



Biscayne Bay Economic Study Update **Final Report**

Prepared for the South Florida Water Management District
and Miami-Dade County, Florida
September 15, 2023





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September 15, 2023

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South Florida Water Management District
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Re: Biscayne Bay Economic Study Update – Final Report

Dear Mr. Biondolillo:

Hazen and Sawyer is pleased to submit the final report for the Biscayne Bay Study Update that provides estimates of the uses and economic contribution of Biscayne Bay to Miami-Dade County, to southeast Florida, and to Florida. The methods and data used to construct these estimates are provided in this report.

We thank the South Florida Water Management District and Miami-Dade County Florida for funding this study. A special thanks to Irela Bague, Miami-Dade County’s Chief Bay Officer, for leading the effort to update the previous 2005 Biscayne Bay Economic Study.

This study relied on the results of survey research where over 1,600 Miami-Dade County residents and visitors were surveyed regarding their recreational uses and expenditures associated with Biscayne Bay. We thank these respondents for their time in completing the sometimes-long survey. We thank Mars Research, Hazen’s subcontractor, for providing and supervising the survey researchers who worked over a nine-month period to obtain high quality survey responses. These survey researchers worked with energy and in earnest, often in the hot sun, to conduct these interviews. Without these individuals, the study of recreational uses and economic contributions would not have been possible.

We appreciate the support and feedback of this study’s Independent Technical Review (ITR) Committee whose members were very watchful in identifying issues and errors in the progress report and draft report submittals that formed the basis for this study and this final report. All comments and errors found by the ITR Committee members were incorporated into this final report. The ITR Committee members represented Miami-Dade County, the South Florida Water Management District, the US Army Corp of Engineers, Biscayne National Park, the Builders Association of South Florida, the Greater Miami & Beaches Hotel Association, the Greater Miami Convention and Visitors Bureau, Miami Marine Council, Miami Realtors, Miami Waterkeeper, and PortMiami.

We enjoyed working with you, Irela Bague, Ana Fiotte, and Galen Treuer on this unique and important natural resource valuation study.

Very truly yours,

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

Enclosure

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Appendix A – Biscayne Bay User Survey for Residents

Appendix B – Biscayne Bay User Survey for Visitors

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Appendix D – General Survey for Visitors

Cover photo credits: Both cover photos are from Miami-Dade County.

Executive Summary

Biscayne Bay is a large, shallow tropical saline lagoon surrounded by the sizable and diverse greater Miami and Miami Beach. The Bay extends for almost the entire length of Miami-Dade County from Haulover Inlet to the upper reaches of Key Largo. Just south of downtown Miami is the mouth of the Miami River which is fully channelized to Lake Okeechobee.

Biscayne Bay and the Miami River are important components of the county's quality of life and economy. These resources support a wide variety of recreational and economic uses including:

- Recreational fishing, swimming, boating, sailing and other activities
- Commercial fishing
- Shipping operations at PortMiami and the Miami River
- Cruise ship operations at PortMiami
- Bayfront and riverfront views

Methods and Data. This 2023 study used survey research and the available data and studies to estimate the economic contribution of Biscayne Bay on the economies of Miami-Dade County, southeast Florida, and Florida and is an update of the Biscayne Bay Economic Study completed in 2005. The impact of the Bay and River on property values was not part of the 2005 study but was added to the scope of the 2023 study to improve public understanding of the Bay's and the River's economic value.

Most of this 2023 study effort was focused on the recreational uses of the Bay and the impact of the Bay and River on residential property values. The Miami River's economic contribution is measured in this study through its impact on property values and its importance to recreation. All other types of economic contributions presented in this report including from recreation, commercial fishing and PortMiami operations reflect the contribution of Biscayne Bay.

This Biscayne Bay Economic Study Update provides the following information:

- (1) Recreational use intensity of Biscayne Bay in 2022 in terms of the types of activities and number of person-days that Miami-Dade County residents and visitors spent in each of these activities. The historic total number of person-days from 2005 to 2022 are also provided in this report.
- (2) Economic contribution of Biscayne Bay-related recreation and commercial fishing to the economies of Miami-Dade County, southeast Florida, and Florida from 2005 to 2022 as measured by the estimated direct, indirect, and induced sales, income, employment, and tax revenue generated by these activities and as a percent of the overall Miami-Dade County economy.
- (3) Economic contribution of shipping and cruise ship operations at PortMiami to the economies of Miami-Dade County, southeast Florida, and Florida in 2018 taken from an existing study.
- (4) Impact of Biscayne Bay and the Miami River on property values in 2022 which are direct measures of resident willingness-to-pay for the benefits of living on or near the Bay.

This report does not provide the results of an original study of the economic contributions of PortMiami and the Miami River. The scope and budget for this study limited such research to reporting the results of existing studies. The most recent existing study of PortMiami was completed in 2017. It was partially updated by its authors to estimate 2018 economic impacts, and those results are provided in this

document. There are no studies that provide estimates of the economic contribution of shipping operations along the Miami River other than that provided in the 2005 Biscayne Bay Economic Study report.

Estimates of the economic importance of Biscayne Bay to Florida residents as reported in this document can be used to justify investments and programs to protect Biscayne Bay as it generates economic activity and community wellbeing.

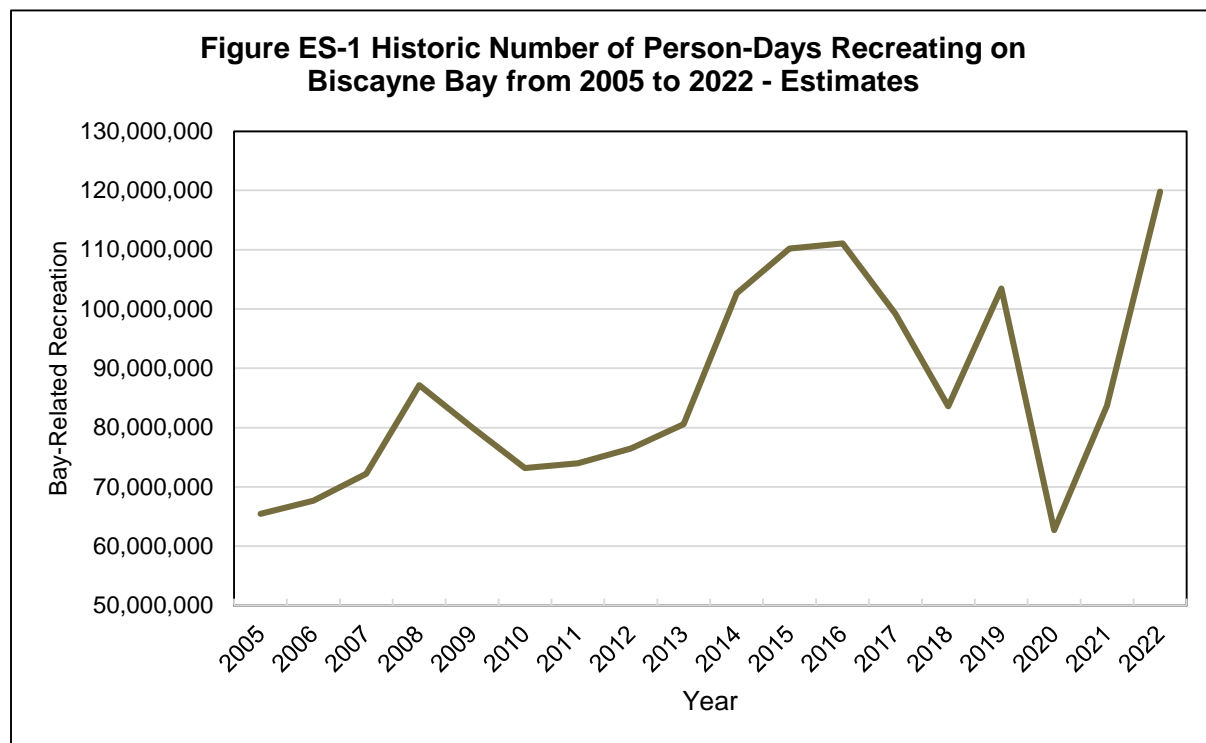
Biscayne Bay-Related Recreation. The estimated numbers of person-days spent recreating on Biscayne Bay and the Miami River are provided by primary recreation activity in **Table ES-1**. The number of days participating in a primary activity can also include days when other recreation activities on the Bay or River took place. These other activities are not counted in this table to avoid double-, triple- and quadruple- counting of person-days spent on the Bay.

Table ES-1 - Number of Person-Days Spent Participating in Biscayne Bay-Related Recreation Activities in 2022

Primary Activity	Visitors to Miami-Dade County (a)	Residents of Miami-Dade County	Total	Percentage of Total
(1)	(2)	(3)	(4) = (2) + (3)	(5) = (4) / 119,814,000
Fishing from Shore	599,000	1,637,000	2,236,000	1.87%
Fishing from Boat	575,000	5,397,000	5,972,000	4.98%
Snorkeling from Shore	991,000	265,000	1,256,000	1.05%
Snorkeling from Boat	607,000	897,000	1,504,000	1.26%
Scuba Diving from Shore	8,000	14,000	22,000	0.02%
Scuba Diving from Boat	232,000	451,000	683,000	0.57%
Swimming from Shore	5,773,000	2,373,000	8,146,000	6.80%
Swimming from Boat	1,458,000	2,289,000	3,747,000	3.13%
Boating for Pleasure/Partying	923,000	2,460,000	3,383,000	2.82%
Sightseeing/Birdwatching from Boat	1,784,000	1,494,000	3,278,000	2.74%
Water-skiing	48,000	1,184,000	1,232,000	1.03%
Parasailing	32,000	33,000	65,000	0.05%
Windsurfing	64,000	159,000	223,000	0.19%
Kite Sailing	0	159,000	159,000	0.13%
Paddleboarding	585,000	1,760,000	2,345,000	1.96%
Personal Watercraft Boating	643,000	973,000	1,616,000	1.35%
Sailing	104,000	276,000	380,000	0.32%
Canoeing / Kayaking	817,000	3,003,000	3,820,000	3.19%
<i>Viewing the Bay from Shore</i>	<i>49,535,000</i>	<i>19,551,000</i>	<i>69,086,000</i>	<i>57.66%</i>
Sunset Cruise	1,466,000	329,000	1,795,000	1.50%
Picnicking on Biscayne Bay	3,052,000	5,598,000	8,650,000	7.22%
Participating in Biscayne Bay Cleanup Event	8,000	208,000	216,000	0.18%
Total	69,304,000	50,510,000	119,814,000	100.00%
<i>All Bay-Related Activities Other than Viewing the Bay from Shore</i>	<i>19,769,000</i>	<i>30,959,000</i>	<i>50,728,000</i>	<i>42.34%</i>

Miami-Dade County residents and visitors spent an estimated 119.8 million person-days participating in recreation activities on the Bay in 2022, including viewing the Bay from shore while participating in an on-shore activity. Of this total, visitors spent an estimated 69.3 million person-days and residents spent an estimated 50.5 million person-days.

The annual numbers of person-days of recreation on Biscayne Bay from 2005 to 2022 are plotted in **Figure ES-1**. During the 2005 study, recreational use was estimated to be 65.5 million person-days. This 2022 update found that Bay-related recreation grew to 119.8 million person-days by 2022. This growth is attributed to the growth in the number of person-days spent viewing the Bay from shore while dining, shopping, jogging, strolling, sightseeing, bird watching, and/or exercising. The number of person-days in all other recreation activities was about the same during the two years.



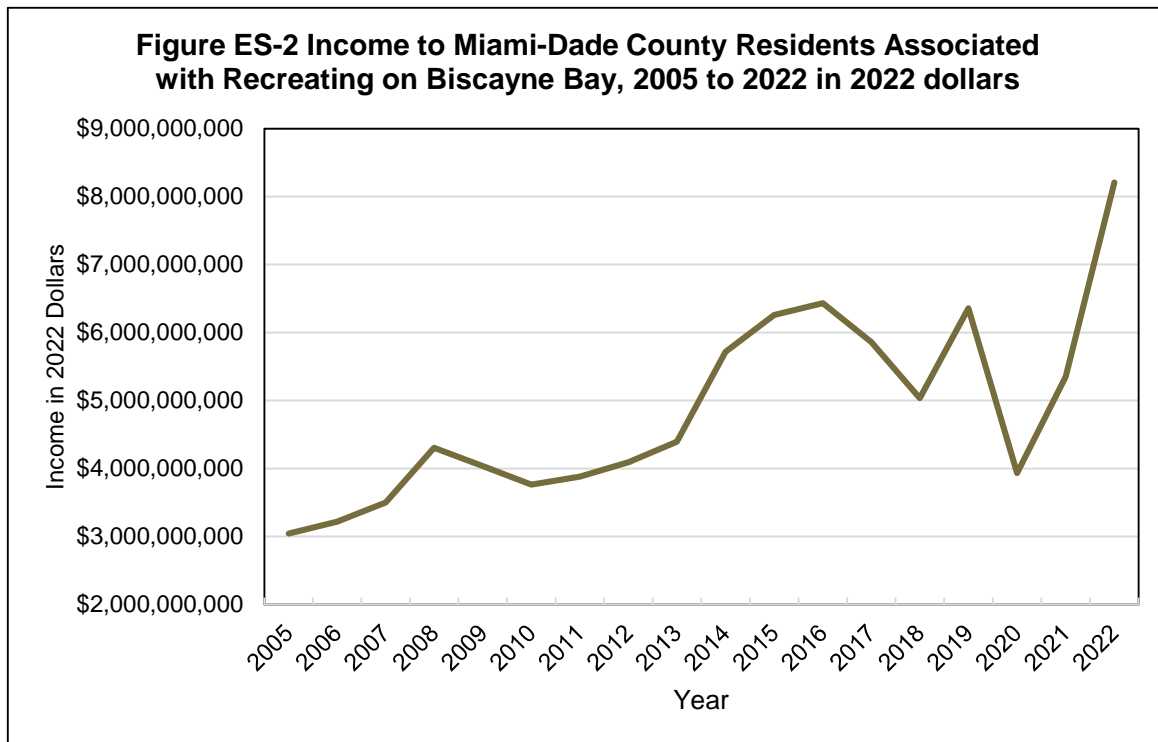
Initially, recreation use grew from 2005 to 2008 and fell in 2009. The drop in the number of person-days from 2009 to 2013 could be because of the Great Recession which lasted from December 2007 through June 2009 and had lasting effects years later. Recreational use increased from 2014 to about 2016 and then fell in 2017 and 2018 probably in response to Hurricane Irma which hit the Florida Keys as a category 4 and made landfall in Marco Island as a category 3 in September 2017. In 2019 recreation began to bounce back but was stymied by the Covid-19 pandemic in 2020. In 2021 and 2022, recreation grew and in 2022 reached its highest level since 1980¹ and probably its highest level ever.

One of the measures of economic contribution is the income that residents receive as businesses and households spend and re-spend the Bay-related expenditures throughout the County, southeast Florida,

¹ From Hazen and Sawyer, 2005 Biscayne Bay Economic Study, Figure 3.2-1 on page 3-8.

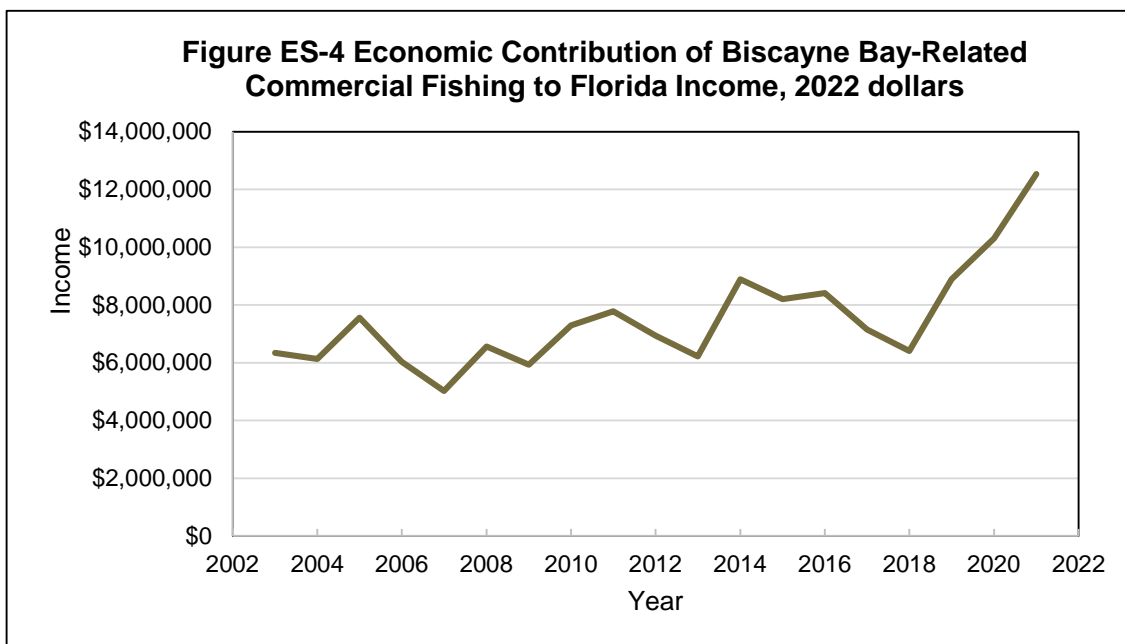
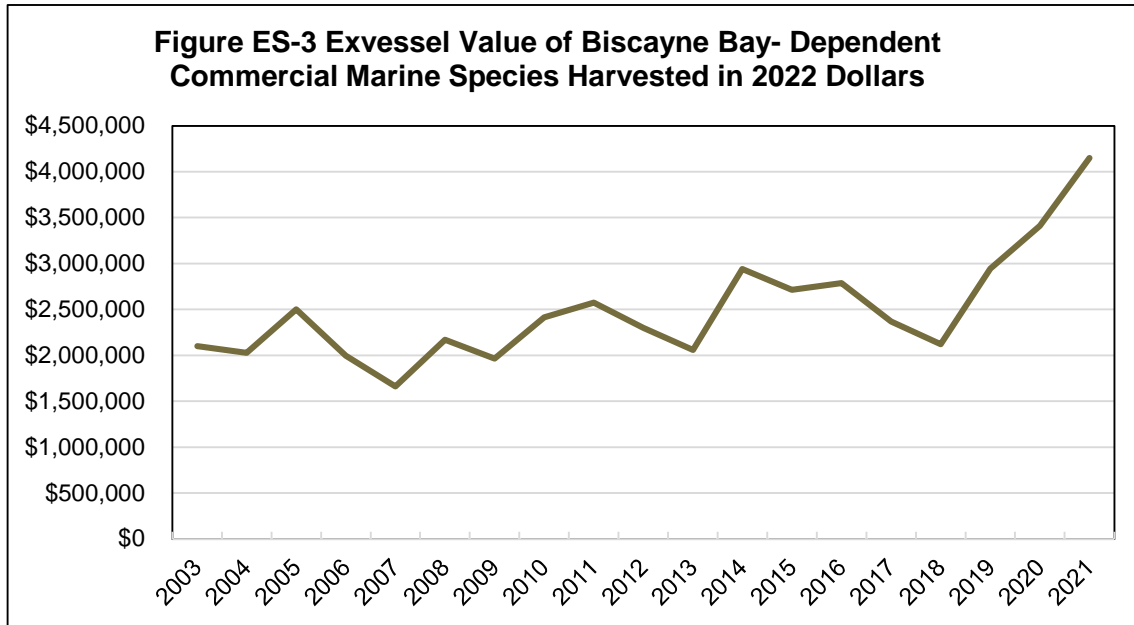
and Florida. This income includes employee compensation, proprietor’s income, and other property type income (rents, royalties, and profits). The reported income values include income taxes and reflect 2022 dollars.

The estimated annual income from Bay-related recreation to residents living in Miami-Dade County from 2005 to 2022 is plotted in **Figure ES-2**. These annual values follow the same trend as the number of person-days growing from \$3.1 billion in 2005 to \$8.2 billion in 2022. This growth is due to the increase in the number of person-days spent viewing the Bay from the shore and the increase in real recreation-related expenditure per person per day in all activity categories.



Commercial Fishing. The dockside (exvessel) value of Biscayne Bay-dependent commercial marine species harvested from 2003 through 2021 is plotted in **Figure ES-3**. Dockside value grew from \$2.1 million in 2003 to \$4.2 million in 2021. In 2021, three commercial species comprised 92 percent of the total value: spiny lobster at \$2.4 million or 63 percent of the total dockside value; stone crab at \$632,000 or 15 percent of total dockside value and bait shrimp at \$578,000 or 14 percent of total dockside value.

The annual total income of Florida residents from Biscayne Bay-related commercial fishing is plotted in **Figure ES-4**. Almost all the income accrues to Miami-Dade County residents. In 2003, total income is estimated to be \$6.3 million and increases to \$12.5 million by 2021.



Biscayne Bay-Related Shipping and Cruising. This study’s scope did not include original assessments of the economic contribution of PortMiami or the Miami River shipping industry. Instead, the scope included the collection of available studies that provide estimates of these economic contributions.

PortMiami, located in Biscayne Bay, supports shipping and cruising activities in Miami-Dade County. The most recent assessment of PortMiami’s estimated economic contribution to the regional economy is the 2017 study prepared by Martin Associates for PortMiami. The Martin Associates study is the most recent and comprehensive publicly available economic impact study of the Port and provides a detailed account of the large economic role that PortMiami plays in the regional economy. Martin Associates developed updated impact estimates for 2018 and these have been included in this report.

The overall estimates of the Port’s economic contribution to the regional economy are provided in **Table ES-2**. This table is based on Exhibit I-1 in the Martin Associates Study Report but with updated values for 2018 provided by Martin Associates in September 2023. As shown in the Table, the Port supported 334,532 jobs which produced a total of \$12.9 billion in personal income in 2018 dollars. In 2022 dollars the personal income contribution is \$14.8 billion. Output in 2018 totaled \$42.9 billion or \$48.8 billion in 2022 dollars.

Most of this economic contribution is attributed to the exporting and importing firms, which are referred to as “users” of the Port. These users are not exclusive to PortMiami and could potentially make greater use of other Ports if PortMiami did not exist. These “users” conduct business with the Port for multiple reasons including cost and time considerations and efficiency advantages over the other accessible Ports. This user group comprises about 80 percent of the estimated economic contributions reported in **Table ES-2** and its contribution demonstrates the value of PortMiami to the regional economy.

**Table ES-2 - Economic Impact of PortMiami Cargo and Cruise Activity, 2018
(in 2018 dollars)**

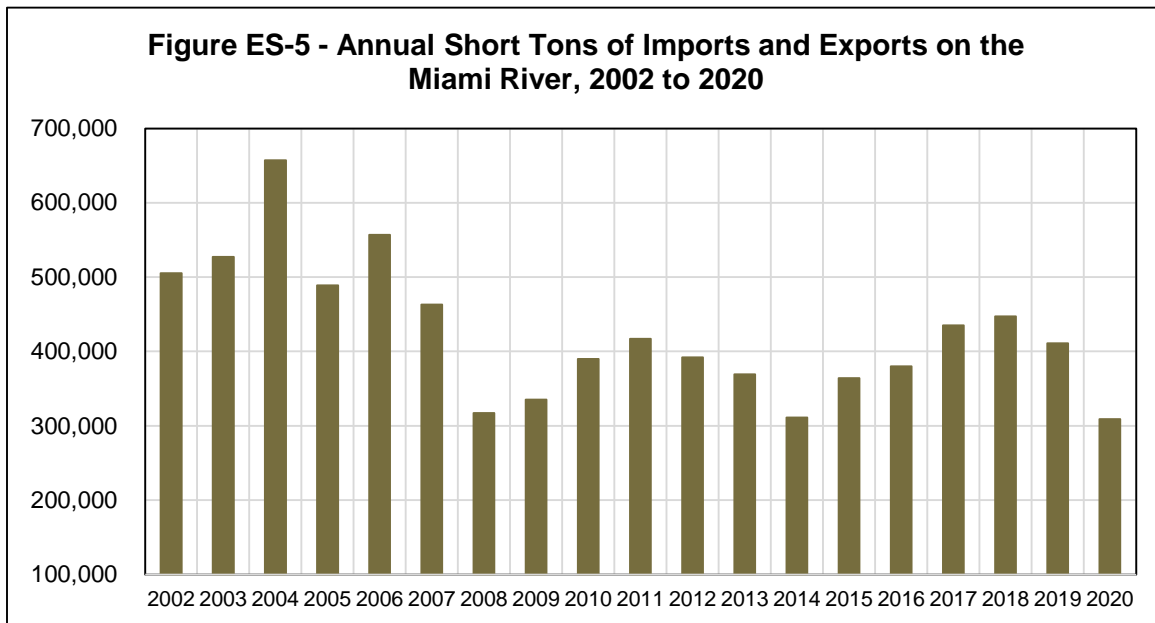
(2018 Update of Exhibit I-1 of the report “The Local and Regional Economic Impacts of PortMiami” prepared for PortMiami by Martin Associates, March 28, 2017),

Impact Category	Cargo	Cruise	Total
Jobs			
Direct	7,585	14,829	22,414
Induced	5,647	8,831	14,478
Indirect	2,869	6,428	9,297
Users	288,342	NA	288,342
Total	304,443	30,088	334,532
Personal Income (\$ millions)			
<i>Direct</i>	\$366.8	\$549.3	\$916.1
<i>Re-Spending/Consumption User Income</i>	\$721.2	\$945.9	\$1,667.1
<i>Indirect</i>	\$111.7	\$218.0	\$329.8
<i>User Income</i>	\$10,079.2	NA	\$10,079.2
Total Income and Consumption	\$11,279	\$1,713.3	\$12,992.2
Value Of Economic Output (\$ millions)			
Business Services Revenue	\$1,387.2	\$4,812.4	\$6,199.6
Re-Spending/Consumption	\$721.2	\$945.9	\$1,667.1
User Output	\$35,107.6	NA	\$35,107.6
Total Value Of Economic Output	\$37,215.9	\$5,758.3	\$42,974.2
State and Local Taxes (\$ Millions)			
Direct, Indirect, Induced	\$110.4	\$188.9	\$299.2
User Taxes	\$1,255.0	NA	\$1,255.0
Total State and Local Taxes	\$1,365.4	\$188.9	\$1,554.2

There have been no recent economic impact studies performed to estimate the contributions of the Miami River to the regional economy and such an assessment is beyond the scope of this study. Previous studies

including the 2005 Biscayne Bay Economic Study have estimated the River’s marine industry’s impact on the regional economy. The 2005 Biscayne Bay Economic study estimated that the Miami River shipping industry generated \$682 million in output, 6,106 jobs, \$339 million in income, and \$37.7 million in tax revenues in 2005.

The scope of the current study is more limited and the data from the 2005 report have not been updated. The only available information is the total annual tonnage of freight transported on the Miami River from 2002 to 2020 which is plotted in **Figure ES-5**. This tonnage includes imported and exported cargo and is from the US Army Corps of Engineers (USACE).



The USACE data indicate that after the increase in traffic from 2002 to 2004, transported tonnage underwent a steep decline, dropping from a peak of 657,000 tons in 2004 to a low of 317,000 tons in 2008, which could be explained by the Great Recession which lasted from December 2007 through June 2009. Shipping increased from 2009 to another cyclical peak of 417,000 tons in 2011 and then fell to a low of 311,000 in 2014. In 2015, shipping began a rebound before experiencing another steep decline beginning in 2019. In 2020, the latest year of available data, shipping on the Miami River fell to its lowest level in 19 years likely due to the severe economic impacts of the Covid-19 pandemic that slowed down economic activity.

Contribution of Biscayne Bay and Miami River to Property Values. A summary of the value of Biscayne Bay and the Miami River as they contribute to residential property values is provided in **Table ES-3**. The hedonic price analysis found that the impact of Biscayne Bay on residential property value is \$7.9 billion and the impact of the Miami River is \$98 million. The combined contribution of Biscayne Bay and the Miami River to residential property value is \$8.0 billion in 2021 dollars.

These capitalized values were converted to an annual value that represents the property owner’s willingness to pay for the aesthetic and recreational benefits homeowners and renters receive as they live on or near the Bay and the River. For this analysis, these values are \$237 million per year in benefit value

associated with living on or near Biscayne Bay and \$2.9 million per year in benefit value associated with living on or near the Miami River using a real discount rate of 3.0 percent. The combined annual value of living on or near Biscayne Bay and the Miami River is estimated to be \$240 million. Because the market values used in this analysis reflect their values on January 1, 2022, these values are considered to represent 2021 dollars.

Table ES-3 - Estimated Contribution of Biscayne Bay and the Miami River on Property Values in 2021 (2021 dollars)

Property Type	Increased Market Value, \$			Annualized Benefit Value, \$ / year		
	Biscayne Bay	Miami River	Total	Biscayne Bay	Miami River	Total
Single-Family	\$3,327,745,000	\$28,716,000	\$3,356,461,000	\$100,000,000	\$861,000	\$100,861,000
Multi-Family	\$4,251,034,000	\$52,758,000	\$4,303,792,000	\$128,000,000	\$1,583,000	\$129,583,000
Apartment Buildings	\$305,802,000	\$16,400,000	\$322,202,000	\$9,000,000	\$492,000	\$9,492,000
Total	\$7,884,581,000	\$97,874,000	\$7,982,455,000	\$237,000,000	\$2,936,000	\$239,936,000

Overall Economic Contribution. The overall economic contribution of Biscayne Bay to the Miami-Dade County economy in 2022 is summarized in 2022 dollars in **Table ES-4** and as a percentage of the Miami-Dade County economy in **Table ES-5**.

Biscayne Bay-related recreation contributed an estimated \$15.1 billion in output, \$8.2 billion in income, 113,300 jobs and \$2.3 billion in tax revenue in Miami-Dade County. These contributions represent four percent of income to the County’s residents and six percent of the County’s total employment.

Biscayne Bay-related commercial fishing contributed an estimated \$19.6 million in output, \$11.9 million in income, 196 jobs and \$2.7 million in tax revenue in Miami-Dade County. These contributions represent less than one percent of the County’s overall economy.

PortMiami shipping and cruising contributed an estimated \$48.8 billion in output, \$14.8 billion in income, 334,530 jobs and \$1.78 billion in tax revenue in Miami-Dade County. These contributions represent 8.2 percent of total income and 18.2 percent of employment in the County.

Overall, the Biscayne Bay-related recreation, commercial fishing, and shipping industries contributed \$63.9 billion in output, \$23.3 billion in income, 448,000 jobs and \$3.9 billion in tax revenue in Miami-Dade County. These values represent 18.7 percent of the County’s output, 12.8 percent of the County’s income and 24.4 percent of the County’s employment.

Table ES-4 Annual Economic Contribution of Biscayne Bay to the Miami-Dade County Economy in 2022 (2022 dollars) (a)

Study Area	Output (b)	Income (c)	Employment (d)	Tax Revenue (e)
Recreation	\$15,081,913,000	\$8,211,172,000	113,300	\$2,263,646,000
Commercial Fishing	\$19,600,000	\$11,900,000	200	\$2,700,000
PortMiami Shipping and Cruising	\$48,849,242,000	\$14,830,563,000	334,530	\$1,774,115,000
Miami River Shipping	Not Available	Not Available	Not Available	Not Available
Property Values (f)	Not Applicable	\$240,800,000	Not Applicable	Not Available
Total	\$63,950,755,000	\$23,294,435,000	448,030	\$4,040,461,000

(a) Includes direct, indirect, and induced effects.

(b) Output is defined as the value of the additional goods and services produced in Miami-Dade County.

(c) Income is the sum of wages, salaries, proprietor's income, profits, rents, royalties, and dividends.

(d) Employment includes the number of full-time and part-time jobs created.

(e) Tax revenue is the sum of the excise taxes, property taxes, fees, licenses, and sales taxes collected. It includes local, county, State and Federal tax revenue. It excludes taxes on profit and income. For PortMiami Shipping and Cruising, the reported tax revenue does not include Federal taxes.

(f) The annualized impact of Biscayne Bay and the Miami River on property value is treated as income in this table to reflect the value provided to residents as they live on or near the Bay and River. There is no Output measure for this impact. The additional value of the properties would contribute to property tax revenue but this impact was not included in this study or in the table.

Table ES-5 Economic Contribution of Biscayne Bay for Recreation, Commercial Fishing, and Shipping/Cruising as Percentage of Study Area Economies

Study Area	Output	Income	Employment
Recreation	4.41%	4.56%	6.17%
Commercial Fishing	0.0057%	0.0066%	0.0107%
PortMiami Shipping and Cruising	14.30%	8.23%	18.23%
Miami River Shipping	Not Available	Not Available	Not Available
All Estimated Economic Contributions	18.71%	12.80%	24.41%

Editor's Note

All readers of this document should read Section 1 Introduction before reading the other sections of this report. Section 1 includes the definition of terms used in this document and the overall methodology used in this study.

1. Introduction

Biscayne Bay is a large, shallow tropical saline lagoon surrounded by the sizable and diverse greater Miami and Miami Beach. Biscayne Bay is the most prominent feature in Miami-Dade County's landscape, extending for almost the entire length of the county from Haulover Inlet in the north to the upper reaches of Key Largo in the south. An aerial of Biscayne Bay and the Miami River is provided in **Figure 1-1**.

Biscayne Bay is an important component of the county's quality of life and economy and supports a wide variety of recreational and economic uses including:

- Recreational fishing, swimming, boating, sailing and other activities
- Commercial fishing
- Shipping operations at PortMiami and the Miami River
- Cruise ship operations at PortMiami
- Bayfront and riverfront views

Most of this study focuses on the economic contribution of Biscayne Bay. The Miami River extends from Biscayne Bay at downtown Miami to Lake Okeechobee and is a gateway to Biscayne Bay-related recreation, much like the many parks and marinas that surround the Bay. It is also an important component of residential property values and commercial shipping. The Miami River's economic contribution is measured in this study through its impact on property values and its support of Biscayne Bay-related recreation. All other types of economic contributions reported in this document, including commercial fishing and shipping operations, reflect the contribution of Biscayne Bay only.

1.1 Study Background

In 2004 and 2005, Hazen and Sawyer conducted a study for the South Florida Water Management District that provided estimates of the recreational uses and economic values of Biscayne Bay and the Miami River for the year 2004. These estimates were used in conjunction with other data to estimate the historic economic contribution of Biscayne Bay and the Miami River from 1980 to 2003. The economic contribution of the Bay and the River to the overall economies of Miami-Dade County, southeast Florida and Florida were estimated over the period from 1980 to 2004. The data, methods and results of this study are provided in the study's 2005 report [Hazen and Sawyer]. The 2005 study was funded by the State of Florida and the Florida Inland Navigation District.

In 2022, the South Florida Water Management District, in cooperation with Miami-Dade County, contracted with Hazen and Sawyer to update the 2005 study and to add estimates of the impact of the Bay and River to the County's property values. This document provides the methods, data, and results of this Biscayne Bay Economic Study Update.

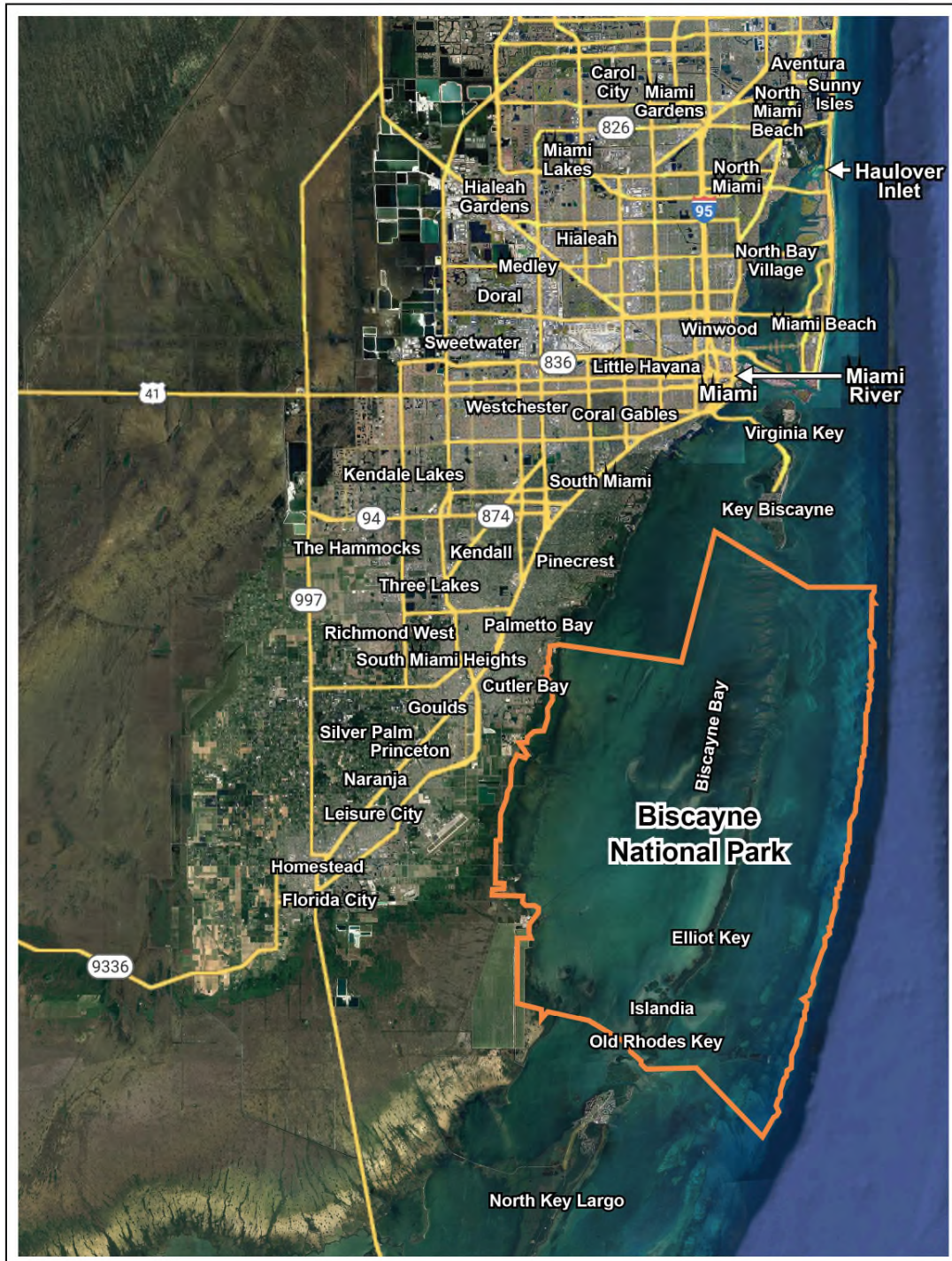


Figure 1-1 Location of Biscayne Bay and the Miami River in Miami-Dade County, Florida, 2023

1.2 Study Objectives

This Biscayne Bay Economic Study Update provides the following information:

- (1) Recreational use intensity of Biscayne Bay in 2022 in terms of the types of activities and number of person-days that Miami-Dade County residents and visitors spent in each of these activities. The historic total number of person-days from 2005 to 2022 are also provided in this report.
- (2) Economic contribution of Biscayne Bay-related recreation and commercial fishing to the economies of Miami-Dade County, southeast Florida, and Florida from 2005 to 2022 as measured by the estimated direct, indirect, and induced sales, income, employment, and tax revenue generated by these activities and as a percent of the overall Miami-Dade County economy.
- (3) Economic contribution of shipping and cruise ship operations at PortMiami to the economies of Miami-Dade County, southeast Florida, and Florida in 2016 taken from an existing study.
- (4) Impact of Biscayne Bay and the Miami River on property values in 2022 which are direct measures of resident willingness-to-pay for the benefits of living on or near the Bay.

This report does not provide the results of an original study of the economic contributions of PortMiami and the Miami River. The scope and budget for this study limited such research to reporting the results of existing studies. The most recent existing study of PortMiami was completed in 2017 and its results are provided in this document. There are no studies that provide estimates of the economic contribution of shipping operations along the Miami River other than that provided in the 2005 Biscayne Bay Economic Study report.

These estimates of the economic importance of Biscayne Bay to Florida residents can be used to justify investments and programs to protect Biscayne Bay as it generates economic activity and community well-being.

1.3 Study Areas

This report provides the estimated economic contributions of Biscayne Bay to three economies or study areas: (1) Local area which is Miami-Dade County; (2) Regional area which is southeast Florida and includes the counties of Palm Beach, Broward, Miami-Dade, and Monroe; and (3) the State of Florida.

1.4 Study Period

This study primarily focuses on the economic contribution of Biscayne Bay and the Miami River during the year 2022 for recreation, 2021 for commercial fishing, and 2018 for shipping. These are the most recent years for which data are available. The historic contributions from 1980 to 2021 were also estimated using the available data and are included in this report.

1.5 Definitions

The definitions of terms used in this report are provided as follows.

2022 Dollars. This term means that dollar values realized during a particular year represent the value of the dollar as it existed in 2022. All dollars are reported in 2022 dollars unless otherwise noted.

Visitors. This term is defined as persons who visit Miami-Dade County and live outside of the county for over six months per year.

Residents. This term is defined as persons who live in Miami-Dade County at least six months per year.

Number of Person-Days. This term describes the recreational use intensity of Biscayne Bay. A person-day is one person participating in a recreational activity for all or a portion of a day.

Number of Person-Days by Activity. In this study the numbers of person-days associated with nineteen specific “primary” recreation activities on the Bay were estimated. It is common for people to participate in multiple Bay-related activities during a day. For example, it is common to picnic and swim on the Bay during the same day. The estimation of person-days by activity was based on the responses of residents and visitors as they answered surveys conducted in-person. A person-day is attributed to an activity only if it was the “primary” activity that day as determined by the respondent.

For example, the survey respondent spent sixteen person-days fishing from a boat in 2022. The activity type, such as fishing from a boat, is the predominant activity of the day, even though the respondent may have participated in other activities on the day they fished from a boat, such as swimming and picnicking. The portions of the days spent swimming or picnicking are not counted on the days when fishing from a boat was the primary activity. The primary activity is the motivating factor for recreating on the Bay.

Number of Person-Trips. This term means one trip by one visitor to Miami-Dade County where the visitor is not just passing through the county to get elsewhere and is not commuting to work. A trip can last one day or many days.

Recreation Expenditures. The amount of money spent by people while they were recreating on the Bay or to purchase goods and services needed to recreate on the Bay.

Output. The value of the additional goods and services produced in the study area because of the uses of the Bay. Output will be less than recreation expenditures or direct sales if some of the direct goods purchased in a study area are not produced in the study area.

Income. Income includes labor, proprietor’s and other property type income generated because of the Bay-related uses. Labor income is total payroll costs including benefits such as the costs of health and life insurance, retirement payments, and non-cash compensation. Proprietary income consists of payments received by self-employed individuals as income, including income received by private business owners, doctors, lawyers and so forth. Other property type income includes payments for rents, profits, royalties, and dividends generated because of the Bay-related uses.

Employment. Employment is the number of full and part-time jobs generated from the Bay-related uses.

Tax revenue. Also called indirect business taxes and is the sum of the excise taxes, property taxes, fees, licenses, and sales taxes collected because of the Bay-related uses, including local, county, State and Federal tax revenue and excluding taxes on profit and income which are accounted for under income.

Economic contribution. The contribution of Biscayne Bay-related uses to output, income, employment, and tax revenue.

Direct businesses. The businesses who provide goods and services to those using the Bay for recreation and businesses that provide goods and services using the attributes (fishing, navigation) of the Bay.

Indirect businesses. The direct businesses purchase goods and services from these businesses.

Induced businesses. The indirect businesses and the employees of the direct, indirect, and induced businesses purchase goods and services from these businesses.

Direct, indirect, and induced economic contribution. The contribution of Biscayne Bay as the sales of the direct businesses move through the economy to create output, income, employment, and tax revenue. As the geographic extent of the study area becomes larger, the size of the indirect and induced economic contribution increases as more businesses and employees are included in the evaluation. Throughout this report, the total direct, indirect, and induced economic contribution is presented unless otherwise noted.

IMPLAN Economic Input-Output Model. Computer model that simulates the supply of and demand for goods and services within zip codes, a county, or county groups. The model uses detailed business, household, sales, income, employment and tax data at the zip code, county, and state level. This model was developed in the 1980s by the U.S. Forest Service and was privatized in 1993 by the Minnesota IMPLAN Group, Inc. The firm was sold in 2013 and its name was changed to IMPLAN Group LLC. For this study, the economic data in this model represents Miami-Dade County, southeast Florida, and Florida and was developed by the IMPLAN Group LLC from data obtained from the US Bureau of Economic Analysis, the US Bureau of Labor Statistics, and the US Census, among other sources. This data represent the year 2021, the most recent year available due to the timing of Federal data publication for the calendar year and the length of time needed to organize this data into industry and household sectors used in the IMPLAN model. The IMPLAN Economic Input-Output Model was used to convert Bay-related expenditures and commercial fishing exvessel values into direct, indirect, and induced output, income, employment, and tax revenue in 2022 for recreation and 2021 for commercial fishing.

Commercial Fishing Ex-Vessel Value. This value is the physical quantity of fish products caught times the prices that fishers receive directly for their catch, or the price at which the catch is sold when it first enters the supply chain.

