>St. Lucie County</b>	<b>Martin County</b>	<b>Total All Counties</b>
Annual Number of Visitor-Trips by Those Who Did not Use Lagoon in 2007	470,920	210,284	5,449,629
Number of Visitors Who Did Not Recreate on Lagoon in 2007 <sup>(a)</sup>	160,356	71,605	1,855,686
Maximum one- time tax to improve Lagoon per visitor who did not use Lagoon in 2007	\$22.05	\$22.05	\$22.05
Total Annual Visitor Non-Use Value to Improve Lagoon in 2007 - Visitors Who Did Not Use Lagoon in 2007	\$71,000	\$32,000	\$818,000
Total One Time Tax	\$3,535,000	\$1,579,000	\$40,911,000

<sup>(a)</sup> 2007 Visitor Trips when Lagoon not used for recreation divided by average number of trips per visitor in 2007 (2.94 trips) when Lagoon not used for recreation.

A summary of the annual visitor recreational consumer surplus and non-use values associated with improving the environmental quality of the Lagoon by county and in total is provided in Table B-10. For all five counties, the visitor recreational use value is \$42 million and the visitor non-use value is \$1.5 million. Comparing these values to the corresponding values under the Lagoon's 2007 environmental condition, visitors are willing to pay an additional \$10,800,000 per year to improve the environmental quality of the Lagoon over its 2007 condition.

**Table B-10**  
**Summary of Annual Visitor Recreational Consumer Surplus and Non-Use Value**  
**Associated with Improving the Environmental Quality of the Lagoon – 2007**

<b>Item</b>	<b>Volusia County</b>	<b>Brevard County</b>	<b>Indian River County</b>
Visitor Recreational Consumer Surplus in 2007	\$10,000,000	\$21,000,000	\$4,000,000
Visitor Non-Use Value in 2007	\$658,000	\$514,000	\$99,000
<b>Total Visitor Recreational Consumer Surplus and Non-Use Value</b>	<b>\$10,658,000</b>	<b>\$21,514,000</b>	<b>\$4,099,000</b>
<b>Difference in Values Under Improved Versus Maintain Quality (Using Table B-5)</b>	<b>\$2,858,000</b>	<b>\$5,414,000</b>	<b>\$939,000</b>

<b>Item</b>	<b>St. Lucie County</b>	<b>Martin County</b>	<b>Total All Counties</b>
Visitor Recreational Consumer Surplus in 2007	\$5,000,000	\$2,000,000	\$42,000,000
Visitor Non-Use Value in 2007	\$153,000	\$65,000	\$1,489,000
<b>Total Visitor Recreational Consumer Surplus and Non-Use Value</b>	<b>\$5,153,000</b>	<b>\$2,065,000</b>	<b>\$43,489,000</b>
<b>Difference in Values Under Improved Versus Maintain Quality (Using Table B-5)</b>	<b>\$1,163,000</b>	<b>\$425,000</b>	<b>\$10,799,000</b>

## **B.2 Residents**

To obtain estimates of the recreational uses of the Lagoon by residents, their expenditures associated with the Lagoon and their use and non-use values, a telephone survey of 1,000 residents in the five IRL counties was conducted from March 2008 through June 2008. An equal number of residents (200) in each county were interviewed. All information collected from the 1,000 survey respondents refers to their uses of the Lagoon over the past 12 months at the time each survey was conducted. For brevity, all information collected and the results are referred to as the values for the year 2007. For this study, a resident of one of the five IRL counties is a person who is at least 18 years old and lives in that county more than six months per year. This is the population that was surveyed.

### **B.2.1 Recreational Uses and Expenditures**

The methods used to estimate Bay-related recreational uses and expenditures by residents and the economic contribution of these uses are summarized as follows.

1. Estimate the percent of residents who used the Indian River Lagoon for recreation in 2007 in total and by activity using the results of the Resident Survey.
2. Estimate the number of person-days residents spent participating in Lagoon-related recreation using the results from (1) above; the resident population 18 years and older from the U.S. Census; and the responses to the Resident Survey regarding the number of days spent in each activity over the past 12 months.
3. Calculate the average itemized expenditures per person-day by recreation activity from responses to the Resident Survey.
4. Estimate the total itemized expenditures by recreation activity using (2) and (3) above.
5. Estimate the 2007 expenditures for big-ticket items purchased and used while recreating on the Lagoon such as boat purchases, boat repair and maintenance, and equipment using the Resident Survey responses. Allocate the expenditures to days when the item is used on the Lagoon.
6. Use the IMPLAN regional economic input-output model to estimate the direct, indirect and induced output, income, employment and taxes generated by these Lagoon-related expenditures (Items (4) and (5) above).
7. Quality control the data and results at each step by assessing the consistency of the survey responses among the survey questions and by comparing the results to available data from other sources.
8. Section 3.0 of the IRL Study report describes the results of each step in the list above.

### **B.2.2 Recreational Consumer Surplus of the Indian River Lagoon to Residents Under Existing Environmental Conditions**

The resident survey included contingent valuation questions to estimate the consumer surplus that residents place on the Indian River Lagoon in its existing condition and in an improved condition.

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Consumer surplus is the maximum amount of money that residents who use the Lagoon for recreation would be willing to pay to keep the Lagoon in its existing condition (or in an improved condition) above their 2007 expenditures to recreate on the Lagoon. The sum of consumer surplus and the expenditures represents the total use value to residents.

At the beginning of the survey, the respondent was asked about his/her familiarity with the Indian River Lagoon. The question is as follows.

“Q5. Please tell me if you are very familiar with the Indian River Lagoon, somewhat familiar with the Indian River Lagoon or not very familiar with the Indian River Lagoon. (DO NOT READ “DON’T KNOW” ANSWER CATEGORY)

1. VERY FAMILIAR WITH THE INDIAN RIVER LAGOON.
2. SOMEWHAT FAMILIAR WITH THE INDIAN RIVER LAGOON
3. NOT VERY FAMILIER WITH THE INDIAN RIVER LAGOON
8. DON’T KNOW”

A summary of the responses is provided in Table B-11. Of the 363 respondents who used the Lagoon for recreation in the past 12 months, 65 percent were very familiar with the Lagoon, 15 percent were somewhat familiar with the Lagoon and 20 percent were not very familiar with the Lagoon. Ninety percent of the respondents said they knew the location of the Lagoon in their area.