1.6 Overall Study Methodology

Biscayne Bay and Miami River-related economic contributions as these water bodies support the following three sectors were estimated during this study: (1) Recreation; (2) Commercial Fishing; and (3) Property Values. PortMiami's economic contribution was taken from an existing study. Different data sources and methods were used to estimate the values in each sector as summarized below.

Recreation. The recreation uses and economic contribution estimates are heavily dependent on the results of 1,600 in-person surveys of residents and visitors in Miami-Dade County conducted from July 2022 through April 2023. These surveys asked the respondents for their uses of the Bay and associated expenditures over the previous 12 months. These responses were used to estimate the number of person-days by recreation activity over a one-year period and the annual expenditures associated with participating in these activities. The estimated expenditures were input into the IMPLAN Economic Input-Output Model to obtain estimates of the direct, indirect, and induced output, income, employment, and tax revenue associated with Bay-related recreation to the local, regional, and State economies. While some of the recreation activities were spent on the Miami River, most of the person-days are associated with activities on Biscayne Bay.

Commercial Fishing. The annual commercial marine harvest from Biscayne Bay, the harvest of species dependent on the Bay, and the exvessel values by marine species were obtained from the Florida Fish and

Wildlife Conservation Commission. The annual values reflect the period from 2003 through 2021. These values were entered into the IMPLAN model to obtain the annual economic contribution of Bay-dependent commercial marine harvests to the local, regional, and State economies.

Commercial Shipping and Cruising. Due to budget limitations, the scope of work associated with this study did not include an original estimation of the economic contribution of Bay and River-related commercial shipping and cruising, as was conducted during the 2005 Biscayne Bay Economic Study. Instead, this updated study relied upon existing studies. The only recent existing study for PortMiami is a 2017 study prepared by Martin Associates that provides information regarding the estimated economic contribution of PortMiami shipping and cruise ship operations in 2016. The 2016 estimates were subsequently updated by Martin Associates to reflect the year 2018. There was no other information available to document the historic contribution of PortMiami shipping and cruise operations after 2004.

There are no existing studies that provide contemporary updates to the economic contribution of the Miami River shipping industry. Instead, a time series of total inbound and outbound short tons of freight are provided for the period 2002 to 2020. This is the only publicly available information regarding the Miami River shipping industry.

Property Values. This updated study includes an additional metric of economic value associated with Biscayne Bay and the Miami River that was not included in the 2005 study. This updated study includes an estimate of the impact of Biscayne Bay and the Miami River on residential property values in Miami-Dade County in 2022. This estimate was obtained using a statistical analysis called “hedonic price analysis.” For this study, the residential market values and property characteristics of individual houses, condominiums, and apartment buildings obtained from the Miami-Dade County Property Appraiser’s office were used to estimate the impact of the Bay and River on the market value of these residences. These values are direct measures of resident willingness-to-pay for the benefits of living on or near the Bay.

1.7 Report Organization

This report is organized into an executive summary, eight sections and four appendices. Section 1.0 is the introduction which includes the project background, project objectives, study areas, study period, definitions, overall methodology, and report organization. Section 2.0 presents the data, methods, and results for estimating the economic contribution of Biscayne Bay-dependent recreation in 2022. Section 3.0 presents the historic contribution of Biscayne Bay-dependent recreation from 1980 to 2022. Section 4.0 presents the data, methods, and results for estimating the economic contribution of Biscayne Bay-dependent commercial fishing in 2021, and from 1980 to 2020.

Section 5.0 presents the results for the Miami-Dade County shipping and cruising industry. Section 6.0 presents the data, methods, and results for estimating the contribution of Biscayne Bay and the Miami River to residential property values. Section 7.0 presents the conclusions of this study in terms of the uses and economic contribution of Biscayne Bay and the Miami River. Section 8.0 provides the bibliography of documents referenced in this report. The four appendices provide the recreation survey instruments.

2. Biscayne Bay-Dependent Recreation in 2022

This Section presents the estimated annual economic contributions of Biscayne Bay to Miami-Dade County, southeast Florida, and Florida as it was used for recreation in 2022. The data and methods used to obtain these estimates are also provided. Biscayne Bay is used for a wide variety of recreational activities. The recreational activities are listed as follows:

Recreation Activities on Biscayne Bay	
1. Fishing from Shore	13. Windsurfing
2. Fishing from Boat	14. Kite Sailing
3. Snorkeling from Shore	15. Personal Watercraft Boating
4. Snorkeling from Boat	16. Paddleboarding
5. Scuba Diving from Shore	17. Sailing
6. Scuba Diving from Boat	18. Canoeing / Kayaking
7. Swimming from Shore	19. Viewing the Bay from Shore (including while dining, shopping, jogging, strolling, sightseeing, bird watching, and/or exercising)
8. Swimming from Boat	
9. Boating for Pleasure/Partying	20. Sunset Cruise
10. Sightseeing/Birdwatching from Boat	21. Picnicking on Biscayne Bay
11. Water-skiing	22. Participating in Biscayne Bay Cleanup Event
12. Parasailing	

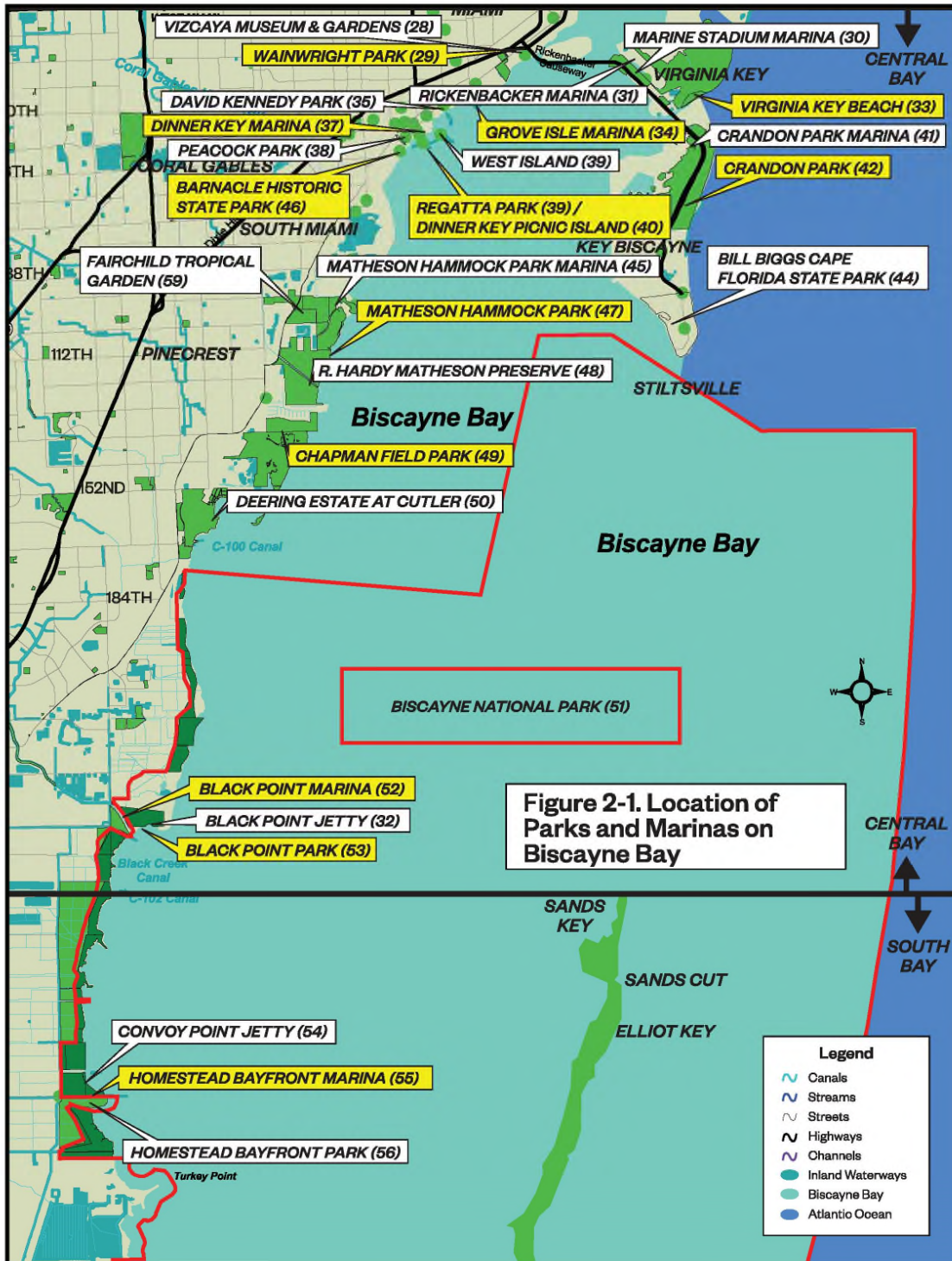
Biscayne Bay is accessible through many parks, marinas, boat ramps and private docks. The locations of the parks and marinas along the Bay and the Miami River are provided in **Figure 2-1** which is presented in two pages, each covering the northern and southern Bay and shows the location of the Miami River just south of downtown Miami.

There is no system that counts the number of persons entering the Bay or participating in activities on or near the Bay. Therefore, the use intensity and economic contribution of Bay-related recreation was estimated using survey research.

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 and to focus only on Biscayne Bay and not the nearby Atlantic Ocean. These 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.

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.

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



All respondents were at least 18 years of age as required for these surveys. The surveys were administered in English and Spanish. While there are other languages spoken among visitors and residents, these are the most predominant and provided sufficient survey data to successfully meet the purposes of the surveys.

The purposes of the General Survey and the Biscayne Bay User Survey were 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 Bay recreational use and expenditures must have taken place within the past 12 months from the time the survey is completed. There were two survey periods, Summer/Fall 2022, and Winter/Spring 2023. Because there were two survey periods, the information collected during these surveys are records of recreation that represent 12-month periods extending from August 2021 to April 2023. Because most of the responses reflect the respondents' annual recreational behavior during the period from January 2022 to April 2023, the results of this study are said to represent the year 2022 for brevity.

From the survey responses, the number of person-days of Biscayne Bay recreational use by activity for 2022 was estimated. The total itemized expenditures made by these recreators to participate in each activity in 2022 were also estimated using the survey responses. The IMPLAN economic input-output models for Miami-Dade County, southeast Florida and State of Florida were used to convert the total itemized expenditures for 2022 into the direct, indirect, and induced output, income, employment, and tax revenue 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 Survey were intercept surveys where survey researchers were stationed in areas where visitors, residents, and Bay users were likely to be. People who met the survey criteria were asked to participate in an interview at that time. For example, a visitor was administered the General Survey if he/she was a visitor to Miami-Dade County, was leaving the county before noon the next day, was at least 18 years of age, and agreed to be interviewed. The survey researcher asked the respondent questions from the survey instrument and entered the answers directly into a portable computer from which the data were uploaded for further evaluation.

Mars Research, Inc. was the survey research firm that recruited, trained, and managed the survey researchers; developed the survey software; obtained access to Miami International Airport; and worked with Hazen to ensure high quality completed surveys. All survey researchers were local to the area and many were fluent in both English and Spanish.

Prior to entering the interview site, the survey researcher must decide whether to administer the General Survey or the Bay User Survey and that same survey must be administered until the survey researcher leaves the interview site. This process minimizes sampling bias in the General Survey where one part of the population is over surveyed. For example, if the survey researcher is administering the General Survey and finds out from the respondent that he/she used the Bay in the past 12 months, the researcher might be tempted to switch to the Bay User Survey instead of completing the General Survey. The result would be that the General Survey would oversample those who do not use the Bay and the proportion of the sample who used the Bay for recreation would be underestimated. Likewise, the survey researchers were instructed not to complete the General Survey for anyone who had also just completed a Biscayne Bay User Survey to avoid sampling bias in the General Survey toward those who use the Bay.

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 each of the Bay access sites, and a comparison of total days spent on the Bay to the sum of the days spent by recreation activity were used to ensure multiple activities in one day were counted as one day and not multiple days. Also, asking the respondent to indicate which Bay and River access sites they visited over the past 12 months using the map provided (**Figure 2-1**) oriented the respondent to only answer questions related to their activities on the Bay and River, and not at other locations such as the beaches along the Atlantic Ocean. Overall, the completed surveys were of high quality in terms of the consistency of responses among the questions and the likelihood that the respondent was only referring to their activities on the Bay and River.

2.1 Biscayne Bay Users Survey

The Biscayne Bay Users Survey of residents and visitors was implemented to collect information regarding the types of recreational activities, the number of days by primary recreation activity, and the itemized expenditures associated with these activities. The intercept survey was conducted over two seasons, the Summer/Fall season, and the Winter/Spring season. These two survey periods provided a method to capture any differences in the uses of the Bay from season to season and allowed the project team to have sufficient time to make any necessary adjustments in survey research effort at the interview sites to obtain representative samples. The Summer/Fall survey was conducted from July 30 through September 25, 2022. The Winter/Spring survey was conducted from January 7 through April 15, 2023.

There are two survey instruments for this survey: one for residents and one for visitors. 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, expenditures on the last day spent on the Bay, and socioeconomic characteristics of the respondent. The **Biscayne Bay User Survey instrument is provided in Appendix A for residents and Appendix B for visitors.**

A summary of the number of completed Biscayne Bay User surveys is provided in **Table 2-1**. There are 554 completed resident surveys and 503 completed visitor surveys.

Table 2-1 - Number of Completed Biscayne Bay User Surveys

Survey Type	Summer / Fall Survey July 30 to Sept. 25, 2022	Winter / Spring Survey January 7 to April 15, 2023	Total
Residents	280	274	554
Visitors	243	260	503

All public access points to the Bay were included as an interview site and site permissions were obtained. The number of persons intercepted during the Biscayne Bay Users Survey by interview site is provided in

Table 2-2.² The survey response rate and the percent of completed surveys at each interview site are provided in **Table 2-3**. The percentage of eligible persons who agreed to be interviewed among all sites was 29 percent or about one out of three people. This response rate and the distribution of completed surveys among the sites (Column 5 of **Table 2-3**) provides a representative sample of Biscayne Bay recreational users at a given point in time.

Table 2-2 - Number of Persons Intercepted During Biscayne Bay Users Survey by Interview Site

Interview Site	Doesn't Use Bay	Refusal	Language Barrier	Too Young	Resident Surveyed	Visitor Surveyed
Alice Wainwright Park	0	20	5	1	7	1
Bayfront Park	12	764	45	2	71	212
Bayside Marketplace	0	4	0	0	0	2
Bill Baggs Cape Florida State Park	4	148	54	3	34	37
Black Point Park and Marina	3	182	6	0	29	4
Crandon Park	0	24	3	0	9	3
Dinner Key Marina	2	51	4	0	33	4
Doral Library	1	1	0	0	0	0
E. Albert Pallot Park	0	24	0	0	10	5
Gerry Curtis Park (Miami River)	0	4	0	0	0	0
Greynolds Park	0	16	2	0	4	1
Haulover Park and Bill Bird Marina	2	93	5	0	21	13
Homestead Bayfront Park and Marina	3	22	5	0	19	6
Jose Marti Park (Miami River)	3	36	17	1	23	4
Kennedy Park	2	60	7	5	45	5
Lake Stevens Park	0	0	0	0	0	0
Legion Park	1	15	2	0	12	1
Lummus Park (Miami River)	12	20	5	0	5	6
Lummus Park (South Beach)	1	243	18	0	13	61
Magnolia (Stearns)	0	6	1	0	3	2
Margaret Pace Park	2	104	9	0	14	8
Matheson Hammock Park	0	63	7	1	18	12
Maurice A. Ferre' Park	0	6	0	0	0	0
Maurice Gibb Memorial Park	0	22	2	0	1	1
Miamarina Marina At Bayside	2	202	12	3	21	22
Miami International Airport	5	0	1	0	0	21

² Hazen and Sawyer sincerely thanks the site owners who allowed the survey researchers to conduct voluntary interviews at their place of business. The table cited in this paragraph lists the sites whose owners' provided permission.

Table 2-2 - Number of Persons Intercepted During Biscayne Bay Users Survey by Interview Site

Interview Site	Doesn't Use Bay	Refusal	Language Barrier	Too Young	Resident Surveyed	Visitor Surveyed
Morningside Park	1	44	2	0	18	2
North Dade Regional Library	1	22	0	0	19	4
Oleta River State Park	2	102	10	0	37	18
Peacock Park / Myers Park	0	4	0	0	6	1
Pelican Harbor Marina	0	4	2	0	2	0
Perez Art Museum Miami	3	41	5	1	13	8
Phillip and Patricia Frost Museum of Science	1	62	7	0	26	10
Rickenbacker Causeway Beaches	0	38	3	0	17	5
Robert is Here Fruit Stand near Everglades National Park	0	45	0	0	3	0
Sewell Park (Miami River)	0	0	0	0	12	1
South Pointe Park	1	17	11	5	5	2
Ultra Music Festival	0	26	2	0	2	15
Virginia Key Beach	0	12	4	1	2	5
Watson Island	0	1	0	0	0	0
Wynwood Walls	0	45	0	0	0	1
Total	64	2,593	256	23	554	503

Table 2-3 - Number of Persons Surveyed, Response Rate and Percent Surveyed at Each Interview Site - Biscayne Bay User Survey

Interview Site	Surveyed and Refusals	Total Surveyed	% Response Rate	% Surveyed at Site
(1)	(2)	(3)	(4) = (3) / (2)	(5) = (3) / 1057
Alice Wainwright Park	28	8	29%	0.76%
Bayfront Park	1,047	283	27%	26.77%
Bayside Marketplace	6	2	33%	0.19%
Bill Baggs Cape Florida State Park	219	71	32%	6.72%
Black Point Park and Marina	215	33	15%	3.12%
Crandon Park	36	12	33%	1.14%
Dinner Key Marina	88	37	42%	3.50%
Doral Library	1	0	0%	0.00%
E. Albert Pallot	39	15	38%	1.42%
Gerry Curtis (Miami River)	4	0	0%	0.00%
Greynolds Park	21	5	24%	0.47%

Table 2-3 - Number of Persons Surveyed, Response Rate and Percent Surveyed at Each Interview Site - Biscayne Bay User Survey

Interview Site	Surveyed and Refusals	Total Surveyed	% Response Rate	% Surveyed at Site
(1)	(2)	(3)	(4) = (3) / (2)	(5) = (3) / 1057
Haulover Park and Bill Bird Marina	127	34	27%	3.21%
Homestead Bayfront Park and Marina	47	25	53%	2.37%
Jose Marti Park (Miami River)	63	27	43%	2.55%
Kennedy Park	110	50	45%	4.73%
Legion Park	28	13	46%	1.23%
Lummus Park (Miami River)	31	11	35%	1.04%
Lummus Park (South Beach)	317	74	23%	7.00%
Magnolia (Stearns) Park	11	5	45%	0.47%
Margaret Pace Park	126	22	17%	2.08%
Matheson Hammock Park	93	30	32%	2.84%
Maurice A. Ferre' Park	6	0	0%	0.00%
Maurice Gibb Memorial Park	24	2	8%	0.19%
Miamarina Marina At Bayside	245	43	18%	4.07%
Miami International Airport	21	21	100%	1.99%
Morningside Park	64	20	31%	1.89%
North Dade Regional Library	45	23	51%	2.18%
Oleta River State Park	157	55	35%	5.20%
Peacock Park / Myers Park	11	7	64%	0.66%
Pelican Harbor Marina	6	2	33%	0.19%
Perez Art Museum Miami	62	21	34%	1.99%
Phillip and Patricia Frost Museum of Science	98	36	37%	3.41%
Rickenbacker Causeway Beaches	60	22	37%	2.08%
Robert is Here Fruit Stand (near Everglades National Park)	48	3	6%	0.28%
Sewell Park (Miami River)	13	13	100%	1.23%
South Pointe Park	24	7	29%	0.66%
Ultra Music Festival	43	17	40%	1.61%
Virginia Key Beach	19	7	37%	0.66%
Watson Island	1	0	0%	0.00%
Wynwood Walls	46	1	2%	0.09%
Total	3,650	1,057	29%	100.00%

The distribution of completed surveys among the sites listed in the two tables above represents the concentration of residents and visitors at these locations. For example, the concentration of people at Alice Wainwright Park on the western side of the Bay is much lower than that at Bayfront Park on the eastern side of the Bay. Even though the survey researchers spent time at all the survey sites, more encounters with residents and visitors were had at the sites that have the largest percentage of completed surveys.

2.2 General Intercept Survey

The General Intercept Survey was used to collect information needed to estimate the proportion of all Miami-Dade County visitors and the proportion of all Miami-Dade County residents who used Biscayne Bay for recreation during the previous 12 months. These proportions were needed to infer the Bay-related recreational user days and expenditure responses of visitors and residents obtained from the Biscayne Bay Users Survey to the population of visitors and residents in Miami-Dade County. General survey respondents who did not use the Bay in the past 12 months were asked why they did not use the Bay.

Appendices C and D provide the General Survey instrument for residents and visitors, respectively.

The General Intercept Survey was conducted during the same two time periods as the Biscayne Bay User Survey. A summary of the number of completed General Intercept Surveys is provided in **Table 2-4**. There are 303 completed General Intercept Surveys of visitors and 278 completed General Intercept Surveys of residents. Initially, 302 completed resident surveys were counted but it was found that 24 of them had residence zip codes that referred to areas outside of Miami-Dade County so their responses were removed from the analysis.

Table 2-4 - Number of Completed General Intercept Surveys

Survey Type	Summer Survey August 5 to October 28, 2022	Winter / Spring Survey January 13 to March 26, 2023	Total
General Survey – Visitors	108	195	303
General Survey – Residents	120	158	278

The interview sites were chosen to obtain representative samples of general visitors and general residents and site permissions were obtained. Because a variety of visitors who participate in all types of activities are concentrated at the Miami International Airport,³ this site was chosen as the key location for the General Survey of visitors. The survey researchers were instructed to obtain about one-half of their completed visitor surveys from the airport and the rest from a variety of popular visitor venues. This goal was achieved. While at the airport, residents were also surveyed if they were encountered and agreed to be surveyed. A tally of the number of surveys attempted and completed, the percent response rate and the percent surveyed at each interview site is provided in **Table 2-5**.⁴ The overall survey response rate was 33 percent, which is expected to provide a representative sample of all visitors to and residents of Miami-Dade County.

³ Hazen and Sawyer would like to thank the Miami International Airport for their permission to survey passengers in the airline terminals. The areas available to the survey researchers appeared to provide sufficient access to visitors from all over the world. The success of this survey is due to this site permission.

⁴ Hazen and Sawyer sincerely thanks the site owners who allowed the survey researchers to conduct voluntary interviews at their place of business. The table cited in this paragraph lists the sites whose owners’ provided permission.

Table 2-5 - Number of Persons Intercepted, Percentage Response Rate, and Percentage Surveyed During General Survey by Interview Site

Interview Site	Refusal	Language Barrier	Visitors Surveyed	Residents Surveyed	Surveyed and Refusals	% Response Rate	% Surveyed at Site
(1)	(2)	(3)	(4)	(5)	(6) = (2) + (4) + (5)	(7) = [(4) + (5)] / (6)	(8) = [(4) + (5)] / (303 + 278)
Bayfront Park	39	4	20	3	62	37%	4.0%
Biscayne Shores and Gardens Park	1	1	0	2	3	67%	0.3%
Black Point Park and Marina	0	0	1	1	2	100%	0.3%
California Club Library	2	0	0	7	9	78%	1.2%
Doral Library	20	2	0	3	23	13%	0.5%
Doral Library / Downtown Doral Park	32	0	4	10	46	30%	2.4%
E. Albert Pallot Park	5	0	0	1	6	17%	0.2%
Homestead Air Reserve Park	4	1	0	2	6	33%	0.3%
International Mall Library	15	1	0	4	19	21%	0.7%
Kendall Lakes Library	30	3	0	12	42	29%	2.1%
Lake Stevens Park	1	1	0	1	2	50%	0.2%
Lummus Park (South Beach)	38	3	11	3	52	27%	2.4%
Matheson Hammock Park	12	1	0	6	18	33%	1.0%
Maurice A. Ferre' Park	15	3	2	5	22	32%	1.2%
Miami International Airport, terminals	192	5	170	76	438	56%	42.3%
Miami Springs Library	5	1	1	4	10	50%	0.9%
Northeast Dade - Aventura Library	15	0	0	7	22	32%	1.2%
Pelican Harbor Marina	2	0	0	1	3	33%	0.2%
Perez Art Museum Miami	16	1	4	4	24	33%	1.4%
Phillip and Patricia Frost Museum of Science	69	5	25	21	115	40%	7.9%
Robert is Here Fruit Stand (near Everglades National Park)	141	4	14	40	195	28%	9.3%
Ultra Music Festival	2	0	19	5	26	92%	4.1%
Virginia Key Beach	23	1	2	12	37	38%	2.4%
Westwind Lakes Park	6	3	0	0	6	0%	0.0%
Wynwood Walls	181	9	16	32	229	21%	8.3%
Zoo Miami	317	16	14	16	347	9%	5.2%
Total	1,183	65	303	278	1,764	33%	100.0%

The percentage of visitors surveyed by interview site and percentage of residents surveyed by interview site are provided in **Table 2-6**.

Of the 303 completed General Surveys of visitors and 278 completed General Surveys of residents (581 total completed surveys), 42 percent were completed at Miami International Airport. Of the visitor surveys, 56 percent were completed at the airport and of the resident surveys, 27 percent were completed at the airport. The distribution of visitor General Surveys across the County and at the airport are considered to provide a representative sample of visitors.

Table 2-6 - Percentage of Completed General Surveys by Interview Site

Interview Site	% Visitors Surveyed	% Residents Surveyed
(1)	(2)	(3)
Bayfront Park	6.6%	1.1%
Biscayne Shores and Gardens Park	0.0%	0.7%
Black Point Park and Marina	0.3%	0.4%
California Club Library	0.0%	2.5%
Doral Library	0.0%	1.1%
Doral Library / Downtown Doral Park	1.3%	3.6%
E. Albert Pallot Park	0.0%	0.4%
Homestead Air Reserve Park	0.0%	0.7%
International Mall Library	0.0%	1.4%
Kendall Lakes Library	0.0%	4.3%
Lake Stevens Park	0.0%	0.4%
Lummus Park (South Beach)	3.6%	1.1%
Matheson Hammock Park	0.0%	2.2%
Maurice A. Ferre' Park	0.7%	1.8%
Miami International Airport	56.1%	27.3%
Miami Springs Library	0.3%	1.4%
Northeast Dade - Aventura Library	0.0%	2.5%
Pelican Harbor Marina	0.0%	0.4%
Perez Art Museum Miami	1.3%	1.4%
Phillip and Patricia Frost Museum of Science	8.3%	7.6%
Robert is Here Fruit Stand (near Everglades National Park)	4.6%	14.4%
Ultra Music Festival	6.3%	1.8%
Virginia Key Beach	0.7%	4.3%
Westwind Lakes Park	0.0%	0.0%
Wynwood Walls	5.3%	11.5%
Zoo Miami	4.6%	5.8%
Total	100.0%	100.0%

A representative distribution of residents across the County was achieved by surveying at County libraries in areas where other publicly accessible interview sites were not available. Five of these libraries, located in the northern, central, and western areas of the County, were the interview sites of 17 percent of the completed resident surveys.

The sample of survey residents closely represents the population of residents by resident location within the county as demonstrated in **Table 2-7**. This table compares the percentage of surveyed residents by resident zip code to the percentage of all residents living in the northeast, northwest, southeast and southwest quadrants of the County. There is no more than a four-percentage point difference between the percentage of the surveyed residents and the percentage of the County population living in each of the County’s quadrants. The General Survey of residents also provides a good representation of the population distribution of Hispanic, Latino, or of Spanish Origin residents in the County as demonstrated in **Table 2-8** where 69 percent of the County residents and the resident sample are of Hispanic, Latino, or of Spanish origin.

However, the completed surveys represent residents who are at least 18 years old and who move about the County and/or travel through Miami International Airport. As discussed later in this section, the proportion of residents who use the Bay for recreation was adjusted to reflect all residents: those who move about the county, those who travel, and those who tend to stay at or near home. It is this latter population that is not represented by the General Survey of residents.

Table 2-7 - Location of General Survey Resident Respondents and Population of Miami-Dade County Residents

Location	% of Completed Surveys	% of County Population
Northeast	27%	23%
Northwest	25%	28%
Southeast	24%	22%
Southwest	24%	27%
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.

Table 2-8 - Percentage of Hispanic, Latino, or of Spanish Origin - Miami-Dade County Residents and General Survey of Resident Respondents

Hispanic, Latino or of Spanish origin	Miami-Dade County Population		Respondents to General Survey of Residents	
	2022 (a)	Percentage	Number	Percentage
Yes	1,844,948	69%	192	69%
No	828,889	31%	85	31%
I don't know	0	0%	1	0.36%
Total	2,673,837	100%	278	100%

(a) US Census, Quick Facts, Miami-Dade County, 2022

The distribution of household income of the respondents to the General Survey of residents is provided in **Table 2-9**. Due to the income ranges that could be chosen by the respondents, the median household income is in the range of \$50,000 to \$100,000. According to the U.S. Census, the median household income of residents in Miami-Dade County representing the years 2017 to 2021 in 2021 dollars is \$58,000, which is consistent with the respondent data.

While it is not possible to calculate an exact average of respondent incomes due to the ranges used, taking the midpoint of the ranges provides an estimated average annual household income of \$79,000. The estimated 2023 average annual household income in Miami-Dade County is \$90,000 according to MiamiMatters.org sponsored by the Health Council of South Florida. This income value is consistent with the resident responses provided in the table.

Table 2-9 - Annual Household Income of Respondents to the General Survey of Residents

Annual Household Income Range	Number of Respondents	Percent of Respondents
A - Less than \$50,000	83	37%
B - \$50,001 to \$100,000	80	36%
C - \$100,001 to \$150,000	34	15%
D - \$150,001 to \$200,000	16	7%
E - \$200,001 or more	10	4%
Sub-total	223	100%
Don't know	35	
Refused	20	
Total	278	
Average Income of Respondents to General Resident Survey, estimate		\$79,036
Median Household Income of Respondents to General Resident Survey, range		B - \$50,001 to \$100,000

2.3 Biscayne Bay-Related Recreation by Visitors to Miami-Dade County in 2022

The responses to the General Survey of visitors and the Bay User Survey of visitors were applied to the population of Miami-Dade County visitors. This population as measured by the number of visitor-trips in 2021 was estimated by the Greater Miami Convention and Visitors Bureau. A visitor-trip is one person taking one trip to Miami-Dade County. A trip can be for any number of days including a day trip. The numbers of visitor trips by overnight visitors and by day visitors are provided in **Table 2-10A**. In 2021, an estimated 24.2 million visitor-trips were taken to Miami-Dade County of which 15.9 million were overnight visitors and 8.3 million were day visitors.

Table 2-10A - Number of Visitor-Trips in 2021 Reported by the Greater Miami Convention and Visitors Bureau (a)

Origin	Overnight Visitors	Day Visitors	Total
Florida	3,450,000	3,508,000	6,958,000
United States outside of Florida	8,719,000	3,355,000	12,074,000
International	3,747,000	1,442,000	5,189,000
Total	15,916,000	8,305,000	24,221,000

(a) Source: Greater Miami Convention and Visitors Bureau, Greater Miami & Miami Beach 2021 Visitor Industry Overview, pages 8 and 9.

The Greater Miami Convention and Visitors Bureau (GMCVB) does not estimate the number of visitors from Broward County, which is just north of Miami-Dade County. Therefore, the 24.2 million visitors to the County in 2021 is an underestimate of the number of visitors to the County. Based on the results of the Biscayne Bay User Survey of visitors conducted during this study, the exclusion of visitors from Broward County may underestimate the number of visitor-trips to Miami-Dade County by about 14 percent, or 3.9 million visitor-trips.

This estimate was used to increase the number of visitor-days reported in **Table 2-10A** from 24.2 million visitor-trips to 28.1 million visitor-trips. This adjustment is provided in **Table 2-10B**. The percentage of visitors from Broward County obtained from the General Survey of visitors would have been more representative of the percentage of all visitors from Broward County. Unfortunately, the county of origin was not consistently asked of or answered by the respondents so there is not a study database of general visitor origin by Florida county. More effort was put into obtaining the origin Florida county during the user survey of visitors and this survey has such a database.

Table 2-10B Using the Results of the General Survey of Visitors to Adjust the Number of Visitor-Trips reported by the GMCVB to include Visitors from Broward County

Row Number	Metric	Value
(1)	Proportion of Florida Visitors From Broward County (a)	0.610
(2)	Proportion of US Visitors from Florida (a)	0.340
(3)	Proportion of US and International Visitors from US (a)	0.670
(4) = (1) x (2) x (3)	Proportion of All Visitors from Broward County	0.139
(5)	Total Number of Visitor-Trips Reported by the GMCVB in 2021 (Excludes Visitors from Broward County) (b)	24,221,000
(6) = (5) / [(1 - (4))]	Adjusted Estimate of the Number of Visitor-Trips to Miami-Dade County in 2021 including Broward County	28,129,871

(a) From the responses to the General Survey of visitors.

(b) From Table 2-10A

The numbers of visitor respondents by origin and type of stay (overnight or day trip) are provided in **Table 2-11**. Of the 303 completed surveys, 265 represent overnight visitor respondents and 38 percent represent day visitors.

Table 2-11 - Number of Respondents to General Survey of Visitors by Overnight Stay and Origin

Origin	Overnight Visitors	Day Visitors	Total
Florida	42	32	74
United States outside of Florida	144	4	148
International	79	2	81
Total	265	38	303

Using the visitor data from the GMCVB provided in **Table 2-10A**, the proportions of all visitors to Miami-Dade County are provided in **Table 2-12**. Of all visitors to the County, 14 percent (0.14 proportion) were overnight visitors from Florida and another 14 percent were day visitors from Florida. Thirty-six percent and 14 percent were overnight and day visitors, respectively, from other states in the country. Fifteen percent and six percent were international overnight and day visitors, respectively.

Table 2-12 - Proportions of All Visitor-Trips in 2021 Reported by the Greater Miami Convention and Visitors Bureau (a)

Origin	Overnight Visitors	Day Visitors	Total
Florida	0.14	0.14	
Other Domestic	0.36	0.14	
International	0.15	0.06	
Total	0.66	0.34	1.00

(a) Source: Greater Miami Convention and Visitors Bureau, Greater Miami & Miami Beach 2021 Visitor Industry Overview, pages 8 and 9.

By comparison, **Table 2-13** provides the proportions of all visitor respondents to the General Survey by origin and trip type. The Florida proportions between overnight and day visitors are similar for the population and the survey respondents, indicating that the responses for Florida are a good representation for that of the Florida population. However, when comparing the United States and international origins between the population and the respondents, the proportion of day visitors is underrepresented in the General Survey of residents. The impact of this difference on the inferences implied by the survey responses was evaluated and found not to be of concern.

Table 2-13 - Proportions of All Visitor-Trips by General Survey Visitor Respondents (a)

Origin	Overnight Visitors	Day Visitors	Total
Florida	0.14	0.11	
Other Domestic	0.48	0.01	
International	0.26	0.01	
Total	0.87	0.13	1.00

(a) Source: General Survey of visitor responses

The most important statistic from the General Survey was evaluated to assess whether this representation of the sample will impact the visitor results for this study. This statistic is the proportion of General Survey visitor respondents who participated in Bay-related recreation activities by origin and trip type and the results are provided in **Table 2-14**.

Table 2-14 - Proportions of Respondents who Participated in Bay-Related Recreation in Past 12 Months by Origin and Trip Type from the General Survey of Visitors

Origin	Overnight Visitors	Day Visitors
Florida	0.52	0.56
United States Outside of Florida	0.51	0.00
International	0.59	0.00

For four of the six categories represented in **Table 2-14**, the proportions are close in value ranging from 0.51 to 0.59. The lack of completed surveys of the US and international day visitors resulted in their proportions being 0.0 percent, indicating that there is not enough data to estimate these proportions. The average proportion of residents using the Bay for recreation using all 303 responses weighed evenly (straight average) is 0.53, which is the same as that for the four individual categories of visitors in **Table 2-14**.

Because the issue is the lack of completed surveys for two of the six categories in **Table 2-14**, it was assumed that the proportion for these two categories is the same as the proportions of the other four categories and the 0.53 value was used as the proportion of visitors who used the Bay for recreation in the past 12 months. On this basis, it was decided not to weight any of the respondent answers to obtain the needed statistics from the data, including the proportion of respondents who participated in each of the recreation activities and the average visitor nights per trip.

Further verification regarding the representative sample of visitors surveyed is provided in **Table 2-15** which compares the proportion of visitors by accommodation as estimated by the GMCVB and the proportion as estimated from the responses to the General Survey of visitors. The distribution of respondents to the General Survey is similar to the distribution of visitors to the County.

Table 2-15 - Accommodations in 2021 Reported by the Greater Miami Convention and Visitors Bureau Compared to General Survey of Visitors

Accommodation	Percent of Visitor-Trips	
	County Visitors (a)	From General Visitor Survey
(1)	(2)	(3)
Hotels/Motels/Resort/Spa	59%	70%
Home of Family and Friends	29%	20%
All Other Accommodations including home sharing rentals	12%	10%
Total	100%	100%

(a) Source: Greater Miami Convention and Visitors Bureau, Greater Miami & Miami Beach 2021 Visitor Industry Overview, pages 18, 28 and 34.

The calculation of the total number of person-trips to Miami-Dade County when Biscayne Bay was used for recreation is provided in **Table 2-16**. The total number of person-trips to the county, 28,130,000, as provided in **Table 2-16**, was multiplied by the “Proportion of Person-Trips Taken By Visitors Who Used Bay for Recreation Other than Viewing the Bay from Shore” of 0.25 taken from the responses to the General Visitor Survey. This calculation provides an estimate of the “Number of Person-Trips When Visitors Used the Bay For Recreation Activities Other than Viewing Bay from Shore”. This estimate is 7.2 million person-trips in 2022.

Similarly, the total person trips was multiplied by the “Proportion of Person-Trips Taken By Visitors Who Did No Other Bay-Related Activity Except Viewing the Bay from Shore” of 0.28 to obtain an estimate of the number of person trips taken by those who only viewed the Bay from shore. The estimate is 7.8 million person-trips.

The total number of person-trips by visitors to Miami-Dade County when Biscayne Bay was used for recreation in 2022 is estimated to be 15.0 million person-trips.

Table 2-16 - Person-Trips of Visitors To Miami-Dade County Who Used Biscayne Bay for Recreation in 2022

Item	Total
(1) Total Person Trips to County - All Visitors	28,130,000
(2) Proportion of Person Trips Taken By Visitors Who Used Bay for Recreation Other than Viewing the Bay from Shore (a)	0.25
(3) Number of Person Trips When Visitor Used the Bay For Activities Other than Viewing Bay from Shore (3) = (1) x (2)	7,149,000
(4) Proportion of Person Trips Taken By Visitors Who Did No Other Bay-Related Activity Except Viewing the Bay from Shore while dining, shopping, jogging, strolling (a)	0.28
(5) Number of Person Trips When Visitor Used the Bay For No Activities Except Viewing Bay from Shore (5) = (1) x (4)	7,798,000
(6) Number of Person Trips When Visitor Used the Bay for Recreation (6) = (3) + (5)	14,947,000

(a) From General Visitor Survey. Number of yes answers to Questions 20 with or without those respondents who only Viewed the Bay from Shore (In the past 12 months, have you participated in any of the Biscayne Bay-related activities listed on this card?) divided by total number of respondents in the sample (303).

The total person-days Bay-using visitors spent visiting the County in 2022 was calculated as described in **Table 2-17**. The number of person-trips when recreation activities took place on Biscayne Bay was multiplied by the average nights per trip of visitor Bay users obtained from the responses to the General Survey of visitors. This average is 8.92 nights per trip. The total number of person-days Bay-using visitors spent visiting Miami-Dade County in 2022 was 63.8 million for those who participated in Bay-related recreation activities other than only viewing the Bay from shore. Visitors who only viewed the Bay from shore during their trip spent 69.6 million person-days in Miami-Dade County.

Table 2-17 - Calculation of Total Person-Days Bay-Using Visitors Spent Visiting Miami-Dade County in Year 2022

Row	Description of Information	Activities other than viewing Bay from Shore	Viewing Bay from Shore Only
(1)	Total Visitor Person-Trips when Biscayne Bay was Used in 2022 (a)	7,149,000	7,798,000
(2)	Average Nights per Trip for visitor Bay users (b)	8.92	8.92
(3)	Total Person-Days Bay-Using Visitors Spent Visiting the County in Year 2022, (3) = (1) x (2)	63,765,000	69,562,000

(a) From Table 2-16

(b) From General Survey of visitors - 161 visitor respondents who said they participated in Biscayne Bay recreation in past 12 months.

Using the responses of the visitors who completed the Biscayne Bay User Survey, the proportion of total days spent in the county that was spent on each activity was calculated. The total days all visitor respondents spent in the county in 2022 was 7,980 for those who participated in at least one Bay-related recreation activity other than viewing the Bay from shore and 1,945 for those visitors who only viewed the Bay from shore. The number of days these respondents spent in each recreation activity was calculated from the Biscayne Bay User Survey responses and divided by the total number of days these respondents spent in the county (7,980 or 1,945). These calculations are provided in **Table 2-18**, Columns 2 and 3.

Table 2-18 - Number of Visitor Person-Days Spent Participating in Biscayne Bay-Related Activities, 2022

Activity	No. of Days Respondents Participated (a)	Proportion of All Visiting Days (b)	No. of Person Days - Population (c)
(1)	(2)	(3) = (2) / 7,980 or 1,945	(4) = (3) x 63.8 m or 69.6 m
Fishing from Shore	75.0	0.94%	599,293
Fishing from Boat	72.0	0.90%	575,321
Snorkeling from Shore	124.0	1.55%	990,831
Snorkeling from Boat	76.0	0.95%	607,283
Scuba Diving from Shore	1.0	0.01%	7,991
Scuba Diving from Boat	29.0	0.36%	231,727
Swimming from Shore	722.5	9.05%	5,773,187
Swimming from Boat	182.5	2.29%	1,458,279
Boating for Pleasure/Partying	115.5	1.45%	922,911
Sightseeing/Birdwatching from Boat	223.3	2.80%	1,783,895
Water-skiing	6.0	0.08%	47,943
Parasailing	4.0	0.05%	31,962
Windsurfing	8.0	0.10%	63,925
Kite Sailing	0.0	0.00%	0
Paddleboarding	73.3	0.92%	585,309
Personal Watercraft Boating	80.5	1.01%	643,241
Sailing	13.0	0.16%	103,877
Canoeing / Kayaking	102.3	1.28%	817,036
<i>Viewing the Bay from Shore (By Participants in Other Activities)</i>	<i>1231.0</i>	<i>15.43%</i>	<i>9,836,392</i>
Sunset Cruise	183.5	2.30%	1,466,270
Picnicking on Biscayne Bay	382.0	4.79%	3,052,398
Participating in Biscayne Bay Cleanup Event	1.0	0.01%	7,991
Sub-Total	3705.3	46.43%	29,607,062
Viewing the Bay from Shore (By Those Who Did Not Participate in Other Activities)	1110.0	57.07%	39,698,365
Total	4815.3	48.52%	69,305,427

(a) Of 503 respondents who completed the Biscayne Bay User Survey - Visitors.

(b) For all respondents, except respondents who only Viewed the Bay from Shore, the proportion of Total Visiting Days by Activity equals Total Days by Activity reported by all Bay-using visitor respondents other than Viewing Bay from Shore Only (Questions 12 and 13 of BBUS - Visitors) divided by Total Days Spent in Miami-Dade County in past 12 months by Bay-using visitor respondents other than Viewing Bay from Shore Only (Question 6 of BBUS - Visitors equal to 7,980 days). For those who only Viewed the Bay from Shore, the same equation is used except that only the days corresponding to respondents who only Viewed the Bay from the Shore were used (1,110 days divided by 1,945 days from Question 6).

(c) For all activities except Viewing the Bay from Shore Only, the Number of Person-days Visitors Spent Participating in each Activity is equal to the Total Person-days Bay-Using Visitors (other than Viewing the Bay from Shore only) Spent Visiting the County in Year 2022 (63.8 million person-days from Table 2-17) times the Proportion of Total Visiting Days by Activity (Column 3). For Viewing the Bay from Shore Only, the same equation is used except that the total days visiting the County by Bay-viewing visitors who only viewed the Bay on their trip (69.6 million person-days from Table 2-17) times the proportion of days these visitors viewed the Bay (0.5707) was used to calculate the number of person-days these visitors viewed the Bay from shore.

The number of person-days visitors spent in each recreation activity was calculated as the total number of person-days Bay-using visitors spent in the county times the proportion of these person-days spent in each activity as provided in Column 3 of **Table 2-18**. The results of this calculation are provided in Column 4 of **Table 2-18**.

From these calculations, visitors spent 69.3 million person-days participating in Bay-related recreation activities in 2022 (last row of **Table 2-18**). Of these person-days, 39.7 million were spent viewing the Bay from shore by visitors who participated in no other Bay-related recreation except viewing the Bay from shore. Another 9.8 million person-days were spent viewing the Bay from shore by visitors who participated in other Bay-related recreation activities (see italicized line in **Table 2-18**). An estimated 19.8 million person-days were spent in all other Bay-related recreation activities (29.6 million minus 9.8 million).

The average number of days visitors participated in each activity in the past 12 months for those who participated in that activity is provided in **Table 2-19**.

Table 2-19 - Average Days Visitors Spent Participating in Biscayne Bay Activities in the Past 12 Months for Those Who Participated in the Activity (a)

Activity	Average (Mean)	Sample Size
Fishing from Shore	4.41	17
Fishing from Boat	4.50	16
Snorkeling from Shore	9.54	13
Snorkeling from Boat	8.44	9
Scuba Diving from Shore	1.00	1
Scuba Diving from Boat	7.25	4
Swimming from Shore	5.27	137
Swimming from Boat	5.70	32
Boating for Pleasure/Partying	3.12	37
Sightseeing/Birdwatching from Boat	6.38	35
Water-skiing	1.50	4
Parasailing	1.33	3
Windsurfing	8.00	1
Kite Sailing	N/A	0
Paddleboarding	3.49	21
Personal Watercraft Boating	3.50	23
Sailing	1.86	7
Canoeing / Kayaking	3.30	31
Viewing the Bay from Shore <i>(All)</i>	5.90	397
Sunset Cruise (b)	6.80	27
Picnicking on Biscayne Bay	4.66	82
Participating in Biscayne Bay Cleanup Event	1.00	1

(a) From Biscayne Bay User Survey - Visitors.

(b) The sunset cruise can be either a charter or a private boat.

2.4 Visitor Daily Expenditures to Participate in Biscayne Bay-Related Recreation in 2022

The Biscayne Bay User Survey asked respondents to state the amount of money they spent for Bay-related goods and services on the last day that they used the Bay for recreation. To avoid double-counting expenditures, survey researchers were directed to enter the expenditures under the “predominant” activity in which the respondent participated during that day. The respondent was also asked how many people spent or benefited from those expenditures.

The average itemized visitor expenditures by type of expenditure and recreation activity per person per day are provided in **Table 2-20**. The expenditures for each item were averaged over all those who reported expenditures for that recreation activity, even if some respondents did not spend any money on that item. For example, a visitor fishing the Bay from a motorboat spent, on average, \$194 that day on Bay-related goods and services. Of this amount, \$92 was spent on boat fuel, \$23 was spent on bait, tackle, and ice, \$15 and \$34, respectively, was spent on boat rental and charter boat fees, \$22 was spent on food and beverages at stores and restaurants and bars, and \$8 was spent on other items. This information was obtained from 12 respondents representing 42 people in the fishing parties.

Six of the activities are associated with a lodging expenditure ranging from \$7.67 to \$19.63 per person per day. The lodging expenditure item includes lodging cost for hotels, motels, and other accommodations. The expenditure per night per person is lower than what one would expect to pay for lodging because it is the average expenditure among all respondents, including those who stayed with family or friends and those who were day trippers.

Table 2-20 - Average Itemized Biscayne Bay-Related Expenditures in Miami-Dade County Per Person Per Day by Visitors – 2022 in 2022 dollars

Expenditure Item	Fishing From Motorboat	Fishing From Shore	Dive/ Snorkel From Motorboat	Dive/Snorkel from Shore
Boat fuel	\$92.11	\$0.00	\$1.67	\$0.00
Tackle, bait, and/or ice	\$22.52	\$12.71	\$0.00	\$0.00
Boat Rental	\$14.58	\$0.00	\$33.33	\$15.63
Charter Boat Fee	\$34.17	\$0.00	\$64.10	\$0.00
Equipment Rental	\$0.00	\$6.43	\$11.79	\$75.00
Ramp, Marina, and Parking Fees	\$0.63	\$0.57	\$0.00	\$0.00
Park Entrance Fees	\$2.08	\$2.51	\$0.00	\$0.00
Lodging (per night)	\$0.00	\$0.00	\$0.00	\$15.63
Camping fees (per night)	\$0.00	\$0.00	\$0.00	\$0.00
Food and Beverages – Stores	\$10.91	\$6.43	\$5.13	\$15.63
Food and Beverages – Restaurants/Bars	\$10.08	\$10.00	\$0.00	\$0.00
Auto gas	\$5.00	\$9.29	\$0.00	\$3.75
Auto Rental, Taxi, Bus fares	\$1.92	\$0.00	\$0.00	\$0.00
Shopping and Sundries	\$0.00	\$0.17	\$0.00	\$0.00
Total	\$194.00	\$48.11	\$116.03	\$125.63
People in Party	42	13	24	17
Number of Respondents	12	7	3	4

Table 2-20, continued, Average Itemized Biscayne Bay-Related Expenditures in Miami-Dade County Per Person Per Day by Visitors – 2022 in 2022 dollars

Expenditure Item	Swimming	Boating for birdwatching / pleasure/ partying	Waterski / Parasail / Windsurf / Kite Sail / Paddleboard	Personal Watercraft Boating
Boat fuel	\$1.65	\$5.50	\$0.00	\$11.46
Tackle, bait, and/or ice	\$0.00	\$0.00	\$0.00	\$0.00
Boat Rental	\$28.48	\$23.40	\$0.00	\$95.83
Charter Boat Fee	\$0.14	\$32.80	\$0.00	\$0.00
Equipment Rental	\$3.02	\$0.00	\$61.88	\$30.63
Ramp, Marina, and Parking Fees	\$1.02	\$0.15	\$0.00	\$1.38
Park Entrance Fees	\$1.55	\$0.96	\$1.08	\$0.00
Lodging (per night)	\$18.19	\$11.27	\$0.00	\$0.00
Camping fees (per night)	\$0.37	\$0.00	\$0.00	\$0.00
Food and Beverages – Stores	\$14.81	\$7.50	\$35.42	\$14.08
Food and Beverages – Restaurants/Bars	\$11.07	\$59.80	\$25.83	\$49.44
Auto gas	\$4.41	\$4.89	\$1.25	\$5.33
Auto Rental, Taxi, Bus fares	\$4.93	\$9.28	\$3.33	\$2.08
Shopping and Sundries	\$2.33	\$32.80	\$0.00	\$0.00
Total	\$91.97	\$188.35	\$128.79	\$210.24
People in Party	212	62	12	38
Number of Respondents	91	25	6	12

Table 2-20, continued, Average Itemized Biscayne Bay-Related Expenditures in Miami-Dade County Per Person Per Day by Visitors – 2022 in 2022 dollars

Expenditure Item	Canoe/Kayak/ Sail	Viewing the Bay From Shore / Picnicking	Sunset Cruise
Boat fuel	\$0.00	\$0.00	\$0.19
Tackle, bait, and/or ice	\$0.00	\$0.00	\$0.00
Boat Rental	\$5.38	\$0.64	\$21.04
Charter Boat Fee	\$0.00	\$0.03	\$7.36
Equipment Rental	\$12.00	\$0.00	\$0.00
Ramp, Marina, and Parking Fees	\$0.88	\$2.19	\$0.46
Park Entrance Fees	\$1.04	\$4.37	\$0.17
Lodging (per night)	\$10.75	\$19.63	\$7.67
Camping fees (per night)	\$0.00	\$0.22	\$0.00
Food and Beverages – Stores	\$8.04	\$13.62	\$7.22
Food and Beverages – Restaurants/Bars	\$2.75	\$21.69	\$32.76
Auto gas	\$3.84	\$4.01	\$2.93
Auto Rental, Taxi, Bus fares	\$0.00	\$6.62	\$3.87
Shopping and Sundries	\$9.50	\$7.94	\$8.00
Total	\$54.17	\$82.00	\$91.65
People in Party	48	622	79
Number of Respondents	20	291	20

These expenditures per person per day were multiplied by the number of person-days spent in each activity to obtain an estimate of total visitor expenditures associated with Bay-related recreation in 2022. These total expenditures by activity are presented in **Table 2-21. In 2022, visitors spent about \$5.8 billion on Biscayne Bay recreation-related goods and services other than “big ticket” items to be discussed in the next section.**

Table 2-21 - Total Itemized Biscayne Bay-Related Expenditures in Miami-Dade County by Visitors – 2022 in 2022 dollars

Expenditure Item	Fishing From Motorboat	Fishing From Shore	Dive/ Snorkel From Motorboat	Dive/Snorkel from Shore
Boat fuel	\$52,995,000	\$0	\$1,012,000	\$0
Tackle, bait, and/or ice	\$12,956,000	\$7,620,000	\$0	\$0
Boat Rental	\$8,390,000	\$0	\$20,243,000	\$15,482,000
Charter Boat Fee	\$19,657,000	\$0	\$38,928,000	\$0
Equipment Rental	\$0	\$3,853,000	\$7,163,000	\$74,312,000
Ramp, Marina, and Parking Fees	\$360,000	\$342,000	\$0	\$0
Park Entrance Fees	\$1,199,000	\$1,507,000	\$0	\$0
Lodging (per night)	\$0	\$0	\$0	\$15,482,000
Camping fees (per night)	\$0	\$0	\$0	\$0
Food and Beverages – Stores	\$6,278,000	\$3,853,000	\$3,114,000	\$15,482,000
Food and Beverages – Restaurants/Bars	\$5,801,000	\$5,993,000	\$0	\$0
Auto gas	\$2,877,000	\$5,565,000	\$0	\$3,716,000
Auto Rental, Taxi, Bus fares	\$1,103,000	\$0	\$0	\$0
Shopping and Sundries	\$0	\$103,000	\$0	\$0
Total	\$111,616,000	\$28,836,000	\$70,460,000	\$124,474,000

Expenditure Item	Swimming	Boating for birdwatching / pleasure/ partying	Waterski / Parasail / Windsurf / Kite Sail / Paddleboard	Personal Watercraft Boating
Boat fuel	\$2,404,000	\$14,887,000	\$0	\$7,370,000
Tackle, bait, and/or ice	\$0	\$0	\$0	\$0
Boat Rental	\$41,532,000	\$63,339,000	\$0	\$61,644,000
Charter Boat Fee	\$200,000	\$88,783,000	\$0	\$0
Equipment Rental	\$4,407,000	\$0	\$45,116,000	\$19,699,000
Ramp, Marina, and Parking Fees	\$1,488,000	\$406,000	\$0	\$884,000
Park Entrance Fees	\$11,178,000	\$2,599,000	\$790,000	\$0
Lodging (per night)	\$131,557,000	\$30,497,000	\$0	\$0
Camping fees (per night)	\$2,649,000	\$0	\$0	\$0
Food and Beverages – Stores	\$107,128,000	\$20,301,000	\$25,824,000	\$9,059,000
Food and Beverages – Restaurants/Bars	\$80,049,000	\$161,867,000	\$18,836,000	\$31,805,000
Auto gas	\$31,920,000	\$13,245,000	\$911,000	\$3,431,000
Auto Rental, Taxi, Bus fares	\$35,654,000	\$25,119,000	\$2,430,000	\$1,340,000
Shopping and Sundries	\$16,847,000	\$88,783,000	\$0	\$0
Total	\$467,013,000	\$509,826,000	\$93,907,000	\$135,232,000

Table 2-21, continued, Total Itemized Biscayne Bay-Related Expenditures in Miami-Dade County by Visitors – 2022 in 2022 dollars

Expenditure Item	Canoe/Kayak/ Sail	Viewing the Bay From Shore / Picnicking	Sunset Cruise	Total
Boat fuel	\$0	\$0	\$275,000	\$78,943,000
Tackle, bait, and/or ice	\$0	\$0	\$0	\$20,576,000
Boat Rental	\$4,950,000	\$31,491,000	\$30,847,000	\$277,918,000
Charter Boat Fee	\$0	\$1,447,000	\$10,789,000	\$159,804,000
Equipment Rental	\$11,053,000	\$0	\$0	\$165,603,000
Ramp, Marina, and Parking Fees	\$806,000	\$108,616,000	\$672,000	\$113,574,000
Park Entrance Fees	\$955,000	\$216,361,000	\$244,000	\$234,833,000
Lodging (per night)	\$9,900,000	\$972,198,000	\$11,241,000	\$1,170,875,000
Camping fees (per night)	\$0	\$11,064,000	\$0	\$13,713,000
Food and Beverages – Stores	\$7,406,000	\$674,726,000	\$10,590,000	\$883,761,000
Food and Beverages – Restaurants/Bars	\$2,533,000	\$1,074,546,000	\$48,031,000	\$1,429,461,000
Auto gas	\$3,536,000	\$250,418,000	\$4,290,000	\$319,909,000
Auto Rental, Taxi, Bus fares	\$0	\$327,791,000	\$5,670,000	\$399,107,000
Shopping and Sundries	\$8,749,000	\$393,242,000	\$11,730,000	\$519,454,000
Total	\$49,888,000	\$4,061,900,000	\$134,379,000	\$5,787,531,000

2.5 Visitor Expenditures for “Big Ticket” Items Needed to Recreate on Biscayne Bay

Many recreators use their own boats and equipment to recreate on Biscayne Bay and sometimes they need to spend money locally to maintain and repair their boats and equipment. Purchases within the county, the region or the state contribute to the economy in terms of output, income, employment, and tax revenue.

The expenditures on “big ticket” items that were used to recreate on Biscayne Bay were estimated using the responses to the Biscayne Bay User Survey. The survey asked respondents if they purchased any goods or services in Florida over the past 12 months to repair or maintain their boats and equipment so that they could participate in Biscayne Bay-related recreation activities. If the respondent said yes, the respondent was asked to list the type of good or service, the amount of money spent, the county or city in Florida where the purchase was made, and the average days per year that the good or service was used or enjoyed. The responses were used to estimate the amount of money spent in Florida in 2022 for these “big ticket” items.

The calculation of these visitor purchases for the year 2022 is provided in **Table 2-22**. Only seven of the visitor respondents said they incurred these expenditures in Florida and all of them said the expenditures were made in Miami-Dade County to repair or maintain their boat (including jet skis). Each respondent's expenses for these items were divided by the days per year that the good or service was used, as provided by the respondent, to obtain an estimate of the part of the purchase that was needed to recreate on Biscayne Bay. This estimate is the average purchase for one day's recreation on Biscayne Bay.

These adjusted expenses were added over all respondents and the result was divided by the annual number of person-days respondents participated in Bay-related recreation activities other than viewing the Bay from Shore. This provides the average “big ticket” purchase per person-day of recreation. This average was multiplied by the total number of person-days spent recreating on Biscayne Bay (other than viewing the Bay from shore) to obtain the annual purchases of goods and services from visitors for “big ticket” items needed to recreate on Biscayne Bay. **This estimate of 2022 purchases of “big ticket” items by visitors to Miami-Dade County needed to use the Bay for recreation is \$27.5 million.**

The 503 Bay-using visitors to Miami-Dade County that were surveyed did not purchase any boats in Miami-Dade County or in Florida to participate in Biscayne Bay-related recreation. This is not to say that no Bay-using visitor ever purchased a boat in Miami-Dade County or in Florida to participate in Biscayne Bay-related recreation – we just didn’t find one in this sample population.

Table 2-22 - Visitor Purchases of “Big Ticket” Items in Miami-Dade County Needed to Participate in Biscayne Bay-Related Activities, 2022 in 2022 dollars

Row Number	Calculation	Boat Maintenance and Repair
(1)	Total Purchases In Past 12 Months by Respondents Attributed to Biscayne Bay Activities	\$3,448
(2)	Annual Person-Days Respondents Participated in Bay-Related Recreation Activities Other Than Viewing Bay from Shore	2,476
(3) = (1) / (2)	Average Purchase Per Person-Day of Bay-Related Activities Other than Only Viewing Bay from Shore	\$1.39
(4)	Total Number of Person-Days of Bay-Related Activities Other than Viewing Bay from Shore in 2022	19,770,669
(5) = (3) x (4)	Total Purchases in Miami-Dade County	\$27,528,022

2.6 Economic Contribution Associated with Biscayne Bay-Related Expenditures By Visitors

Expenditures by visitors generate output, income, tax revenue, and jobs within the industries that supply Bay-related goods and services, such as charter / party boat operations, grocery stores, restaurants, and hotels. These industries are called direct industries. In addition, these expenditures create multiplier effects wherein additional output, income, tax revenue, and employment are created as the income earned by the Bay-related industries and their employees is re-spent within the county. These additional effects of Bay-related expenditures are called indirect and induced. Indirect effects are generated as the Bay-related industries purchase goods and services from other industries in the county. Induced effects are created when the indirect industries and the employees of the direct and indirect industries spend their money in the county.

The direct, indirect, and induced economic contribution of Biscayne Bay-related recreation was estimated using the estimated itemized Bay-related expenditures presented in **Table 2-21** and **Table 2-22** as input to the IMPLAN regional economic input-output model. This computer model simulates the supply of and demand for goods and services within a county or within groups of counties. It allows the user to estimate the extent to which new investments or increases in demand affect a region’s economy in terms of output,

income, tax revenue, and employment. IMPLAN stands for Impact Analysis for PLANning. The economic input-output data for Miami-Dade County, southwest Florida, and Florida represents 2021 economic conditions, which is the most recent data year provided with the IMPLAN model.

The IMPLAN model uses detailed data on the economy of the county or groups of counties to estimate economic multipliers and to model the impact of Bay-related recreation expenditures on the economy. The IMPLAN Model was used to convert these expenditures into estimates of direct, indirect, and induced output, income, tax revenue and employment generated within Miami-Dade County, southeast Florida, and Florida.

The itemized expenditures were matched to industries that are included in the IMPLAN model as summarized in Table 2-23. Biscayne Bay-related expenditures by visitors totaled \$5.8 billion. Based on the survey responses, this amount is assumed to have been spent in Miami-Dade County. The reason why the dollar value of the Bay-related expenditures are the same for the three study areas is because the visitors who were surveyed said they did not make any purchases outside of Miami-Dade County to participate in Bay-related recreation. That is not to say that no visitors make purchases outside of the County – it’s just that those people were not intercepted and interviewed during the survey.

Table 2-23 – Visitor Biscayne-Bay Related Expenditures by IMPLAN Industry Sector, 2022 dollars

Expenditure Item	IMPLAN Sector	Value of Expenditures		
		Miami-Dade County	Southeast Florida	Florida
Ramp, Marina, and Parking Fees	504 – Other amusement and recreation industries	\$113,600,000	\$113,600,000	\$113,600,000
Park Entrance Fees	501 – Museums, historical sites, zoos, and parks	\$234,800,000	\$234,800,000	\$234,800,000
Food and Beverages – Stores / Bait, Tackle, Ice	406 – Retail – Food and Beverage Stores (includes grocery and convenience stores)	\$904,300,000	\$904,300,000	\$904,300,000
Boat and Equipment Rental	451 – General and consumer goods rental except video tapes and discs	\$443,500,000	\$443,500,000	\$443,500,000
Charter Boat Fee	420 – Scenic and sightseeing transportation and support activities for transportation	\$159,800,000	\$159,800,000	\$159,800,000
Boat Maintenance and Repair	516 – Personal and household goods repair and maintenance (includes boat repair)	\$27,500,000	\$27,500,000	\$27,500,000
Boat Purchase	402 – Retail – Motor vehicle and parts dealers	\$0	\$0	\$0
Boat and Auto Fuel	408 – Retail – Gasoline stores	\$398,900,000	\$398,900,000	\$398,900,000
Food and Beverages – Full-Service Restaurants/Bars	509 – Full-service restaurants (75% of expenditures at restaurants/bars)	\$1,072,100,000	\$1,072,100,000	\$1,072,100,000
Food and Beverages – Limited-Service Restaurants/Bars	510 – Limited-service restaurants (25% of expenditures at restaurants/bars)	\$357,400,000	\$357,400,000	\$357,400,000

Table 2-23 – Visitor Biscayne-Bay Related Expenditures by IMPLAN Industry Sector, 2022 dollars

Expenditure Item	IMPLAN Sector	Value of Expenditures		
		Miami-Dade County	Southeast Florida	Florida
Shopping	409 – Retail – Clothing and clothing accessories stores (33% of shopping expenditures)	\$171,400,000	\$171,400,000	\$171,400,000
Shopping	410 – Retail – Sporting goods, hobby, musical instrument, and bookstores (34% of shopping expenditures)	\$176,600,000	\$176,600,000	\$176,600,000
Shopping	412 – Retail – Miscellaneous store retailers (includes gift, novelty and souvenir stores) (33% of shopping expenditures)	\$171,400,000	\$171,400,000	\$171,400,000
Lodging Fees	507 – Hotels and motels, including casino hotels	\$1,170,900,000	\$1,170,900,000	\$1,170,900,000
Camping Fees	508 – Other accommodations	\$13,700,000	\$13,700,000	\$13,700,000
Auto Rental, Taxi, Bus Fares	450 – Automotive equipment rental and leasing	\$399,100,000	\$399,100,000	\$399,100,000
Total	All IMPLAN Sectors	\$5,815,000,000	\$5,815,000,000	\$5,815,000,000

The itemized values in **Table 2-23** were input into the IMPLAN model to estimate the economic contribution of Biscayne Bay-related recreation to Miami-Dade County, southeast Florida, and Florida. The results are presented in **Table 2-24**. Because all the big-ticket items were purchased in Miami-Dade County, all Bay-related spending takes place in the county.

Table 2-24 – Economic Contribution of Biscayne Bay-Related Expenditures by Visitors to Miami-Dade County, 2022 (a)

Study Area	Output (b)	Income (c)	Employment (d)	Tax Revenue (e)
Miami-Dade County	\$8,150,013,000	\$4,453,772,000	57,000	\$1,076,246,000
Southeast Florida	\$8,687,788,000	\$4,742,521,000	60,000	\$1,135,250,000
Florida	\$8,948,428,000	\$4,859,019,000	62,000	\$1,166,959,000

(a) Includes direct, indirect, and induced effects.

(b) Output is the value of the additional goods and services produced in the study area due to the Bay-related recreation expenditures.

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

(d) Employment includes the number of full-time and part-time jobs created due to the Bay-related recreation expenditures.

(e) 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 includes local, county, State and Federal tax revenue. It excludes taxes on profit and income.

In 2022, visitor expenditures associated with Biscayne Bay-related recreation created \$8.2 billion in output, \$4.5 billion in income, 57,000 jobs, and \$1.08 billion in tax revenue within Miami-Dade County. Within southeast Florida, \$8.7 billion in output, \$4.7 billion in income, 60,000 jobs and \$1.13 billion in tax revenues were generated. Within Florida, \$8.9 billion in output, \$4.9 billion in income, 62,000 jobs, and \$1.17 billion in tax revenues were generated.

2.7 Biscayne Bay-Related Recreation by Miami-Dade County Residents in 2022

The responses to the General Survey of residents provides the data needed to estimate the percentage of the Miami-Dade County resident population who participated in recreational activities on Biscayne Bay in 2022. The survey sample represents the Miami-Dade County population who are at least 18 years of age and who moved about the County and/or traveled through Miami International Airport. The proportion of this sample of 278 residents who used the Bay for recreation in the past 12 months by location and overall is provided in **Table 2-25**. As expected, the percentage of respondents using the Bay is higher in the eastern parts of the county than in the western parts of the county, 90 and 92 percent versus 75 and 78 percent.

Table 2-25 - Proportion of Miami-Dade County Resident Respondents Who Participated in Recreation Activities on Biscayne Bay in Past 12 Months, Overall and By Location

From General Resident Survey				
Location	Number of Yeses	Total Respondents at Location	Percentage of Respondents Who Said Yes	Percent of Residents who use the Bay for Recreation (a)
(1)	(2)	(3)	(4) = (2) / (3)	(5) = (4) * 0.8
Northeast	69	75	92%	74%
Northwest	54	69	78%	63%
Southeast	60	67	90%	72%
Southwest	50	67	75%	60%
Total or Average	233	278	84%	67%

(a) Because this is an intercept survey, the results were weighted to account for an assumed 20% of residents who are unlikely to be intercepted because they leave their homes infrequently. This 20% of residents is assumed not to have used the Bay for recreation in the past 12 months. Therefore, the weighted average is $84\% \times 0.80 + 0\% \times 0.20 = 67\%$.

Because the distribution of the survey sample resident locations is the same as the population distribution, the overall percentage of 84 percent is the estimated percent of the County’s population at least 18 years of age and moving about the County who used the Bay for recreation in 2022. This estimate needs to be adjusted to reflect all residents, including those who tend to stay at or near home and therefore did not have the opportunity to be intercepted for the General Survey. This adjustment assumes that 20 percent of the Miami-Dade County resident population tends to stay at or near home. This part of the population is assumed not to have used the Bay for recreation over the past 12 months (in 2022). Therefore, the weighted average percentage of the County’s population at least 18 years of age who used the Bay for recreation in 2022 is 67 percent ($[84\% \times 0.80] + [0\% \times 0.20] = 67\%$).

Multiplying the 67 percent by the Miami-Dade County population at least 18 years old provides an estimate of the total number of County residents at least 18 years of age who participated in Bay-related recreation activities in 2022. This Miami-Dade County population as of April 1, 2022 was estimated to be 2,133,732 by the U.S. Census Bureau. **The result is that an estimated 1.4 million Miami-Dade County residents at least 18 years of age used the Bay for recreation at least one day in 2022.** The responses to the Biscayne Bay User Survey of residents were used to estimate the numbers of person-days in each primary recreation activity. The calculations and results are provided in **Table 2-26**.

Table 2-26 - Number of Person-Days Residents Spent Participating in Biscayne Bay-Related Recreation Activities in 2022

Activity	% of Bay-Using Residents who Participated (% of 523 respondents) (a)	Number of Residents Who Participated (b)	Average Days per Year Per Person in Activity (of the 523 respondents) (c)	Total Person-Days Per Year in Activity (d)
(1)	(2)	(3) = (2) x 2,133,722 x 0.67	(4)	(5) = (3) x (4)
Fishing from Shore	3.44%	49,202	33.3	1,637,336
Fishing from Boat	13.96%	199,542	27.0	5,397,195
Snorkeling from Shore	1.72%	24,601	10.8	265,145
Snorkeling from Boat	5.93%	84,737	10.6	896,571
Scuba Diving from Shore	0.19%	2,733	5.0	13,667
Scuba Diving from Boat	1.72%	24,601	18.3	451,019
Swimming from Shore	6.50%	92,937	25.5	2,372,634
Swimming from Boat	16.25%	232,343	9.9	2,289,263
Boating for Pleasure/Partying	16.44%	235,077	10.5	2,460,104
Sightseeing/Birdwatching from Boat	11.66%	166,740	9.0	1,493,830
Water-skiing	4.02%	57,402	20.6	1,183,583
Parasailing	0.76%	10,934	3.0	32,801
Windsurfing	1.34%	19,134	8.3	158,540
Kite Sailing	1.72%	24,601	6.4	158,540
Paddleboarding	11.66%	166,740	10.6	1,760,341
Personal Watercraft Boating	7.27%	103,871	9.4	973,108
Sailing	2.87%	41,002	6.7	276,078
Canoeing / Kayaking	18.74%	267,878	11.2	3,002,694
Viewing the Bay from Shore	64.05%	915,705	21.4	19,550,993
Sunset Cruise	3.82%	54,669	6.0	329,381
Picnicking on Biscayne Bay	33.84%	483,820	11.6	5,598,103
Participating in Biscayne Bay Cleanup Event (c)	3.82%	54,669	3.8	207,742
Total				50,508,668

(a) From Biscayne Bay User Survey of residents.

(b) Based on April 1, 2022 Miami-Dade County population older than 18 of 2,133,732 from U.S. Census Bureau times proportion of all residents who used Bay in past 12 months from General Visitor Survey - Residents (67.0%).

(c) Nine of the 20 resident Bay users who participated in a Bay cleanup event (45%) said they spent 5 to 10 days at Bay cleanup events in the past 12 months. These data are causing the average days per person per year to be as high as 3.8.

(d) Numbers may not be exact due to the rounding of the numbers in columns (3) and (4) in this Table. Windsurfing and Kite Sailing have the same number of person-days.

Of the 554 completed Biscayne Bay User surveys of residents, 16 were removed from the sample because it could not be verified that the numbers of person-days spent in each activity were not double counted. This was an issue in the early days of the survey when it was found that it was easy to double count person days using a computer tablet as a data entry device. Methods were developed and used to prevent double counting of the number of person-days recreating on the Bay.

Another 15 completed surveys were removed because the only Bay-related recreation activity of the respondent was viewing the Bay from shore for more than 200 days in the past twelve months. This large number of days viewing the Bay from shore with no other recreation activity on the Bay is believed to be indicative of a person who lives on or near the Bay and is enjoying the view of the Bay on or near the respondent's property. This value is included in the hedonic analysis of property values and therefore, these respondents were excluded from the recreation valuation. **The resulting sample size of the resident respondents to the Biscayne Bay User Survey is 523.**

As presented in Table 2-26, residents spent an estimated 50.5 million person-days recreating on Biscayne Bay in 2022. About 19.6 million person-days were spent Viewing the Bay from Shore, which is 39 percent of the total person-days of Bay recreation. The remaining 30.9 million person-days were spent participating in 21 other Bay activities with the most prominent being picnicking on the Bay, fishing from a boat, swimming from a boat or shore, boating for pleasure / partying / birdwatching / sightseeing, and canoeing / kayaking / paddleboarding.

2.8 Resident Daily Expenditures to Participate in Biscayne Bay-Related Recreation in 2022

The Biscayne Bay User Survey asked respondents to state the amount of money they spent on Bay-related goods and services on the last day that they used the Bay for recreation. To avoid double-counting expenditures, survey researchers were directed to enter the expenditures under the “predominant” activity in which the respondent participated during that day. The respondent was also asked how many people spent or benefited from those expenditures.

The average itemized resident expenditures by type of expenditure and recreation activity per person per day are provided in **Table 2-27**. The expenditures for each item were averaged over all those who reported expenditures for that recreation activity, even if some respondents did not spend any money on that item. For example, a resident fishing the Bay from a motorboat spent, on average, \$380 that day on Bay-related goods and services. Of this amount, \$146 was spent on boat fuel, \$44 was spent on bait, tackle, and ice, \$13 and \$58, respectively, was spent on boat rental and charter boat fees, \$33 was spent on food and beverages at stores, \$39 was spent restaurants and bars, and \$48 was spent on other items. This information was obtained from 41 respondents representing 140 people in the fishing parties.

These expenditures per person per day were multiplied by the number of person-days spent in each activity to obtain an estimate of total visitor expenditures associated with Bay-related recreation in 2022. These total expenditures by activity are presented in **Table 2-28**. **In 2022, visitors spent about \$9.73 billion on Biscayne Bay recreation-related goods and services other than “big ticket” items to be discussed in the next section.**

Table 2-27 - Average Itemized Biscayne Bay-Related Expenditures in Miami-Dade County Per Person Per Day by Residents – 2022 in 2022 dollars

Expenditure Item	Fishing From Motorboat	Fishing From Shore	Dive/ Snorkel From Motorboat	Dive/Snorkel from Shore
Boat fuel	\$145.98	\$0.00	\$100.00	\$23.33
Tackle, bait, and/or ice	\$44.39	\$23.66	\$0.00	\$8.33
Boat Rental	\$12.80	\$4.55	\$0.00	\$0.00
Charter Boat Fee	\$58.05	\$0.00	\$0.00	\$0.00
Equipment Rental	\$25.49	\$5.34	\$24.29	\$0.00
Ramp, Marina, and Parking Fees	\$11.76	\$2.02	\$16.43	\$9.17
Park Entrance Fees	\$2.17	\$2.07	\$2.14	\$3.00
Lodging (per night)	\$0.00	\$0.00	\$0.00	\$0.00
Camping fees (per night)	\$0.00	\$0.00	\$0.00	\$0.00
Food and Beverages – Stores	\$33.05	\$26.50	\$25.71	\$31.67
Food and Beverages – Restaurants/Bars	\$38.78	\$19.09	\$71.43	\$16.67
Auto gas	\$7.59	\$8.14	\$11.43	\$4.17
Auto Rental, Taxi, Bus fares	\$0.00	\$0.00	\$0.00	\$0.00
Shopping and Sundries	\$0.00	\$0.00	\$0.00	\$0.00
Total	\$380.05	\$91.36	\$251.43	\$96.33
People in Party	140	97	29	11
Number of Respondents	41	44	7	6

Expenditure Item	Swimming	Boating for birdwatching / pleasure/ partying	Waterski / Parasail / Windsurf / Kite Sail / Paddleboard	Personal Watercraft Boating
Boat fuel	\$9.20	\$67.78	\$23.26	\$58.13
Tackle, bait, and/or ice	\$0.00	\$1.67	\$2.61	\$0.00
Boat Rental	\$34.37	\$490.00	\$41.30	\$31.25
Charter Boat Fee	\$0.57	\$160.00	\$0.00	\$0.00
Equipment Rental	\$2.93	\$14.44	\$5.22	\$118.75
Ramp, Marina, and Parking Fees	\$2.30	\$4.64	\$10.87	\$1.25
Park Entrance Fees	\$1.93	\$5.64	\$0.70	\$1.25
Lodging (per night)	\$0.57	\$8.33	\$0.00	\$0.00
Camping fees (per night)	\$1.21	\$1.39	\$0.00	\$0.00
Food and Beverages – Stores	\$32.95	\$73.89	\$14.00	\$58.13
Food and Beverages – Restaurants/Bars	\$37.99	\$66.25	\$0.43	\$10.63
Auto gas	\$7.36	\$6.58	\$2.04	\$10.63
Auto Rental, Taxi, Bus fares	\$0.95	\$3.33	\$0.35	\$0.00
Shopping and Sundries	\$0.41	\$1.67	\$0.00	\$0.00
Total	\$132.75	\$905.61	\$100.78	\$290.00
People in Party	263	164	47	29
Number of Respondents	87	36	23	8

Table 2-27, continued, Average Itemized Biscayne Bay-Related Expenditures in Miami-Dade County Per Person Per Day by Residents – 2022 in 2022 dollars

Expenditure Item	Canoe/Kayak/ Sail	Viewing the Bay From Shore / Picnicking	Sunset Cruise
Boat fuel	\$5.00	\$2.79	\$24.00
Tackle, bait, and/or ice	\$2.50	\$0.80	\$0.00
Boat Rental	\$9.75	\$9.20	\$7.00
Charter Boat Fee	\$5.25	\$0.00	\$0.00
Equipment Rental	\$17.55	\$2.04	\$0.00
Ramp, Marina, and Parking Fees	\$1.08	\$3.10	\$1.00
Park Entrance Fees	\$2.48	\$3.37	\$3.00
Lodging (per night)	\$0.00	\$1.77	\$0.00
Camping fees (per night)	\$0.00	\$0.29	\$0.00
Food and Beverages – Stores	\$8.78	\$20.13	\$10.40
Food and Beverages – Restaurants/Bars	\$6.48	\$27.76	\$10.00
Auto gas	\$7.48	\$6.44	\$2.00
Auto Rental, Taxi, Bus fares	\$0.00	\$1.23	\$6.00
Shopping and Sundries	\$0.05	\$3.53	\$4.00
Total	\$66.38	\$82.44	\$67.40
People in Party	109	528	14
Number of Respondents	40	226	5

Table 2-28 - Total Itemized Biscayne Bay-Related Expenditures in Miami-Dade County by Residents – 2022 in 2022 dollars

Expenditure Item	Fishing From Motorboat	Fishing From Shore	Dive/ Snorkel From Motorboat	Dive/Snorkel from Shore
Boat fuel	\$787,859,000	\$0	\$89,657,000	\$6,187,000
Tackle, bait, and/or ice	\$239,583,000	\$38,738,000	\$0	\$2,210,000
Boat Rental	\$69,110,000	\$7,442,000	\$0	\$0
Charter Boat Fee	\$313,301,000	\$0	\$0	\$0
Equipment Rental	\$137,563,000	\$8,745,000	\$21,774,000	\$0
Ramp, Marina, and Parking Fees	\$63,450,000	\$3,312,000	\$14,729,000	\$2,430,000
Park Entrance Fees	\$11,716,000	\$3,386,000	\$1,921,000	\$795,000
Lodging (per night)	\$0	\$0	\$0	\$0
Camping fees (per night)	\$0	\$0	\$0	\$0
Food and Beverages – Stores	\$178,371,000	\$43,389,000	\$23,055,000	\$8,396,000
Food and Beverages – Restaurants/Bars	\$209,306,000	\$31,258,000	\$64,041,000	\$4,419,000
Auto gas	\$40,940,000	\$13,322,000	\$10,247,000	\$1,105,000
Auto Rental, Taxi, Bus fares	\$0	\$0	\$0	\$0
Shopping and Sundries	\$0	\$0	\$0	\$0
Total	\$2,051,199,000	\$149,592,000	\$225,424,000	\$25,542,000

Expenditure Item	Swimming	Boating for birdwatching / pleasure/ partying	Waterski / Parasail / Windsurf / Kite Sail / Paddleboard	Personal Watercraft Boating
Boat fuel	\$21,051,000	\$267,989,000	\$76,617,000	\$56,562,000
Tackle, bait, and/or ice	\$0	\$6,590,000	\$8,593,000	\$0
Boat Rental	\$78,677,000	\$1,937,428,000	\$136,049,000	\$30,410,000
Charter Boat Fee	\$1,316,000	\$632,629,000	\$0	\$0
Equipment Rental	\$6,710,000	\$57,112,000	\$17,185,000	\$115,557,000
Ramp, Marina, and Parking Fees	\$5,276,000	\$18,342,000	\$35,802,000	\$1,216,000
Park Entrance Fees	\$4,421,000	\$22,296,000	\$2,291,000	\$1,216,000
Lodging (per night)	\$2,679,000	\$32,949,000	\$0	\$0
Camping fees (per night)	\$5,626,000	\$5,492,000	\$0	\$0
Food and Beverages – Stores	\$153,628,000	\$292,152,000	\$46,113,000	\$56,562,000
Food and Beverages – Restaurants/Bars	\$177,099,000	\$261,948,000	\$1,432,000	\$10,339,000
Auto gas	\$34,294,000	\$26,030,000	\$6,731,000	\$10,339,000
Auto Rental, Taxi, Bus fares	\$4,448,000	\$13,180,000	\$1,146,000	\$0
Shopping and Sundries	\$1,929,000	\$6,590,000	\$0	\$0
Total	\$497,154,000	\$3,580,727,000	\$331,959,000	\$282,201,000

Table 2-28, continued, Total Itemized Biscayne Bay-Related Expenditures in Miami-Dade County by Residents – 2022 in 2022 dollars

Expenditure Item	Canoe/Kayak/ Sail	Viewing the Bay From Shore / Picnicking	Sunset Cruise	Total
Boat fuel	\$16,394,000	\$54,501,000	\$142,260,000	\$1,519,077,000
Tackle, bait, and/or ice	\$8,197,000	\$15,572,000	\$0	\$319,483,000
Boat Rental	\$31,968,000	\$179,938,000	\$41,492,000	\$2,512,514,000
Charter Boat Fee	\$17,214,000	\$0	\$0	\$964,460,000
Equipment Rental	\$57,542,000	\$39,794,000	\$0	\$461,982,000
Ramp, Marina, and Parking Fees	\$3,525,000	\$60,689,000	\$5,927,000	\$214,698,000
Park Entrance Fees	\$8,115,000	\$65,833,000	\$17,782,000	\$139,772,000
Lodging (per night)	\$0	\$34,604,000	\$0	\$70,232,000
Camping fees (per night)	\$0	\$5,623,000	\$0	\$16,741,000
Food and Beverages – Stores	\$28,771,000	\$393,555,000	\$61,646,000	\$1,285,638,000
Food and Beverages – Restaurants/Bars	\$21,230,000	\$542,670,000	\$59,275,000	\$1,383,017,000
Auto gas	\$24,509,000	\$125,957,000	\$11,855,000	\$305,329,000
Auto Rental, Taxi, Bus fares	\$0	\$24,019,000	\$35,565,000	\$78,358,000
Shopping and Sundries	\$164,000	\$69,034,000	\$23,710,000	\$101,427,000
Total	\$217,629,000	\$1,611,789,000	\$399,512,000	\$9,372,728,000

2.9 Resident Expenditures for “Big Ticket” Items Needed to Recreate on Biscayne Bay

Many recreators use their own boats and equipment to recreate on Biscayne Bay and sometimes they need to spend money locally to maintain and repair their boats and equipment. Purchases within the county, the region or the state contribute to the economy in terms of output, income, employment, and tax revenues.

The expenditures on “big ticket” items that were used to recreate on Biscayne Bay were estimated using the responses to the Biscayne Bay Users Survey. The survey asked respondents if they purchased any goods or services in Florida over the past 12 months to repair or maintain their boats and equipment so that they could participate in Biscayne Bay-related recreation activities. If the respondent said yes, the respondent was asked to list the type of good or service, the amount of money spent, the county or city in Florida where the purchase was made, and the average days per year that the good or service was used or enjoyed. The responses were used to estimate the amount of money spent in Florida in 2022 for these “big ticket” items.

The calculation of these resident purchases for the year 2022 is provided in **Table 2-29**. Of the 523 resident respondents, only 31 said they made “big ticket” purchases over the past 12 months. Each respondent's expenses for these items were divided by the days per year that the good or service was used, as provided by the respondent, to obtain an estimate of the part of the purchase that was needed to recreate on Biscayne Bay. This estimate is the average purchase for one day’s recreation on Biscayne Bay.

These adjusted expenses were added over all respondents and the result was divided by the annual number of person-days respondents participated in Bay-related recreation activities other than viewing the Bay from Shore. This provides the average “big ticket” purchase per person-day of recreation. This average was multiplied by the estimated total number of person-days all residents spent recreating on Biscayne Bay (other than viewing the Bay from shore) to obtain the annual purchases of goods and services from residents for “big ticket” items needed to recreate on Biscayne Bay. **This estimate of 2022 purchases of “big ticket” items by Miami-Dade County residents needed to use the Bay for recreation is \$11 million.**

Table 2-29 - Resident Purchases of “Big Ticket” Items in Florida Needed to Participate in Biscayne Bay-Related Activities

Expense Item	Average Purchase Over Past 12 Months Per Person-Day of Recreation Activity (a)			Total Purchases of Participants in Biscayne Bay-Related Recreation in 2022 (b)		
	Miami-Dade County	Southeast Florida	Florida	Miami-Dade County	Southeast Florida	Florida
(1)	(2)	(3)	(4)	(5) = (2) x 29,197,334	(6) = (3) x 29,197,334	(7) = (4) x 29,197,334
Boat Maintenance and Repair	\$0.0527	\$0.0527	\$0.0527	\$1,537,801	\$1,537,801	\$1,537,801
Boat Purchase and Replacement Parts	\$0.0073	\$0.2109	\$0.2109	\$213,261	\$6,158,712	\$6,158,712
Equipment (scuba, snorkeling, non-motorized boating, fishing, sailing)	\$0.1032	\$0.1094	\$0.1094	\$3,012,017	\$3,193,773	\$3,193,773
Total	\$0.1631	\$0.3730	\$0.3730	\$4,763,079	\$10,890,286	\$10,890,286

(a) Each respondent's expenses for these items were divided by the number of people in the person's party and the days per year that the good or service is used as provided by the respondent to estimate the prorated use of the item on a per person per day basis. Then these adjusted expenses were added over all respondents and divided by the number of people in all the respondents' parties who participated in a Bay-related activity other than viewing the Bay from Shore (838 people). This provides the estimated average purchase per person day of Bay-related recreation activity.

(b) Average Purchase Per Person per Day Multiplied by the Number of Person-Days For All Activities Except Viewing Bay and Picnicking on Bay equal to 29,197,334.

2.10 Economic Contribution Associated with Biscayne Bay-Related Expenditures By Residents

Expenditures by residents generate output, income, tax revenue and jobs within the industries that supply Bay-related goods and services, such as charter / party boat operations, grocery stores, boat dealers, and gas stations. These industries are called direct industries. For residents, the expenditures reported in **Tables 2-28 and 2-29** were converted to output, income, employment, and tax revenue generated within the directly affected industries using the IMPLAN Regional Economic Input-Output Model as discussed earlier in this section under visitors.

The multiplier effect of Biscayne Bay-related spending by residents in the county was not estimated because this spending is also the result of multiplier effects from other economic activities within the county and does not represent new money coming into the economy. The multiplier effect of resident

spending on Biscayne Bay-related activities is attributed both to the Bay and to other economic activities that generated the resident income used to purchase the Bay-related goods and services. Thus, the economic importance of the Bay would be overstated if the multiplier effects were considered. To obtain a conservative estimate of the economic contribution of resident recreational use of the Bay, the multiplier effects were not included. Only the direct economic contribution of resident Bay-related expenditures were estimated.

The IMPLAN model uses detailed data on the economy of the county or groups of counties to estimate economic multipliers and to model the impact of Bay-related recreation expenditures on the economy. The IMPLAN Model was used to convert these expenditures into estimates of direct output, income, tax revenue and employment generated within Miami-Dade County, southeast Florida, and Florida.