**Table B-11**  
**Familiarity of the Lagoon-Using Respondents**  
**with the Indian River Lagoon**

<b>Familiar with Indian River Lagoon</b>	<b>Number of Yes Responses</b>	<b>% of Yes Responses</b>
Very Familiar	237	65%
Somewhat Familiar	54	15%
Not Very Familiar	72	20%
Total	363	100%

To collect information regarding consumer surplus, the survey instrument set up a situation where the survey respondent who recreated on the Lagoon was asked to value the environmental quality of the Indian River Lagoon in existing condition. This situation is as follows and is from the survey instrument.

“The Indian River Lagoon National Estuary Program has worked towards improving and protecting the environmental quality of the Indian River Lagoon over the past seventeen years. It is funded by Federal, State and local governments. Continued funding is needed to maintain the environmental

## Appendix B – Excerpts from Indian River Lagoon Economic Study

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quality at existing levels which includes monitoring and research; habitat restoration; law enforcement; and maintenance due to recreational uses.

Now I would like to ask you a few questions about your support for this plan that maintains the quality of the Indian River Lagoon in its current condition.

Q73. First, consider your total trip costs for your last trip to visit the Indian River Lagoon in any of the five counties of the Lagoon system. If your total costs for this trip would have been \$\_\_\_\_\_ higher, would you have been willing to pay this amount to maintain the water, sediment and ecosystem qualities of the Indian River Lagoon in its existing condition? Keep in mind that you could have gone to other places for recreation instead, or spent this money on other things.”

1 YES (GO to Q75)            2 NO (CONTINUE TO Q74)

Q74. Which of the following statements best describes your reason for answering NO.

- A. That amount is more than this plan is worth.
- B. I'm not interested in maintaining the quality of the Indian River Lagoon.
- C. There is not enough information to make a decision.
- D. I'm opposed to new taxes.
- E. The quality of the Indian River Lagoon does not need to be maintained.”

The following values were inserted into the blank above. Each value was inserted on an equal number of surveys. \$5, \$10, \$25, \$50, \$75 and \$100 per trip to use the Lagoon. These values are called **bid amounts**. The purpose of this question was to collect the data needed to estimate the resident population's use value per Lagoon trip for those residents who used the Lagoon in the past 12 months.

This type of question is different from that used to solicit the willingness to pay values from the visitors. Because the visitor survey was an intercept survey, the survey respondent was handed one of two payment cards that listed the possible values. Payment Card 1 listed 70 values over a range of \$0 to \$350 or more and Payment Card 2 listed 44 values over a range of \$0 to \$210 or more. This allowed for a large range of possible answers. In contrast, payment cards cannot be used in a telephone survey so the referendum responses were used. In this case, the maximum value of the range is chosen by the project team. The \$100 maximum value was used because it is significantly higher than the average willingness to pay values reported in the 1996 Indian River Lagoon economic valuation study and converted to 2007 dollars, and the \$100 is in line with the referendum results of similar studies in Florida.

It was expected that this \$0 to \$100 per trip range would be sufficient to create a frequency distribution from which the average consumer surplus could be calculated. Unlike the intercept visitor survey, in which the use amount was an open ended question where the respondent referred to a list of possible values, the survey of residents used this referendum method because it was not possible to have the respondents refer to anything over the phone. It is best to have the respondent focus on the range of

possible answers or be given a yes/no option to a specific question in order to improve the accuracy of the respondent's preferences.

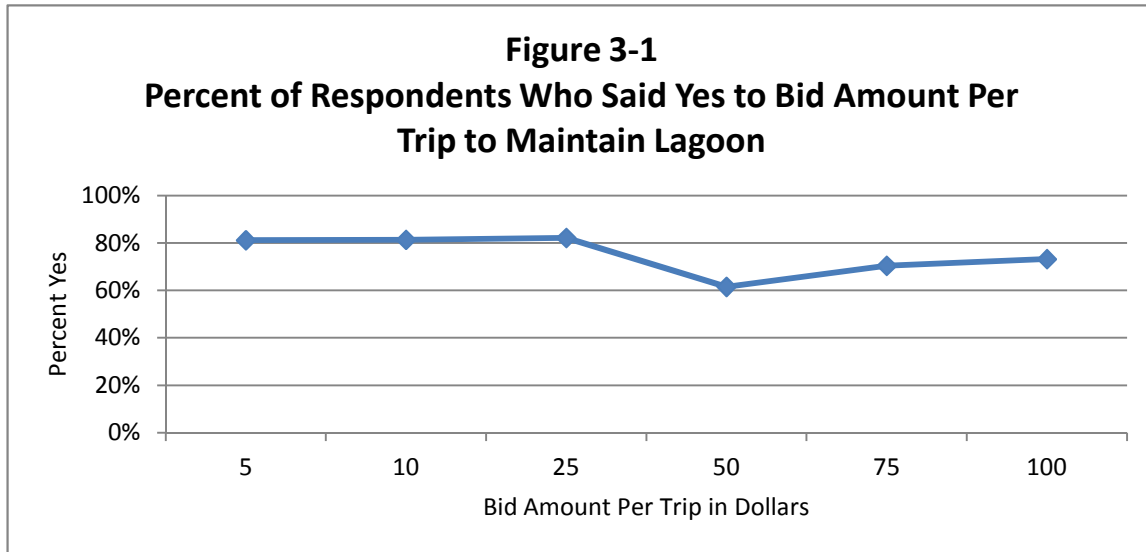
The expectation is that as the bid amount is increased, the percent of Lagoon-users willing to pay the added cost would decline. If the percentage of respondents accepting the lower bid amount starts high and declines very gradually as the bid amount increases then the consumer surplus per trip is high for the Lagoon. Respondents were also given the option to say "NO" the bid amount. It would be expected that the percentage of respondents answering "NO" to the bid amount would increase with the size of the bid amount because the respondent's income is the limiting factor to the amount of money that can be spent to maintain the Lagoon.