Total Biscayne Bay-related expenditures by residents were estimated to be \$9.378 billion in Miami-Dade County and \$9.384 billion in southeast Florida and in Florida in 2022. In other words, residents (who live in Miami-Dade County) spent \$9.384 billion in Florida to participate in Biscayne Bay-related recreation. Of this amount, \$9.378 billion was spent on goods and services in Miami-Dade County. The itemized expenditures were matched to industries that are included in the IMPLAN model as summarized in **Table 2-30**. These values were input into the IMPLAN model to estimate the economic contribution of Biscayne Bay resident spending to Miami-Dade County, southeast Florida, and Florida.

Table 2-30 - Itemization of Resident Biscayne-Bay Related Expenditures Applied to IMPLAN Model Sectors, 2022 in 2022 dollars

Expenditure Item	IMPLAN Sector	Value of Expenditures		
		Miami-Dade County	Southeast Florida	Florida
Ramp, Marina, and Parking Fees	504 - Other amusement and recreation industries	\$214,700,000	\$214,700,000	\$214,700,000
Park Entrance Fees	501 - Museums, historical sites, zoos, and parks	\$139,800,000	\$139,800,000	\$139,800,000
Food and Beverages – Stores / Bait, Tackle, Ice	406 - Retail - Food and Beverage Stores (includes grocery and convenience stores)	\$1,605,100,000	\$1,605,100,000	\$1,605,100,000
Boat and Equipment Rental	451 - General and consumer goods rental except video tapes and discs	\$2,974,500,000	\$2,974,500,000	\$2,974,500,000
Charter Boat Fee	420 - Scenic and sightseeing transportation and support activities for transportation	\$964,500,000	\$964,500,000	\$964,500,000
Boat Maintenance and Repair	516 - Personal and household goods repair and maintenance (includes boat repair)	\$1,500,000	\$1,500,000	\$1,500,000
Boat Purchase	402 - Retail - Motor vehicle and parts dealers	\$200,000	\$6,200,000	\$6,200,000
Boat and Auto Fuel	408 - Retail - Gasoline stores	\$1,824,400,000	\$1,824,400,000	\$1,824,400,000
Food and Beverages – Full-Service Restaurants/Bars	509 - Full-service restaurants (75% of expenditures at restaurants/bars)	\$1,037,300,000	\$1,037,300,000	\$1,037,300,000

Table 2-30 - Itemization of Resident Biscayne-Bay Related Expenditures Applied to IMPLAN Model Sectors, 2022 in 2022 dollars

Expenditure Item	IMPLAN Sector	Value of Expenditures		
		Miami-Dade County	Southeast Florida	Florida
Food and Beverages – Limited-Service Restaurants/Bars	510 - Limited-service restaurants (25% of expenditures at restaurants/bars)	\$345,800,000	\$345,800,000	\$345,800,000
Shopping	409 - Retail - Clothing and clothing accessories stores (33% of shopping expenditures)	\$33,500,000	\$33,500,000	\$33,500,000
Shopping	410 - Retail - Sporting goods, hobby, musical instrument, and bookstores (34% of shopping expenditures)	\$37,500,000	\$37,700,000	\$37,700,000
Shopping	412 - Retail - Miscellaneous store retailers (includes gift, novelty, and souvenir stores) (33% of shopping expenditures)	\$33,500,000	\$33,500,000	\$33,500,000
Lodging Fees	507 - Hotels and motels, including casino hotels	\$70,200,000	\$70,200,000	\$70,200,000
Camping Fees	508 - Other accommodations	\$16,700,000	\$16,700,000	\$16,700,000
Auto Rental, Taxi, Bus Fares	450 - Automotive equipment rental and leasing	\$78,400,000	\$78,400,000	\$78,400,000
Total	All IMPLAN Sectors	\$9,377,600,000	\$9,383,800,000	\$9,383,800,000

The estimated economic contributions of Biscayne Bay-dependent recreation to Miami-Dade County are presented in **Table 2-31**.

Table 2-31 - Economic Contribution of Biscayne Bay-Related Expenditures by Residents of Miami-Dade County, 2022 (a)

Study Area	Output (b)	Income (c)	Employment (d)	Tax Revenue (e)
Miami-Dade County	\$6,931,900,000	\$3,757,400,000	56,300	\$1,187,400,000
Southeast Florida	\$6,933,300,000	\$3,758,300,000	56,300	\$1,187,700,000
Florida	\$6,933,300,000	\$3,758,300,000	56,300	\$1,187,800,000

(a) Includes direct effects only as explained in the text. Because only the direct effects are included, the difference between the direct effects among the three study areas is not as great as if the total direct, indirect, and induced effects were included. For southeast Florida and Florida, the differences are so small they disappear in the rounding.

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

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

(d) Employment includes the number of full-time and part-time jobs created due to the Bay-related recreation expenditures.

(e) 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 includes local, county, State and Federal tax revenue. It excludes taxes on profit and income.

In 2022, resident expenditures associated with Biscayne Bay-related recreation created \$6.932 billion in output, \$3.757 billion in income, 56,300 jobs, and \$1.187 billion in tax revenue within Miami-Dade County. Within southeast Florida, \$6.933 billion in output, \$3.758 billion in income, 56,300 jobs and \$1.188 billion in tax revenue were generated. Within Florida, output, income, and tax revenue generated are the same as that for southeast Florida after rounding to the nearest \$100,000. There is one additional job created outside of southeast Florida. This small difference between the economic contribution in southeast Florida and all of Florida is due to the use of only the direct spending of residents to estimate economic contribution.

2.11 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 was described in this section.

The number of person-days spent by residents and visitors in 2022 by primary recreation activity is provided in **Table 2-32**. The total number of person-days in all activities by residents and visitors is 119.8 million. The number of person-days estimated during the 2005 Biscayne Bay Economic Study was 65.5 million. However, the number of person-days for all activities other than viewing the Bay from shore is about the same in 2022 as it was in 2005, 50.7 million in 2022 versus 49.0 million in 2005. Since both are estimates, this result indicates that non-viewing recreation activity remained about the same during these two years. The number of person-days spent viewing the Bay from shore or by air (including while dining, shopping, jogging, strolling, sightseeing, bird watching, and/or exercising), increased significantly between the two years. The estimated number of person-days was 16 million in 2005 and 69 million in 2022.

These results indicate that the overall growth in Bay-related recreation use is because a larger number of residents and visitors in the County have chosen to recreate around the Bay rather than recreating in the Bay (fishing, swimming, boating, etc.). Also, it is possible that the available access to the Bay has limited additional recreational opportunities. For example, boat ramps, beach areas, and parking lots may become overcrowded during periods when visitors and residents wish to recreate on the Bay.

Table 2-32 - Number of Person-Days Spent Participating in Biscayne Bay-Related Recreation Activities in 2022

Primary Activity	Visitors to Miami-Dade County (a)	Residents of Miami-Dade County	Total	Percentage of Total
(1)	(2)	(3)	(4) = (2) + (3)	(5) = (4) / 119,814,000
Fishing from Shore	599,000	1,637,000	2,236,000	1.87%
Fishing from Boat	575,000	5,397,000	5,972,000	4.98%
Snorkeling from Shore	991,000	265,000	1,256,000	1.05%
Snorkeling from Boat	607,000	897,000	1,504,000	1.26%
Scuba Diving from Shore	8,000	14,000	22,000	0.02%
Scuba Diving from Boat	232,000	451,000	683,000	0.57%
Swimming from Shore	5,773,000	2,373,000	8,146,000	6.80%
Swimming from Boat	1,458,000	2,289,000	3,747,000	3.13%
Boating for Pleasure/Partying	923,000	2,460,000	3,383,000	2.82%
Sightseeing/Birdwatching from Boat	1,784,000	1,494,000	3,278,000	2.74%
Water-skiing	48,000	1,184,000	1,232,000	1.03%
Parasailing	32,000	33,000	65,000	0.05%
Windsurfing	64,000	159,000	223,000	0.19%
Kite Sailing	0	159,000	159,000	0.13%
Paddleboarding	585,000	1,760,000	2,345,000	1.96%
Personal Watercraft Boating	643,000	973,000	1,616,000	1.35%
Sailing	104,000	276,000	380,000	0.32%
Canoeing / Kayaking	817,000	3,003,000	3,820,000	3.19%
<i>Viewing the Bay from Shore</i>	<i>49,535,000</i>	<i>19,551,000</i>	<i>69,086,000</i>	<i>57.66%</i>
Sunset Cruise	1,466,000	329,000	1,795,000	1.50%
Picnicking on Biscayne Bay	3,052,000	5,598,000	8,650,000	7.22%
Participating in Biscayne Bay Cleanup Event	8,000	208,000	216,000	0.18%
Total	69,304,000	50,510,000	119,814,000	100.00%
<i>All Bay-Related Activities Other than Viewing the Bay from Shore</i>	<i>19,769,000</i>	<i>30,959,000</i>	<i>50,728,000</i>	<i>42.34%</i>

The total economic contribution of Biscayne Bay-related recreation by visitors and residents is summarized in **Table 2-33**. The overall economies of the three study areas are summarized in **Table 2-34**. The economic contributions of Biscayne Bay-related recreation are compared to the overall economies in **Table 2-35**.

Table 2-33 - Economic Contribution of Biscayne Bay-Related Expenditures by Residents of and Visitors to Miami-Dade County, 2022

Study Area	Output (a)	Income (b)	Employment (c)	Tax Revenue (d)
Miami-Dade County	\$15,081,913,000	\$8,211,172,000	113,300	\$2,263,646,000
Southeast Florida	\$15,621,088,000	\$8,500,821,000	116,300	\$2,322,950,000
Florida	\$15,881,728,000	\$8,617,319,000	118,300	\$2,354,759,000

(a) Output is defined as the value of the additional goods and services produced in the study area due to the Bay-related recreation expenditures.

(b) Income is the sum of wages, salaries, proprietor's income, profits, rents, royalties, and dividends due to the Bay-related recreation expenditures.

(c) Employment includes the number of full-time and part-time jobs created due to the Bay-related recreation expenditures.

(d) 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 includes local, county, State and Federal tax revenue. It excludes taxes on profit and income.

Table 2-34 - Economy of Study Areas, 2021 in 2021 dollars

Study Area	Output	Income	Employment
Miami-Dade County	\$341,623,000,000	\$180,148,500,000	1,835,127
Southeast Florida	\$755,791,900,000	\$406,004,600,000	4,094,427
Florida	\$2,227,211,600,000	\$1,183,528,700,000	12,534,465

From IMPLAN model database

Table 2-35 - Economic Contribution as Biscayne Bay is Used for Recreation by Residents and Visitors as Percentage of Study Area Economies

Study Area	Output	Income	Employment
Miami-Dade County	4.41%	4.56%	6.17%
Southeast Florida	2.07%	2.09%	2.84%
Florida	0.71%	0.73%	0.94%

In Miami-Dade County, Bay-related recreation expenditures generated an estimated \$15.1 billion in output, \$8.2 billion in income, 113,300 jobs and \$2.3 billion in tax revenue in 2022. This economic contribution represents 4.4 percent of the county’s total output, 4.6 percent of the county’s income and 6.2 percent of the county’s employment.

In the southeast Florida counties of Palm Beach, Broward, Miami-Dade and Monroe, Bay-related recreation expenditures generated \$15.6 billion in output, \$8.5 billion in income, 116,300 jobs and \$2.3 billion in tax revenues in 2022. This economic contribution represents 2.1 percent of southeast Florida’s total output, 2.1 percent of its income and 2.8 percent of its employment.

In Florida, Bay-related recreation expenditures generated \$15.9 billion in output, \$8.6 billion in income, 118,300 jobs and \$2.4 billion in tax revenues in 2022. This economic contribution represents 0.7 percent of Florida’s total output, 0.7 percent of its total income and 0.9 percent of its employment.

Itemizations of the direct, indirect, and induced output, income, and employment by industry sector in Miami-Dade County from the visitor and resident expenditures on Biscayne Bay-related recreation are provided in **Tables 2-36** through **Table 2-38**.

The boat and equipment rental industry (under Rentals - General and Consumer Goods Rental) is one of the greatest beneficiaries of Biscayne Bay recreation, adding an estimated \$3.4 billion to the County’s 2022 output, \$1.7 billion to County residents’ 2022 income and 19,400 jobs in 2022. The eating and drinking establishment industry (under Services - Eating and Drinking Establishments) was also one of the greatest beneficiaries, adding about \$3.0 billion to the County’s 2022 output, \$1.8 billion to County residents’ 2022 income and 29,600 jobs in 2022.

The charter boat industry (under Transportation - Scenic and sightseeing transportation and support activities) was the third greatest beneficiary providing \$1.2 billion in output, \$0.8 billion in income, and 12,500 jobs. The Bay’s contribution to the Hotels and Lodging Places industry added \$1.3 billion in 2022 output, \$0.8 billion in 2022 income, and 8,100 jobs. Other benefiting industries in Miami-Dade County included Finance / Insurance / Real Estate; Retail Trade - Food Stores; Retail Trade - Gasoline Stores; Retail Trade - All Other; Professional Services; and Entertainment.

Because most of the expenditures were assumed to be made in Miami-Dade County, the itemized economic contributions to output, income, employment, and tax revenue for southeast Florida and Florida are not significantly different from each other or with the data in **Tables 2-36 through 2-38**.

Table 2-36 - Economic Contribution to Miami-Dade County of Visitor and Resident Expenditures for Biscayne Bay-Related Recreation, 2022

Industry Type	IMPLAN Codes	Output, 2022 Dollars			
		Direct	Indirect	Induced	Total
Agriculture, Forestry, Agricultural Services	1 - 16, 18 and 19	\$0	\$852,296	\$962,976	\$1,815,273
Commercial Fishing	17	\$0	\$49,500	\$3,572	\$53,072
Mining	20 - 38	\$0	\$672,663	\$372,499	\$1,045,162
Utilities	39 - 49	\$0	\$118,423,841	\$26,075,008	\$144,498,849
Construction	50 - 62	\$0	\$20,184,522	\$13,239,482	\$33,424,004
Manufacturing	63 - 391	\$0	\$20,548,942	\$15,178,967	\$35,727,910
Transportation - Scenic and sightseeing transportation, support	420	\$1,128,333,368	\$18,433,450	\$4,060,972	\$1,150,827,790
Transportation - All Other	414 - 419, 421 - 422	\$0	\$106,003,138	\$51,866,914	\$157,870,052
Wholesale Trade	392 - 401	\$0	\$106,397,077	\$114,666,683	\$221,063,759
Retail - Food Stores	406	\$850,905,776	\$2,080,647	\$20,297,753	\$873,284,176
Retail - Gasoline Stores	408	\$576,365,723	\$730,905	\$4,674,994	\$581,771,622
Retail Trade - All Other	402 - 405, 407, 409 - 413	\$223,686,429	\$122,292,109	\$105,356,093	\$451,334,632
Publishing	423 - 428	\$0	\$8,897,816	\$6,676,734	\$15,574,550
Communication	429 - 438	\$93,026,790	\$162,078,774	\$72,844,448	\$327,950,012
Finance, Insurance and Real Estate	439 - 447	\$0	\$469,063,951	\$286,942,851	\$756,006,802
Occupied Housing	448 - 449	\$0	\$0	\$240,503,003	\$240,503,003
Rentals - General and Consumer Goods Rental	451	\$3,428,317,866	\$3,167,845	\$3,420,853	\$3,434,906,563
Rentals and Leasing - all other goods	450, 452 - 454	\$476,386,227	\$33,912,521	\$12,212,441	\$522,511,189
Professional Services	455 - 479	\$0	\$499,187,611	\$146,536,823	\$645,724,434
Education	480 - 482	\$0	\$4,716,139	\$16,351,932	\$21,068,072
Medical, Dental, Community Services	483 - 495	\$0	\$8,187,269	\$204,490,237	\$212,677,506
Entertainment - Museums, historical sites, zoos, parks	501	\$376,018,846	\$1,589	\$396,706	\$376,417,140
Entertainment - All Other	496-500, 502 - 506	\$330,406,512	\$21,427,998	\$14,357,206	\$366,191,717
Services - Hotels and Lodging Places	507 and 508	\$1,261,234,301	\$2,895,635	\$12,068,364	\$1,276,198,299
Services - Eating and Drinking Establishments	509 - 511	\$2,825,430,129	\$66,381,236	\$90,782,591	\$2,982,593,956
Services - Personal and household goods repair and maintenance	516	\$28,483,621	\$6,977,488	\$3,122,997	\$38,584,106
Services - All Other	512 to 515, 517 to 525	\$0	\$71,893,614	\$53,455,572	\$125,349,186
Government	526 to 534, 539 to 546	\$0	\$58,434,156	\$28,568,992	\$87,003,148
Total		\$11,598,595,587	\$1,933,892,733	\$1,549,487,663	\$15,081,975,983

Table 2-37 - Economic Contribution to Miami-Dade County of Visitor and Resident Expenditures for Biscayne Bay-Related Recreation, 2022

Industry Type	IMPLAN Codes	Income, 2022 Dollars			
		Direct	Indirect	Induced	Total
Agriculture, Forestry, Agricultural Services	1 - 16, 18 and 19	\$0	\$474,043	\$544,065	\$1,018,108
Commercial Fishing	17	\$0	\$43,322	\$3,126	\$46,448
Mining	20 - 38	\$0	\$275,757	\$115,968	\$391,725
Utilities	39 - 49	\$0	\$49,502,794	\$10,854,766	\$60,357,559
Construction	50 - 62	\$0	\$8,603,896	\$5,635,536	\$14,239,432
Manufacturing	63 - 391	\$0	\$7,112,163	\$4,221,899	\$11,334,062
Transportation - Scenic and sightseeing transportation and support	420	\$769,718,352	\$12,574,798	\$2,770,285	\$785,063,435
Transportation - All Other	414 - 419, 421 - 422	\$0	\$46,879,687	\$21,586,292	\$68,465,979
Wholesale Trade	392 - 401	\$0	\$73,885,361	\$39,821,078	\$113,706,439
Retail - Food Stores	406	\$449,625,283	\$1,099,430	\$10,725,492	\$461,450,205
Retail - Gasoline Stores	408	\$230,123,779	\$291,826	\$1,866,571	\$232,282,176
Retail Trade - All Other	402 - 405, 407, 409 - 413	\$149,296,301	\$13,343,906	\$63,432,509	\$226,072,716
Publishing	423 - 428	\$0	\$4,417,566	\$7,437,315	\$11,854,882
Communication	429 - 438	\$0	\$103,106,121	\$31,163,645	\$134,269,766
Finance, Insurance and Real Estate	439 - 447	\$0	\$170,684,276	\$121,013,189	\$291,697,466
Occupied Housing	448 - 449	\$0	\$0	\$167,229,105	\$167,229,105
Rentals - General and consumer goods rental	451	\$1,662,196,913	\$1,535,908	\$1,658,577	\$1,665,391,399
Rentals and Leasing - all other goods	450, 452 - 454	\$231,155,455	\$22,161,835	\$7,129,809	\$260,447,099
Professional Services	455 - 479	\$0	\$281,376,529	\$78,492,889	\$359,869,418
Education	480 - 482	\$0	\$3,153,938	\$11,849,021	\$15,002,959
Medical, Dental, Community Services	483 - 495	\$0	\$11,103	\$136,075,592	\$136,086,695
Entertainment - Museums, historical sites, zoos, parks	501	\$221,279,284	\$935	\$233,453	\$221,513,672
Entertainment - All Other	496-500, 502 - 506	\$193,055,283	\$14,283,452	\$9,204,561	\$216,543,297
Services - Hotels and Lodging Places	507 and 508	\$796,063,900	\$253,846	\$390,227	\$796,707,973
Services - Eating and Drinking Establishments	509 - 511	\$1,717,795,316	\$43,747,017	\$52,688,760	\$1,814,231,093
Services - Personal and household goods repair and maintenance	516	\$16,891,507	\$4,137,827	\$1,852,016	\$22,881,350
Services - All Other	512 to 515, 517 to 525	\$0	\$36,446,687	\$32,077,925	\$68,524,612
Government	526 to 534, 539 to 546	\$0	\$37,787,328	\$16,616,716	\$54,404,044
Total		\$6,437,201,374	\$937,191,352	\$836,690,388	\$8,211,083,114

Table 2-38 - Economic Contribution to Miami-Dade County of Visitor and Resident Expenditures for Biscayne Bay-Related Recreation, 2022

Industry Type	IMPLAN Codes	Employment, Number of Full and Part-time Jobs			
		Direct	Indirect	Induced	Total
Agriculture, Forestry, Agricultural Services	1 - 16, 18 and 19	0	7	9	16
Commercial Fishing	17	0	1	0	2
Mining	20 - 38	0	1	1	2
Utilities	39 - 49	0	83	18	101
Construction	50 - 62	0	77	51	128
Manufacturing	63 - 391	0	74	34	108
Transportation - Scenic and sightseeing transportation, support	420	12,266	200	44	12,511
Transportation - All Other	414 - 419, 421 - 422	0	1,188	473	1,661
Wholesale Trade	392 - 401	0	471	213	685
Retail - Food Stores	406	9,804	24	234	10,062
Retail - Gasoline Stores	408	3,713	5	30	3,748
Retail Trade - All Other	402 - 405, 407, 409 - 413	3,645	193	1,015	4,853
Publishing	423 - 428	0	25	37	62
Communication	429 - 438	0	272	100	371
Finance, Insurance and Real Estate	439 - 447	0	2,027	1,110	3,137
Occupied Housing	448 - 449	0	0	80	80
Rentals - General and consumer goods rental	451	19,309	18	19	19,346
Rentals and Leasing - all other goods	450, 452 - 454	1,470	58	32	1,560
Professional Services	455 - 479	0	3,445	1,007	4,453
Education	480 - 482	0	51	210	261
Medical, Dental, Community Services	483 - 495	0	0	1,858	1,858
Entertainment - Museums, historical sites, zoos, parks	501	3,553	0	4	3,556
Entertainment - All Other	496-500, 502 - 506	4,687	256	160	5,104
Services - Hotels and Lodging Places	507 and 508	8,067	3	4	8,074
Services - Eating and Drinking Establishments	509 – 511	27,999	707	893	29,599
Services - Personal and household goods repair and maintenance	516	213	52	23	288
Services - All Other	512 to 515, 517 to 525	0	802	959	1,760
Government	526 to 534, 539 to 546	0	234	83	317
Total		94,726	10,275	8,702	113,703

2.12 Location of Recreation Activities on Biscayne Bay

The Biscayne Bay User Survey asked respondents to indicate whether they spent their days in each recreation activity in the northern part of the Bay, the central part of the Bay, or the southern part of the Bay. After the respondent indicated how many days were spent in each activity over the past 12 months, the respondent was asked to provide the location of these activities, north, central, or south Bay.

The three areas are indicated in the Biscayne Bay map provided in **Figure 2-1**. The North Bay area is defined as the area of the Bay north of the Miami River and Government Cut. Central Bay is defined as the area of the Bay south of and including the Miami River/Government Cut and north of and including Black Point Park and Marina. The South Bay is defined as the area south of Black Point Park and Marina.

The number of visitor and resident respondents who provided the location of each activity is provided in **Table 2-39**. Not all visitors and residents could remember or knew where in the Bay they recreated so the distribution of person-days in each activity provided in **Table 2-39** is slightly different from that inferred from the entire sample.

Table 2-39 - Number of Visitor and Resident Respondents by Location of Recreation Activity from the Biscayne Bay User Survey

Recreation Activity	North Bay	Central Bay	South Bay	Total
(1)	(2)	(3)	(4)	(5) = Sum of (1) through (4)
Water Skiing	22	9	9	40
Parasailing	4	1	2	7
Windsurfing	5	3	2	10
Kite Sailing	6	5	1	12
Paddleboarding	59	31	16	106
Personal Watercraft	50	16	9	75
Sailing	15	9	4	28
Canoeing / Kayaking	98	46	23	167
Viewing the Bay from Shore or by Air	555	248	123	926
Sunset Cruise	31	19	5	55
Water Taxi	25	11	2	38
Picnicking on Biscayne Bay	201	97	49	347
Biscayne Bay Cleanup Event	15	9	2	26
Sightseeing and/or Birdwatching on Boat	65	39	22	126
Boating for pleasure/partying	92	42	19	153
Fishing	108	68	62	238
Snorkeling	49	32	26	107
Scuba Diving	11	6	6	23
Swimming	268	162	106	536
Total	1,679	853	488	3,020

The percentage of visitor and resident respondents by location of recreation activity is provided in **Table 2-40**. These percentages were calculated using the data provided in **Table 2-39**. The percentage of respondents who participated in activities in the North Bay ranged from 45 percent to 67 percent, depending on the activity. In the Central Bay, the percentage of respondents ranged from 14 percent to 42 percent and in the south Bay, the percentage of respondents ranged from 5 percent to 29 percent. For all activities, about 56 percent took place in the North Bay, 28 percent took place in the Central Bay and 16 percent took place in the South Bay.

Table 2-40 - Percentage of Visitor and Resident Respondents by Location of Recreation Activity from the Biscayne Bay User Survey

Recreation Activity	Percentage of Respondents by Location of Recreation Activity				Percent of All Respondents in All Activities
	North Bay	Central Bay	South Bay	Total	
Water Ski	55%	23%	23%	100%	1.3%
Parasailing	57%	14%	29%	100%	0.2%
Windsurfing	50%	30%	20%	100%	0.3%
Kite Sailing	50%	42%	8%	100%	0.4%
Paddleboarding	56%	29%	15%	100%	3.5%
Personal Watercraft	67%	21%	12%	100%	2.5%
Sailing	54%	32%	14%	100%	0.9%
Canoeing / Kayaking	59%	28%	14%	100%	5.5%
Viewing the Bay from Shore or by Air	60%	27%	13%	100%	30.7%
Sunset Cruise	56%	35%	9%	100%	1.8%
Water Taxi	66%	29%	5%	100%	1.3%
Picnicking on Biscayne Bay	58%	28%	14%	100%	11.5%
Biscayne Bay Cleanup Event	58%	35%	8%	100%	0.9%
Sightseeing and/or Birdwatching on Boat	52%	31%	17%	100%	4.2%
Boating for pleasure/partying	60%	27%	12%	100%	5.1%
Fishing	45%	29%	26%	100%	7.9%
Snorkeling	46%	30%	24%	100%	3.5%
Scuba Diving	48%	26%	26%	100%	0.8%
Swimming	50%	30%	20%	100%	17.7%
All Activities	56%	28%	16%	100%	100.0%

2.13 Demographic Characteristics of Those Who Recreate on Biscayne Bay

The Biscayne Bay User Survey asked resident and visitor respondents to describe themselves in terms of age, sex, race/ethnicity, income, years living in or visiting Miami-Dade County, boat ownership, fishing/diving club membership, and if they knew when they were boating in Biscayne National Park.

A comparison of residents and visitors is provided in **Table 2-41**. Resident and visitor Bay users are similar in many respects. The median age of residents and visitors was similar at 38 years and 36 years,

respectively. The percentage of male and female respondents was 62 percent and 38 percent, respectively, for residents and 56 percent and 44 percent, respectively, for visitors.

Table 2-41 - Demographic Characteristics of Those Who Recreate on Biscayne Bay - Resident and Visitor Respondents, 2022

Characteristic	Residents			Visitors		
Median Age of Respondent	38			36		
Sex Of Respondent	Percent			Percent		
Male	62%			56%		
Female	38%			44%		
Race Of Respondent	% of Resident Bay-Users			% of Visitor Bay-Users		
	White	Black	Other	White	Black	Other
	66%	15%	15%	58%	18%	19%
Percent Hispanic, Latino or of Spanish Origin	% of Resident Bay-Users			% of Visitor Bay-Users		
	58%			38%		
Median Household Income	Resident Bay-Users			Visitor Bay-Users		
	\$100,001 to \$150,000			\$100,001 to \$150,000		
Average Years Living in / Visiting Miami-Dade County	Residents			Visitors		
	18			16		
% Who Own Their Own Boat	Residents			Visitors		
	9%			4%		
% Who Belong to Fishing and/or Diving Clubs	Residents			Visitors		
	1%			2%		
When you are boating, do you know when you are in Biscayne National Park? Percent saying yes.	84%			44%		

Source: From the Biscayne Bay User Survey responses of 523 residents and 503 visitors who used Biscayne Bay for recreation in the past 12 months.

Of residents, about 66 percent of the respondents were white, 15 percent were black, and 15 percent were other races. This represents an increase in the percent participation of non-white Bay using residents. In 2005, the percentages for residents were 93 percent white, six percent black and 1 percent other races.

Of visitors, about 58 percent of the respondents were white, 18 percent were black, and 19 percent were other races. This also represents an increase in the percent participation of non-white Bay using visitors. In 2005, the percentages for visitors were 91 percent white, six percent black and 3 percent other races.

About 58 percent of resident Bay users and 38 percent of visitor Bay users were Hispanic, Latino or of Spanish origin. In 2005, these percentages were 52 percent and 20 percent of residents and visitors, respectively.

Both residents and visitors have a median household income in the range of \$100,000 to \$150,000 per year. In 2005, residents had a median annual household income of \$43,000 and visitors had an income of \$55,000 (both in 2005 dollars).

Less than 10 percent of Bay-using residents and visitors surveyed owned their own boat, which is a significant drop from that found in 2005 when 29 percent of residents and 22 percent of visitors said they owned their own boat.

Very few residents and visitors belong to a fishing or diving club - only one percent of residents and two percent of visitors said they belong to such a club. This is down from four percent and three percent, respectively, in 2005.

Of those who boated on Biscayne Bay, 84 percent of residents and 44 percent of visitors said they knew when they were boating in Biscayne National Park.

The distributions of years lived in or visited Miami-Dade County by residents and visitors, respectively, are provided in **Table 2-42**. Bay-using residents have lived in Miami-Dade County an average of 18 years while Bay-using visitors have been visiting the county an average of 9 years. About 40 percent of resident Bay users have lived in Miami-Dade County for 10 years or less. About 58 percent of the county’s Bay-using visitors have visited the county for less than five years.

Table 2-42 - Years Lived In or Visited Miami-Dade County

Years	Years Lived in Miami-Dade County		Years Visiting in Miami-Dade County	
	Resident Bay User Respondents		Visitor Bay User Respondents	
	Number	Percent	Number	Percent
< 5	138	26%	305	58%
6 to 10	75	14%	65	12%
11 to 20	122	23%	69	13%
21 to 30	93	18%	40	8%
31 to 40	41	8%	14	3%
41 to 50	24	5%	8	2%
51 to 60	19	4%	2	0%
61 to 70	10	2%	0	0%
70+	1	0%	0	0%
Total	523	100%	503	96%
Average Number of Years	18		9	

Source: Biscayne Bay User Survey responses of 523 residents and 503 visitors who recreated on Biscayne Bay in the past 12 months.

2.14 Origin of Bay-Using Visitors to Miami-Dade County in 2022

Bay-using visitors were also asked where their trip originated in terms of the city, state and/or country. The countries where the 503 Bay-using visitor respondents began their trip to Miami-Dade County are provided in **Table 2-43**. The origin states of the 331 visitor respondents from the United States who answered the question are provided in **Table 2-44**. The origin counties of the 34 Bay-using visitor respondents from Florida who answered the question are provided in **Table 2-45**.

Table 2-43 - Origin of Visitors Who Recreate on Biscayne Bay, 2022

Country of Origin	Number of Visitor Respondents	% of All Respondents
Angola	1	0.20%
Antigua and Barbuda	1	0.20%
Argentina	6	1.19%
Bahamas	1	0.20%
Barbados	1	0.20%
Belgium	4	0.80%
Bolivia	2	0.40%
Brazil	11	2.19%
Canada	17	3.38%
Cayman Islands	1	0.20%
Chile	12	2.39%
Colombia	14	2.78%
Cuba	3	0.60%
Dominican Republic	2	0.40%
Ecuador	4	0.80%
Egypt	2	0.40%
France	8	1.59%
Germany	12	2.39%
Greece	1	0.20%
Guatemala	1	0.20%
Guyana	1	0.20%
Haiti	1	0.20%
Honduras	4	0.80%
Hungary	2	0.40%
India	1	0.20%
Ireland	2	0.40%
Israel	1	0.20%
Italy	3	0.60%
Korea, Republic of (So. Korea)	2	0.40%
Mexico	3	0.60%

Table 2-43 - Origin of Visitors Who Recreate on Biscayne Bay, 2022

Country of Origin	Number of Visitor Respondents	% of All Respondents
Netherlands	1	0.20%
Nicaragua	4	0.80%
Paraguay	1	0.20%
Peru	4	0.80%
Poland	1	0.20%
Puerto Rico	1	0.20%
Spain	10	1.99%
United Arab Emirates	1	0.20%
United Kingdom	11	2.19%
United States	335	66.60%
Uzbekistan	2	0.40%
Venezuela	7	1.39%
(blank)	1	0.20%
Total	503	100.00%

Source: Biscayne Bay User Survey of 503 visitors who recreated on Biscayne Bay in past 12 months.

Table 2-44 - Origin of United States' Visitors Who Recreate on Biscayne Bay, 2022

State	Number of Respondents	% of U.S. Respondents
Alabama	4	1.21%
Arizona	4	1.21%
California	18	5.44%
Colorado	4	1.21%
Connecticut	4	1.21%
Delaware	6	1.81%
Florida	113	34.14%
Georgia	15	4.53%
Illinois	14	4.23%
Indiana	2	0.60%
Iowa	1	0.30%
Kansas	1	0.30%
Kentucky	1	0.30%
Louisiana	2	0.60%
Maryland	2	0.60%
Massachusetts	4	1.21%
Michigan	8	2.42%
Minnesota	1	0.30%
Mississippi	4	1.21%
Missouri	5	1.51%
Nevada	3	0.91%
New Hampshire	1	0.30%
New Jersey	20	6.04%
New York	26	7.85%
North Carolina	10	3.02%
Ohio	3	0.91%
Oklahoma	2	0.60%
Oregon	2	0.60%
Pennsylvania	8	2.42%
Rhode Island	1	0.30%
South Carolina	3	0.91%
Tennessee	1	0.30%
Texas	22	6.65%
Utah	5	1.51%
Virginia	5	1.51%
Washington	4	1.21%
West Virginia	1	0.30%
Wyoming	1	0.30%
Total	331	100.00%

Source: Biscayne Bay User Survey of visitors who recreated on Biscayne Bay in past 12 months.

Table 2-45 - Origin of Florida Visitors Who Recreate on Biscayne Bay, 2022

County	Number of Respondents	% of Florida Respondents
Broward	20	60.61%
Duval	1	3.03%
Hendry	1	3.03%
Hillsborough	1	3.03%
Lee	3	9.09%
Martin	2	6.06%
Monroe	1	3.03%
Osceola	1	3.03%
Palm Beach	2	6.06%
Sarasota	1	3.03%
Total	33	100.00%

Source: Biscayne Bay User Survey of 503 visitors who recreated on Biscayne Bay in past 12 months. Only 33 of the 113 Florida visitors indicated their origin county.

2.15 Importance of Biscayne Bay to All Residents and Visitors Surveyed

The importance of Biscayne Bay to all residents and visitors surveyed in 2022 and 2023 regardless of whether they used the Bay for recreation is summarized in **Table 2-46**.

Table 2-46 - Importance of Biscayne Bay to Residents and Visitors Surveyed Regardless of Bay-Related Recreational Use

Importance Scale	Number of Residents (to live in County)	Percentage of Residents Surveyed	Number of Visitors (to visit County)	Percentage of Visitors Surveyed
5 - most important	146	53%	66	22%
4	53	19%	48	16%
3	43	15%	58	19%
2	12	4%	44	15%
1 - least important	24	9%	87	29%
Total Surveyed	278	100%	303	100%

For Miami-Dade County residents who completed the General Survey, this question was asked of all of them (regardless of whether they participated in a recreation activity on the Bay): “On a scale of 1 to 5; with 1 being least important and 5 being most important, how important is Biscayne Bay in terms of your decision to live in Miami-Dade County?” Of the 278 Miami-Dade County residents surveyed, 53 percent said that Biscayne Bay is a most important part in their decision and nine percent said it was least important. **The average score of the resident respondents is 4.07 which is very close to being the most important reason for living in Miami-Dade County.**

For all Miami-Dade County visitors who completed the General Survey, regardless of whether they used the Bay, the question asked of them was: “On a scale of 1 to 5; with 1 being least important and 5 being most important, how important is Biscayne Bay in terms of your decision to visit Miami-Dade County?”

Of the 305 Miami-Dade County visitors surveyed, 22 percent said that Biscayne Bay is the most important reason to visit the County and 29 percent said it was least important. **The average score of the respondents is 2.87 which is the midpoint of the range of most important and the least important.**

2.16 Top Reasons for Not Recreating on Biscayne Bay in Past 12 Months

For those residents and visitors who completed the General Survey but did not participate in any recreation activities on Biscayne Bay in the past 12 months, the following question was asked of them: “Which were the most important reasons why you did not participate in Biscayne Bay-related recreation activities in the past 12 months in order of their importance? (Indicate top three answers in order of importance.)” Their responses are summarized in **Table 4-47**.

Table 4-47 - Top Reasons for Not Recreating on Biscayne Bay in Past 12 Months (From General Survey Responses to top 3 reasons)

Reason for Not Recreating on Biscayne Bay	Residents - Number Who Gave This Reason	% of 45 Residents Surveyed Who Did Not Recreate On Bay	Visitors - Number Who Gave This Reason	Percentage of 142 Visitors Surveyed Who Did Not Recreate On Bay
Too busy to visit the Bay	44	98%	135	95%
I never thought about/wasn't aware of it	25	56%	114	80%
I don't like saltwater-related recreation	10	22%	25	18%
I prefer the Atlantic Ocean	10	22%	37	26%
Bay is too polluted	7	16%	14	10%
Bay is too crowded	10	22%	23	16%
Not enough fish to catch	1	2%	1	1%
Bay is unattractive	3	7%	12	8%
Not enough boat ramps/launch facilities	2	4%	1	1%
Not enough parking	14	31%	31	22%
Not enough dry dock storage	1	2%	0	0%
Not enough parks; undeveloped areas	2	4%	3	2%
Not enough beach areas	4	9%	9	6%
Other - Did not know about activities	1	2%	0	0%
Other - Expensive	3	7%	1	1%
Other - Age	1	2%	0	0%
Other - Too far away	1	2%	4	3%
Other - Not familiar with the Bay	1	2%	0	0%
Other - Not fan of water activities	0	0%	1	1%
Other - Weather	0	0%	1	1%
Other - Spent 1 night here	0	0%	2	1%
Other - Difficult to get there	0	0%	1	1%
Other - Didn't come for flora	0	0%	1	1%
Other - Traveling solo, wouldn't go alone	0	0%	1	1%
Other - No interest	0	0%	2	1%
Other - Stays away from tourist areas	0	0%	1	1%

Each reason was counted only once regardless of the order of importance indicated by the respondent. The most popular response was the respondent was “Too busy to visit the Bay” as indicated by 98 percent of the residents and 95 percent of the visitors who did not use the Bay for recreation. The next most popular reason was that the respondent “Never thought about it / wasn’t aware of it” as indicated by 56 percent of residents and 80 percent of visitors. Other popular responses were that there was not enough parking, the Bay is too polluted, the Bay is too crowded, the respondent does not like saltwater recreation or prefers the Atlantic Ocean.

3. Biscayne Bay-Dependent Recreation - Historic

This section compares the results of the 2022 study to those of the 2005 study and provides an historic look at the recreational uses and economic contribution of Biscayne Bay from 2006 to 2022 using the available data.

3.1 Comparison of the 2005 Study Results to the 2022 Study Results

A comparison of the 2022 number of person-days presented in this report to the results from the 2005 Biscayne Bay Economic Study report is provided in **Table 3-1**. This comparison is possible because, for the most part, the data sources and methodologies employed during the two studies were the same.

The total number of person-days in all Bay-related recreation activities increased from an estimated 66 million to 119 million over the 17-year period. The percentage increase over the period is 83 percent. A comparison of all activities except viewing the Bay from shore finds that the number of person-days only increased by about two percent from about 50 million in 2005 to 51 million in 2022. However, the estimated number of person-days spent viewing the Bay from shore increased by 336 percent between 2005 and 2022 going from 16 million person-days in 2005 to 69 million person-days in 2022.

Table 3-1 - Comparison of Person-Days of Biscayne Bay-related Recreation in 2005 and 2022

Number of Person-Days, Annual	2005 Estimate	2022 Estimate	Percentage Change from 2005 to 2022
(1)	(2)	(3)	(4) = [(3) - (2)] / (2)
All Activities Except Viewing Bay from Shore	49,601,000	50,728,000	2%
Viewing Bay from Shore	15,856,000	69,086,000	336%
Total Number of Person-Days:	65,457,000	119,814,000	83%

The 2022 economic contribution of Biscayne Bay-related recreation to Miami-Dade County presented in this report is compared to the results from the 2005 Biscayne Bay Economic Study report in **Table 3-2**.

Table 3-2 - Comparison of Economic Contributions from Biscayne Bay-related Recreation in 2005 and 2022

Miami-Dade County:	2005 Estimate in 2005 dollars	2005 Estimate in 2022 dollars (except Employment)	2022 Estimate	Percentage Change from 2005 to 2022
(1)	(2)	(3) = (2) x 1.4444	(4)	(5) = [(4) - (3)] / (3)
Output	\$3,789,000,000	\$5,470,007,681	\$15,081,913,000	176%
Income	\$2,112,000,000	\$3,048,998,739	\$8,211,172,000	169%
Employment	57,100	57,100	113,300	98%
Tax Revenue	\$257,000,000	\$371,019,259	\$2,263,646,000	510%

The Bay-related recreation expenditures in 2005 created \$5.5 billion in output as measured in 2022 dollars (see Column (3)). In 2022, output increased to \$15 billion or 176 percent which is greater than the 83 percent growth in the number of person-days of recreation. This is because the real (inflation-adjusted) expenditures per person-day of recreation increased over time and this increase is reflected in the annual

growth in economic contribution from 2005 to 2022 as presented in the next sub-section. Similarly, income increased by 169 percent between the two periods from \$3.1 billion in 2005 (2022 dollars) to \$8.2 billion in 2022. Employment increased by 98 percent from 57,100 in 2005 to 113,300 in 2022.

Tax revenue increased by an unexpected 510 percent. This is probably due to fewer tax sources included in the 2005 tax revenue data and modeling. The tax sources in the 2022 modeling include all local, county, State and Federal tax revenues. The tax revenue measured in 2005 may not have included the tax revenue collected by the Federal government. For 2022, the Federal tax revenue collected was about \$1 billion. Multiplying \$371 million measured in 2005 by 176 percent to capture the growth in output between the two years yields \$1 billion. Adding the \$1 billion in Federal tax revenue collected in 2022 to the growth in tax revenue due to the increase in output (\$1 billion) yields a total 2022 tax revenue of \$2 billion which is close to what was estimated for 2022 (\$2.3 billion). Therefore, the actual increase in tax revenue was probably about 176 percent. A direct comparison of tax revenue in **Table 3-2** should not be made without adding in Federal tax revenue to the 2005 value.

3.2 Estimated Historic Recreational Uses and Economic Contribution

The pattern of annual visitation from 2005 to 2021 at the three State parks and Biscayne National Park which surround the Bay was used to model the historic recreational uses and economic contribution of Biscayne Bay. The values estimated in 2005 and 2022 are the values at the beginning and end of the historic period 2005 to 2022.

The annual attendance from 2005 to 2022 at Biscayne National Park, the Barnacle Historic State Park, the Oleta River State Park, and the Cape Florida / Bill Baggs State Park are provided in **Table 3-3**. The locations of these parks provide a good distribution of recreational access surrounding the Bay. Oleta River State Park is in the northern part of the Bay, the Barnacle Historic State Park is on the west Bay just south of downtown Miami, Biscayne National Park is in the south part of the Bay and Cape Florida / Bill Baggs State Park is on Key Biscayne.

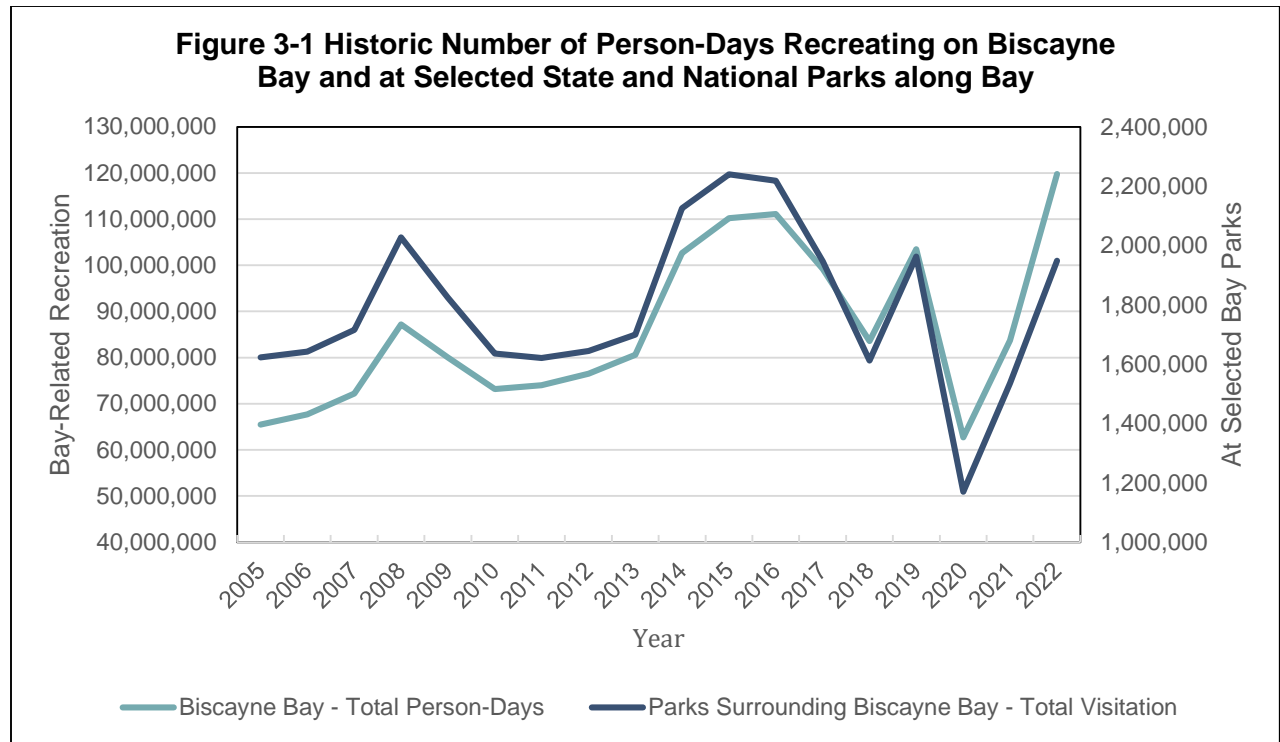
Total attendance at the four parks surrounding the Bay rose and fell during the period 2005 to 2022. Total attendance between 2005 to 2022 increased by 20 percent. This growth is lower than the 68 percent growth in the number of person-days of Bay-related recreation that was estimated during the 2005 and the 2022 Biscayne Bay Economic studies. It is higher than the person-day growth in the “on-the-Bay” activities which did not grow at all and lower than the person-day growth in viewing the Bay from shore which increased by 336 percent.

Table 3-3 - Attendance at State and National Parks Along Biscayne Bay, 2001 to 2022

Year	Biscayne National Park	Barnacle Historic State Park	Oleta River State Park	Cape Florida / Bill Baggs State Park	Total	Annual % Change
(1)	(2)	(3)	(4)	(5)	(6) = Sum of (2) to (5)	(7) = % change in Col (6)
2005	563,728	28,387	268,020	762,968	1,623,103	
2006	608,836	28,890	295,397	709,434	1,642,557	1.2%
2007	517,442	39,955	353,254	805,004	1,715,655	4.5%
2008	686,062	32,712	392,269	916,253	2,027,296	18.2%
2009	437,745	51,265	406,790	928,438	1,824,238	-10.0%
2010	467,612	30,418	358,480	778,947	1,635,457	-10.3%
2011	476,077	46,884	374,348	723,408	1,620,717	-0.9%
2012	495,613	57,157	466,271	624,953	1,643,994	1.4%
2013	486,848	70,593	469,080	672,782	1,699,303	3.4%
2014	525,745	103,396	595,738	900,816	2,125,695	25.1%
2015	508,164	117,856	655,484	959,166	2,240,670	5.4%
2016	514,709	131,856	621,540	950,279	2,218,384	-1.0%
2017	446,961	136,007	499,846	863,575	1,946,389	-12.3%
2018	469,253	150,003	387,776	605,445	1,612,477	-17.2%
2019	708,522	154,969	423,690	675,000	1,962,181	21.7%
2020	402,770	119,544	241,625	406,057	1,169,996	-40.4%
2021	705,655	91,944	316,155	421,781	1,535,535	31.2%
2022	701,023	145,489	383,882	718,234	1,948,628	26.9%
Overall Percent Change in Total Visitation from 2005 to 2022						20.1%

(a) Data sources are the Florida Department of Environmental Protection for the State park attendance data requested through email and from the National Park Service <https://irma.nps.gov/Stats/Reports/Park/BISC> for the Biscayne National Park attendance data. Attendance is the number of people entering the park each year.

A graph of the total of state and national park attendance and the number of person-days of Bay-related recreation that mirrors the historic park attendance pattern is provided in **Figure 3-1**. Recreation use grew from 2005 to 2008 and fell precipitously in 2009. The drop in the number of person-days from 2009 to 2013 could be because of the Great Recession, which officially lasted from December 2007 through June 2009, but which impacted the economy for a much longer duration. Recreation increased from 2014 to about 2016 and then fell in 2017 and 2018 probably in response to Hurricane Irma which hit the Florida Keys as a category 4 and made landfall in Marco Island as a category 3 in September 2017. In 2019 recreation began to bounce back but was stymied by the Covid-19 pandemic in 2020. In 2021 and 2022, recreation grew and in 2022 reached the highest level that it had achieved back in 2015 and 2016. In reviewing the number of person-days back to 1980 as reported on page 3-8 of the 2005 Biscayne Bay Economic Study report, the 119 million person-days in 2022 dwarfs all documented historic recreation activity.



The park visitation and Biscayne Bay-related recreation that was used to create **Figure 3-1** is provided in **Table 3-4**.

Table 3-4 - Historic Number of Person-Days Recreating on Biscayne Bay, 2005 to 2022

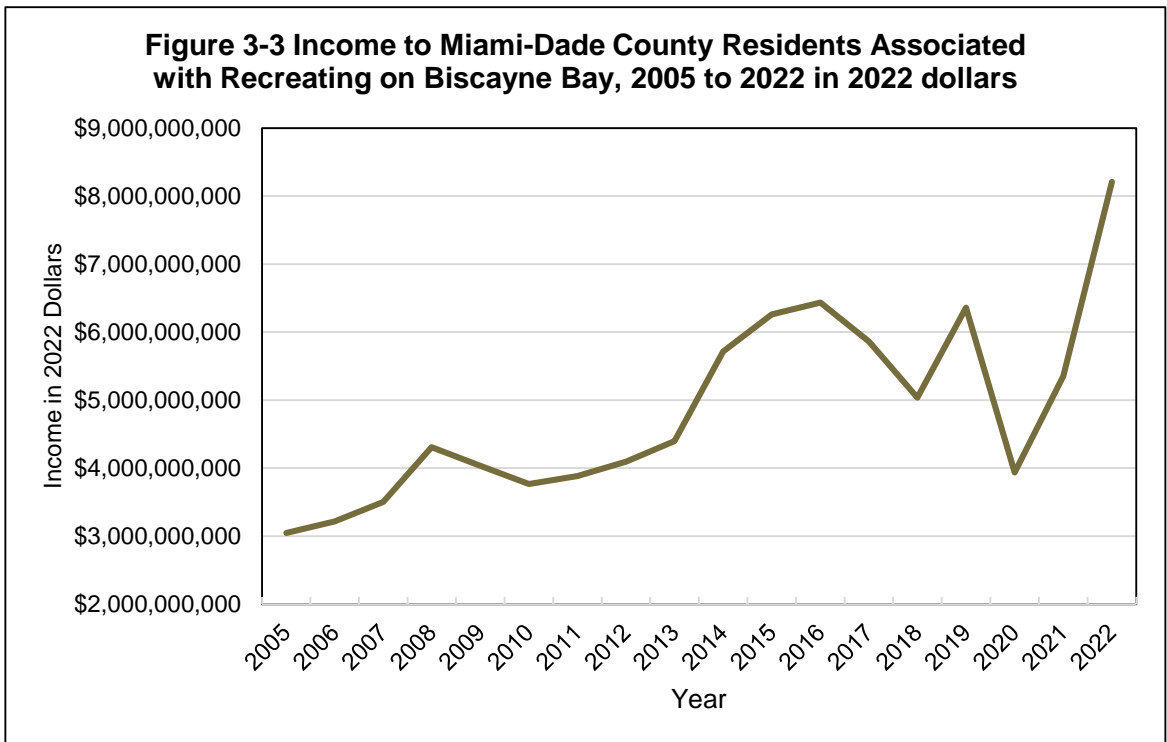
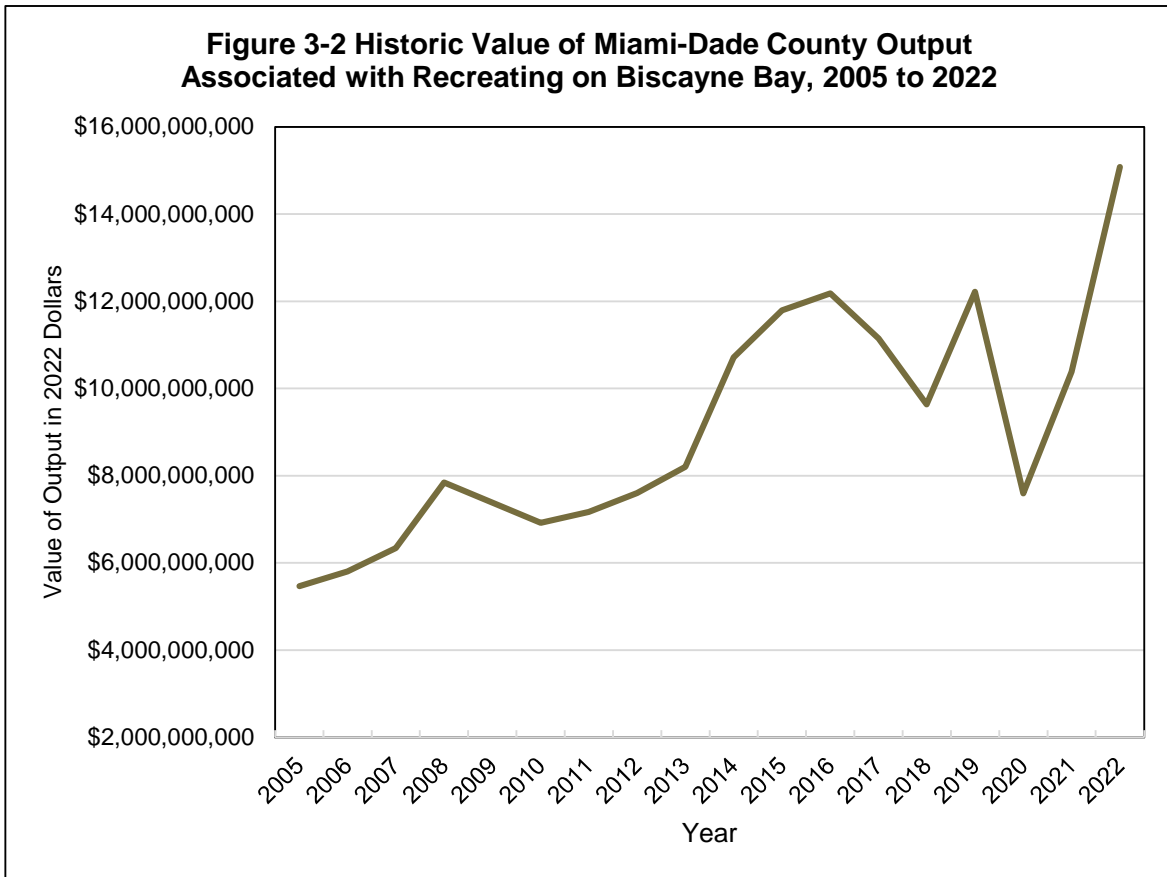
Year	State and National Parks Surrounding Biscayne Bay	Biscayne Bay
2005	1,623,103	65,457,000
2006	1,642,557	67,696,249
2007	1,715,655	72,228,347
2008	2,027,296	87,143,740
2009	1,824,238	80,030,855
2010	1,635,457	73,197,288
2011	1,620,717	73,972,938
2012	1,643,994	76,491,325
2013	1,699,303	80,569,686
2014	2,125,695	102,668,954
2015	2,240,670	110,206,543
2016	2,218,384	111,075,088
2017	1,946,389	99,180,011
2018	1,612,477	83,593,286
2019	1,962,181	103,460,250
2020	1,169,996	62,726,764
2021	1,535,535	83,684,255
2022	1,948,628	119,814,000

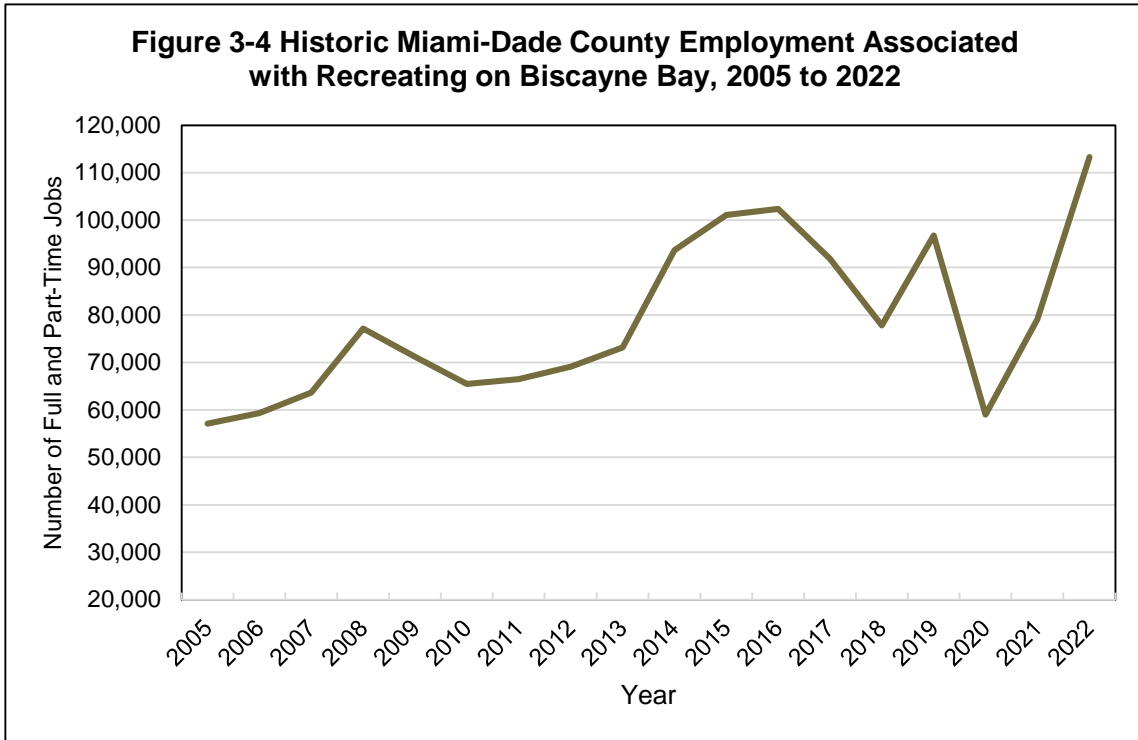
The historic number of person-days spent recreating on Biscayne Bay as provided in the previous table and the total output, income, employment, and tax revenue estimated for 2005 (updated to 2022 dollars) and 2022 were used to create an historic profile of these economic metrics from 2005 through 2022. The historic values follow the trend in visitation at the four parks surrounding the Bay and the percentage increase in output, income, and employment per person-day from 2005 to 2022 as was estimated during the two Hazen studies. The annual person-days, output, income, and employment from 2005 to 2022 are presented in **Table 3-5**.

Table 3-5 - Estimated Historic Output, Income, and Employment in Miami-Dade County Generated from Recreation on Biscayne Bay

Year	Biscayne Bay - Total Person-Days	Output	Income	Employment
2005	65,457,000	\$5,470,000,000	\$3,049,000,000	57,100
2006	67,696,000	\$5,798,600,000	\$3,216,400,000	59,300
2007	72,228,000	\$6,341,400,000	\$3,500,300,000	63,600
2008	87,144,000	\$7,842,200,000	\$4,307,600,000	77,200
2009	80,031,000	\$7,382,200,000	\$4,035,100,000	71,200
2010	73,197,000	\$6,920,600,000	\$3,764,400,000	65,500
2011	73,973,000	\$7,168,800,000	\$3,880,400,000	66,500
2012	76,491,000	\$7,598,200,000	\$4,092,700,000	69,100
2013	80,570,000	\$8,203,400,000	\$4,397,200,000	73,100
2014	102,669,000	\$10,714,800,000	\$5,715,300,000	93,700
2015	110,207,000	\$11,789,000,000	\$6,257,600,000	101,100
2016	111,075,000	\$12,179,000,000	\$6,433,100,000	102,400
2017	99,180,000	\$11,146,600,000	\$5,859,100,000	91,900
2018	83,593,000	\$9,629,700,000	\$5,037,000,000	77,800
2019	103,460,000	\$12,216,300,000	\$6,358,800,000	96,800
2020	62,727,000	\$7,591,800,000	\$3,932,400,000	59,000
2021	83,684,000	\$10,381,400,000	\$5,351,200,000	79,100
2022	119,814,000	\$15,081,900,000	\$8,211,200,000	113,300

Graphs of the estimated annual output, income, and employment presented in **Table 3-5** are provided in **Figure 3-2**, **Figure 3-3**, and **Figure 3-4**. Annual tax revenue from 2005 to 2022 is not provided in this report because the components of tax revenue used in 2005 versus in 2022 are not the same. The 2005 tax revenue is missing Federal taxes while the 2022 tax revenue includes Federal taxes.





4. Biscayne Bay-Dependent Commercial Fishing

This section provides the estimated economic contribution of Biscayne Bay-related commercial fishing to the local, regional, and state economy. The economic contribution of Biscayne Bay-related commercial fishing includes the economic activity generated by harvesting and retailing the Bay-related marine species and the economic activity generated by the investments made to purchase and refurbish the commercial fishing boats. The contributions of each are discussed as follows.

4.1 Economic Contribution of Bay-Related Commercial Marine Species Harvesting and Retailing

The contribution of Biscayne Bay to commercial marine species harvesting and retailing is two-fold. First, commercial fishing takes place in the Bay for the harvest of fish and shellfish. Second, Biscayne Bay and Florida Bay are very important grounds for the lifecycle of many fish species that are commercially landed in Miami-Dade County and other areas. Historically, these species have included 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.

The commercial marine harvest from Biscayne Bay, the commercial marine landings in Miami-Dade County, and their exvessel values by species were obtained from the Florida Fish and Wildlife Conservation Commission and reflect the period 2003 through 2021. “Exvessel value” means the dollar value of the marine species at dockside or just off the fishing boat. The word “harvest” refers to marine life known to be caught from Biscayne Bay. The word “landings” means that the fish were “landed” at a dock in Miami-Dade County and these fish could have been “harvested” from anywhere.

The pounds landed and the exvessel value of Biscayne Bay-related commercial marine species is equal to the pounds landed and exvessel value of the marine life harvested from Biscayne Bay plus the values associated with species that depend on the Bay for a part of their lifecycle but were not harvested from Biscayne Bay (to avoid double-counting). White shrimp is the only species not harvested from the Bay, but dependent on the Bay. Biscayne Bay-dependent fish species that are landed in other Florida counties are not included in this Biscayne Bay economic evaluation.

The annual harvest and exvessel value for Biscayne Bay, Barnes Sound, and Card Sound from 2003 to 2021 are provided in **Table 4-1**. The relatively small harvest from Barnes Sound and Card Sound was included with the Biscayne Bay harvest and exvessel value data to be consistent with the data reported in the 2005 Biscayne Bay Economic Study report.

The annual landings and exvessel value of white shrimp in Miami-Dade County from 2003 to 2021 are provided in **Table 4-2**. In reviewing the annual data for white shrimp landings, the year 2010 is the peak year and the pounds landed and exvessel value are outliers in the annual data. The cause of this peak is not known. According to NOAA Fisheries, “Annual harvests of white shrimp vary considerably from year to year, primarily due to environmental conditions.” (<https://www.fisheries.noaa.gov/species/white-shrimp>)

Table 4-1 - Annual Harvest and Exvessel Value of Marine Species from Biscayne Bay, Barnes Sound and Card Sound, 2003 to 2021

Landings in Pounds, Fish and Shellfish			Total Exvessel Value, All Species	
Year	Pounds Harvested*	Numbers of Marine Life Caught	Nominal Dollars	2022 Dollars
2003	376,541	-	\$1,398,944	\$2,065,237
2004	497,881	29	\$1,402,065	\$2,020,458
2005	807,285	7,689	\$1,748,754	\$2,445,809
2006	613,930	5,353	\$1,419,132	\$1,922,217
2007	415,179	5,353	\$1,257,692	\$1,658,077
2008	490,703	28,652	\$1,668,738	\$2,155,034
2009	691,668	1,325	\$1,508,674	\$1,928,724
2010	508,004	-	\$1,639,745	\$2,078,214
2011	630,424	-	\$2,033,564	\$2,526,424
2012	671,477	460	\$1,728,282	\$2,108,504
2013	364,659	-	\$1,588,112	\$1,902,678
2014	380,746	710	\$2,444,122	\$2,872,668
2015	538,062	1,270	\$2,318,554	\$2,694,196
2016	863,659	-	\$2,406,591	\$2,773,513
2017	1,014,965	236	\$2,084,214	\$2,359,852
2018	643,345	-	\$1,909,915	\$2,113,274
2019	595,182	-	\$2,650,639	\$2,876,772
2020	709,387	-	\$3,111,100	\$3,332,053
2021	651,930	344	\$3,981,807	\$4,137,470

Table 4-2 – Annual Pounds and Exvessel Value of White Shrimp Landed in Miami-Dade County, 2003 to 2021

Year	Pounds Harvested	Total Value in 2022 Dollars
2003	23,197	\$33,350
2004	3,136	\$6,920
2005	27,739	\$55,145
2006	33,560	\$73,327
2007	2,584	\$5,338
2008	7,407	\$15,052
2009	13,542	\$34,039
2010	244,199	\$334,866
2011	23,183	\$49,235
2012	69,760	\$188,391
2013	42,215	\$154,778
2014	49,910	\$68,066
2015	11,120	\$20,205
2016	9,370	\$11,586
2017	6,740	\$6,822
2018	6,026	\$8,245
2019	26,015	\$66,090
2020	23,727	\$78,662
2021	4,168	\$12,795

Biscayne Bay-related commercial fishing generates additional benefits beyond the exvessel value of marine landings. The value-added from marketing and retailing these landings also generates economic contributions. The estimated 2021 value-added was input into the IMPLAN economic input-output model to obtain estimates of these contributions. To identify the industries that directly benefit from the marketing and retailing of the Bay-dependent commercial marine landings, the distribution of exvessel value by species in 2021 was reviewed. This distribution is provided in **Table 4-3**. Data identifying the species harvested from Barnes Sound and Card Sound were not available so, for the purposes of this study, it was assumed that the distribution of the harvested species is the same as for the species caught in Biscayne Bay.

Table 4-3 - Distribution of Biscayne Bay-Related Commercial Marine Exvessel Value by Species in 2021

Species	Total (2022 \$)	Percentage of Total Value
Bait Fish	\$227,434	5.48%
Bait Shrimp	\$578,939	13.95%
Blue Crab	\$74,391	1.79%
Jack spp.	\$99	0.00%
Mackerel spp.	\$78	0.00%
Misc. Fish	\$333	0.01%
Misc. Inverts	\$2,309	0.06%
Marine Life Invertebrates	\$7,472	0.18%
Mullet spp.	\$5,733	0.14%
Pink Shrimp	\$2,769	0.07%
Snapper spp.	\$798	0.02%
Spiny Lobster	\$2,604,960	62.77%
Stone Crab	\$632,156	15.23%
White Shrimp	\$12,795	0.31%
Total Value	\$4,150,265	100.00%

Shrimp and fish for bait comprised 19 percent of the total value of Bay-related commercial marine landings in 2021. Spiny lobster, stone crab, and blue crab accounted for 80 percent of the total exvessel value.

Output, income, jobs, and tax revenue are created as these species are marketed at the retail level. The retail industries used in the IMPLAN model for these commercial marine landings are bait shops and restaurants. All the spiny lobster, blue crab, stone crab, and other finfish species were assumed to be sold in restaurants. All retail sales are assumed to take place in Miami-Dade County.

No recent studies have been published on commercial seafood marketing margins in the United States. The only available data on the marketing margin that converts exvessel value to retail value is from Berkeley, et.al (1985). As discussed in the 2005 Biscayne Bay Economic Study report, this Florida Sea Grant technical paper reports exvessel, wholesale, and retail prices for bait shrimp harvested from Biscayne Bay. The exvessel price to wholesale price margin is 1.62. The wholesale price to retail price margin is 1.92. The total margin from exvessel price to retail price is 3.11.

The 2021 exvessel value of \$4.15 million was multiplied by the estimated exvessel-to-retail margin of 3.11 to obtain the total retail value of \$12.9 million. This \$12.91 million is comprised of the \$4.15 million exvessel value and the \$8.76 million exvessel-to-retail margin. These results are provided in **Table 4-4**.

Table 4-4 - Annual Exvessel Value for Biscayne Bay-Related Commercial Marine Landings and Associated Estimated Marketing Margin in 2021

Annual Exvessel Value (2022 \$)	Exvessel to Retail Margin	Total Retail Value
(1)	(2) = [(1) x (3.11)] – (1)	(3) = (1) + (2)
\$4,150,265	\$8,757,059	\$12,908,985

The IMPLAN economic input-output model was used to estimate the economic contribution of the 2021 retail value of the Biscayne Bay-related commercial fishery as follows.

The estimated total retail value of the commercial fishery as presented in Column (3) of **Table 4-4**, \$12.9 million, was input to the IMPLAN Regional Economic Input Output Model representing Miami-Dade County, southeast Florida, and Florida.

The industries included in the modeling were:

- Commercial Fishing (IMPLAN Sector 17) at \$4.2 million (Column (1) of **Table 4-4**);
- Full-Service Restaurants (IMPLAN 509) at \$7.0 million (\$8.76 million x 0.80 – Column (2) of **Table 4-4** and assuming that 80 percent of the retail value is sold by local restaurants); and,
- Miscellaneous Retail Establishments (IMPLAN 412) (representing bait shops and pet stores) at \$1.8 million (\$8.76 million x 0.20).

The IMPLAN model provides the direct, indirect, and induced output, income, employment, and tax revenue generated from the Biscayne Bay-related commercial fishery. This method was implemented for the year 2021 which is the latest complete year of available data.

Table 4-5 summarizes the estimated economic contribution of the 2021 Bay-related commercial fishing industry to the Miami-Dade County economy. **In 2021, the Biscayne Bay-related commercial fishing industry generated \$18.3 million in output, \$11.3 million in income, 190 jobs, and \$2.6 million in tax revenue.**

Table 4-5 Economic Contribution of the Biscayne Bay-Related Commercial Fishing Industry on Miami-Dade County’s Economy in 2021 (2022 dollars)

Impact	Output	Income	Employment	Tax Revenue
Direct	\$12,131,347	\$8,305,178	153	\$1,824,010
Indirect	\$3,070,694	\$1,416,605	17	\$331,499
Induced	\$3,101,837	\$1,612,419	20	\$405,577
Total	\$18,303,878	\$11,334,202	190	\$2,561,087

These values are significantly lower than what would be expected given the results from the 2005 Biscayne Bay Economic Study report. The difference is mostly attributed to the large reduction in

induced impacts between Miami-Dade County’s commercial fishing industry in 2022 versus that reported in the 2005 report.

The economic contribution of Bay-related commercial fishing to southeast Florida and Florida are presented in **Table 4-6** and **Table 4-7**, respectively. To estimate the magnitude of these economic contributions, the IMPLAN model was run using Miami Dade County as the location where the commercial fishing and retailing activities are conducted.

The results provided in these tables compared to the results in **Table 4-5** demonstrate that most of the economic contribution of Bay-related commercial fishing is enjoyed by residents in Miami-Dade County. This would be expected when it is assumed that all the fish harvested in Biscayne Bay are landed in Miami-Dade County and that all the marketing and retailing takes place in the County.

Table 4-6 - Economic Contribution of the Biscayne Bay-Related Commercial Fishing Industry on Southeast Florida’s Economy in 2021 (2022 dollars)

Contribution	Output	Income	Employment	Tax Revenue
Direct	\$12,131,347	\$8,305,487	153	\$1,824,010
Indirect	\$3,177,027	\$1,470,753	17	\$343,238
Induced	\$3,807,094	\$1,985,275	24	\$494,326
Total	\$19,115,467	\$11,761,515	195	\$2,661,575

Table 4-7 - Economic Contribution of the Biscayne Bay-Related Commercial Fishing Industry on Florida’s Economy in 2021 (2022 dollars)

Impact	Output	Income	Employment	Tax Revenue
Direct	\$12,131,347	\$8,305,487	153	\$1,824,010
Indirect	\$3,255,348	\$1,502,928	18	\$352,765
Induced	\$4,118,838	\$2,134,257	26	\$539,859
Total	\$19,505,532	\$11,942,673	197	\$2,716,634

4.2 Economic Contribution of Bay-Related Commercial Fishing Investment

Beyond the economic contribution generated by commercial marine landings and the marketing and retailing of the resulting products, commercial fishing enterprises provide additional economic contribution through capital investments to purchase and maintain their fishing vessels. These investments are in addition to the regular maintenance and repair that are included in the economic contribution of the commercial fishery described in **Tables 4-5 through 4-7**.

The annual capital investment from the Bay-related commercial fishery was estimated as the annual depreciation of the typical vessel type times an estimate of the number of full-time equivalent vessels that participate in the Biscayne Bay-related commercial fishery. To estimate this additional economic contribution to the region, the estimated annual depreciation was input into the IMPLAN regional economic input-output model under the industry sector “Ship Building and Boat Repair”.

While a variety of vessels are used to harvest Bay-related marine species, they are typically about 20 to 30 feet in length.⁵ The typical cost of a new commercial fishing vessel of this size is about \$240,000 as inferred from commercial vessel sales asking prices of all models listed in several websites including www.shipsusa.com and www.boatrader.com. These web sites post fishing vessel boats for sale throughout the United States by type of vessel. The quotes used for this estimate were offers for boats for sale in the State of Florida. The \$240,000 estimate represents a 27-foot trawler. Asking prices for new boats or almost new (less than 4 years old) boats within the 20-to-30-foot length size ranged from \$120,000 to \$320,000.

This \$240,000 cost for a new fishing vessel was divided by 10 years to get the average ten-year depreciation of the vessel or \$24,000 per vessel per year. The use of 10 years is made under the assumption that the vessel would undergo significant refurbishment about every ten years.

The estimated number of full-time equivalent fishing vessels that participate in the Bay-related commercial fishery was estimated as the direct employment associated with the Bay-related commercial fishery (number of fishers) divided by an average approximate crew size of 1.5 persons per vessel.⁶ The number of vessels times the average depreciation per vessel was then calculated. From the IMPLAN Model, the \$4.15 million in 2021 Bay-related commercial marine landings generates a total of 47 direct jobs. This indicates that there are 31.33 full-time-equivalent vessels engaged in Bay-related commercial fishing (47 divided by 1.5 = 31.33).

To obtain an estimate of the 2021 capital investment, the \$24,000 depreciated value per vessel was multiplied by the 31.33 vessels to yield \$752,000 in estimated capital investment related to the Bay-related commercial fishery. This value was entered into the IMPLAN Model under the industry sector “Ship Building and Repair”. **Tables 4-8 through 4-10** present the economic contribution of Bay-related commercial fishing investment in Miami-Dade County, in southeast Florida and in Florida, respectively.

Table 4-8 - Economic Contribution of Commercial Fishing Capital Investments to the Miami-Dade County Economy in 2021 (In 2022 dollars)

Impact	Output	Income	Employment	Tax Revenue
Direct	\$752,000	\$268,510	3	\$54,493
Indirect	\$313,815	\$152,270	2	\$35,509
Induced	\$221,690	\$115,414	1	\$28,989
Total	\$1,287,505	\$536,194	6	\$118,992

⁵ Based on conversations with experts at the Southwest Fisheries Science Center, NOAA, Miami, Florida, April 2005.

Table 4-9 - Economic Contribution of Commercial Fishing Capital Investments to the Southeast Florida Economy in 2021 (In 2022 dollars)

Impact	Output	Income	Employment	Tax Revenue
Direct	\$752,000	\$268,510	3	\$54,493
Indirect	\$332,193	\$161,404	2	\$37,545
Induced	\$280,669	\$146,390	2	\$36,411
Total	\$1,364,862	\$576,304	7	\$128,449

Table 4-10 - Economic Contribution of Commercial Fishing Capital Investments to the Florida Economy in 2021 (In 2022 dollars)

Impact	Output	Income	Employment	Tax Revenue
Direct	\$752,000	\$268,510	3	\$54,493
Indirect	\$341,404	\$165,317	2	\$38,726
Induced	\$308,289	\$159,640	2	\$40,424
Total	\$1,401,693	\$593,467	7	\$133,642

4.3 Overall Economic Contribution of Biscayne Bay-Related Commercial Fishing

The overall economic contribution of Biscayne Bay-related commercial fishing to the Miami Dade-County economy is provided in **Table 4-11** and includes marine species harvesting and retailing, and fishing vessel capital investment. **Tables 4-12 and 4-13** provide the overall contribution to the southeast Florida economy and the State of Florida economy.

Table 4-11 - Overall Estimated Economic Contribution of Biscayne Bay-Related Commercial Fishing to the Miami Dade Economy in 2021 (in 2022 dollars)

Direct Sector	Output	Income	Employment	Tax Revenue
Commercial Fishing*	\$18,303,878	\$11,334,202	190	\$2,561,087
Capital Expenditures	\$1,287,505	\$536,194	6	\$118,992
Total	\$19,591,383	\$11,870,396	196	\$2,680,079

Table 4-12 - Overall Estimated Economic Contribution of Biscayne Bay-Related Commercial Fishing to the Southeast Florida Economy in 2021 (in 2022 dollars)

Direct Sector	Output	Income	Employment	Tax Revenue
Commercial Fishing*	\$19,115,467	\$11,761,515	195	\$2,661,575
Capital Expenditures	\$1,364,861	\$576,304	7	\$128,449
Total	\$20,480,328	\$12,337,819	202	\$2,790,024

Table 4-13 - Overall Estimated Economic Contribution of Biscayne Bay-Related Commercial Fishing to the Florida Economy in 2021 (in 2022 dollars)

Direct Sector	Output	Income	Employment	Tax Revenue
Commercial Fishing*	\$19,505,532	\$11,942,673	197	\$2,716,634
Capital Expenditures	\$1,401,693	\$593,467.13	7	\$133,642
Total	\$20,907,225	\$12,536,140	204	\$2,850,276

A breakdown of the top ten industries that benefit from Bay-related commercial fish harvest, marketing and capital expenditures based on resident income is provided in **Table 4-14**. These top ten industries comprise 82 percent of the resident income generated.

Table 4-14 - Economic Contribution of Biscayne Bay-related Commercial Fishing in 2021 to Miami-Dade County Resident Income Itemized by the Top 10 Industries that Benefit (2022 \$)

Rank	Industry Sector	Income
1	509 - Full-service restaurants	\$4,041,690
2	17 - Commercial fishing	\$3,835,862
3	412 - Retail - Miscellaneous store retailers	\$499,679
4	447 - Other real estate	\$285,209
5	360 - Ship building and repairing	\$268,684
6	449 - Owner-occupied dwellings	\$258,790
7	469 - Management of companies and enterprises	\$216,174
8	490 - Hospitals	\$107,254
9	448 - Tenant-occupied housing	\$82,931
10	47 - Electric power transmission and distribution	\$80,250
	Sub-Total Income	\$9,676,524
	Total Income	\$11,870,396
	Percentage of Total Income	82%

As indicated in **Table 4-14**, full-service restaurants in Miami-Dade County, which are assumed to be the retailers of 80 percent of the Bay-dependent commercial marine harvest, are the largest beneficiaries of Biscayne Bay-dependent commercial fishing, receiving \$4.0 million of the \$11.9 million in resident income in 2021. This sector is followed by the commercial fishing sector which contributed \$3.8 million to resident income in the County. The third greatest beneficiary was miscellaneous store retailers providing \$500,000 in resident income. This sector reflects the supply of 20 percent of the marine harvest to bait shops and pet stores in the county. Other benefiting sectors include ship building and repairing, management of companies and enterprises, other real estate, health care, and electric services. The owner and tenant occupied housing sectors also receive income which is part of “other property type income” as described in the definitions found in Section 1. They are included in the top ten list and reflect the imputed value of the property being owned or rented or, in other words, the rental value associated with owning or renting a home.

The overall economic contributions of Biscayne Bay-related commercial fishing to the Miami-Dade County economy, the southeast Florida economy and the Florida economy are provided in **Table 4-15**. These results include fish harvest and retailing, and capital investment. The results are based on the data

provided in **Tables 4-11 to 4-13**. These contributions as a percentage of the overall economies of each area are provided in **Table 4-16**.

Biscayne Bay-dependent commercial fishing contributed \$20 million to Miami-Dade County’s output, \$11.9 million to its resident income, 196 jobs, and \$2.7 million in tax revenue. In Southeast Florida, commercial fishing contributed \$20.5 million in output, \$12.3 million in resident income, 202 jobs and \$2.8 million in tax revenue. In Florida, commercial fishing contributed \$20.9 million in output, \$12.5 million in resident income, 204 jobs and \$2.9 million in tax revenue. These contributions are less than one percent of each study area’s economy.

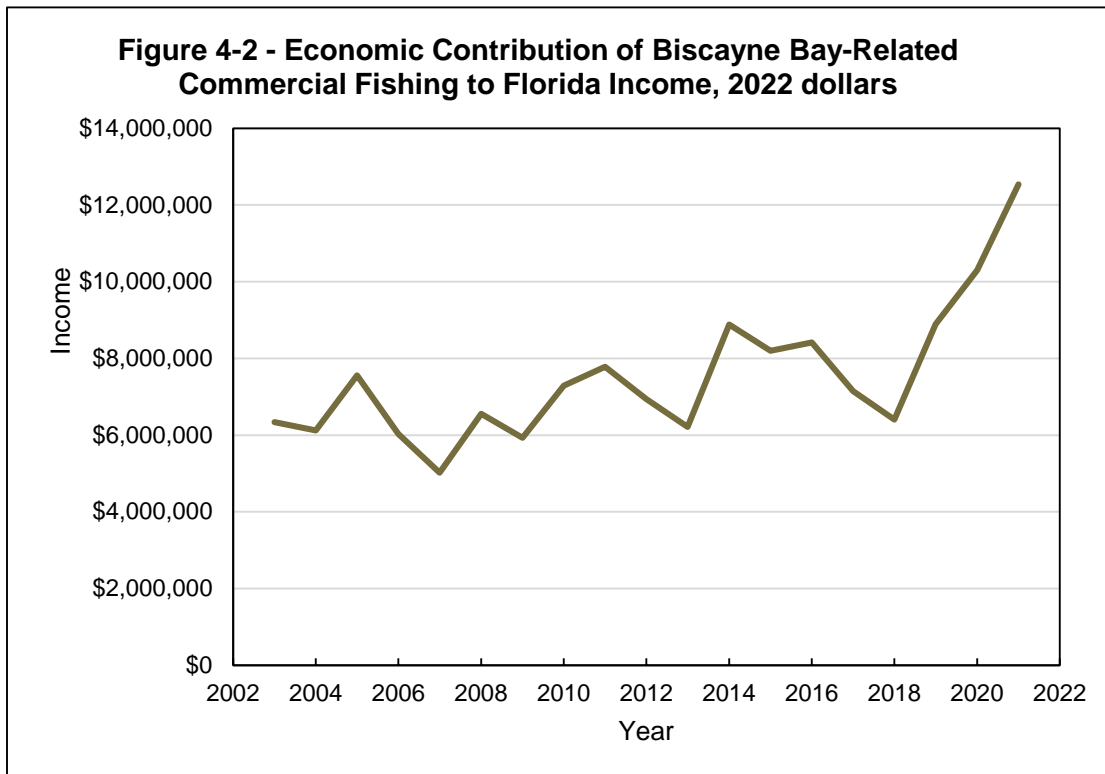
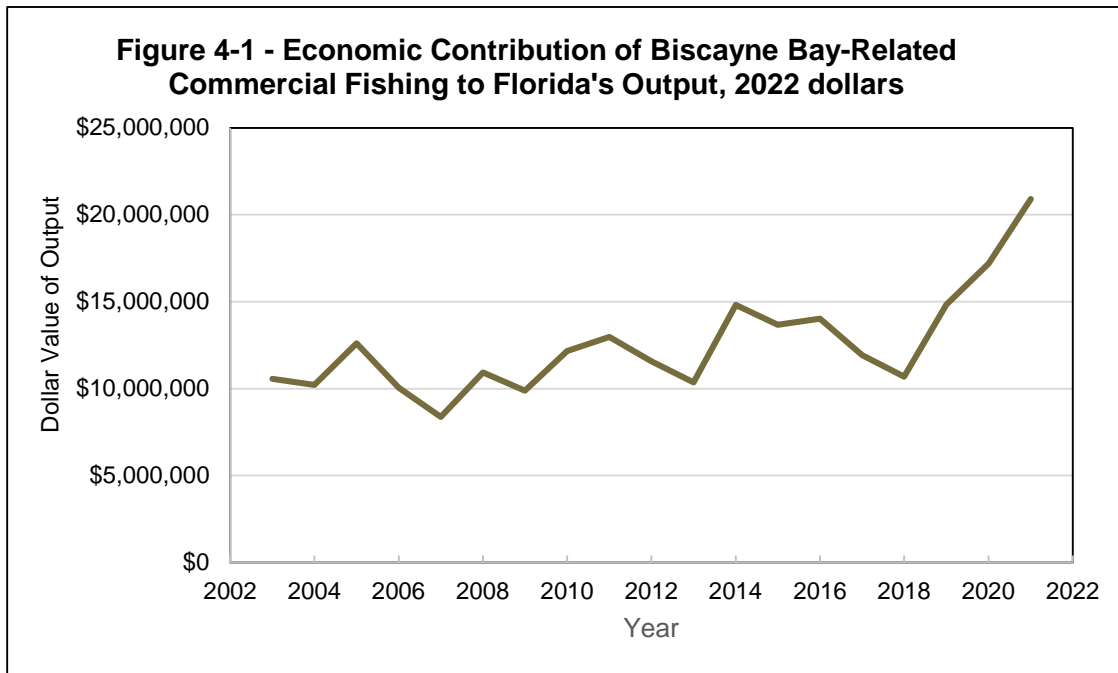
Table 4-15 - Overall Estimated Economic Contribution of Biscayne Bay-Related Commercial Fishing in 2021 (in 2022 dollars)

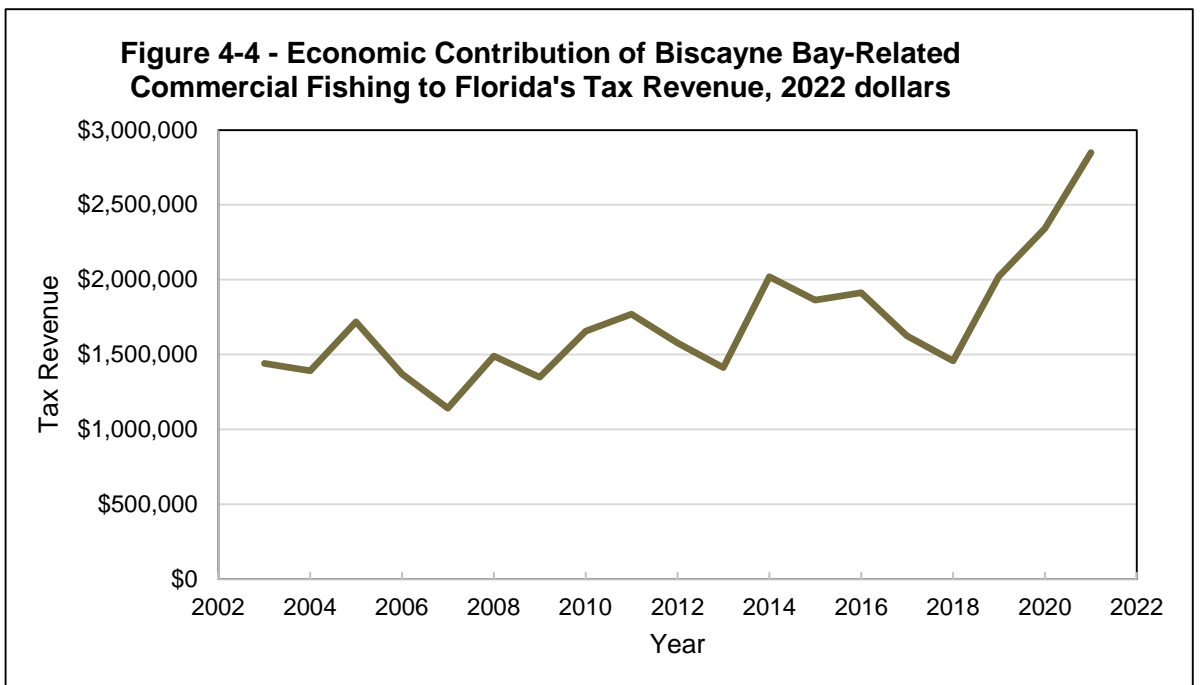
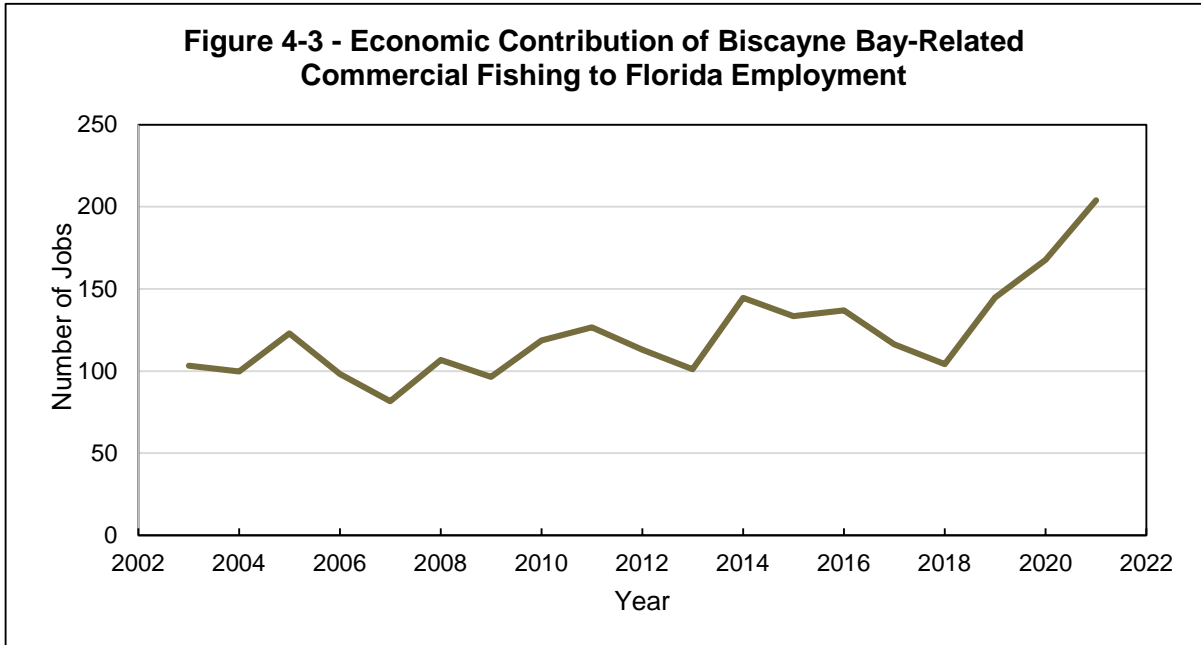
Study Area	Output	Income	Employment	Tax Revenue
Miami-Dade County	\$19,591,383	\$11,870,396	196	\$2,680,079
Southeast Florida	\$20,480,328	\$12,337,819	202	\$2,790,024
Florida	\$20,907,225	\$12,536,140	204	\$2,850,276

Table 4-16 - Economic Contribution of Biscayne Bay-Related Commercial Fishing in 2021 as Percentage of the Study Area Economies

Study Area	Output	Income	Employment
Miami-Dade County	0.0057%	0.0066%	0.0107%
Southeast Florida	0.0027%	0.0030%	0.0049%
Florida	0.0009%	0.0011%	0.0016%

Plots of the estimated historic economic contribution of Bay-related commercial fishing to Florida’s economy from 2002 to 2021 are provided in **Figures 4-1 through 4-4**, for output, income, employment, and tax revenue, respectively. The data provided in these figures represent the direct, indirect, and induced economic contribution of commercial fishing harvest, retailing and investments as measured by output, income, employment, and tax revenue. They rely only on the 2022 estimated economic contributions as provided in **Table 4-13** and the trends in the exvessel value of marine species dependent on Biscayne Bay as was provided in **Tables 4-1 and 4-2**. Because it appears that the structure of the commercial fishing industry changed from the 2005 Biscayne Bay Economic Study report to this 2022 study, the estimated economic contributions plotted in these graphs are likely low-end estimates during the early years and are more representative in later years.