The frequency of responses as the bid amount increases is provided in Table B-12 and Figure 3-1 (as numbered in the IRL Study report).

**Table B-12**  
**Frequency of Yes Responses to the Recreational Use Value Bid**  
**Amounts to Maintain the Environmental Quality of Lagoon in its**  
**Existing Condition**

<b>Bid Amount Per Trip</b>	<b>Number of Respondents Who Said Yes to the Bid Amount</b>	<b>Total Number of Respondents</b>	<b>Percent of Respondents Who Said Yes</b>
\$5	56	69	81%
\$10	48	59	81%
\$25	46	56	82%
\$50	32	52	62%
\$75	50	71	70%
\$100	41	56	73%
<b>Total</b>		<b>363</b>	





As shown in Table B-12, 81 percent of 59 respondents who recreated on the Lagoon in the past 12 months would be willing to pay an additional \$10 per trip to use the Lagoon in its existing condition. About 73 percent of 56 respondents would be willing to pay \$100 more per trip.

Of the respondents who were not willing to pay any amount of money to maintain the Lagoon, 31 percent said no because the bid amount is more than the plan is worth to them (22 percent) or the respondent was not interested in maintaining the environmental quality of the Lagoon (9 percent). The no responses from these respondents measure their use value to maintain the Lagoon. The rest of the “no” respondents said that there is not enough information to make a decision (30 percent), they are opposed to new taxes (34 percent) or the quality of the Lagoon does not need to be maintained (5 percent). These responses are called protest votes. They do not necessarily reflect the respondent’s willingness to pay to maintain the Lagoon. Because the no responses of these protesting respondents were used to estimate the average use value to maintain the Lagoon, the actual average use value may be higher than that reported in this study.

The plot shown in Figure 3-1 is not downward sloping as one would expect. Instead, the percent yes is flat through the \$25 bid amount, falls when moving to the \$50 bid amount and rises slightly through the \$100 bid amount. This result indicates one or both of the following conclusions.

1. The range of consumer surplus per trip among residents who use the Lagoon is significantly greater than \$0 to \$100. The upper range of values could be \$300, \$500, \$1,000 or greater.
2. The variability of consumer surplus among residents is very high and, as a result, the number of respondents (completed surveys) is too low to obtain an average consumer surplus.

To obtain an average consumer surplus per respondent using the survey responses, a lower bound estimate was derived using the 363 responses that were provided in Table B-12. The calculation and result are provided in Table B-13. The average consumer surplus was constrained at \$100 per trip even though it is likely that many respondents would have said yes to bid amounts larger than \$100. This

constraint is necessary because there are no responses to bid amounts higher than \$100 per trip. Given the available responses, the lower bound estimate of average consumer surplus to maintain the environmental quality of the Lagoon is \$66 per respondent per trip.

**Table B-13**  
**Lower Bound Average Resident Recreational**  
**Consumer Surplus To Maintain Lagoon in Existing**  
**Environmental Condition (Value Constrained at**  
**\$100 per Trip)**

<b>Bid Amount</b>	<b>% of Residents For Which Bid Is Maximum Amount They Would Pay</b>	<b>Calculation of Average Bid Amount</b>
<b>(1)</b>	<b>(2)</b>	<b>(3) = (1) x (2)</b>
\$0	19%	\$0
\$25	20%	\$5
\$100	62%	\$62
<b>Sum</b>	<b>100%</b>	<b>\$66</b>

This \$66 value per trip was multiplied by the estimated total number of trips to the Indian River Lagoon made by the residents of the five IRL counties. The total number of trips was estimated as the respondent average number of trips to the Lagoon in 2007, 24 trips, times the estimated number of residents recreating on the Lagoon in 2007. These calculations for each county and in total are provided in Table B-14.

**Table B-14**  
**Annual Resident Recreational Consumer Surplus**  
**To Maintain the Indian River Lagoon in its Existing Condition, 2007**

Item	Row No.	Volusia	Brevard	Indian River
Average Number of Trips to Lagoon per Respondent (From Survey Responses)	(1)	24	24	24
Number of Residents Recreating on Lagoon in 2007	(2)	112,000	160,000	55,000
Annual Number of Resident Trips to Use IRL for Recreation in 2007	(3) = (1) x (2)	2,688,000	3,840,000	1,320,000
Recreational Consumer Surplus per Person-Trip to Maintain IRL (From Survey Responses)	(4)	\$66.00	\$66.00	\$66.00
<b>Total Annual Resident Recreational Consumer Surplus to Maintain IRL in 2007</b>	<b>(5) = (3) x (4)</b>	<b>\$177,408,000</b>	<b>\$253,440,000</b>	<b>\$87,120,000</b>

Item	Row No.	St. Lucie	Martin	Total
Average Number of Trips to Lagoon per Respondent (From Survey Responses)	(1)	24	24	24
Number of Residents Recreating on Lagoon in 2007	(2)	73,000	61,000	461,000
Annual Number of Resident Trips to Use IRL for Recreation in 2007	(3) = (1) x (2)	1,752,000	1,464,000	11,064,000
Recreational Consumer Surplus per Person-Trip to Maintain IRL (From Survey Responses)	(4)	\$66.00	\$66.00	\$66.00
<b>Total Annual Resident Recreational Consumer Surplus to Maintain IRL in 2007</b>	<b>(5) = (3) x (4)</b>	<b>\$115,632,000</b>	<b>\$96,624,000</b>	<b>\$730,224,000</b>

Row number (4) of this table provides an estimate of the annual recreational consumer surplus that residents place on maintaining the Lagoon in its existing condition. For all five IRL counties, the consumer surplus was estimated to be \$730 million in 2007.