5. Economic Contribution of PortMiami and Miami River

This section describes the economic contribution of PortMiami taken from an existing study and provides the available information regarding shipping activities on the Miami River.

5.1 Shipping and Cruising Operations at PortMiami

PortMiami, located on Biscayne Bay, supports shipping and cruising activities in Miami-Dade County. The most recent assessment of PortMiami’s estimated economic contribution to the regional economy is the 2017 study prepared by Martin Associates for PortMiami.⁷ The Martin Associates study is the most recent and comprehensive publicly available economic impact study of the Port and provides a detailed account of the large economic role that PortMiami plays in the regional economy. While Martin Associates has not issued a revised report since 2017, they provided Hazen with a 2018 update of selected economic impact estimates, and it is those updated estimates that are presented in this report.

The 2017 Martin Associates Report estimated the economic impacts of PortMiami based on telephone and personal interviews of 500 firms in the Miami-Dade County area. The Report states that the survey data collected at the firm level included detailed employment (both full time and part time), annual payroll, local purchases, and employee residence. The detailed survey data were used along with U.S. Census Consumer Expenditure Survey data to generate estimates of the direct and indirect economic impacts, including employment, personal income, economic output, and tax revenue.

As defined in the report, direct employment impacts are the jobs created at the port that are directly involved in cargo and cruising activities such as cargo handling. These jobs and the resulting income and output they generate would not exist without the port. Indirect impacts such as indirect employment are generated because of purchases by firms directly involved in the cargo and cruising facilities. Induced impacts are generated by the purchase of goods and services by individuals directly involved in the Port’s operations.

In addition, the Martin Associates Study includes the estimated impact of the Port on related shipper/consignee (related user) jobs. The report defines these jobs as:

“jobs with shippers and consignees (exporters and importers) using the marine terminals for shipment and receipt of cargo. These related user jobs measure the impact of the port at a given point of time as these importers and exporters can and do you use other ports for export and import. The related user impacts are used to measure the current sphere of influence of the Port at a given point in time, and are not “generated” by the Port in the same sense as the direct, induced, and indirect impacts”

For all categories of impacts, the Report differentiates impacts generated by the Port’s cargo activities from impacts generated by the Port’s cruising activities.

The Martin Associates study’s overall estimates of the Port’s economic contribution to the regional economy are provided in **Table 5-1**. This table is based on Exhibit I-1 in the Martin Associates study

⁷ The Local and Regional Economic Impacts of PortMiami, Prepared for PortMiami by Martin Associates, March 28, 2017

report but has been updated with 2018 estimates that were provided by Martin Associates. As shown in the Table, the Port directly supported 22,414 jobs which produced a total of \$916.1 million in personal income in 2018 dollars. In 2022 dollars the personal income contribution is approximately \$1.05 billion. Cruise activities at the Port generated almost double the direct jobs generated by cargo activities, although cargo employment on a per job basis generated more personal income than that of cruise activities (\$48,358 per job for cargo versus \$37,042 per job for cruise in 2018 dollars).

**Table 5-1 - Economic Impact of PortMiami Cargo and Cruise Activity, 2018
(in 2018 dollars)**

(2018 Update of Exhibit I-1 of the report “The Local and Regional Economic Impacts of PortMiami” prepared for PortMiami by Martin Associates, March 28, 2017)

Impact Category	Cargo	Cruise	Total
Jobs			
Direct	7,585	14,829	22,414
Induced	5,647	8,831	14,478
Indirect	2,869	6,428	9,297
Users	288,342	NA	288,342
Total	304,443	30,088	334,532
Personal Income (\$ millions)			
<i>Direct</i>	\$366.8	\$549.3	\$916.1
<i>Re-Spending/Consumption User Income</i>	\$721.2	\$945.9	\$1,667.1
<i>Indirect</i>	\$111.7	\$218.0	\$329.8
<i>User Income</i>	\$10,079.2	NA	\$10,079.2
Total Income and Consumption	\$11,279.0	\$1,713.3	\$12,992.2
Value Of Economic Output (\$ millions)			
Business Services Revenue	\$1,387.2	\$4,812.4	\$6,199.6
Re-Spending/Consumption	\$721.2	\$945.9	\$1,667.1
User Output	\$35,107.6	NA	\$35,107.6
Total Value Of Economic Output	\$37,215.9	\$5,758.3	\$42,974.2
State and Local Taxes (\$ millions)			
Direct, Indirect, Induced	\$110.4	\$188.9	\$299.2
User Taxes	\$1,255.0	NA	\$1,255.0
Total State and Local Taxes	\$1,365.4	\$188.9	\$1,554.2

An additional 14,478 induced jobs and 9,297 indirect jobs were also created by the Port which generated another \$329.8 million in indirect personal income and \$1,667 million in induced personal income (Re-Spending/Consumption User Income) in 2018 dollars. In 2022 dollars the indirect income is an estimated \$376.5 million and the induced income is \$1.9 billion.

The cargo moving through PortMiami generated an additional 304,443 jobs in the State of Florida. These jobs were created because of the demand for the product, not the use of the Port. The 2018 personal income generated was \$11.3 billion in 2018 dollars which is \$12.9 billion in 2022 dollars. Should PortMiami not be available for use by these importers and exporters, other ports could be used and the

overall number of related jobs would not be impacted. In contrast the direct, indirect, and induced jobs and income created in the County would not exist if the cargo does not move through PortMiami.

The 2018 total income contribution of the Port, which is comprised of direct, induced (re-spending / consumption user income), indirect, and user income was estimated to be \$12.9 billion in 2018 dollars which is equal to \$14.8 billion in 2022 dollars. This total income represents about 8.24 percent of the Miami-Dade County economy as presented in **Table 5-2**.

The total output contribution from all sources was estimated to be \$42.9 billion in 2018 dollars which is \$48.8 billion in 2022 dollars. Employment generated as a result of PortMiami operations was estimated to be 334,532 jobs in 2018 or 18.3 percent of the County’s economy.

Table 5-2 - Economic Contribution of PortMiami to Miami-Dade County in 2022 – Estimate

Study Area	Output	Income	Employment
Estimated Value (Output and Income are in 2018 dollars).	42,974,000	12,992,000	334,552
Estimated Value (Output and Income are in 2022 dollars (a))	48,849,000	14,830,000	NA
Percentage of Miami-Dade County Economy	13.99%	8.24%	18.33%

(a) The 2018 value was multiplied by 1.14 to reflect inflation from 2018 to 2022. The 1.14 is the ratio of the GDP (Chained) Price Index in 2022 and in 2018 (1.2593/1.1032) taken from the U.S. White House Office of Management and Budget Historical Tables Table 10.1 downloaded on May 9, 2023.

The economic impact of the Port extended beyond Miami Dade County although that is where 74 percent of the direct employees live. As shown in **Table 5-3**, reproduced from Exhibit II-3 of the Martin Associates study report, an estimated 22 percent of the direct cargo employees lived in Broward County. The Report did not provide a similar distribution for Port cruising activities. This distribution was not updated for 2018 so note that the total employment numbers are somewhat smaller than in the previous tables.

Table 5-3 - Distribution of Direct Cargo Jobs by Location (2016)

County	Direct Jobs	Percentage Share
Miami-Dade	5,409	74.3%
Broward	1,599	22.0%
Palm Beach	27	0.4%
Other Florida	243	3.3%
Other U.S.	4	0.1%
Total	7,282	100.0%

Source: Martin Associates, Exhibit II-3

The Martin Associates study report provides information regarding PortMiami’s large influence on exporting and importing firms, which they refer to as “related users” of the Port. As noted above, the users are not exclusive to PortMiami and could potentially make greater use of other Ports. These “users”

conduct business with the Port for multiple reasons including cost and time considerations and efficiency advantages over the other accessible Ports. The magnitude of this user group, including the fact that they directly employ an estimated 288,000 workers, far greater than the direct, indirect, and induced employment generated by the Port, demonstrates the value of PortMiami to the regional economy.

5.2 Miami River Shipping

There have been no recent economic impact studies performed to estimate the contributions of the Miami River to the regional economy and such an assessment is beyond the scope of this study. Instead, this study uses historic data from the United States Army Corps of Engineers (USACE) to present the tonnage and composition of cargo transported on the Miami River. Although these data cannot be used to quantify the economic contribution of the Miami River to the regional economy, they can be used to show the vital importance the river plays in moving commodities to and from domestic and international markets.

The Miami River is a short (5.5 mile) but important waterway for the transport of vital goods to and from southeast Florida to foreign destinations. Previous studies including the 2005 Biscayne Bay Economic Study have estimated the River’s marine industry impact on the regional economy. The 2005 study estimated that the Miami River shipping industry generated \$682 million in output, 6,106 jobs, \$339 million in income, and \$37.7 million in tax revenues in 2005.

Because the scope of the current study is more limited and the data from the 2005 report have not been updated, this study summarizes the trends and characteristics of cargo traffic monitored by the USACE. The total annual tonnage of freight transported on the Miami River from 2002 to 2020 is provided in **Table 5-4**. The total includes both imported and exported cargo. The data are plotted in **Figure 5-1**.

Table 5-4 - Annual Short Tons of Imports and Exports at the Miami River, 2002 through 2020

Year	Short Tons	Year	Short Tons
2002	505,000	2012	392,000
2003	527,000	2013	369,000
2004	657,000	2014	311,000
2005	489,000	2015	364,000
2006	557,000	2016	380,000
2007	463,000	2017	435,000
2008	317,000	2018	447,000
2009	335,000	2019	411,000
2010	390,000	2020	309,000
2011	417,000		

Source: US Army Corps of Engineers, Waterborne Commerce of the United States, 2011 and 2020, Part 1 - Waterways and Harbors, Atlantic Coast, pages 159 and 144, respectively

The USACE data indicate that after the increase in traffic from 2002 to 2004, transported tonnage underwent a steep decline, dropping from a peak of 657,000 tons in 2004 to a low of 317,000 tons in 2008, which could be explained by the Great Recession which lasted from December 2007 through June 2009. Shipping increased from 2009 to another cyclical peak of 417,000 tons in 2011 and then fell to a

low of 311,000 in 2014. In 2015, shipping began a rebound before experiencing another steep decline beginning in 2019. In 2020, the latest year of available data, shipping on the Miami River fell to its lowest level in 19 years likely due to the severe economic impacts of the Covid-19 pandemic that slowed down economic activity.



The USACE 2020 Waterborne Commerce data indicate that manufactured goods accounted for about 56 percent of the transported tonnage. Outbound vehicles and parts were the largest export item within this group. Food products comprised about 17 percent of the total cargo transported with most of those products being exported to foreign destinations.

A study to estimate the economic contribution of the Miami River shipping industry would provide a fresh perspective on the importance of this transportation resource. This study would identify the benefits of the river’s shipping activities including the employment and income generated, the types of products imported versus exported, and the destinations of this cargo. The study’s scope would include a survey of the importers and exporters who ship their products to and from the river and the businesses who provide the shipping services. The survey results would be supplemented with data from USACE to estimate the Miami River’s economic contribution as it is used for shipping.

6. Contribution of Biscayne Bay and Miami River to Property Values

This section presents estimates of the contribution of Biscayne Bay and the Miami River to the market value of residential properties in Miami-Dade County and provides the methods and data used. Hedonic price analysis using residential market values and housing unit characteristics data obtained from the Miami-Dade County Property Appraiser's office were used to obtain these estimates. The market value contributions provide direct measures of resident willingness-to-pay for the benefits of living on or near the Bay and the River.

6.1 Method and Data Source

Part of the market values of the properties located on or near Biscayne Bay and the Miami River reflect the property owner's value of the Bay or River as a visual amenity and as a convenient recreational opportunity. This value is measured by the property owner's willingness to pay an additional amount of money in the purchase price of a housing unit to live on or near the Bay or River. This value is a component of the total economic value of Biscayne Bay and the Miami River.

This additional market value can be annualized to reflect an estimate of the annual value of the aesthetic and recreational benefits associated with living on or near the Bay or River. The additional market value is multiplied by the discount rate to obtain this annual value. The value of the discount rate used depends on the benefits being valued.⁸

Hedonic price analysis was employed to statistically estimate the contribution of Biscayne Bay and the Miami River to the market value of all residential properties located on the Bay or the River and near the Bay or the River. The types of residential properties are listed below.

- (1) Single-family – One housing unit on the property
- (2) Multi-family – An individually-owned housing unit in a building of multiple housing units
- (3) Apartment buildings – Residential buildings with housing units rented from the building owner

One hedonic price equation was estimated for each of these three types of properties. For each property type, one equation was estimated using properties on or near the Bay and another was estimated using properties on or near the River. For the few properties on or near both the Bay and the River, properties directly on the Bay and those right behind them were included in the Bay equations and properties directly on the River and those right behind them were included in the River equations. A property was included in either the Bay equation or the River equation but not in both equations.

⁸ By way of background, the discount rate is used to calculate the Net Present Value (NPV) of an investment, such as a new real estate development, and its value is chosen for one or more of the following reasons: (1) Account for the time value of money; (2) Account for the riskiness of an investment; and (3) Represent the opportunity cost of the investment to a firm, a community, or a person. Opportunity cost is the rate of return associated with the next best foregone alternative investment. As the number of years after the investment increases and a positive annual income is obtained each year, the NPV calculation converges to the annual net income divided by the discount rate. This calculation could represent the market value of a residential property. For example, if the property owner could rent the property and obtain an annual net income of \$10,000, then using a three percent annual discount rate, the market value would be \$333,334.

Originally the project team tried to distinguish multi-family dwelling units in low rise buildings from those in high rise buildings, but the available data were unable to support an accurate identification of units in low rise versus high rise buildings. The resulting statistical analysis using this distinction left confusing results likely caused by data errors. Therefore, all multi-family dwelling units are included in one hedonic price equation for the Bay and one for the River.

The market value contribution, or increased market value, is the estimated additional market value per housing unit (or apartment building) by property type for the following properties.

- ON THE BAY – These properties are located directly on Biscayne Bay.
- NEAR THE BAY – These properties are within 0.30 miles of the Bay and do not include properties ON THE BAY.
- NOT ON OR NEAR THE BAY – These properties are from 0.30 miles to 1.0 mile of the Bay.
- ON THE RIVER– These properties are located directly on the Miami River.
- NEAR THE RIVER – These properties are within 0.30 miles of the River and do not include properties ON THE RIVER.
- NOT ON OR NEAR THE RIVER – These properties are from 0.30 miles to 1.0 mile of the River.

Aerials of the study areas identified by these definitions are provided in **Figure 6-1** for the northern area of Biscayne Bay, **Figure 6-2** for the central and southern area of Biscayne Bay, and **Figures 6-3** for the Miami River.

The statistical evaluation included the data for all residential properties within one mile of the Bay and the River. From this data, the market values of properties on or near the Bay or the River were compared to the market values of the same types of properties from 0.30 miles to one mile from the Bay and the River.

The thresholds of 0.30 miles and 1.0 mile were based on visual inspection of aerial views of the Bay and River to distinguish areas that have easy access to or have views of the Bay or the River and those that likely do not. Three types of viewing software were used: (1) the Miami-Dade County Property Appraiser GIS datafiles; (2) Google Earth; and (3) Bing Maps. It is likely that the ease of access to and views of the Bay and River continuously change as one moves away from these water bodies while the statistical analysis cuts off the benefits at 0.3 miles. Visual inspection and the statistical analysis described in this section suggest that the bulk of the benefits of living on or near the Bay and the River are experienced within about 0.30 miles of these water bodies.

The market value of the properties within 0.3 miles of the Bay or River were statistically compared to residential properties located from 0.3 miles to 1.0 mile from these water bodies. This is because, as one moves away from the Bay and the River, the characteristics of the communities and neighborhoods change significantly, and this will impact market values. To try to hold constant as many characteristics affecting market value as possible (other than proximity to the Bay and the River), the analysis did not compare properties outside of the 1.0-mile threshold. In addition, the estimated equations account for the location of the property along the Bay and along the River. These comparisons of locations along the Bay and the River are discussed further on in this section.



Figure 6-1 Study Area for Properties Within 1.0 Mile of Biscayne Bay in North Bay



Figure 6-2 Study Area for Properties Within 1.0 Mile of Biscayne Bay in Central Bay



Figure 6-3 Study Area for Properties Within 1.0 Mile of the Miami River

The contributions of the Bay and the River to residential property values were estimated using hedonic price analysis. Hedonic price analysis is the statistical estimation of an equation that relates the market value of a property to factors that significantly affect its market value. For example, factors known to significantly influence the market value of residential properties include lot size, building square footage, building age and location.

Given the large range in market value for the large number of properties used in the analysis, it was found that the semi-logarithmic equation can appropriately capture the relationship between the dependent variable (market value) and independent variables (factors affecting market value). The general form of the equation is provided in Equation 1 and is as follows.

$$Y_i = \alpha + \sum_{j=1}^m \beta_j X_{ij} + \varepsilon_i$$

Equation 1

where;

i = index representing the i^{th} residential property

Y_i = Natural log of the market value of the i^{th} residential property (dependent variable)

X_{ij} = Value of the j^{th} independent (explanatory) variable associated with the i^{th} residential property

α = The estimated y-intercept of the regression equation

β_j = Estimated parameters that measure the relationship between Y and the set of j independent variables, X

ε_i = a random error term that denotes the difference between actual Y_i , and Y_i as estimated from the equation

This semi-logarithmic functional form is typically used in hedonic price analysis of property values. This is because, through the estimated parameters, it provides estimates of the percentage of the property's value, not the dollar value, attributed to a one unit increase in the independent variable. Using an average dollar value among all properties with such a large range of market values is not expected to capture all the value of the Bay and the River. Therefore, the unlogged linear functional form was not used.

For the Biscayne Bay analysis, three equations were estimated using the data on Bay properties. For the Miami River analysis, three equations were estimated using the data on River properties. The three equations represent (1) single-family properties, (2) multi-family housing units, and (3) apartment buildings. Therefore, six equations were estimated.

The market value and the characteristics of each property for all single-family, multi-family and apartment building properties within the County were obtained from the Miami-Dade County Property Appraiser database and represent the property's value and characteristics on January 1, 2022. Because this is the first day of the year 2022, the year represented by the market values is 2021.

The dependent variable is the natural log of the market value of each individual property. This market value is the amount a willing purchaser would pay a willing seller, exclusive of reasonable fees and costs

of purchase, in cash or the immediate equivalent, in an arm's length transaction. This market value was estimated by the Miami-Dade County Property Appraiser based on the comparable sales approach, the cost approach, and/or the income approach to valuing real property. It is this market value by which the property's assessed value and taxable value are determined. The method used by the appraiser to estimate the market value of a parcel of land (real property) is summarized at the end of this section.

All residential properties within one mile of Biscayne Bay were used to estimate the equations after removing a few large outliers and all residential parking spaces (these spaces are bought and sold by condominium owners and are assessed property taxes). These properties were identified using GIS data files provided by the County. This dataset provides a market value for every property in the County which allows for the estimation of the average and total additional value of the Bay and River to all impacted properties.

The independent variables included in the equations are those known to influence the market value of residential housing units and apartments and include enclosed living area square feet, lot size in square feet, effective year built, and location variables. The location variables are explained further in this section.

The PROC REG procedure of SAS statistical software was used to generate the parameter estimates (i.e., α and β_j) of Equation 1 for each property type and water body (Bay and River) using the ordinary least squares (OLS) regression method. Diagnostic procedures were employed to ensure consistency with the requirements of the classic linear regression model, as well as to ensure that the results were not unduly influenced by outlying observations. The parameter estimates are statistically unbiased and efficient because of the estimation method used.⁹

Evaluation of Cook's D statistics for the input data identified about 25 outliers in the data and those properties were removed from the analysis. Meanwhile, visual inspection of the residuals suggested that although they were normally distributed, some of the estimated equations did not appear strictly to have uniform variance with respect to one or more independent variables (i.e., were heteroskedastic). White's (1980) robust heteroskedasticity-consistent standard errors were estimated and reported for the parameter estimates of all equations to permit valid inferences about them.¹⁰

Because the data used to estimate the model was purely cross-sectional, the estimated equations were not tested for autocorrelation.¹¹ Finally, for single-family properties, data for "Enclosed living area square feet" and "Land area of property square in feet" were highly correlated and therefore, could not be

⁹ An estimator (the estimated parameter) is said to be unbiased if the expected value of the estimator matches that of the parameter. An efficient estimator has the smallest possible variance, indicating that there is a small deviance between the estimated value and the "true" value.

¹⁰ Heteroskedasticity is a common problem in estimating regression models, especially from purely cross-sectional data. Although OLS parameter estimates remain unbiased under these conditions, their corresponding standard errors will be biased, which invalidates standard hypothesis tests. White's procedure was employed because of the lack of information on the precise underlying form of heteroskedasticity and for its relative simplicity in application within SAS. For a technical discussion on the properties of the robust standard error estimator see Halbert White, "A Heteroskedasticity-Consistent Covariance Matrix Estimator and a Direct Test for Heteroskedasticity", *Econometrica*, Volume 48, Number 4, May, 1980, pages 817-837.

¹¹ Autocorrelation is a condition where model error terms are correlated with one another. Like heteroskedasticity, the presence of autocorrelated errors invalidates statistical inferences about model parameters. Autocorrelation is commonly a problem with models that employ time-series data.

included together in the same equation. Therefore, it was decided to remove the size of the property from the two single-family equations and keep the living area square feet variable in the model.

The County’s database included the data on the type of construction and the quality of the structure. Originally, the project team included these data as categorical (0 or 1) variables in the equations but the results were mixed. The parameter estimates for the type of construction variables were often statistically significant but added little to the explanatory power of the equation. The parameter estimates for the quality variables were usually the incorrect sign with many not statistically different from zero. To improve clarity and brevity of the estimated equations, these variables were removed. Their presence did not noticeably impact the estimated values of the other parameters.

6.2 Biscayne Bay’s Contribution to the Market Value of Residential Properties

Almost all properties located on Biscayne Bay are residential, including single-family housing units, individual housing units in multi-family buildings (multi-family); and apartment buildings where the individual housing units are rented from the building owner (apartments). The area in and surrounding downtown Miami, along the western shore of the central Bay area, is dominated by commercial buildings such as hotels, museums, arenas, shops, restaurants, marinas, and offices. Most of the multi-family and apartment properties along Biscayne Bay are located north of the 79th Street Causeway. South of the causeway, the bayfront residential properties are predominantly single-family houses.

A summary of the data used in the hedonic equations is provided in **Table 6-1**. Properties located directly on the Atlantic Ocean were excluded from the analysis because most of the locational value of these properties will be tied to their direct proximity to the popular Miami beaches. All other residential properties on the barrier islands were included in the model.

Table 6-1 – Biscayne Bay Economic Study - Summary of Residential Property Data Used in the Hedonic Price Analysis of Biscayne Bay

Location	Single-Family	Multi-Family (Individual Units)	Apartment Buildings
	Number of Properties (Observations)		
On Biscayne Bay but not on Island in Bay	1,176		
On or Near (less than 0.30 miles) Biscayne Bay but not on Island		78,855	414
On Island in Biscayne Bay	975	4,831	24
Near Biscayne Bay - Within 0.30 miles of Bay but not on Bay	8,881		
Not On or Near Biscayne Bay – From 0.30 to 1.0 miles of Bay	13,779	31,839	830
Total Number of Properties in Sample	24,811	115,525	1,268
Location	Percentage of All Properties in Sample		
On Biscayne Bay but not on Island in Bay	5%		
On or Near (less than 0.30 miles) Biscayne Bay		68%	33%
On Island in Biscayne Bay	4%	4%	2%
Near Biscayne Bay – Within 0.30 miles of Bay but not on Bay	36%		
Not On or Near Biscayne Bay – From 0.30 to 1.0 miles of Bay	56%	28%	65%
Total	100%	100%	100%

The natural logarithm of the property's market value was modeled as a linear additive function of the following explanatory (independent) variables.

Continuous Variables

1. Land Area of Property in Square Feet – Total lot size of the property. This variable was included only in the apartment building equation because in the single-family equation the data are collinear with Enclosed Living Area Square Feet and in the multi-family equation, the size of the multi-family building's lot was found not to impact the housing unit's market value. For apartment buildings, the larger the lot size, the higher the market value. The data are provided for each property from the Miami-Dade County Property Appraiser's database obtained for this study.
2. Enclosed living area square feet – As indicated, it is the size of the enclosed living area and was included in all three equations. The larger the living area, the higher the market value. The data are provided for each property from the Miami-Dade County Property Appraiser's database obtained for this study.
3. Effective Year Built (4 digits - 19XX or 20YY) – As indicated, it is the 4-digit year that the building was constructed or the last year that it was significantly changed. This variable is meant to capture age-dependent technology and natural building deterioration. This variable was included in all equations. The larger the effective year, the higher the market value. The data are provided for each property from the Miami-Dade County Property Appraiser's database obtained for this study.

Categorical Variables

4. Intercept Term – This is an estimated parameter value that helps to define the equation and depends on how the equation is specified and the values of the data used. For this analysis, the intercept of each equation is the baseline for comparing the locational parameter estimates and includes only those properties that are from 0.30 to 1.0 miles from Biscayne Bay and are in the North Bay Area and are west of Biscayne Bay. The North Bay Area is defined as all properties that are north of the Miami River.
5. In Central Bay Area – The property is in the Central Bay Area defined as all properties located from south of the Miami River to Black Point Park. The value of this variable is 1 if the property is in the Central Bay Area and 0 if it is not. All three property types exist in this area so this variable is included in all three equations. There are no residential properties within one mile of the Bay that are south of Black Point Park. The areas of the north, central and south Bay are indicated in **Figure 6-1** and **Figure 6-2**.
6. East of Biscayne Bay – Properties located on one of the barrier islands east of the Bay, including Bay Harbor Islands, Surfside, Miami Beach, and Key Biscayne. This variable does not include properties on the smaller manmade islands inside the Bay. The value of this variable is 1 if the property is in the East and 0 if it is not. This variable was included in all three equations. Properties located on the Atlantic Ocean side of these islands were not included in the data.
7. On Biscayne Bay – Properties located directly on the Bay. The value of this variable is 1 if the property is directly on the Bay and 0 if it is not. This variable was included in the single-family equation only because multi-family and apartment buildings are too large to distinguish which housing units benefit from being directly on the Bay and which do not.

8. Near (within 0.3 miles) Biscayne Bay – Properties located within 0.30 miles of the Bay but are not directly on the Bay. The value of this variable is 1 if the property is near Biscayne Bay and 0 if it is not. This variable was included in the single-family equation only.
9. On or Near Biscayne Bay – If the property is either directly on or within 0.30 miles of the Bay, the value of this variable equals 1 and it equals 0 otherwise. This variable was used in the multi-family unit and apartment building equations because separating these properties into those on the Bay and those near the Bay in the statistical analysis demonstrated a very weak distinction between being on or near the Bay. This is probably due to a lack of any significant difference in the additional benefits of living on versus near the Bay in terms of aesthetics (views and wildlife) and access to the Bay.
10. On Island in Bay – If the property is on one of the small islands inside Biscayne Bay, the value of this variable is 1, otherwise it is 0. Also, for all properties on these islands, the “On Biscayne Bay” and “Near Biscayne Bay” variables equal 0 so that the parameter estimate for “On Island in Bay” picks up all the benefits of being on or near Biscayne Bay.

6.3 Results for Single-Family Properties on Biscayne Bay

The statistical results for the single-family properties are provided in **Table 6-2**. The intercept of the equation represents single-family properties located from 0.30 to 1.0 mile from Biscayne Bay and are west of Biscayne Bay (landside) and are in the North Area of Biscayne Bay (north of the Miami River). The parameter estimates of the location variables in the equation reflect the impact of the location as described by the variable title on the natural logarithm of market value. So, for example, the parameter estimate for “On Biscayne Bay” equal to 0.69 applies to all properties located “On the Bay” regardless of location because the equation controls for all other locational factors impacting market value.

The estimated equation explains 71 percent of the variation in the natural log of the market value of single-family properties. The parameters of all the variables are statistically different from zero at the $\alpha = 0.05$ level (absolute value of t-ratio greater than 1.96). All parameter estimates are considered rational, in that they have the expected signs and relative magnitudes. However, there are no a priori expectations for the signs associated with the parameters of the East and Central Areas. The estimated parameters of the equation imply that, all else the same, properties east of Biscayne Bay are more valuable than properties west of the Bay and, compared to the North Bay Area, properties in the Central Bay Area are more valuable.

Table 6-2 - Statistical Results of Hedonic Analysis of Single-Family Dwelling Unit Property Values to Estimate the Value of Living On or Near Biscayne Bay in 2021

Natural Logarithm of the Market Value of Single-Family Residential Property in 2021 is Dependent Variable				
Number of Observations (Properties) = 24,811				
Average Value of Unlogged Dependent Variable (Market Value of Property) = \$1,600,000				
Variable (a)	Average Value of Sample	Parameter Estimate	Asymptotic Standard Error	Asymptotic t Value
Intercept *		8.56	0.31	27.5
Enclosed living area square feet *	2,958	0.000312	0.000004	78.0
Effective Year Built *	1977	0.002070	0.000161	12.9
In Central Bay Area *	0.46	0.12	0.01	18.9
East of Biscayne Bay *	0.28	0.33	0.01	41.4
On Biscayne Bay *	0.05	0.69	0.02	40.3
Near but not on Biscayne Bay *	0.36	0.25	0.01	33.5
On Island in Bay *	0.04	0.85	0.02	35.1
Equation Goodness of Fit Measures		Adjusted R2 =	0.71	Pr > F =
		F-Statistic =	8,779	< 0.0001

^(a) The intercept includes properties that are from 0.30 to 1.0 miles from Biscayne Bay and are on the north side of Biscayne Bay and are west of Biscayne Bay.

Note: A * means that the parameter estimate is statistically different from zero at the alpha = 5% level.

The impact of Biscayne Bay on the market value of single-family properties is provided in the parameter estimates associated with “On Biscayne Bay”, “Near but not on Biscayne Bay”, and “On Island in Bay” as follows.

- The parameter estimate associated with “On Biscayne Bay” is 0.69. Converting this parameter value to a proportion of the market value, $[(e^{0.69} - 1) = (1.99 - 1.00) = 0.99]$, where $e = 2.71828183$, finds that being directly on the Bay increases the market value of the single-family property by 99%.
- The parameter estimate associated with “Near (but not on) Biscayne Bay” is 0.25. In the same manner as above, converting this parameter value to a proportion of the market value, $[(e^{0.25} - 1) = (1.29 - 1.00) = 0.29]$, finds that being near but not on the Bay increases the market value of the single-family property by 29%.
- The parameter estimate associated with “On Island in Bay” is 0.85. Converting this parameter value to a proportion of the market value, $[(e^{0.85} - 1) = (2.34 - 1.00) = 1.34]$, finds that being on an island in the Bay increases the market value of the single-family property by 134%.

The estimated dollar value of the Bay’s contribution to the market value of a single-family property is calculated in **Table 6-3**. The estimated parameters of the equation as presented in **Table 6-2** were used to calculate the natural log of market value in columns (2) and (4) of **Table 6-3**. For example, the average natural log of the market value of single-family properties located from 0.30 to 1.0 mile from the Bay and in the North Bay area and west of the Bay is 13.28 and the inverse of this natural log is \$585,000 (Column (5)).

To the 13.28 value can be added the estimated location parameters in **Table 6-2** depending on the location of the property. For example, the natural log of the market value of properties located in the North Bay area and west of the Bay that are ON the Bay is equal to 13.28 plus 0.69 or 13.97 (Column (2)). Taking the inverse of the natural log of 13.97 ($e^{13.53}$) equals \$1.2 million (Column (3)).

The difference between the \$1.2 million on the Bay and the \$585,000 not on the Bay is \$600,000 (Column (6)). This means that being directly on the Bay in the North Bay area west of Biscayne Bay increases the market value of a single-family property by \$600,000. Multiplying this increase by the number of properties in this location (458 in Column (7)) yields a total market value increase of \$267 million (Column (8)).

The location parameters of **Table 6-2** were used to create the rest of the values in Columns (2) and (4) of **Table 6-3** which were used to estimate the contribution of the Bay to single family market value as summarized in this table. For example, the market value of single-family properties not on or near the Bay but in the Central Bay area and east of the Bay equals $e^{(13.28 + 0.12 + 0.33)} = e^{13.73} = \$918,000$. For single-family properties near but not on the Bay, Column (2) is equal to Column (4) plus 0.25 which is the parameter estimate in the row titled “Near But Not on Biscayne Bay” of **Table 6-2**. The result is that the market value of the property when it is near but not on the Bay and located in the Central Bay area and east of the Bay is equal to $e^{13.98}$ ($13.98 = 13.73 + 0.25$) or \$1,182,000. The contribution of the Bay to the market value of single-family properties near but not on the Bay is the difference between the two market values or \$264,000. Multiplying this value by the 1,124 single-family properties in this location yields a total contribution of \$302 million.

The total market value increase associated with living on or near Biscayne Bay is estimated to be \$3.3 billion associated with 11,032 single-family properties in Miami-Dade County. The \$3.3 billion is a capitalized value that can be annualized to represent the average annual dollar value of the aesthetic and recreational benefits associated with living on or near Biscayne Bay.

To convert this capitalized value to an annual value, the capitalized value 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 time value of money is the average yield on 30-year U.S. Government bonds over the past 30 years (1992 to 2021) which is 5.00 percent per year¹² minus the average annual inflation over the past 30 years of 2.00 percent. The net is 3.00 percent per year. Thus, the annualized value would be \$100 million (\$3.3 billion times 0.0300) for single-family properties on or near Biscayne Bay.

¹² Also, the average capitalization rate for multifamily properties in four cities in Florida (Jacksonville, Orlando, Tampa, West Palm Beach) during the first quarter of 2023 is 4.9 percent. This average is based on the CBRE capitalization rates survey H1 2023. The only residential capitalization rates available from this report are for multifamily properties.

Table 6-3 - Impact of Biscayne Bay on the Market Value of Single-Family Properties in Miami-Dade County in 2021

Single-Family Properties Located Directly on Biscayne Bay							
Property Location	Market Value On Bay		Market Value From 0.30 to 1.0 mile from Bay		Increase in Value	Number of Properties on Bay	Total Increase in Value
	Natural Log	Market Value	Natural Log	Market Value			
(1)	(2)	(3) = e^(2)	(4)	(5) = e^(4)	(6) = (3) - (5)	(7)	(8) = (6) x (7)
In North Bay Area and west of Bay	13.97	\$1,167,552	13.28	\$585,370	\$582,182	458	\$266,890,084
In Central Bay Area and west of Bay	14.09	\$1,316,833	13.40	\$660,214	\$656,618	387	\$254,302,991
In North Bay Area and east of Bay	14.30	\$1,623,590	13.61	\$814,012	\$809,578	179	\$144,934,658
In Central Bay and east of Bay	14.42	\$1,831,178	13.73	\$918,089	\$913,089	151	\$138,099,237
On Island in Bay	14.13	\$1,372,672	13.28	\$585,370	\$787,302	975	\$767,617,748
Total Market Value							\$1,571,844,717
Annualized Market Value							\$47,155,342
Single-Family Properties Located Near but Not Directly on Biscayne Bay (up to 0.30 miles from Bay)							
Property Location	Market Value Near (but not on) Bay		Market Value From 0.30 to 1.0 mile from Bay		Increase in Value When Located Near Bay	Number of Properties Near Bay	Total Increase in Value When Located Near Bay
	Natural Log	Market Value	Natural Log	Market Value			
(1)	(2)	(3) = e^(2)	(4)	(5) = e^(4)	(6) = (3) - (5)	(7)	(8) = (6) x (7)
In North Bay Area and west of the Bay	13.53	\$753,685	13.28	\$585,370	\$168,315	3,462	\$582,711,499
In Central Bay Area and west of the Bay	13.65	\$850,050	13.40	\$660,214	\$189,835	2,925	\$555,229,609
In North Bay Area and east of the Bay	13.86	\$1,048,069	13.61	\$814,012	\$234,057	1,352	\$316,441,474
In Central Bay and east of the Bay	13.98	\$1,182,073	13.73	\$918,089	\$263,983	1,142	\$301,517,435
Total Market Value							\$1,755,900,017
Annualized Market Value							\$52,677,000
Total Impact of Bay on Single-Family Residential Properties							
Number of Properties Impacted and Market Value Impact:						11,032	\$3,327,744,733
Annualized Market Value Impact:							\$99,832,342

6.4 Results for Multi-Family Properties on Biscayne Bay

The statistical results for the multi-family properties (individual housing units) are provided in **Table 6-4**. The intercept of the equation represents multi-family properties located from 0.30 to 1.0 mile from Biscayne Bay and are west of Biscayne Bay (landside) and are in the North Area of Biscayne Bay. The parameter estimates of the location variables in the equation reflect the impact of the location as described by the variable title on the natural logarithm of market value. So, for example, the parameter estimate for “On or Near Biscayne Bay” equal to 0.14 applies to all properties located on or near the Bay regardless of location because the equation controls for all other locational factors impacting market value.

The estimated equation explains 70 percent of the variation in the natural log of the market value of multi-family properties. The parameters of all the variables are statistically different from zero at the alpha = 0.05 level (absolute value of t-ratio greater than 1.96). All parameter estimates are considered rational, in that they have the expected signs and relative magnitudes.

Table 6-4 - Statistical Results of Hedonic Analysis of Multi-Family Dwelling Unit Property Values to Estimate Value of Living On or Near Biscayne Bay in 2021

Natural Logarithm of Market Value of Multi-Family Residential Units in 2021 is Dependent Variable				
Number of Observations (Properties) = 115,525				
Average Value of Unlogged Dependent Variable (Market Value of Property) = \$444,000				
Variable (a)	Average Value of Sample	Parameter Estimate	Asymptotic Standard Error	Asymptotic t Value
Intercept *		-18.44	2.15	-8.58
Enclosed living area square feet *	1,256	0.000546	0.000105	5.21
Effective Year Built *	1985	0.015190	0.001150	13.24
In Central Bay Area *	0.13	0.39	0.03	12.82
East of Biscayne Bay *	0.37	0.32	0.01	61.94
On or Near Biscayne Bay *	0.68	0.14	0.002	66.20
On Island in Bay *	0.04	0.41	0.02	21.58
Equation Goodness of Fit Measures		Adjusted R2 =	0.70	Pr > F =
		F-Statistic =	45,217	< 0.0001

(a) The intercept includes properties that are between one mile and 0.30 miles of Biscayne Bay and that are on the north side of Bay; and that are west of Biscayne Bay.

Note: A * means that the parameter estimate is statistically different from zero at the alpha = 5% level.

The impact of Biscayne Bay on the market value of multi-family properties is provided in the parameter estimates associated with “On or Near Biscayne Bay” and “On Island in Bay” as follows.

- The parameter estimate associated with “On or Near Biscayne Bay” is 0.14. Converting this parameter value to a proportion of the market value, $[(e^{0.14} - 1) = (1.15 - 1.00) = 0.15]$, finds that being directly on or near the Bay increases the market value of the multi-family property by 15%.
- The parameter estimate associated with “On Island in Bay” is 0.41. Converting this parameter value to a proportion of the market value, $[(e^{0.41} - 1) = (1.51 - 1.00) = 0.51]$, finds that being on an island in the Bay increases the market value of the multi-family property by 51%.

The estimated dollar value of the Bay’s impact on multi-family property value is calculated in **Table 6-5**.

Table 6-5 - Impact of Biscayne Bay on the Market Value of Multi-Family Properties in 2021

Multi-Family Properties Located Directly On or Near (within 0.30 miles) of Biscayne Bay							
Property Location	On or Near Bay		From 0.30 to 1.0 mile from Bay		Increase in Value When Located on Bay	Number of Properties on or near Bay	Total Increase in Value When Located on Bay
	Natural Log of Market Value	Market Value	Natural Log of Market Value	Market Value			
(1)	(2)	(3) = e^(2)	(4)	(5) = e^(4)	(6) = (3) - (5)	(7)	(8) = (6) x (7)
In North Bay Area and west of the Bay	12.57	\$288,232	12.43	\$250,196	\$38,036	42,998	\$1,635,469,498
In Central Bay Area and west of the Bay	12.96	\$425,857	12.82	\$369,660	\$56,197	6,333	\$355,902,681
In North Bay Area and east of the Bay	12.89	\$397,552	12.75	\$345,090	\$52,462	25,733	\$1,350,021,544
In Central Bay and east of the Bay	13.28	\$587,376	13.14	\$509,864	\$77,511	3,790	\$293,784,927
On Island in Bay	12.84	\$377,675	12.43	\$250,196	\$127,479	4,831	\$615,855,280
Number of Properties and Total Market Value						78,855	\$4,251,033,930
Annualized Market Value							\$127,531,018

Using the same method as was described for **Table 6-3**, the impact of Biscayne Bay on multi-family property values in Miami-Dade County is \$4.3 billion associated with 78,855 individual multi-family housing units. The annualized value is \$128 million.

6.5 Results for Apartment Buildings on Biscayne Bay

The statistical results for the apartment buildings are provided in **Table 6-6**. The intercept of the equation represents apartment buildings located from 0.30 to 1.0 mile from Biscayne Bay and are west of Biscayne Bay (landside) and are in the North Area of Biscayne Bay. The parameter estimates of the location variables in the equation reflect the impact of the location as described by the variable title on the natural logarithm of property value. So, for example, the parameter estimate for “On or Near Biscayne Bay” equal to 0.38 applies to all properties located on or near the Bay regardless of location because the equation controls for all other locational factors impacting market value.

The estimated equation explains 64 percent of the variation in the natural log of the market value of apartment buildings. The parameters of all the variables are statistically different from zero at the alpha = 0.05 level (absolute value of t-ratio greater than 1.96). All parameter estimates are considered rational, in that they have the expected signs and relative magnitudes.

Table 6-6 - Statistical Results of Hedonic Analysis of Apartment Building Property Values to Estimate Value of Living On or Near Biscayne Bay in 2021

Natural Logarithm of the Market Value of Apartment Buildings in 2021 is Dependent Variable				
Number of Observations (Properties) = 1,268				
Average Value of Unlogged Dependent Variable (Market Value of Property) = \$4,800,000				
Variable (a)	Average Value of Sample	Parameter Estimate	Asymptotic Standard Error	Asymptotic t Value
Intercept *		-8.76	2.74	-3.20
Enclosed living area square feet *	30,336	0.000004	0.000001	6.43
Land area of property square feet *	22,940	0.000004	0.000002	2.74
Effective Year Built *	1963	0.011390	0.001410	8.08
In Central Bay Area *	0.17	0.40	0.05	8.64
East of Biscayne Bay *	0.31	0.77	0.06	12.82
On or Near Biscayne Bay *	0.33	0.38	0.055	6.82
On Island in Bay *	0.02	1.13	0.13	8.42
Equation Goodness of Fit Measures		Adjusted R2 =	0.64	Pr > F =
		F-Statistic =	317	< 0.0001

(a) The intercept includes properties that are between one mile and 0.30 miles of Biscayne Bay and that are on the north side of Bay; and that are west of Biscayne Bay.

*Note: A * means that the parameter estimate is statistically different from zero at the alpha = 5% level.*

The impact of Biscayne Bay on the market value of apartment buildings is provided in the parameter estimates associated with “On or Near Biscayne Bay” and “On Island in Bay” as follows.

- The parameter estimate associated with “On or Near Biscayne Bay” is 0.38. Converting this parameter value to a proportion of the market value, $[(e^{0.38} - 1) = (1.46 - 1.00) = 0.46]$, finds that being directly on or near the Bay increases the market value of the apartment building by 46%.
- The parameter estimate associated with “On Island in Bay” is 1.13. Converting this parameter value to a proportion of the market value, $[(e^{1.13} - 1) = (3.08 - 1.00) = 2.08]$, finds that being on an island in the Bay increases the market value of the apartment building by 208%.

The estimated dollar value of the Bay’s impact on apartment building market value is calculated in **Table 6-7**. Using the same method as was described for **Table 6-3**, the impact of Biscayne Bay on apartment building market values in Miami-Dade County is \$306 million associated with 438 apartment buildings. The annualized value is \$9.2 million.

Table 6-7 - Impact of Biscayne Bay on the Market Value of Apartment Buildings in 2021

Apartment Buildings Located Directly On or Near (within 0.30 miles) of Biscayne Bay							
Property Location	On or Near Bay		From 0.30 to 1.0 mile from Bay		Increase in Value When Located on Bay	Number of Properties on or near Bay	Total Increase in Value When Located on Bay
	Natural Log of Market Value	Market Value	Natural Log of Market Value	Market Value			
(1)	(2)	(3) = e^(2)	(4)	(5) = e^(4)	(6) = (3) - (5)	(7)	(8) = (6) x (7)
In North Bay Area and west of the Bay	14.12	\$1,353,169	13.74	\$927,270	\$425,899	238	\$101,408,193
In Central Bay Area and west of the Bay	14.52	\$2,028,506	14.14	\$1,390,050	\$638,456	49	\$31,212,975
In North Bay Area and east of the Bay	14.89	\$2,923,845	14.51	\$2,003,588	\$920,257	105	\$96,969,526
In Central Bay and east of the Bay	15.29	\$4,383,070	14.92	\$3,003,534	\$1,379,537	22	\$29,846,774
On Island in Bay	14.87	\$2,859,164	13.74	\$927,270	\$1,931,895	24	\$46,364,379
Number of Properties and Total Market Value						438	\$305,801,848
Annualized Market Value							\$9,174,055

6.6 Estimated Contribution of Biscayne Bay to Residential Property Value

Adding together the Bay’s contribution to market values provided in **Tables 6-3, 6-5 and 6-7** finds that the estimated impact of Biscayne Bay on the market value of residential properties in 2022 is estimated to be \$7.9 billion. The annualized value of this impact is estimated to be \$237 million. These values represent the property owner’s willingness to pay for the aesthetic and recreational benefits of living on or near Biscayne Bay. A summary of these values by type and location of residential property is provided in **Table 6-8**.

Table 6-8 - Impact of Biscayne Bay on Residential Property Values in 2022

Type and Location of Residential Property	Impact on Market Value, \$	Annualized Value of Bay, \$ per year
Single-Family Residences on Bay	\$1,572,000,000	\$47,000,000
Single-Family Residences near but not on Bay	\$1,756,000,000	\$53,000,000
Multi-Family Residences on or near Bay	\$4,251,000,000	\$128,000,000
Apartment Buildings on or near Bay	\$306,000,000	\$9,000,000
Total	\$7,885,000,000	\$237,000,000

6.7 Miami River’s Contribution to the Market Value of Residential Properties

Prior to 1900, the original Miami River ran about four miles from its mouth at Biscayne Bay. By 1919, the river was fully channelized to reach Lake Okeechobee.¹³ According to the US Army Corps of Engineers, the navigable part of the Miami River ends 5.5 miles upstream from its mouth at Biscayne Bay due to the existence of a salinity barrier constructed in 1945 that prevents navigation further upstream.¹⁴ For this study, the residential land uses surrounding the Miami River from its mouth to 15 miles upstream is the focus of this evaluation as explained in this section. There are a variety of land uses along the Miami River including residential, industrial, commercial, governmental, and parks. There are several vacant lots along the river.

Four river areas were defined to control for differences in the river’s impact on property value moving east to west from the mouth of the River. The east and west boundaries of each area were chosen based on differences in the characteristics of the neighborhoods as identified by visual inspection of aerial property maps and land use information from the Miami-Dade County Property Appraiser’s Office. An aerial of the boundaries that define the east, central, and west river areas was provided in **Figure 6-3**. They are defined and described as follows.

East River Area – This area includes all land to the north and south of the river from Biscayne Bay west to where State Road 836 (Dolphin Expressway) crosses the river. The land uses on this segment of the river are hotels, museums, public parks, residential single-family homes, and high rises, light industrial, and marine-related heavy industrial, storage, and warehousing.

Central River Area – This area includes all land to the north and south of the river from State Road 836 (Dolphin Expressway) to the eastern boundary of Miami International Airport. The land uses on this river segment are single- and multi-family housing units and apartments, retail shops and restaurants, public parks, marinas, boat storage, and marine retail engine and repair services.

West River Area - This area includes all land to the north and south of the river from the eastern boundary of Miami International Airport to where State Road 826 (Palmetto Expressway) crosses the river. The land uses on this river segment are primarily residential with single- and multi-family housing units and apartment buildings. Closer to SR 826 the land uses are light manufacturing, warehousing, and storage.

Far West River Area – This area includes all land to the north and south of the river from State Road 826 (Palmetto Expressway) to the eastern edge of Water Conservation Area 3B. The land uses along this river segment include aggregate rock mining and rock pits, light manufacturing, warehousing, and storage. There is no residential land use in this area. The residential areas that are close to the river in this area are blocked from the river by eight traffic lanes of US 27 and Okeechobee Road which run along the north side of the river beginning just west of SR 826.

¹³ William B. Stronge, Lenore Alpert, and Lauren Schild, Center for Urban & Environmental Solutions at Florida Atlantic University, “An Economic Analysis of the Miami River Marine Industry”, prepared for the Miami River Commission, April 2008, pages 9 and 10

¹⁴ Ibid. page 10

The land uses near and within 1.0 mile of the river are primarily residential single- and multi-family housing units and apartment buildings and the associated offices, retail shops, and restaurants commonly found in suburban areas. There are also some areas of light manufacturing and warehousing.

The hedonic price analysis of property values includes all residential properties within one mile of the Miami River from the mouth of the river at Biscayne Bay to State Road 826 (Palmetto Expressway). This is a 15-mile stretch of the river. There are no residential properties along the river west of State Road 826 so the Far West River Area is not included in this analysis.

A summary of the data used in the hedonic price equations is provided in **Table 6-9**. There are single-family, multi-family and apartment buildings: (1) In each of the three area segments of the river – East Area, Central Area, and West Area and (2) On the river, near the river and from 0.30 mile to 1.0 mile from river.

Table 6-9 – Summary of Residential Property Data Used in Hedonic Analysis of the Miami River

Location	Single-Family	Multi-Family (Individual Units)	Apartment Buildings
	Number of Properties (Observations) on River from Biscayne Bay to SR 826		
On the Miami River	150	1,585	42
Near the Miami River (less than 0.3 miles from River but not on River)	2,670	1,590	331
Not on the Miami River (from 0.30 to 1.0 mile from River)	6,889	6,124	831
Total Number of Properties in Sample	9,709	9,299	1,204
Location	Percentage of All Properties in Sample		
On the Miami River	2%	17%	3%
Near the Miami River (less than 0.3 miles from River but not on River)	28%	17%	27%
Not on the Miami River (from 0.30 to 1.0 mile from River)	71%	66%	69%
Total	100%	100%	100%

The natural logarithm of the property’s market value was modeled as a linear additive function of the following explanatory (independent) variables.

Continuous Variables

1. Land Area of Property in Square Feet – Total lot size of the property. This variable was included only in the apartment building equation because in the single-family equation the data are collinear with Enclosed Living Area Square Feet and in the multi-family equation, the size of the multi-family building’s lot was found not to impact the housing unit’s market value. For apartment buildings, the larger the lot size, the higher the market value. The data were obtained for each property from the Miami-Dade County Property Appraiser’s database obtained for this study.
2. Enclosed living area square feet – As indicated, it is the size of the enclosed living area and was included in all three equations. The larger the living area, the higher the market value. The data are

provided for each property from the Miami-Dade County Property Appraiser’s database obtained for this study.

3. Effective Year Built (4 digits - 19XX or 20YY) – As indicated, it is the 4-digit year that the building was constructed or the last year that it was significantly changed. This variable is meant to capture age-dependent technology and natural building deterioration. This variable was included in all equations. The larger the effective year, the higher the market value. The data are provided for each property from the Miami-Dade County Property Appraiser’s database obtained for this study.

Categorical Variables

4. Intercept Term – This is an estimated parameter value that helps to define the equation and depends on how the equation is specified and the values of the data used. For this analysis, the intercept of each equation is the baseline for comparing the locational parameter estimates and includes only those properties that are from 0.30 to 1.0 miles from the Miami River and are in the West River Area and are south of the river.
5. In East River Area –The value of this variable is 1 if the property is in the East River Area as defined above and 0 if it is not.
6. In Central River Area – The value of this variable is 1 if the property is in the Central River Area and 0 if it is not.
7. North of Miami River - The value of this variable is 1 if the property is north of the Miami River and 0 if it is not.
8. On Miami River – Properties located directly on the Miami River. The value of this variable is 1 if the property is directly on the River and 0 if it is not.
9. Near (within 0.3 miles) of Miami River – Properties located within 0.30 miles of the River but are not directly on the River. The value of this variable is 1 if the property is near the river and 0 if not.

6.8 Results for Single-Family Properties on the Miami River

The statistical results for the single-family properties are provided in **Table 6-10**. The intercept of the equation represents single-family properties between 0.30 mile and 1.0 mile of the Miami River; that are on the south side of the River; and that are in the West Area of the Miami River. The parameter estimates of the location variables in the equation reflect the impact of the location as described by the variable title on the natural logarithm of property value. So, for example, the parameter estimate for “On the Miami River” equal to 0.30 applies to all properties located on the River regardless of location because the equation controls for all other locational factors impacting market value.

Table 6-10 - Statistical Results of Hedonic Analysis of Single-Family Dwelling Unit Property Values to Estimate Value of Living On or Near the Miami River in 2021

Natural Logarithm of the Market Value of Single-Family Residential Property in 2021 is Dependent Variable				
Number of Observations (Properties) = 9,709				
Average Value of Unlogged Dependent Variable (Market Value of Property) = \$368,000				
Variable (a)	Average Value of Sample	Parameter Estimate	Asymptotic Standard Error	Asymptotic t Value
Intercept *		10.33	0.23	45.0
Enclosed living area square feet *	1,609	0.00034	0.00001	34.1
Effective Year Built *	1961	0.00102	0.00012	8.6
In East River Area *	0.04	0.13	0.02503	5.2
In Central River Area *	0.41	-0.12	0.00432	-28.0
North of the Miami River *	0.46	-0.17	0.00456	-38.4
On the Miami River *	0.02	0.31	0.04162	7.3
Near (but not on) the Miami River (within 0.30 miles)	0.28	0.007	0.00432	1.5
Equation Goodness of Fit Measures		Adjusted R2 =	0.66	Pr > F =
		F-Statistic =	2,681	< 0.0001

^(a) The intercept includes properties that are between 0.30 mile and 1.0 mile of the Miami River; that are on the south side of the River; and that are in the West Area of the Miami River.

Note: A * means that the parameter estimate is statistically different from zero at the alpha = 5% level.

The estimated equation explains 66 percent of the variation in the natural log of the market value of single-family properties. The parameters of all the variables, except for “Near (but not on) the Miami River”, are statistically different from zero at the alpha = 0.05 level (absolute value of t-ratio greater than 1.96).

The variable “Near (but not on) the Miami River”, is not statistically different from zero in the single-family equation. As will be demonstrated later in this section, the parameter estimate for this same variable in the multi-family equation is statistically different from zero but relatively small and, in the apartment building equation, the parameter estimate is not statistically different from zero. This result is likely due to the limited influence of the river as an aesthetic amenity and recreational opportunity on properties located beyond those immediately surrounding it. Even in high rise apartments and condos near the river, the view from the balcony is dominated by the downtown Miami skyline and Biscayne Bay to the east and the Everglades to the west. This contrasts with properties near the large and dominant Biscayne Bay which extends the entire length of the county and is up to 3 miles wide in the North Bay Area and 5 miles wide in the Central Bay Area. Unlike the Miami River, the value of the Bay as an aesthetic amenity and recreational opportunity is still high for people living near but not on the Bay.

All parameter estimates are considered rational in that they have the expected signs and relative magnitudes. However, there are no a priori expectations for the signs associated with the parameters of the East, Central and North Areas. The estimated parameters of the equation imply that, all else the same, properties north of the Miami River are less valuable than properties south of the River and, compared to

the West River Area, properties in the East River Area are more valuable and properties in the Central River Area are less valuable.

The impact of the Miami River on the market value of single-family properties is provided in the parameter estimates associated with “On the Miami River” and “Near (but not on) the Miami River” as follows.

- The parameter estimate associated with “On the Miami River” is 0.31. Converting this parameter value to a proportion of the market value, $[(e^{0.31} - 1) = (1.36 - 1.00) = 0.36]$, where $e = 2.71828183$, finds that being directly on the Miami River increases the market value of the single-family property by 36%.
- The parameter estimate associated with “Near (but not on) the Miami River” is 0.007. In the same manner as above, converting this parameter value to a proportion of the market value, $[(e^{0.007} - 1) = (1.04 - 1.00) = 0.04]$, finds that being near but not on the River increases the market value of the single-family property by 4%.

The estimated dollar value of the River’s impact on single-family property value is calculated in **Table 6-11**. Using the same method as was described for **Table 6-3**, the impact of the Miami River on single family market values in Miami-Dade County is \$29 million associated with 2,820 single-family properties. The annualized value is \$861,000.

The estimated parameters of the equation as presented in **Table 6-10** were used to calculate the natural log of market value in columns (2) and (4) of **Table 6-11**. The average natural log of the market value of single-family properties located from 0.30 to 1.0 mile from the River that are on the south side of the River; and that are in the West River Area is 13.03 and the inverse of this natural log is \$456,000 (Column (5)).

To the 13.03 value can be added the estimated location parameters in **Table 6-10** depending on the location of the property. For example, the natural log of the market value of properties located south of the Miami River in the West River Area that are ON the River is equal to 13.03 plus 0.31 or 13.34 (Column (2)). Taking the inverse of the natural log of 13.34 ($e^{13.34}$) equals \$619,000 (Column (3)).

The difference between the \$619,000 on the River and the \$456,000 not on the River is \$163,000 (Column (6)). This means that being directly on and south of the River in the West River Area increases the single-family property value by \$163,000. Multiplying this increase by the number of properties in this location (44 in Column (7)) yields a total market value increase of \$7.2 million (Column (8)).

The location parameters of **Table 6-10** were used to create the rest of the values in Columns (2) and (4) of **Table 6-11** which were used to estimate the market value increase as summarized in this table. The total market value increase associated with the Miami River is estimated to be \$28.7 million associated with 2,820 single-family properties in Miami-Dade County.

The \$28.7 million is a capitalized value that can be annualized to represent the average annual dollar value of benefits associated with living on or near the Miami River. To convert this capitalized value to an annual value, the capitalized value was multiplied by 3.0 percent as explained earlier. The annualized value is estimated to be \$861,000 (\$28.7 million times 0.03).

Table 6-11 - Impact of the Miami River on the Market Value of Single-Family Properties in 2021

Single-Family Properties Located Directly on the Miami River							
Property Location	On River		From 0.30 to 1.0 mile from River		Increase in Value When Located on River	Number of Properties on River	Total Increase in Value When Located on River
	Natural Log of Market Value	Market Value	Natural Log of Market Value	Market Value			
(1)	(2)	(3) = e^(2)	(4)	(5) = e^(4)	(6) = (3) - (5)	(7)	(8) = (6) x (7)
South of the River in the West River Area	13.34	\$618,870	13.03	\$455,887	\$162,983	44	\$7,221,116
South of the River in the Central River Area	13.21	\$548,378	12.91	\$403,960	\$144,418	33	\$4,811,532
South of the River in the East River Area	13.47	\$705,061	13.16	\$519,379	\$185,682	3	\$539,009
North of the River in the West River Area	13.16	\$519,535	12.86	\$382,713	\$136,823	38	\$5,230,435
North of the River in the Central River Area	13.04	\$460,358	12.73	\$339,120	\$121,238	29	\$3,485,112
North of the River in the East River Area	13.29	\$591,892	12.99	\$436,014	\$155,878	3	\$390,418
Total Market Value							\$21,677,621
Annualized Market Value							\$650,329
Single-Family Properties Located Near but Not Directly On the Miami River (up to 0.30 miles from River)							
Property Location	Near (but not on) River		From 0.30 to 1.0 mile from River		Increase in Value When Located Near River	Number of Properties Near River	Total Increase in Value When Located Near River
	Natural Log of Market Value	Market Value	Natural Log of Market Value	Market Value			
(1)	(2)	(3) = e^(2)	(4)	(5) = e^(4)	(6) = (3) - (5)	(7)	(8) = (6) x (7)
South of the River in the West River Area	13.04	\$458,860	13.03	\$455,887	\$2,973	789	\$2,344,521
South of the River in the Central River Area	12.92	\$406,594	12.91	\$403,960	\$2,634	593	\$1,562,188
South of the River in the East River Area	13.17	\$522,766	13.16	\$519,379	\$3,387	52	\$175,003
North of the River in the West River Area	12.86	\$385,208	12.86	\$382,713	\$2,496	680	\$1,698,195
North of the River in the Central River Area	12.74	\$341,332	12.73	\$339,120	\$2,211	512	\$1,131,532
North of the River in the East River Area	12.99	\$438,857	12.99	\$436,014	\$2,843	45	\$126,759
Total Market Value							\$7,038,198
Annualized Market Value							\$211,146
Total Impact of Miami River on Single-Family Residential Properties							
Number of Properties Impacted and Market Value Impact:						2,820	\$28,715,819
Annualized Market Value Impact:							\$861,475

6.9 Results for Multi-Family Properties on the Miami River

The statistical results for the multi-family properties are provided in **Table 6-12**. The intercept of the equation represents multi-family properties between 0.30 mile and 1.0 mile of the Miami River; that are on the south side of the River; and that are in the West Area of the Miami River. The parameter estimates of the location variables in the equation reflect the impact of the location, as described by the variable title, on the natural logarithm of property value. So, for example, the parameter estimate for “On the Miami River” equal to 0.16 applies to all properties located on the River regardless of location because the equation controls for all other locational factors impacting market value.

The estimated equation explains 70 percent of the variation in the natural log of the market value of multi-family housing units. The parameters of all the variables are statistically different from zero at the alpha = 0.05 level (absolute value of t-ratio greater than 1.96). The parameter estimate for the variable “Near (but not on) the Miami River” is relatively small but is still statistically different from zero.

All parameter estimates are considered rational in that they have the expected signs and relative magnitudes. Although there are no a priori expectations for the signs associated with the parameters of the East, Central and North Areas, the signs of these estimated parameters are the same as the signs estimated for the single-family equation.

Table 6-12 - Statistical Results of Hedonic Analysis of Multi-Family Dwelling Unit Property Values to Estimate Value of Living On or Near the Miami River in 2021

Natural Logarithm of the Market Value of Multi-Family Residential Units in 2021 is Dependent Variable				
Number of Observations (Properties) = 9,299				
Average Value of Unlogged Dependent Variable (Market Value of Property) = \$159,000				
Variable (a)	Average Value of Sample	Parameter Estimate	Asymptotic Standard Error	Asymptotic t Value
Intercept		0.07	0.25	0.3
Enclosed living area square feet *	908	0.00069	0.00001	76.2
Effective Year Built *	1985	0.00566	0.00013	44.9
In East River Area *	0.18	0.02490	0.00605	4.1
In Central River Area *	0.30	-0.04	0.00402	-9.7
North of the Miami River *	0.61	-0.01	0.00445	-3.2
On the Miami River *	0.17	0.16	0.00479	32.5
Near the Miami River (within 0.3 miles) *	0.17	0.016	0.00336	4.7
Equation Goodness of Fit Measures		Adjusted R2 =	0.70	Pr > F =
		F-Statistic =	3,059	< 0.0001

^(a) The intercept includes properties that are between 0.30 and 1.0 mile from the Miami River; that are on the south side of the River; and that are in the West River Area.

Note: A * means that the parameter estimate is statistically different from zero at the alpha = 5% level.

The impact of the Miami River on the market value of multi-family properties is provided in the parameter estimates associated with “On the Miami River” and “Near (but not on) the Miami River” as follows.

- The parameter estimate associated with “On the Miami River” is 0.16. Converting this parameter value to a proportion of the market value, $[(e^{0.16} - 1) = (1.17 - 1.00) = 0.17]$, finds that being directly on the Miami River increases the market value of the multi-family property by 17%.
- The parameter estimate associated with “Near (but not on) the Miami River” is 0.016. In the same manner as above, converting this parameter value to a proportion of the market value, $[(e^{0.016} - 1) = (1.02 - 1.00) = 0.02]$, finds that being near but not on the River increases the market value of the single-family property by 2%.

The estimated dollar value of the River’s impact on multi-family property value is calculated in **Table 6-13**. The estimated parameters of the equation as presented in **Table 6-12** were used to calculate the natural log of market value in columns (2) and (4) of **Table 6-13**. The average natural log of the market value of multi-family properties (single dwelling units) located from 0.30 to 1.0 mile from the River and south of the River in the West River Area is 12.12 and the inverse of this natural log is \$184,000 per dwelling unit (Column (5)).

To the 12.12 value can be added the estimated location parameters in **Table 6-12** depending on the location of the property. For example, the natural log of the market value of properties located south of the Miami River in the West River Area that are ON the River is equal to 12.12 plus 0.16 or 12.28 (Column (2)). Taking the inverse of the natural log of 12.28 ($e^{12.28}$) equals \$214,000 (Column (3)).

The difference between the \$214,000 on the River and the \$184,000 not on the River is \$30,000 (Column (6)). This means that being directly on and south of the River in the West River Area increases the multi-family housing unit’s property value by \$30,000. Multiplying this increase by the number of properties in this location (324 in Column (7)) yields a total market value increase of \$10 million (Column (8)).

The location parameters of **Table 6-12** were used to create the rest of the values in Columns (2) and (4) of **Table 6-13** which were used to estimate the market value increase as summarized in this table. The total market value increase associated with the Miami River is estimated to be \$53 million associated with 3,175 multi-family housing units in Miami-Dade County.

The \$53 million is a capitalized value that can be annualized to represent the average annual dollar value of benefits associated with living on or near the Miami River. To convert this capitalized value to an annual value, the capitalized value was multiplied by 3.0 percent as explained in Section 2.1. The annualized value is estimated to be \$1.6 million (\$53 million times 0.0300).

Table 6-13 - Impact of the Miami River on the Market Value of Multi-Family Properties in 2021

Multi-Family Properties Located Directly on the Miami River							
Property Location	On River		From 0.30 to 1.0 mile from River		Increase in Value When Located on River	Number of Properties on River	Total Increase in Value When Located on River
	Natural Log of Market Value	Market Value	Natural Log of Market Value	Market Value			
(1)	(2)	(3) = e^(2)	(4)	(5) = e^(4)	(6) = (3) - (5)	(7)	(8) = (6) x (7)
South of the River in the West River Area	12.28	\$214,396	12.12	\$183,506	\$30,890	324	\$10,007,552
South of the River in the Central River Area	12.24	\$206,226	12.08	\$176,513	\$29,713	186	\$5,540,279
South of the River in the East River Area	12.30	\$219,801	12.14	\$188,132	\$31,669	109	\$3,445,973
North of the River in the West River Area	12.26	\$211,390	12.11	\$180,933	\$30,457	505	\$15,388,883
North of the River in the Central River Area	12.22	\$203,335	12.07	\$174,038	\$29,297	291	\$8,519,437
North of the River in the East River Area	12.29	\$216,720	12.13	\$185,494	\$31,225	170	\$5,298,966
Total Market Value							\$48,201,089
Annualized Market Value							\$1,446,033
Multi-Family Properties Located Near but Not Directly On the Miami River (up to 0.30 miles from River)							
Property Location	Near (but not on) River		From 0.30 to 1.0 mile from River		Increase in Value When Located Near River	Number of Properties Near River	Total Increase in Value When Located Near River
	Natural Log of Market Value	Market Value	Natural Log of Market Value	Market Value			
(1)	(2)	(3) = e^(2)	(4)	(5) = e^(4)	(6) = (3) - (5)	(7)	(8) = (6) x (7)
South of the River in the West River Area	12.14	\$186,417	12.12	\$183,506	\$2,911	325	\$946,124
South of the River in the Central River Area	12.10	\$179,313	12.08	\$176,513	\$2,800	187	\$523,784
South of the River in the East River Area	12.16	\$191,117	12.14	\$188,132	\$2,985	109	\$325,786
North of the River in the West River Area	12.12	\$183,803	12.11	\$180,933	\$2,870	507	\$1,454,881
North of the River in the Central River Area	12.08	\$176,799	12.07	\$174,038	\$2,761	292	\$805,436
North of the River in the East River Area	12.15	\$188,437	12.13	\$185,494	\$2,943	170	\$500,970
Total Market Value							\$4,556,980
Annualized Market Value							\$136,709
Total Impact of River on Multi-Family Residential Properties							
Number of Properties Impacted and Market Value Impact:						3,175	\$52,758,070
Annualized Market Value Impact:							\$1,582,742

6.10 Results for Apartment Buildings on the Miami River

The statistical results for apartment buildings are provided in **Table 6-14**. The intercept of the equation represents apartment buildings between 0.30 mile and 1.0 mile of the Miami River; that are on the south side of the River; and that are in the West Area of the Miami River. The parameter estimates of the location variables in the equation reflect the impact of the location as described by the variable title on the natural logarithm of property value. So, for example, the parameter estimate for “On the Miami River” equal to 0.25 applies to all properties located on the River regardless of location because the equation controls for all other locational factors impacting market value.

Table 6-14 - Statistical Results of Hedonic Analysis of Apartment Building Property Values to Estimate Value of Living On or Near the Miami River

Natural Logarithm of the Market Value of Apartment Buildings in 2022 is Dependent Variable				
Number of Observations (Properties) = 1,204				
Average Value of Unlogged Dependent Variable (Market Value of Property) = \$2,200,000				
Variable (a)	Average Value of Sample	Parameter Estimate	Asymptotic Standard Error	Asymptotic t Value
Intercept		-11.09	1.82	-6.1
Enclosed living area square feet *	16,774	0.000008	0.000001	8.0
Effective Year Built *	20,049	0.000008	0.000003	2.7
In East River Area *	1967	0.012600	0.000930	13.5
In Central River Area *	0.44	-0.11	0.040390	-2.8
North of the Miami River	0.52	0.01	0.036370	0.3
On the Miami River *	0.03	0.25	0.083220	3.0
Near the Miami River (within 0.3 miles)	0.27	0.037	0.039340	0.9
Equation Goodness of Fit Measures		Adjusted R2 =	0.60	Pr > F =
		F-Statistic =	231	< 0.0001

^(a) The intercept includes properties that are between 0.30 and 1.0 mile from the Miami River; that are on the south side of the River; and that are in the West River Area.

Note: A * means that the parameter estimate is statistically different from zero at the alpha = 5% level.

The estimated equation explains 60 percent of the variation in the natural log of the market value of single-family properties. The parameters of all the variables, except for the variables “North of the Miami River” and “Near the Miami River” are statistically different from zero at the alpha = 0.05 level (absolute value of t-ratio greater than 1.96). The parameter estimate for the variables “North of the Miami River” and “Near the Miami River” are not statistically different from zero but they were used in estimating the impact of the River on apartment building property value although the estimated impacts are small.

All parameter estimates are considered rational in that they have the expected signs and relative magnitudes. Although there are no a priori expectations for the signs associated with the parameters of the East, Central and North Areas, the signs of these estimated parameters for the East and Central area are the same as the signs estimated for the single-family and multi-family equations. As discussed above, the estimated equation indicates that there is no difference in market value between apartment buildings north versus south of the river.

The impact of the Miami River on the market value of apartment buildings is provided in the parameter estimates associated with “On the Miami River” and “Near (but not on) the Miami River” as follows.

- The parameter estimate associated with “On the Miami River” is 0.25. Converting this parameter value to a proportion of the market value, $[(e^{0.25} - 1) = (1.28 - 1.00) = 0.28]$, finds that being directly on the Miami River increases the market value of apartment buildings by 28%.
- The parameter estimate associated with “Near (but not on) the Miami River” is 0.037. In the same manner as above, converting this parameter value to a proportion of the market value, $[(e^{0.037} - 1) = (1.04 - 1.00) = 0.04]$, finds that being near but not on the River increases the market value of apartment buildings by 4%.

The estimated dollar value of the River’s impact on the market value of apartment buildings is calculated in **Table 6-15**. Using the same method as was described for **Table 6-13**, the impact of the Miami River on the market value of apartment buildings in Miami-Dade County is \$16.4 million associated with 373 apartment buildings. The annualized value is \$492,000.

Table 6-15 - Impact of the Miami River on the Market Value of Apartment Buildings in 2021

Apartments Located Directly on the Miami River							
Property Location	On River		From 0.30 to 1.0 mile from River		Increase in Value When Located on River	Number of Properties on River	Total Increase in Value When Located on River
	Natural Log of Market Value	Market Value	Natural Log of Market Value	Market Value			
(1)	(2)	(3) = e^(2)	(4)	(5) = e^(4)	(6) = (3) - (5)	(7)	(8) = (6) x (7)
South of the River in the West River Area	13.64	\$836,783	13.39	\$653,436	\$183,347	8	\$1,508,488
South of the River in the Central River Area	13.52	\$746,962	13.28	\$583,296	\$163,666	9	\$1,436,703
South of the River in the East River Area	14.03	\$1,237,718	13.78	\$966,523	\$271,195	3	\$837,288
North of the River in the West River Area	13.65	\$847,071	13.40	\$661,470	\$185,601	9	\$1,664,895
North of the River in the Central River Area	13.54	\$756,146	13.29	\$590,468	\$165,679	10	\$1,585,666
North of the River in the East River Area	14.04	\$1,252,936	13.79	\$978,406	\$274,530	3	\$924,101
Total Market Value							\$7,957,141
Annualized Market Value							\$238,714
Apartment Buildings Located Near but Not Directly On the Miami River (up to 0.30 miles from River)							
Property Location	Near (but not on) River		From 0.30 to 1.0 mile from River		Increase in Value When Located Near River	Number of Properties Near River	Total Increase in Value When Located Near River
	Natural Log of Market Value	Market Value	Natural Log of Market Value	Market Value			
(1)	(2)	(3) = e^(2)	(4)	(5) = e^(4)	(6) = (3) - (5)	(7)	(8) = (6) x (7)
South of the River in the West River Area	13.43	\$678,120	13.39	\$653,436	\$24,684	65	\$1,600,528
South of the River in the Central River Area	13.31	\$605,331	13.28	\$583,296	\$22,035	69	\$1,524,363
South of the River in the East River Area	13.82	\$1,003,034	13.78	\$966,523	\$36,511	24	\$888,375
North of the River in the West River Area	13.44	\$686,458	13.40	\$661,470	\$24,988	71	\$1,766,477
North of the River in the Central River Area	13.33	\$612,773	13.29	\$590,468	\$22,306	75	\$1,682,415
North of the River in the East River Area	13.83	\$1,015,366	13.79	\$978,406	\$36,960	27	\$980,485
Total Market Value							\$8,442,643
Annualized Market Value							\$253,279
Total Impact of River on Apartment Buildings							
Number of Properties Impacted and Market Value Impact:						373	\$16,399,784
Annualized Market Value Impact:							\$491,994

6.11 Contribution of the Miami River to Residential Property Value

Adding together the Miami River’s contribution to residential market values provided in **Tables 6-11, 6-13 and 6-15** finds that the estimated impact of the Miami River on the market value of residential properties in 2021 is estimated to be \$98 million. The annualized value of this impact is estimated to be \$2.9 million. These values represent the property owner’s willingness to pay for the aesthetic and recreational benefits of living on or near the Miami River. A summary of these values by type and location of residential property is provided in **Table 6-16**.

Table 6-16 – Estimated Contribution of the Miami River to Residential Property Values in 2022

Type and Location of Residential Property	Impact on Market Value, \$	Annualized Value of River, \$ per year
Single-Family Residences on River	\$21,677,621	\$650,329
Single-Family Residences near but not on River	\$7,038,198	\$211,146
Multi-Family Residences on River	\$48,201,089	\$1,446,033
Multi-Family Residences near but not on River	\$4,556,980	\$136,709
Apartment Buildings on River	\$7,957,141	\$238,714
Apartment Buildings near but not on River	\$8,442,643	\$253,279
Total	\$97,873,672	\$2,936,210

6.12 Conclusions: Biscayne Bay’s and Miami River’s Contribution to the Market Value of Residential Properties

This section presented the data, methods, and results of this study’s hedonic price analysis of residential properties in Miami-Dade County and the conclusions gained from this analysis regarding the contributions of Biscayne Bay and the Miami River on the market values of residential properties.

Market price and housing characteristics data for all properties were taken from the Miami-Dade County Property Appraiser’s Office and were used in the hedonic price analysis. This market price is the amount a willing purchaser would pay a willing seller, exclusive of reasonable fees and costs of purchase, in cash or the immediate equivalent, in an arm’s length transaction. The market price is estimated by the property appraiser each year based on the comparable sales approach, the cost approach, or the income approach. It is this market value by which the property’s assessed value and taxable value are determined.

For each of three property types - single-family home, multi-family housing unit, and apartment building - a semi-logarithmic equation was statistically estimated as follows:

- One equation for properties on, near (up to 0.30 miles), and not near (from 0.30 to 1.0 mile) Biscayne Bay, and;
- Another equation for properties on, near (up to 0.3 miles) and not near (from 0.30 to 1.0 mile) the Miami River.

This results in six equations that were used along with the property data to statistically estimate the parameters associated with the primary factors affecting the market value of residential properties including lot size, square feet of living area, year built, and location.

An estimate of the additional market values of residential properties generated because of their location on and near the Bay and the River are provided for the population of 95,156 residential properties on or near Biscayne Bay and 6,368 residential properties on or near the Miami River. A summary of the number of properties by type located on or near (within 0.30 miles) each water body is provided in **Table 6-17**.

Table 6-17 - Number of Residential Properties On or Near Biscayne Bay and the Miami River

Property Type	Number of Residential Properties		
	Biscayne Bay	Miami River	Total
Single-Family Properties	11,032	2,820	13,852
Multi-Family Properties (housing unit)	83,686	3,175	86,861
Apartment Buildings	438	373	811
Total	95,156	6,368	101,524

Source: Miami-Dade County Property Appraiser’s Office, 2022

The statistical analysis provided estimates of the impact of the Bay and River on residential property values as a percentage of the total market value of the dwelling unit or apartment building. A summary of the percentage increases by water body and type and location of the residential property is provided in **Table 6-18**.

Table 6-18 Estimated 2021 Contribution of Biscayne Bay and the Miami River to the Total Market Value of Residential Properties as a Percentage of Total Market Value

Property Type	Contribution - % Increase in Market Value	Property Type	Contribution - % Increase in Market Value
	Biscayne Bay		Miami River
Single-Family - On the Water Body	99%	Single-Family - On the Water Body	36%
Single-Family - Near the Water Body (within 0.30 miles)	29%	Single-Family - Near the Water Body (within 0.30 miles)	1%
Single-Family - On Island in Bay	134%	Multi-Family - On Water Body	17%
Multi-Family - On or Near the Water Body (within 0.30 miles)	15%	Multi-Family - Near the Water Body (within 0.30 miles)	2%
Multi-Family - On Island in Bay	51%	Apartment Buildings - On the Water Body	28%
Apartment Buildings - On or Near the Water Body (within 0.30 miles)	46%	Apartment Buildings - Near the Water Body (within 0.30 miles)	4%
Apartment Buildings - On Island in Bay	208%		

A summary of the economic value of Biscayne Bay and the Miami River as they impact residential property values is provided in **Table 6-19**. The hedonic price analysis of property values found that the contribution of Biscayne Bay to residential market values is \$7.9 billion and the impact of the Miami River on residential property values is \$98 million.

These capitalized values were converted to an annual value that represents the property owner’s willingness to pay for the aesthetic and recreational benefits to homeowners and renters as they live on or near the Bay and the River. For this analysis, these values are \$237 million per year in benefit value associated with living on or near Biscayne Bay and \$2.9 million per year in benefit value associated with living on or near the Miami River using a real discount rate of 3.0 percent. The total annual value of Biscayne Bay and the Miami River as they contribute to property values in Miami-Dade County is estimated to be \$240 million per year. Because the market values used in this analysis reflect their values on January 1, 2022, these values are considered to represent 2021 dollars.

Table 6-19 - Estimated Impact of Biscayne Bay and the Miami River on Property Values in 2021 dollars

Property Type	Increased Market Value, \$			Annualized Benefit Value, \$ / year		
	Biscayne Bay	Miami River	Total	Biscayne Bay	Miami River	Total
Single-Family	\$3,327,745,000	\$28,716,000	\$3,356,461,000	\$100,000,000	\$861,000	\$100,861,000
Multi-Family (housing unit)	\$4,251,034,000	\$52,758,000	\$4,303,792,000	\$128,000,000	\$1,583,000	\$129,583,000
Apartment Buildings	\$305,802,000	\$16,400,000	\$322,202,000	\$9,000,000	\$492,000	\$9,492,000
Total	\$7,884,581,000	\$97,874,000	\$7,982,455,000	\$237,000,000	\$2,936,000	\$239,936,000

6.13 Impact of the Bay and River on Commercial and Industrial Property Values

The use of hedonic price analysis to estimate the contribution of Biscayne Bay and the Miami River to the market value of commercial and industrial properties is not feasible due to the lack of sufficient population sizes (number of properties) and/or comparable properties. A literature review of past research did not uncover any relevant information to document this market value impact.

6.14 Real Property Valuation Method of Property Appraiser

The Miami-Dade County property appraiser’s estimate of the market value of each residential property was the dependent variable in the hedonic price analysis for the purpose of estimating the contribution of the Bay and the River to residential market values.

The Bay and River have been a constant part of the Miami-Dade County landscape for the County’s entire urban development history. Over the past several years there have not been any changes in the size or quality of the Bay and River that would be noticeable enough to impact the sales price of a residential property to any significant degree. In addition, the market value of each property estimated by the property appraiser is available for all properties in the County and allows for a comprehensive estimate of the impact of these natural features on market value. Therefore, the use of this data source for the market value data is more accurate and less expensive than using raw market sales data.

The method by which the Miami-Dade County property appraiser estimates the market value of each property is described in this sub-section.

The market value of each housing unit representing January 1, 2022 was estimated by Miami-Dade County. According to the Miami-Dade County property appraiser website (https://www.miamidade.gov/pa/property_value.asp):

“There are three types of value associated with each property: market, assessed and taxable value. Our office always calculates the market value first. This is the value of your property as of January 1st each year after considering certain reductions required by law (Ref. Sec. 193.011, Florida Statutes).

How MARKET value is determined as of January 1st each year:

Comparable Sales (Market) Approach – compares properties similar to your property by reviewing property sales in your neighborhood. Adjustments are made to account for differences between the properties such as size and extra features including fences and swimming pools.

Cost Approach – considers how much it would cost, at current material and labor costs, to replace your property and takes into account any applicable depreciation.

Income Approach – considers the income derived from income producing properties such as rental apartments and warehouses. Specific facts evaluated are operating expenses, taxes, insurance, maintenance costs, the degree of financial risk taken in earning income from the property, and the return on the investment.”

As referenced in the determination of market value described above, Section 193.011, Florida Statutes says the following.

*“**Factors to consider in deriving just valuation.** In arriving at just valuation as required under s. 4, Art. VII of the State Constitution, the property appraiser shall take into consideration the following factors:*

(1) The present cash value of the property, which is the amount a willing purchaser would pay a willing seller, exclusive of reasonable fees and costs of purchase, in cash or the immediate equivalent thereof in a transaction at arm’s length;

(2) The highest and best use to which the property can be expected to be put in the immediate future and the present use of the property, taking into consideration the legally permissible use of the property, including any applicable judicial limitation, local or state land use regulation, or historic preservation ordinance, and any zoning changes, concurrency requirements, and permits necessary to achieve the highest and best use, and considering any moratorium imposed by executive order, law, ordinance, regulation, resolution, or proclamation adopted by any governmental body or agency or the Governor when the moratorium or judicial limitation prohibits or restricts the development or improvement of property as otherwise authorized by applicable law. The applicable governmental body or agency or the Governor shall notify the property appraiser in writing of any executive order, ordinance, regulation, resolution, or proclamation it adopts imposing any such limitation, regulation, or moratorium;

- (3) The location of said property;*
- (4) The quantity or size of said property;*
- (5) The cost of said property and the present replacement value of any improvements thereon;*
- (6) The condition of said property;*
- (7) The income from said property; and*
- (8) The net proceeds of the sale of the property, as received by the seller, after deduction of all of the usual and reasonable fees and costs of the sale, including the costs and expenses of financing, and allowance for unconventional or atypical terms of financing arrangements. When the net proceeds of the sale of any property are utilized, directly or indirectly, in the determination of just valuation of realty of the sold parcel or any other parcel under the provisions of this section, the property appraiser, for the purposes of such determination, shall exclude any portion of such net proceeds attributable to payments for household furnishings or other items of personal property.”*

7. Conclusions Regarding the Uses and Economic Contribution of Biscayne Bay

This section provides a summary of the results of the 2022 economic contribution of Biscayne Bay.

7.1 Study Background and Purpose

Biscayne Bay is a large, shallow tropical saline lagoon surrounded by the sizable and diverse greater Miami and Miami Beach and extends for almost the entire length of Miami-Dade County from Haulover Inlet in the north to the upper reaches of Key Largo in the south. The Miami River is fully channelized from Biscayne Bay at downtown Miami to Lake Okeechobee and the navigable part of the river extends upstream 5.5 miles from Biscayne Bay.

Biscayne Bay and the Miami River are important components of the county's quality of life and economy. These natural resources support a wide variety of recreational and economic uses including:

- Recreational fishing, swimming, boating, sailing and other activities
- Commercial fishing
- Shipping operations at PortMiami and the Miami River
- Cruise ship operations at PortMiami
- Bayfront and riverfront views

In 2004 and 2005, Hazen and Sawyer conducted a study for the South Florida Water Management District that provided estimates of the recreational uses and economic values of Biscayne Bay and the Miami River for the year 2004. In 2022, the South Florida Water Management District, in cooperation with Miami-Dade County, contracted with Hazen and Sawyer to update the 2005 study and to add estimates of the contribution of the Bay and River to the County's residential property values. These estimates of the economic importance of Biscayne Bay to Florida residents can be used to justify investments and programs to protect Biscayne Bay as it generates economic activity and community wellbeing.

Most of this current study effort was focused on the recreational uses of the Bay and the impact of the Bay and River on residential property values. The Miami River's economic contribution is measured in this study through its impact on property values and its importance to recreation. All other types of economic contributions presented in this report including from recreation, commercial fishing and PortMiami operations reflect the contribution of Biscayne Bay.