**B.2.3 Recreational Consumer Surplus of the Indian River Lagoon to Residents Under Improved Environmental Conditions**

The survey instrument also set up a situation where the survey respondent who recreated on the Lagoon was asked to value improvements in the environmental quality of the Indian River Lagoon. This situation is as follows and is from the survey instrument.

“Now I am going to describe a different plan that will improve the water, sediment and ecosystem qualities of the Indian River Lagoon. This plan would be implemented instead of the previous plan I

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just described to you. Please consider only this plan and forget about the plan and taxes we just discussed.

This plan would remove harmful muck sediments from the bottom of the entire Lagoon system; restore and reconnect all wetlands; and manage additional freshwater and stormwater flows to protect the Lagoon. Maintenance of past environmental measures would also be conducted.

The effect of this plan would be a significant increase in the amount and diversity of wildlife, such as fish, shellfish, birds, and mammals and increased water clarity throughout the Lagoon system.

Now I would like to ask you a few questions about your support for this plan that improves the quality of the Indian River Lagoon above its current condition.

Q77A. First, consider your total trip costs for your last trip to visit the Indian River Lagoon in any of the five counties of the Lagoon system. If your total costs for this trip would have been \$\_\_\_\_\_ higher, would you have been willing to pay this amount to improve the water, sediment and ecosystem qualities of the Lagoon? Keep in mind that you could have gone to other places for recreation instead or spent this money on other things.

1 YES (GO to Q79) 2 NO (CONTINUE TO Q78)

Q78. Which of the following statements best describes your reason for answering NO.

- A. That amount is more than this plan is worth.
- B. I'm not interested in improving the quality of the Indian River Lagoon.
- C. There is not enough information to make a decision.
- D. I'm opposed to new taxes.
- E. The quality of the Indian River Lagoon does not need to be improved."

The following values, or bid amounts, were inserted into the blank above. Each value was inserted on an equal number of surveys: \$10, \$20, \$30, \$60, \$80 and \$120 per trip to use the Lagoon. These values are called bid amounts. The purpose of this question was to collect the data needed to estimate the resident population's consumer surplus per Lagoon trip for those residents who used the Lagoon in the past 12 months.

The frequency of responses as the bid amount increases is provided in Table B-15 and Figure 3-2 (as numbered in the IRL Study report).

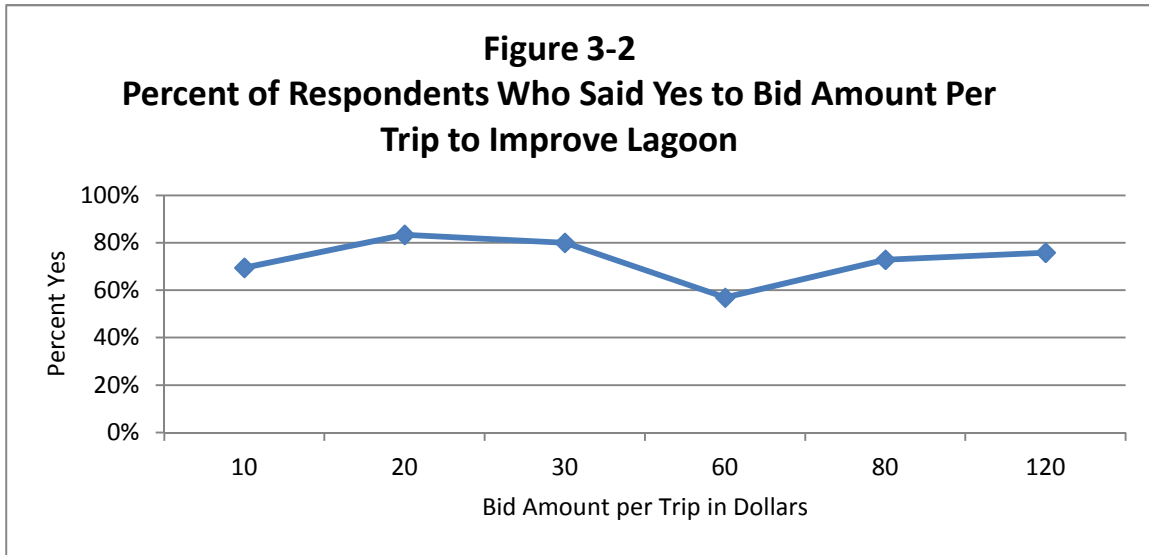
**Table B-15**  
**Frequency of Yes Responses to the Recreational Consumer**  
**Surplus Bid Amounts To Improve the Environmental Quality of**  
**Lagoon**

Bid Amount Per Trip	Number of Respondents Who Said Yes to the Bid Amount	Total Number of Respondents	Percent of Respondents Who Said Yes
\$10	50	72	69%
\$20	50	60	83%
\$30	44	55	80%
\$60	29	51	57%
\$80	51	70	73%
\$120	44	58	76%
<b>Total</b>		<b>366</b>	

As shown in Table B-15, 69 percent of the 72 respondents who recreated on the Lagoon in the past 12 months would be willing to pay an additional \$10 per trip to use the Lagoon in an improved environmental condition. About 76 percent of 58 respondents would be willing to pay \$120 more per trip.

Of the respondents who were not willing to pay any amount of money to improve the Lagoon, 26 percent said no because the bid amount is more than the plan is worth to them (20 percent) or the respondent is not interested in improving the environmental quality of the Lagoon (6 percent). The no responses from these respondents measure their consumer surplus to maintain the Lagoon. The rest of the “no” respondents said that there is not enough information to make a decision (37 percent), they are opposed to new taxes (34 percent) or the quality of the Lagoon does not need to be maintained (3 percent). These responses are called protest votes. They do not necessarily reflect the respondent’s willingness to pay to improve the Lagoon. Because the no responses of these protesting respondents were used to estimate the average consumer surplus to improve the Lagoon, the actual average consumer surplus may be higher than that reported in this study.

The plot shown in Figure 3-2 is not downward sloping as one would expect. Instead, the percent yes goes up and down as the bid amount increases. This result indicates one or both of the following conclusions.



1. The range of consumer surplus per trip among residents who use the Lagoon is significantly greater than \$0 to \$120. The upper range of values could be \$300, \$500, \$1,000 or greater.
2. The variability of consumer surplus among residents is very high and, as a result, the number of respondents (completed surveys) is too low to obtain an average consumer surplus value.

To obtain an average consumer surplus per respondent, a lower bound estimate was derived using the 366 responses that were provided in Table B-15. The calculation and result are provided in Table B-16. The average consumer surplus was constrained at \$120 per trip even though it is likely that many respondents would have said yes to bid amounts larger than \$120. This constraint is necessary because there are no responses to bid amounts higher than \$120 per trip. Given the available responses, the lower bound estimate of consumer surplus to improve the environmental quality of the Lagoon is \$72 per respondent per trip.

**Table B-16**  
**Lower Bound Average Resident Recreational Consumer**  
**Surplus to Improve the Environmental Quality of the Lagoon**  
**(Use Value Constrained at \$120 per Trip)**

Bid Amount	% of Residents For Which Bid Is Maximum Amount They Would Pay	Calculation of Average Bid Amount
(1)	(2)	(3) = (1) x (2)
\$0	31%	0
\$30	13%	4
\$120	57%	68
<b>Sum</b>	<b>100%</b>	<b>\$72</b>

This \$72 value per trip was multiplied by the estimated total number of trips to the Indian River Lagoon made by the residents of the five IRL counties. These total number of trips were estimated as the respondent average number of trips to the Lagoon in 2007, 24 trips, times the estimated number of residents recreating on the Lagoon in 2007 (From Table 3.7). These calculations for each county and in total are provided in Table B-17.

**Table B-17**  
**Annual Resident Recreational Consumer Surplus**  
**To Improve the Environmental Quality of the Indian River Lagoon, 2007**

Item	Row No.	Volusia	Brevard	Indian River
Average Number of Trips to Lagoon per Respondent (From Survey Responses)	(1)	24	24	24
Number of Residents Recreating on Lagoon in 2007	(2)	112,000	160,000	55,000
Annual Number of Resident Trips to Use IRL for Recreation in 2007	(3) = (1) x (2)	2,688,000	3,840,000	1,320,000
Recreational Consumer Surplus per Person-Trip to Improve IRL (From Survey Responses)	(4)	\$72.00	\$72.00	\$72.00
<b>Total Annual Resident Recreational Consumer Surplus to Improve IRL in 2007</b>	<b>(5) = (3) x (4)</b>	<b>\$193,536,000</b>	<b>\$276,480,000</b>	<b>\$95,040,000</b>

Item	Row No.	St. Lucie	Martin	Total
Average Number of Trips to Lagoon per Respondent (From Survey Responses)	(1)	24	24	24
Number of Residents Recreating on Lagoon in 2007	(2)	73,000	61,000	461,000
Annual Number of Resident Trips to Use IRL for Recreation in 2007	(3) = (1) x (2)	1,752,000	1,464,000	11,064,000
Recreational Consumer Surplus per Person-Trip to Improve IRL (From Survey Responses)	(4)	\$72.00	\$72.00	\$72.00
<b>Total Annual Resident Recreational Consumer Surplus to Improve IRL in 2007</b>	<b>(5) = (3) x (4)</b>	<b>\$126,144,000</b>	<b>\$105,408,000</b>	<b>\$796,608,000</b>

Row number (4) of this table provides an estimate of the annual consumer surplus that residents place on improving the environmental quality of the Lagoon. For all five IRL counties, consumer surplus is estimated to be \$797 million in 2007.



#### **B.2.4 Resident Non-Use Value to Maintain the Indian River Lagoon**

The resident survey included contingent valuation questions to estimate the non-use values that all residents place on the Indian River Lagoon (1) in its existing environmental condition and (2) in an improved environmental condition.

The survey instrument set up a situation where the survey respondent was asked to value the environmental quality of the Indian River Lagoon in existing condition in terms of a one-time tax that would be paid regardless of whether the respondent ever uses the Lagoon. This situation is as follows and is from the survey instrument. All resident respondents were asked these questions.

“The Indian River Lagoon National Estuary Program has worked towards improving and protecting the environmental quality of the Indian River Lagoon over the past seventeen years. It is funded by Federal, State and local governments.

Continued funding is needed to maintain the environmental quality at existing levels which includes monitoring and research; habitat restoration; law enforcement; and maintenance due to recreational uses.

Now I would like to ask you a few questions about your support for this plan that maintains the quality of the Indian River Lagoon in its current condition.

Q87. Would you be willing to pay a one-time tax of \$\_\_\_\_\_ that would be put into a trust fund to maintain the quality of the Indian River Lagoon in its existing condition forever into the future. You would pay this tax regardless of whether or not you visited the Indian River Lagoon in the future.

1 YES (GO to Q89) 2 NO (CONTINUE TO Q88)

Q88. Which of the following statements best describes your reason for answering NO.

- A. That amount is more than this plan is worth.
- B. I'm not interested in maintaining the quality of the Indian River Lagoon.
- C. There is not enough information to make a decision.
- D. I'm opposed to new taxes.
- E. The quality of the Indian River Lagoon does not need to be maintained.”

The following values, or bid amounts, were inserted into the blank above. Each value was inserted on an equal number of surveys: \$15, \$30, \$50, \$100, \$200 and \$300. The purpose of this question was to collect the data needed to estimate the resident population's non-use value in terms of a one-time tax paid regardless of whether the respondent used the Lagoon for recreation. These values are larger than those used to solicit the recreational use value because the bid amount for the use values represented the additional cost per trip to use the Lagoon for recreation. In this non-use value scenario, a one time tax is the bid amount so the range of possible values was larger.

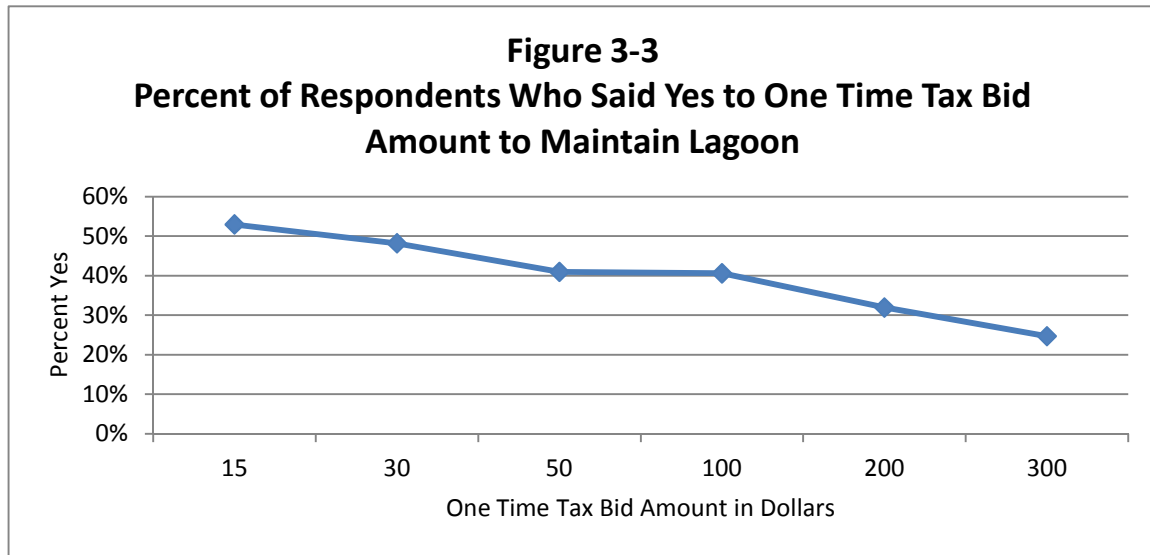
The frequency of responses as the one time tax bid amount increases is provided in Table B-18 and Figure 3-3 (as numbered in the IRL Study report).

**Table B-18**  
**Frequency of Yes Responses to the One-Time Tax Bid**  
**Amounts To Maintain the Environmental Quality of Lagoon**

One-Time Tax Bid Amount	Number of Respondents Who Said Yes to the Bid Amount	Total Number of Respondents	Percent of Respondents Who Said Yes
\$15	89	168	53%
\$30	80	166	48%
\$50	68	166	41%
\$100	67	165	41%
\$200	53	166	32%
\$300	41	166	25%
<b>Total</b>		<b>997</b>	

As shown in Table B-18, 53 percent of 168 resident respondents would be willing to pay a one-time tax of \$15 to maintain the Lagoon in its existing condition. About 25 percent of 41 respondents would be willing to pay a one-time tax of \$300.

Of the respondents who were not willing to pay any amount of money to improve the Lagoon, 34 percent said no because the bid amount is more than the plan is worth to them (15 percent) or the respondent is not interested in improving the environmental quality of the Lagoon (19 percent). The no responses from these respondents measure their non-use value to maintain the Lagoon. The rest of the “no” respondents said that there is not enough information to make a decision (28 percent), they are opposed to new taxes (29 percent) or the quality of the Lagoon does not need to be maintained (2 percent). These responses are called protest votes. They do not necessarily reflect the respondent’s willingness to pay to improve the Lagoon. Because the no responses of these protesting respondents were used to estimate the average non-use value to improve the Lagoon, the actual average non-use value may be higher than that reported in this study.



The plot shown in Figure 3-3 is downward sloping as one would expect. Thus, it is possible to obtain an average non-use value from the survey responses. To evaluate this data, a logit regression equation was estimated where the probability that a person says yes is a function of the bid amount and other characteristics of the respondents. These respondent characteristics include whether they recreated on the Lagoon in the past 12 months, their annual household income before taxes, their education, resident county, whether they live on the Lagoon, their age, number of years they lived in the area, their gender and their familiarity with the Lagoon.

Of these variables, the Bid amount, whether they recreated on the Lagoon, and their familiarity with the Lagoon were statistically significant in terms of their impact on the probability of answering yes. As the Bid Amount increases the probability of saying yes decreases. Lagoon resident users have a higher non-use value than residents who do not use the Lagoon. Non-use value increases as residents become more familiar with the Lagoon.

Using this information and the frequency distribution of yeses provided in Table B-18, the average non-use value in terms of a one-time tax was found to be \$101 per respondent. The calculation is provided in Table B-19.

**Table B-19**  
**Average Non-Use Value Per Resident In Terms of a One-Time Tax**  
**To Maintain the Indian River Lagoon in its Current Condition**

<b>One-Time Tax Bid Amount</b>	<b>Percent of Respondents Who Said Yes</b>	<b>% of Residents For Which Bid Is Maximum Amount They Would Pay</b>	<b>Calculation of Average Bid Amount</b>
<b>(1)</b>	<b>(2)</b>	<b>(3)</b>	<b>(4) = (1) x (3)</b>
\$0		47%	\$40.0
\$15	53%	5%	\$0.7
\$30	48%	7%	\$2.2
\$50	41%	0%	\$0.0
\$100	41%	9%	\$8.7
\$200	32%	7%	\$14.5
\$300	25%	25%	\$75.3
<b>Total</b>			<b>\$101.3</b>

The total nonuse value to all residents of the IRL counties was estimated by multiplying the \$101 per resident by the number of residents older than 18 in each county. This calculation is provided in Table B-20.

**Table B-20**  
**Annual Resident Non-Use Value to Maintain the Environmental Quality of the Indian River Lagoon, 2007**

<b>Item</b>	<b>Row No.</b>	<b>Volusia</b>	<b>Brevard</b>	<b>Indian River</b>
Resident Population 18 Years and older	(1)	399,039	426,607	106,184
Maximum one-time tax to maintain IRL per resident	(2)	\$101.30	\$101.30	\$101.30
<b>Total Annual Resident Non-Use Value to Maintain IRL in 2007</b>	<b>(3) = (4) x 0.02</b>	<b>\$808,453</b>	<b>\$864,306</b>	<b>\$215,129</b>
Total One-Time Tax	(4) = (1) x (2)	\$40,422,651	\$43,215,289	\$10,756,439

<b>Item</b>	<b>Row No.</b>	<b>St. Lucie</b>	<b>Martin</b>	<b>Total</b>
Resident Population 18 Years and older	(1)	197,940	114,125	1,243,895
Maximum one-time tax to maintain IRL per resident	(2)	\$101.30	\$101.30	\$101.30
<b>Total Annual Resident Non-Use Value to Maintain IRL in 2007</b>	<b>(3) = (4) x 0.02</b>	<b>\$401,026</b>	<b>\$231,217</b>	<b>\$2,520,131</b>
Total One-Time Tax	(4) = (1) x (2)	\$20,051,322	\$11,560,863	\$126,006,564

Row number (4) of this table provides an estimate of the non-use values that residents place on maintaining the Lagoon in its existing condition in terms of a one-time tax. For all five IRL counties, this nonuse value is \$126 million. To convert this one-time tax to an annual value, the one-time tax was multiplied by an appropriate discount rate that represents the time value of money. This rate should therefore exclude risk, uncertainty, and inflation which are included in market interest rates. The best available estimate of the current time value of money is the current yield on 30-year U.S. Government bonds which is 4.4 percent per year as of April, 2008 minus the forecasted 2008 inflation rate as provided by the U.S. White House Office of Management and Budget which is 2.4 percent. The net is 2.0 percent per year. Thus, the annual non-use value of the Lagoon in its existing condition to residents is \$2.5 million in 2007 (\$126 million multiplied by 0.02).

### **B.2.5 Resident Non-Use Value to Improve the Indian River Lagoon**

The survey instrument set up a situation where the survey respondent was asked to value improvements to the environmental quality of the Indian River Lagoon in terms of a one-time tax that would be paid regardless of whether the respondent ever uses the Lagoon. This situation is as follows and is from the survey instrument. All resident respondents were asked these questions.

“Q89. Now I am going to describe a different plan that will improve the water, sediment and ecosystem qualities of the Indian River Lagoon. This plan would be implemented instead of the previous plan I just described to you. Please consider only this plan and forget about the plan and taxes we just discussed.

This plan would remove harmful muck sediments from the bottom of the entire Lagoon system; restore and reconnect all wetlands; and manage additional freshwater and stormwater flows to protect the Lagoon. Maintenance of past environmental measures would also be conducted.

The effect of this plan would be a significant increase in the amount and diversity of wildlife, such as fish, shellfish, birds, and mammals and increased water clarity throughout the Lagoon system.

Now I would like to ask you a few questions about your support for this plan that improves the quality of the Indian River Lagoon above its current condition.

Q89A. Would you be willing to pay a one-time tax of \$\_\_\_\_\_ that would be put into a trust fund to improve the quality of the Indian River Lagoon forever into the future. You would pay this tax regardless of whether or not you visited the Indian River Lagoon in the future.

1 YES (GO to Q91) 2 NO (CONTINUE TO Q90)

Q90. Which of the following statements best describes your reason for answering NO.

- A. That amount is more than this plan is worth.
- B. I'm not interested in improving the quality of the Indian River Lagoon.
- C. There is not enough information to make a decision.

D. I'm opposed to any new taxes.

E. The quality of the Indian River Lagoon does not need to be improved."

The following values, or bid amounts, were inserted into the blank above. Each value was inserted on an equal number of surveys: \$20, \$50, \$75, \$150, \$300 and \$400. The purpose of this question was to collect the data needed to estimate the resident population's non-use value in terms of a one-time tax paid regardless of whether the respondent used the Lagoon for recreation.

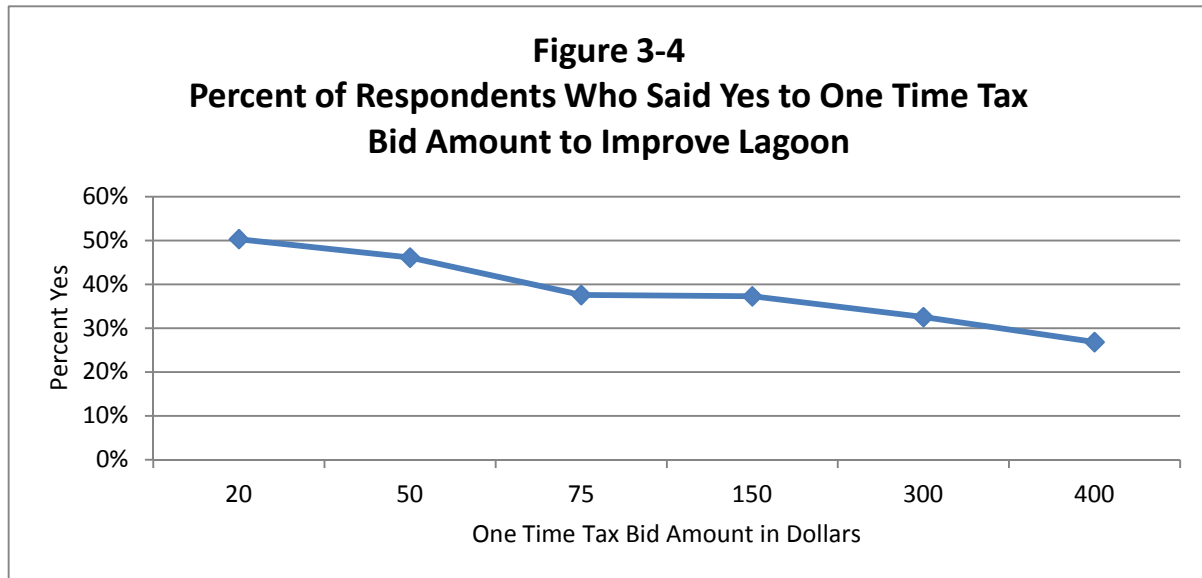
The frequency of responses as the one-time tax bid amount increases is provided in Table B-21 and Figure 3-4 (as numbered in the IRL Study report).

**Table B-21**  
**Frequency of Yes Responses to the One-Time Tax Bid**  
**Amounts To Improve the Environmental Quality of Lagoon**

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One-Time Tax Bid Amount	Number of Respondents Who Said Yes to the Bid Amount	Total Number of Respondents	Percent of Respondents Who Said Yes
\$20	83	165	50%
\$50	77	167	46%
\$75	62	165	38%
\$150	60	161	37%
\$300	53	163	33%
\$400	44	164	27%
<b>Total</b>		<b>985</b>	

As shown in Table 3.35, 50 percent of 165 resident respondents would be willing to pay a one-time tax of \$20 to improve the environmental quality of the Lagoon. About 27 percent of 164 respondents would be willing to pay a one-time tax of \$400.



Of the respondents who were not willing to pay any amount of money to improve the Lagoon, 29 percent said no because the bid amount is more than the plan is worth to them (15 percent) or the respondent is not interested in improving the environmental quality of the Lagoon (14 percent). The no responses from these respondents measure their use value to maintain the Lagoon.

The rest of the no respondents said that there is not enough information to make a decision (28 percent), they are opposed to new taxes (29 percent) or the quality of the Lagoon does not need to be maintained (2 percent). These responses are called protest votes. They do not necessarily reflect the respondent's willingness to pay to improve the Lagoon. Because the no responses of these protesting respondents were used to estimate the average use value to improve the Lagoon, the actual average use value may be higher than that reported in this study.

The plot shown in Figure 3-4 is downward sloping as one would expect. Thus, it is possible to obtain an average non-use value from the survey responses. To evaluate the data, a logit regression equation was estimated where the probability that a person says yes is a function of the bid amount and other characteristics of the respondents. These respondent characteristics include whether they recreated on the Lagoon in the past 12 months, their annual household income before taxes, their education, resident county, whether they live on the Lagoon, their age, number of years they lived in the area, their gender and their familiarity with the Lagoon.

Of these variables, the Bid amount, whether the respondent lived on the Lagoon or a canal leading to the Lagoon, whether the respondent recreated on the Lagoon, respondent age, respondent gender, and the respondent's familiarity with the Lagoon were statistically significant in terms of their impact on the probability of answering yes. As the Bid Amount increases the probability of saying yes decreases. Females have a higher non-use value than males. Lagoon resident users have a higher non-use value than residents who do not use the Lagoon. Non-use value decreases with age. Non-use value increases as residents become more familiar with the Lagoon.

Using this information and the frequency distribution of yeses provided in Table B-21, the average non-use value in terms of a one-time tax was found to be \$137 per respondent. The calculation is provided in Table B-22.

**Table B-22  
Average Non-Use Value Per Resident In Terms of a One-Time Tax  
To Improve the Environmental Quality Of the Indian River Lagoon**

<b>One-Time Tax Bid Amount</b>	<b>Percent of Respondents Who Said Yes</b>	<b>% of Residents For Which Bid Is Maximum Amount They Would Pay</b>	<b>Calculation of Average Bid Amount</b>
<b>(1)</b>	<b>(2)</b>	<b>(3)</b>	<b>(4) = (1) x (3)</b>
\$0		50%	\$0.0
\$20	50%	4%	\$0.8
\$50	46%	9%	\$4.3
\$75	38%	0.31%	\$0.2
\$150	37%	5%	\$7.1
\$300	33%	6%	\$17.1
\$400	27%	27%	\$107.3
<b>Total</b>		<b>100%</b>	<b>\$136.8</b>

The total nonuse value to all residents of the IRL counties was estimated by multiplying the \$137 per resident by the number of residents older than 18 in each county. This calculation is provided in Table B-23.

Row number (4) of this table provides an estimate of the nonuse values that residents place on improving the environmental quality of the Lagoon in terms of a one-time tax. For all five IRL counties, this nonuse value is \$170 million. To convert this one-time tax to an annual value, the one-time tax was multiplied by an appropriate discount rate that represents the time value of money. This rate should therefore exclude risk, uncertainty, and inflation which are included in market interest rates. The best available estimate of the current time value of money is the current yield on 30-year U.S. Government bonds which is 4.4 percent per year as of April, 2008 minus the forecasted 2008 inflation rate as provided by the U.S. White House Office of Management and Budget which is 2.4 percent. The net is 2.0 percent per year. Thus, the annual nonuse value of the Lagoon in its existing condition to residents is \$3.4 million in 2007 (\$170 million multiplied by 0.02).



**Table B-23**  
**Annual Resident Non-Use Value to Improve the Environmental Quality**  
**of the Indian River Lagoon, 2007**

<b>Item</b>	<b>Row No.</b>	<b>Volusia</b>	<b>Brevard</b>	<b>Indian River</b>
Resident Population 18 Years and older	(1)	399,039	426,607	106,184
Maximum one-time tax to improve IRL per resident	(2)	\$136.80	\$136.80	\$136.80
<b>Total Annual Resident Non-Use Value to Improve IRL in 2007</b>	(3) = (4) x 0.02	<b>\$1,091,771</b>	<b>\$1,167,197</b>	<b>\$290,519</b>
Total One Time Tax	(4) = (1) x (2)	\$54,588,535	\$58,359,838	\$14,525,971
<b>Item</b>	<b>Row No.</b>	<b>St. Lucie</b>	<b>Martin</b>	<b>Total</b>
Resident Population 18 Years and older	(1)	197,940	114,125	1,243,895
Maximum one-time tax to improve IRL per resident	(2)	\$136.80	\$136.80	\$136.80
<b>Total Annual Resident Non-Use Value to Improve IRL in 2007</b>	(3) = (4) x 0.02	<b>\$541,564</b>	<b>\$312,246</b>	<b>\$3,403,297</b>
Total One Time Tax	(4) = (1) x (2)	\$27,078,192	\$15,612,300	\$170,164,836