7.2 Recreational Uses of Biscayne Bay

The estimated number of person-days spent recreating on Biscayne Bay is provided by primary activity in **Table 7-1**. The number of days participating in a primary activity can also include days when other recreation activities on the Bay or River took place. These other activities are not counted in this table to avoid double-, triple- and quadruple- counting of person-days spent on the Bay.

An estimated 119.8 million person-days were spent participating recreation activities on the Bay and River in 2022, including viewing the Bay from shore while participating in an on-shore activity. Of this total, an estimated 69.3 million person-days were spent by visitors to the County and 50.5 million person-days were spent by the County's residents.

Table 7-1 - Number of Person-Days Spent Participating in Biscayne Bay-Related Recreation Activities in 2022

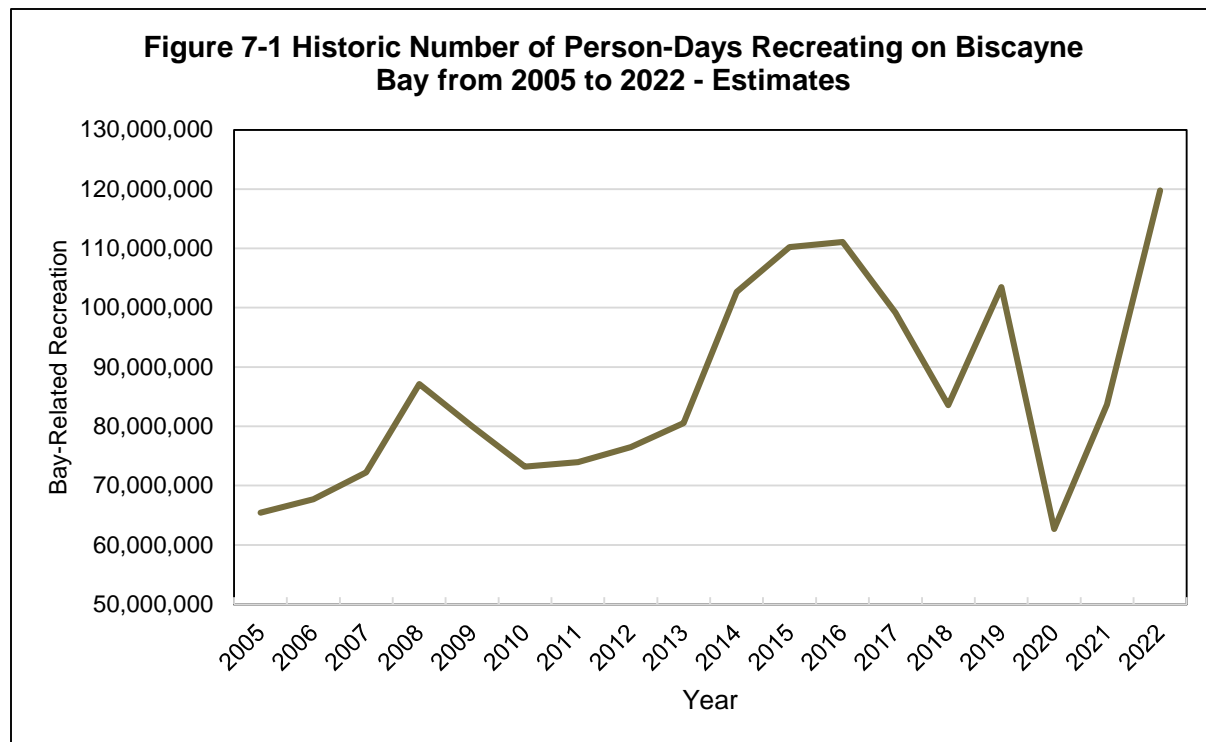
Primary Activity	Visitors to Miami-Dade County (a)	Residents to Miami-Dade County	Total	Percentage of Total
(1)	(2)	(3)	(4) = (2) + (3)	(5) = (4) / 107,923,000
Fishing from Shore	599,000	1,637,000	2,236,000	1.87%
Fishing from Boat	575,000	5,397,000	5,972,000	4.98%
Snorkeling from Shore	991,000	265,000	1,256,000	1.05%
Snorkeling from Boat	607,000	897,000	1,504,000	1.26%
Scuba Diving from Shore	8,000	14,000	22,000	0.02%
Scuba Diving from Boat	232,000	451,000	683,000	0.57%
Swimming from Shore	5,773,000	2,373,000	8,146,000	6.80%
Swimming from Boat	1,458,000	2,289,000	3,747,000	3.13%
Boating for Pleasure/Partying	923,000	2,460,000	3,383,000	2.82%
Sightseeing/Birdwatching from Boat	1,784,000	1,494,000	3,278,000	2.74%
Water-skiing	48,000	1,184,000	1,232,000	1.03%
Parasailing	32,000	33,000	65,000	0.05%
Windsurfing	64,000	159,000	223,000	0.19%
Kite Sailing	0	159,000	159,000	0.13%
Paddleboarding	585,000	1,760,000	2,345,000	1.96%
Personal Watercraft Boating	643,000	973,000	1,616,000	1.35%
Sailing	104,000	276,000	380,000	0.32%
Canoeing / Kayaking	817,000	3,003,000	3,820,000	3.19%
<i>Viewing the Bay from Shore</i>	<i>49,535,000</i>	<i>19,551,000</i>	<i>69,086,000</i>	<i>57.66%</i>
Sunset Cruise	1,466,000	329,000	1,795,000	1.50%
Picnicking on Biscayne Bay	3,052,000	5,598,000	8,650,000	7.22%
Biscayne Bay Cleanup Event	8,000	208,000	216,000	0.18%
Total	69,304,000	50,510,000	119,814,000	100.00%
<i>All Bay-Related Activities Other than Viewing the Bay from Shore</i>	<i>19,769,000</i>	<i>30,959,000</i>	<i>50,728,000</i>	<i>42.34%</i>

(a) Total does not add up exactly to that in Table 4-9 due to rounding of the numbers in this table.

About 58 percent of these person-days, or 69.1 million person-days, were spent “Viewing the Bay from Shore” while dining, shopping, jogging, strolling, sightseeing, bird watching, and/or exercising. The remaining 50.7 million person-days were spent in all other recreation activities, including fishing, snorkeling, scuba diving, swimming, and motorized and non-motorized boating. For all activities, about 56 percent took place in the north bay, 28 percent took place in the central bay and 16 percent took place in the south bay.

The historic total number of person-days from 2005 through 2022 was based on the number of person-days estimated in 2005 and in 2022 using survey research and the trend in the number of visitor-days at four parks surrounding the Bay for which annual visitation data were available. These parks are Biscayne National Park, Barnacle Historic State Park, Oleta River State Park, and Cape Florida / Bill Baggs State Park.

The resulting historic number of person-days of recreation on Biscayne Bay and the Miami River is plotted in **Figure 7-1**. Recreation use grew from 2005 to 2008 and fell precipitously in 2009. The drop in the number of person-days from 2009 to 2013 could be because of the Great Recession which lasted from December 2007 through June 2009 and had lasting effects years later. Recreation increased from 2014 to about 2016 and then fell in 2017 and 2018 probably in response to Hurricane Irma which hit the Florida Keys as a category 4 and made landfall in Marco Island as a category 3 in September 2017. In 2019 recreation began to bounce back but was stymied by the Covid-19 pandemic in 2020. In 2021 and 2022, recreation grew and in 2022 reached the highest level that it had ever achieved at least as far back in time as 1980.



7.3 Economic Contribution of Biscayne Bay-Related Recreation

The economic contribution of Biscayne Bay-related recreation by visitors and residents is summarized in **Table 7-2**. The economic contributions of Biscayne Bay and the Miami River as they are used for recreation are compared to the overall economies in **Table 7-3**.

Table 7-2 - Economic Contribution of Biscayne Bay-Related Expenditures by Residents of and Visitors to Miami-Dade County, 2022

Study Area	Output (a)	Income (b)	Employment (c)	Tax Revenue (d)
Miami-Dade County	\$15,081,913,000	\$8,211,172,000	113,300	\$15,081,913,000
Southeast Florida	\$15,621,088,000	\$8,500,821,000	116,300	\$15,621,088,000
Florida	\$15,881,728,000	\$8,617,319,000	118,300	\$15,881,728,000

(a) Output is defined as the value of the additional goods and services produced in the study area due to the Bay-related recreation expenditures.

(b) Income is the sum of wages, salaries, proprietor's income, profits, rents, royalties, and dividends due to the Bay-related recreation expenditures.

(c) Employment includes the number of full-time and part-time jobs created due to the Bay-related recreation expenditures.

(d) 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 includes local, county, State and Federal tax revenue. It excludes taxes on profit and income.

Table 7-3 - Economic Contribution as Biscayne Bay is Used for Recreation by Residents and Visitors as Percentage of Study Area Economies

Study Area	Output	Income	Employment
Miami-Dade County	4.41%	4.56%	6.17%
Southeast Florida	2.07%	2.09%	2.84%
Florida	0.71%	0.73%	0.94%

In Miami-Dade County, Bay-related recreation expenditures generated an estimated \$15.1 billion in output, \$8.2 billion in income, 113,300 jobs and \$2.1 billion in tax revenue in 2022. This economic contribution represents 4.4 percent of the county's total output, 4.6 percent of the county's income and 6.2 percent of the county's employment.

In the southeast Florida counties of Palm Beach, Broward, Miami-Dade and Monroe, Bay-related recreation expenditures generated \$15.6 billion in output, \$8.5 billion in income, 116,300 jobs and \$2.3 billion in tax revenues in 2022. This economic contribution represents 2.1 percent of southeast Florida's total output, 2.1 percent of its income and 2.8 percent of its employment.

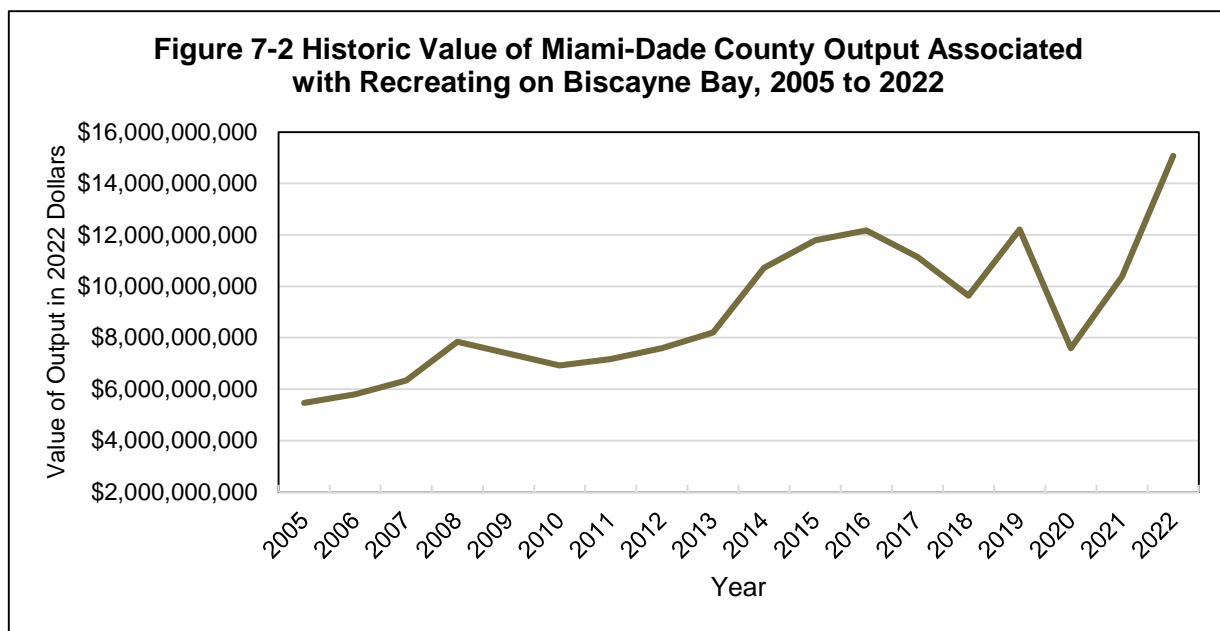
In Florida, Bay-related recreation expenditures generated \$15.9 billion in output, \$8.6 billion in income, 118,300 jobs and \$2.4 billion in tax revenues in 2022. This economic contribution represents 0.7 percent of Florida's total output, 0.7 percent of its total income and 0.9 percent of its employment.

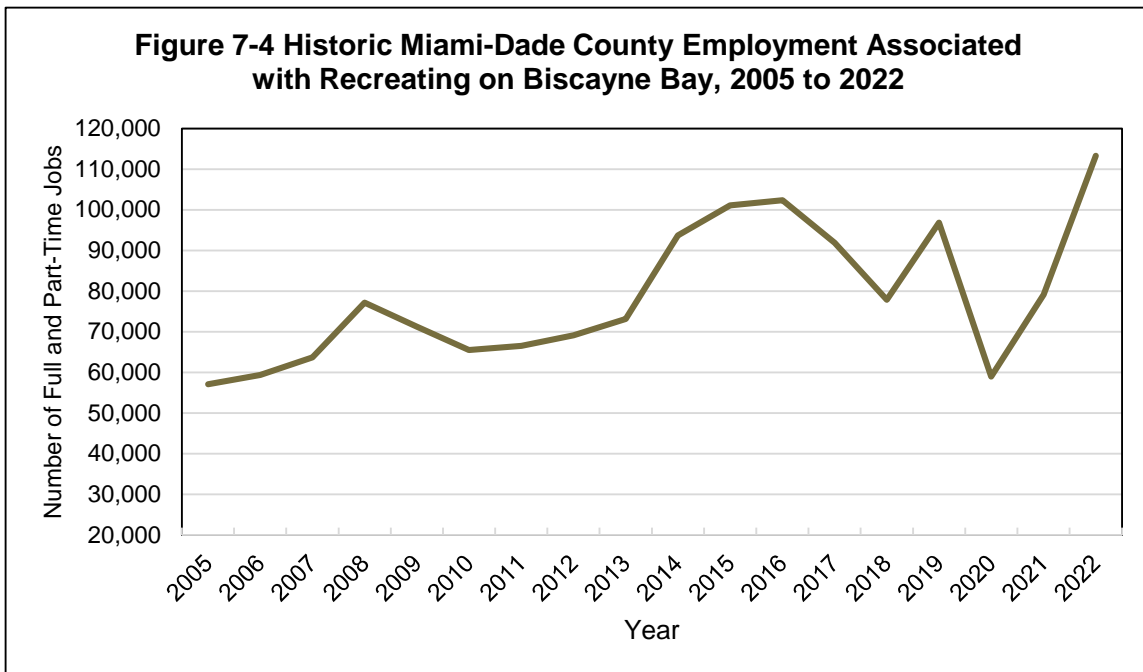
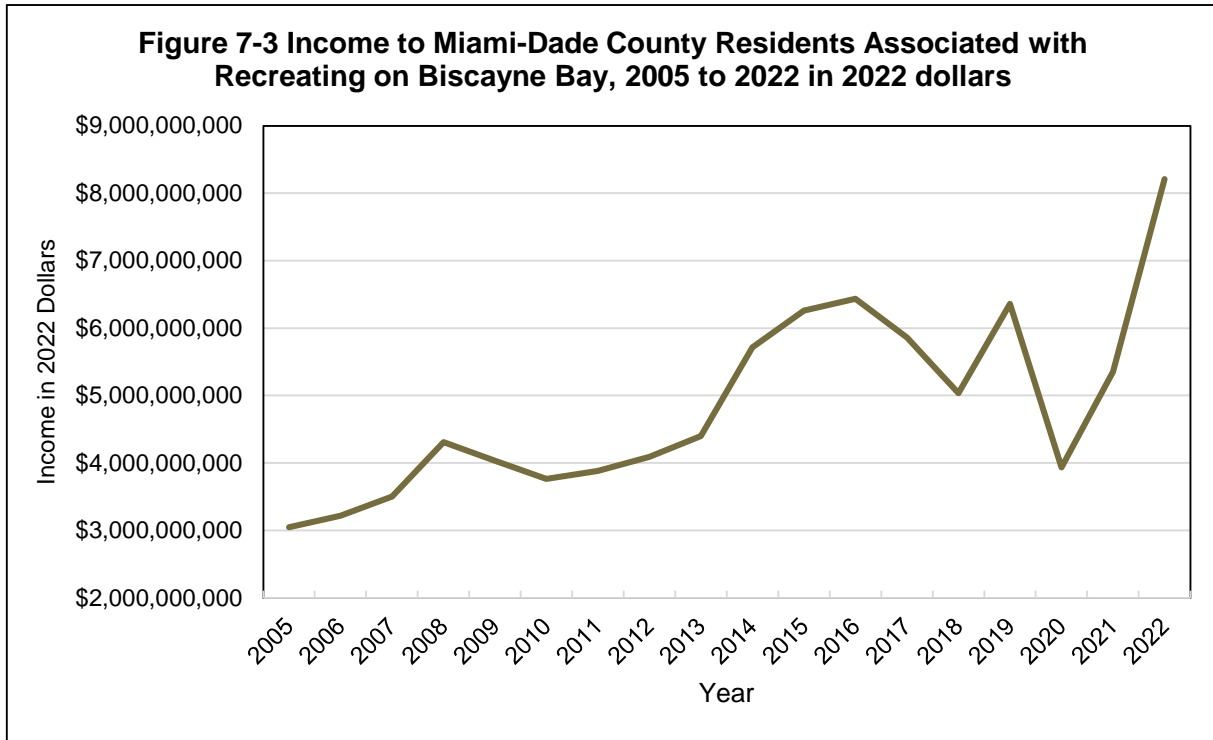
The boat and equipment rental industry (under Rentals - General and Consumer Goods Rental) is one of the greatest beneficiaries of Biscayne Bay recreation, adding an estimated \$3.4 billion to the County's 2022 output, \$1.7 billion to County residents' 2022 income and 19,400 jobs in 2022. The eating and drinking establishment industry (under Services - Eating and Drinking Establishments) was also one of

the greatest beneficiaries, adding about \$3.0 billion to the County’s 2022 output, \$1.8 billion to County residents’ 2022 income and 29,600 jobs in 2022.

The charter boat industry (under Transportation - Scenic and sightseeing transportation and support activities) was the third greatest beneficiary providing \$1.2 billion in output, \$0.8 billion in income, and 12,500 jobs. The Bay’s contribution to the Hotels and Lodging Places industry added \$1.3 billion in 2022 output, \$0.8 billion in 2022 income, and 8,100 jobs. Other benefiting industries in Miami-Dade County included Finance / Insurance / Real Estate; Retail Trade - Food Stores; Retail Trade - Gasoline Stores; Retail Trade - All Other; Professional Services; and Entertainment.

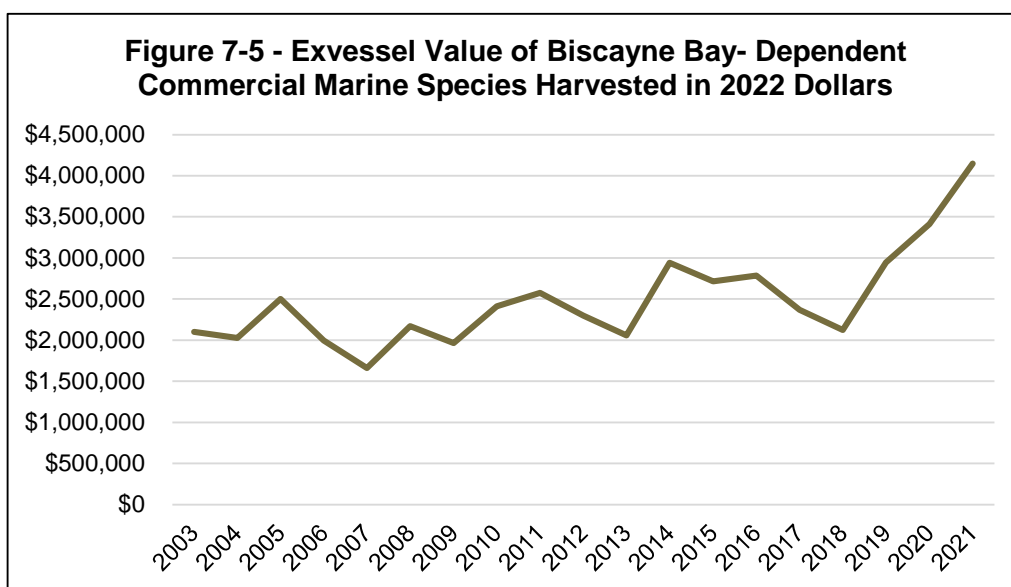
Graphs of the estimated annual output, income, and employment in Miami-Dade County from 2005 to 2022 are provided in **Figure 7-2**, **Figure 7-3**, and **Figure 7-4**. These historic trends mirror the historic annual person-days, the estimated increase in real Bay-related expenditures between 2005 and 2022, and economic changes that took place between 2005 and 2022. Annual tax revenues from 2005 to 2022 are not provided in this report because the components of tax revenue used in 2005 versus in 2022 are not the same. The 2005 tax revenue is missing Federal taxes while the 2022 tax revenue includes Federal taxes.





7.4 Economic Contribution of Biscayne Bay-Related Commercial Fishing

The economic contribution of Biscayne Bay-related commercial fishing includes the economic activity generated by harvesting and retailing the Bay-related marine species and the economic activity generated by the investments made to purchase and refurbish the commercial fishing boats. The annual exvessel values of Biscayne Bay-dependent commercial marine species harvested in 2022 dollars from 2003 through 2021 are plotted in **Figure 7-5**.



The overall economic contributions of Biscayne Bay-related commercial fishing to the Miami-Dade County economy, the southeast Florida economy and the Florida economy are provided in **Table 7-4**. These results include fish harvesting and retailing, and capital investment. The economic contribution of Biscayne Bay-related commercial fishing as a percentage of the overall economy in each study area is provided in **Table 7-5**.

Biscayne Bay-dependent commercial fishing contributed \$19.6 million to Miami-Dade County’s output, \$11.9 million to its resident income, 196 jobs, and \$2.7 million in tax revenue. In southeast Florida, commercial fishing contributed \$20.5 million in output, \$12.3 million in resident income, 202 jobs, and \$2.8 million in tax revenue. In Florida, commercial fishing contributed \$20.9 million in output, \$12.5 million in resident income, 204 jobs and \$2.9 million in tax revenue. These contributions are less than one percent of each study area’s economy.

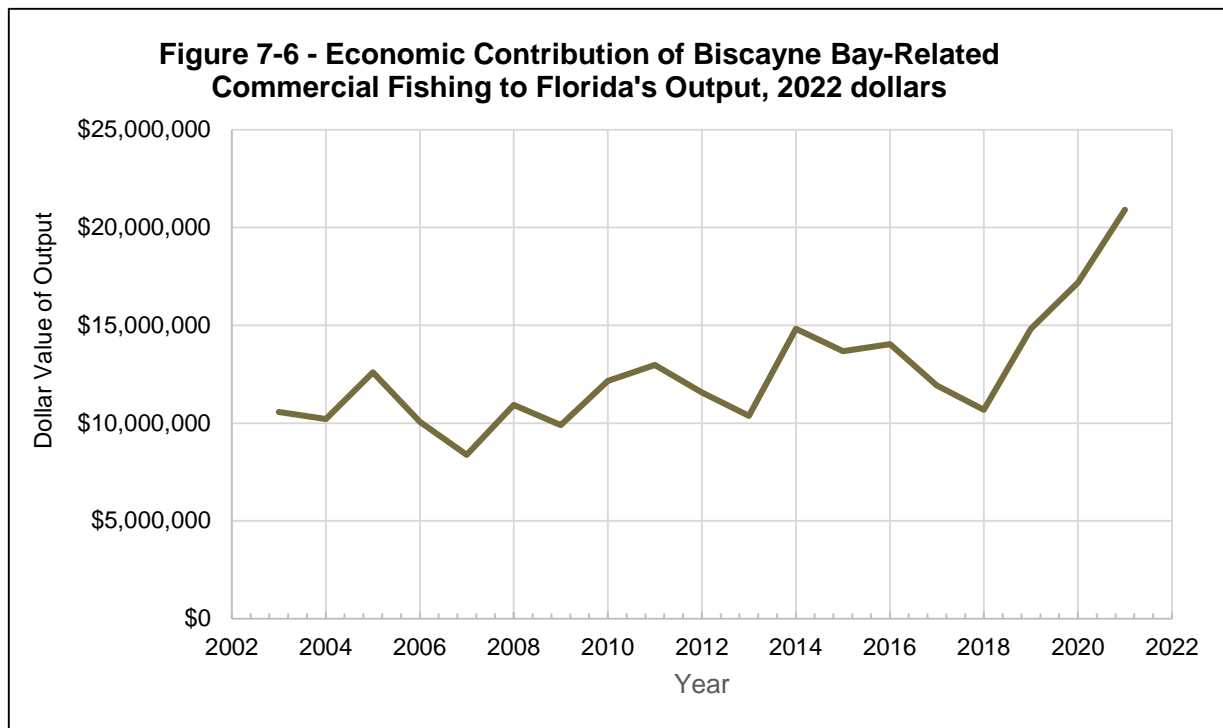
Table 7-4 - Overall Estimated Economic Contribution of Biscayne Bay-Related Commercial Fishing in 2021 (in 2022 dollars)

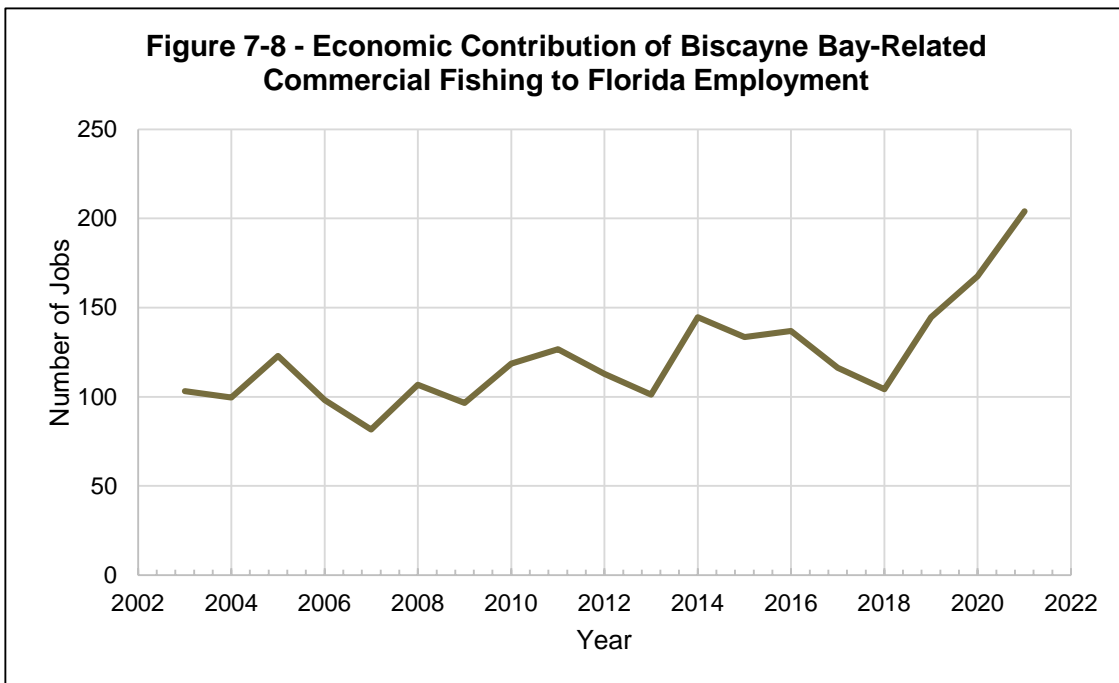
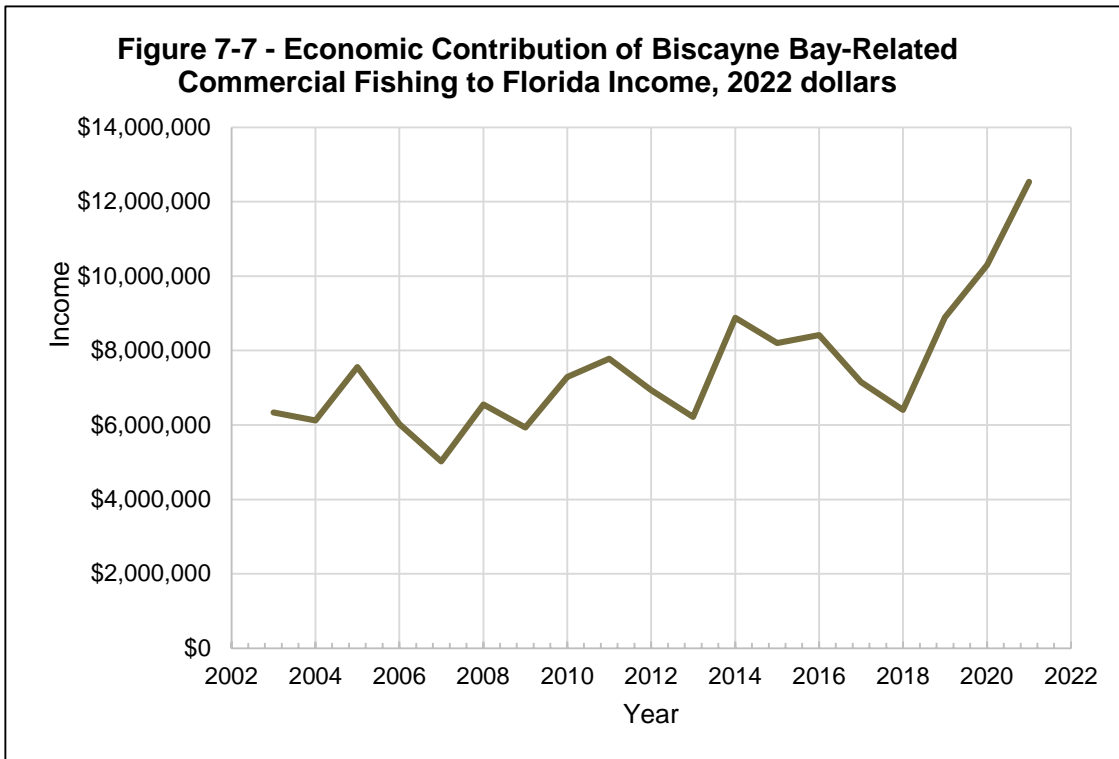
Study Area	Output	Income	Employment	Tax Revenue
Miami-Dade County	\$19,591,383	\$11,870,396	196	\$2,680,079
Southeast Florida	\$20,480,328	\$12,337,819	202	\$2,790,024
Florida	\$20,907,225	\$12,536,140	204	\$2,850,276

Table 7-5 - Economic Contribution of Biscayne Bay-Related Commercial Fishing in 2021 as Percentage of the Study Area Economies

Study Area	Output	Income	Employment
Miami-Dade County	0.0057%	0.0066%	0.0107%
Southeast Florida	0.0027%	0.0030%	0.0049%
Florida	0.0009%	0.0011%	0.0016%

Plots of the estimated historic economic contribution of Bay-related commercial fishing to Florida’s economy from 2002 to 2021 are provided in **Figures 7-6** through **7-8**, for output, income, and employment, respectively. The data provided in these figures represent the direct, indirect, and induced economic contribution of commercial fishing harvesting, retailing, and investments as measured by output, income, and employment.





7.5 Economic Contribution of Shipping and Cruising Operations at PortMiami

PortMiami, located in Biscayne Bay, supports shipping and cruising activities in Miami-Dade County. The most recent assessment of PortMiami’s estimated economic contribution to the regional economy is the 2017 study prepared by Martin Associates for PortMiami that was based on telephone and personal interviews of 500 firms in the Miami-Dade County area. The Martin Associates study is the most recent and comprehensive publicly available economic impact study of the Port and provides a detailed account of the large economic role that PortMiami plays in the regional economy.

The study’s overall estimates of the Port’s economic contribution to the regional economy are provided in **Table 7-6**. In 2018, PortMiami was estimated to contribute \$48.8 billion in output which is about 14 percent of the Miami-Dade County economy. Total income, estimated to be \$14.8 billion, represents about 8.24 percent of the economy. Employment, estimated to be 334,532 jobs, is about 18.3 percent of Miami-Dade County’s economy. These economic contributions include the direct, indirect, and induced contributions of PortMiami’s operations plus the contributions of the goods that flow into and out of the Port.

Table 7-6 - Economic Contribution of PortMiami to Miami-Dade County in 2022 - Estimate

Study Area	Output	Income	Employment
Estimated Value in 2018 dollars	42,974,000	12,992,000	334,532
Estimated Value in 2022 dollars (a)	48,849,000	14,830,000	NA
Percentage of Miami-Dade County Economy	13.99%	8.24%	18.33%

The economic contribution of PortMiami extended beyond Miami Dade County although that is where 74 percent of the direct employees lived in 2016. The Martin Associates study report states that an estimated 22 percent of the direct cargo employees lived in Broward County and most of the remainder lived in other Florida counties with 4 jobs held by people living outside of Florida. The report did not provide a similar distribution for Port cruising activities.

7.6 Economic Contribution of Shipping Operations on the Miami River

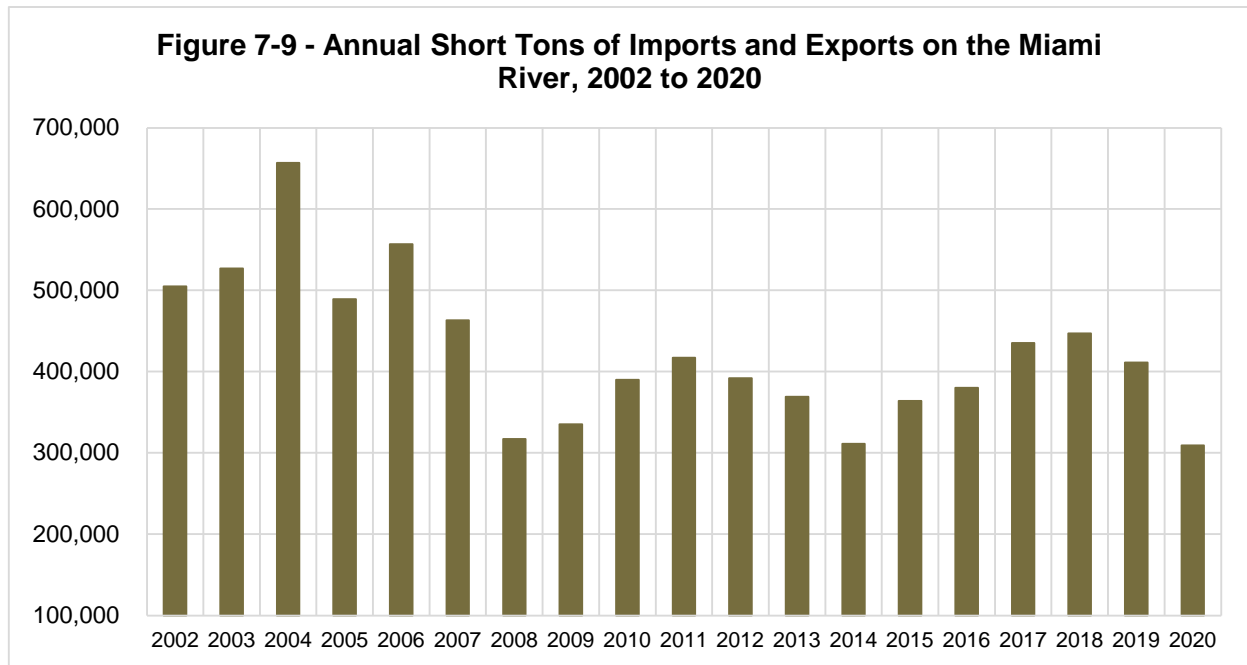
There have been no recent economic impact studies performed to estimate the contributions of the Miami River to the regional economy and such an assessment is beyond the scope of this study.

The Miami River is a short (5.5 mile) but important waterway for the transport of vital goods to and from southeast Florida to foreign destinations. Previous studies including the 2005 Biscayne Bay Economic Study have estimated the River’s marine industry’s impact on the regional economy. The 2005 study estimated that the Miami River shipping industry generated \$682 million in output, 6,106 jobs, \$339 million in income, and \$37.7 million in tax revenues in 2005.

The scope of the current study is more limited and the data from the 2005 report have not been updated. The total annual tonnage of freight transported on the Miami River from 2002 to 2020, which includes imported and exported cargo, is plotted in **Figure 7-9**. These data are from USACE.

The USACE data indicate that after the increase in traffic from 2002 to 2004, transported tonnage underwent a steep decline, dropping from a peak of 657,000 tons in 2004 to a low of 317,000 tons in 2008, which could be explained by the Great Recession which lasted from December 2007 through June

2009. Shipping increased from 2009 to another cyclical peak of 417,000 tons in 2011 and then fell to a low of 311,000 in 2014. In 2015, shipping began a rebound before experiencing another steep decline beginning in 2019. In 2020, the latest year of available data, shipping on the Miami River fell to its lowest level in 19 years likely due to the severe economic impacts of the Covid-19 pandemic that slowed down economic activity.



7.7 Impact of Biscayne Bay and the Miami River on Property Values

During this study, the contribution of Biscayne Bay and the Miami River to residential property values in Miami-Dade County was estimated using hedonic price analysis of residential market values and housing unit characteristics data obtained from the Miami-Dade County Property Appraiser’s office. The data represent January 1, 2022. The market value contributions provide direct measures of resident willingness-to-pay for the benefits of living on or near the Bay. Market value is the amount a willing purchaser would pay a willing seller, exclusive of reasonable fees and costs of purchase, in cash or the immediate equivalent, in an arm’s length transaction. This market value was estimated by the Miami-Dade County Property Appraiser for every property in the county based on the comparable sales approach, the cost approach, and/or the income approach to valuing real property. It is this market value by which the property’s assessed value and taxable value are determined.

A summary of the economic value of Biscayne Bay and the Miami River as they impact residential property values is provided in **Table 7-7**. The hedonic analysis of property values found that the 2021 contribution of Biscayne Bay to residential market value was \$7.9 billion and the contribution of the Miami River to residential market value is \$98 million. The estimated 2021 contribution of Biscayne Bay and the Miami River to residential property values totals \$8.0 billion in 2021 dollars.

These capitalized values were converted to an annual value that represents the property owner’s willingness to pay for the aesthetic and recreational benefits to homeowners and renters as they live on or

near the Bay and the River. For this analysis, these values are \$237 million per year in benefit value associated with living on or near Biscayne Bay and \$3.8 million per year in benefit value associated with living on or near the Miami River using a real discount rate of 3.0 percent. The total contribution of Biscayne Bay and the Miami River to residential property values is estimated to be \$240.8 million per year. Because the market values used in this analysis reflect their values on January 1, 2022, these values are considered to represent 2021 dollars.

Table 7-7 - Estimated 2021 Contribution of Biscayne Bay and the Miami River to Property Values (2021 dollars)

Property Type	Increased Market Value, \$			Annualized Benefit Value, \$ / year		
	Biscayne Bay	Miami River	Total	Biscayne Bay	Miami River	Total
Single-Family	\$3,327,745,000	\$28,716,000	\$3,356,461,000	\$100,000,000	\$1,511,000	\$101,511,000
Multi-Family (housing unit)	\$4,251,034,000	\$52,758,000	\$4,303,792,000	\$128,000,000	\$1,583,000	\$129,583,000
Apartment Buildings	\$305,802,000	\$16,400,000	\$322,202,000	\$9,000,000	\$731,000	\$9,731,000
Total	\$7,884,581,000	\$97,874,000	\$7,982,455,000	\$237,000,000	\$3,825,000	\$240,825,000

8. Bibliography

Berkeley, Steven A., Donald W. Pybas and Wilfredo L. Campos, **Bait Shrimp Fishery of Biscayne Bay**, Florida Sea Grant College, Technical Paper No. 40, Gainesville, Florida, November 1985.

CBRE Research, **United States Cap Rate Survey, H1 2023**, July 2023.

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.

IMPLAN® model, **2021 Data**, using inputs provided by Hazen and Sawyer.

IMPLAN Group LLC, **IMPLAN System (data and software)**, 16905 Northcross Dr., Suite 120, Huntersville, NC 28078, www.IMPLAN.com.

Martin Associates, **The Local and Regional Economic Impacts of PortMiami**, prepared for PortMiami, March 28, 2017.

Martin Associates, **2018 Update of The Local and Regional Economic Impacts of PortMiami**, prepared for PortMiami - Estimates provided to Hazen in an Excel Spreadsheet on September 28, 2023.

Greater Miami Convention and Visitors Bureau, **Greater Miami & Miami Beach 2021 Visitor Industry Overview**.

US Army Corps of Engineers, **Waterborne Commerce of the United States, 2011 and 2020**, Part 1 - Waterways and Harbors, Atlantic Coast.

US Census, **Quick Facts, Miami-Dade County**, 2022.

United States, **Economic Report to the President transmitted to Congress March 2023**, Table B–39. Price indexes for personal consumption expenditures, and percent changes, 1972–2022 and Table B–42. Bond yields and interest rates, 1952–2022.

White, Halbert, **A Heteroskedasticity-Consistent Covariance Matrix Estimator and a Direct Test for Heteroskedasticity**, *Econometrica*, Volume 48, Number 4, May, 1980, pages 817-837.

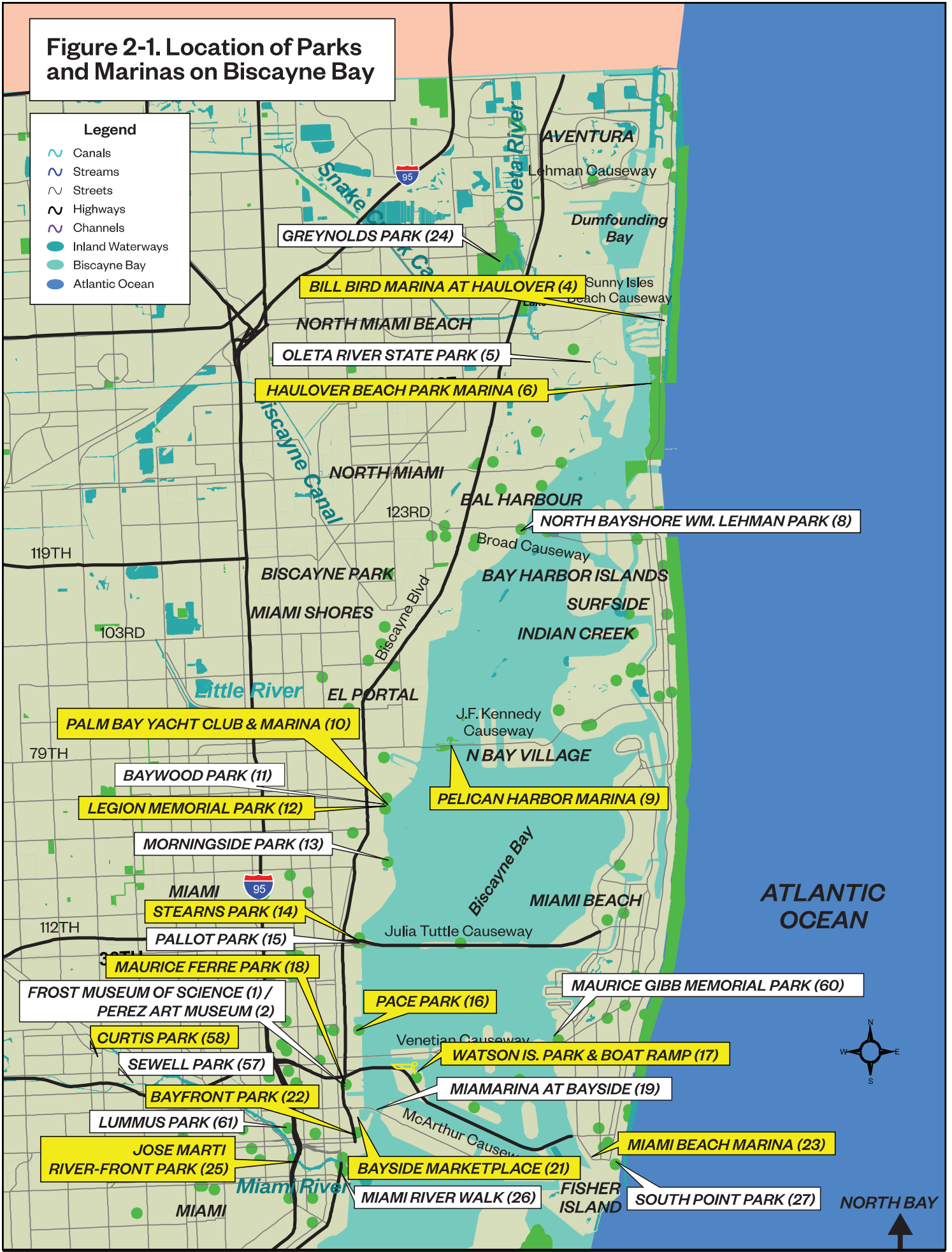
APPENDIX A
Biscayne Bay User Survey - Residents

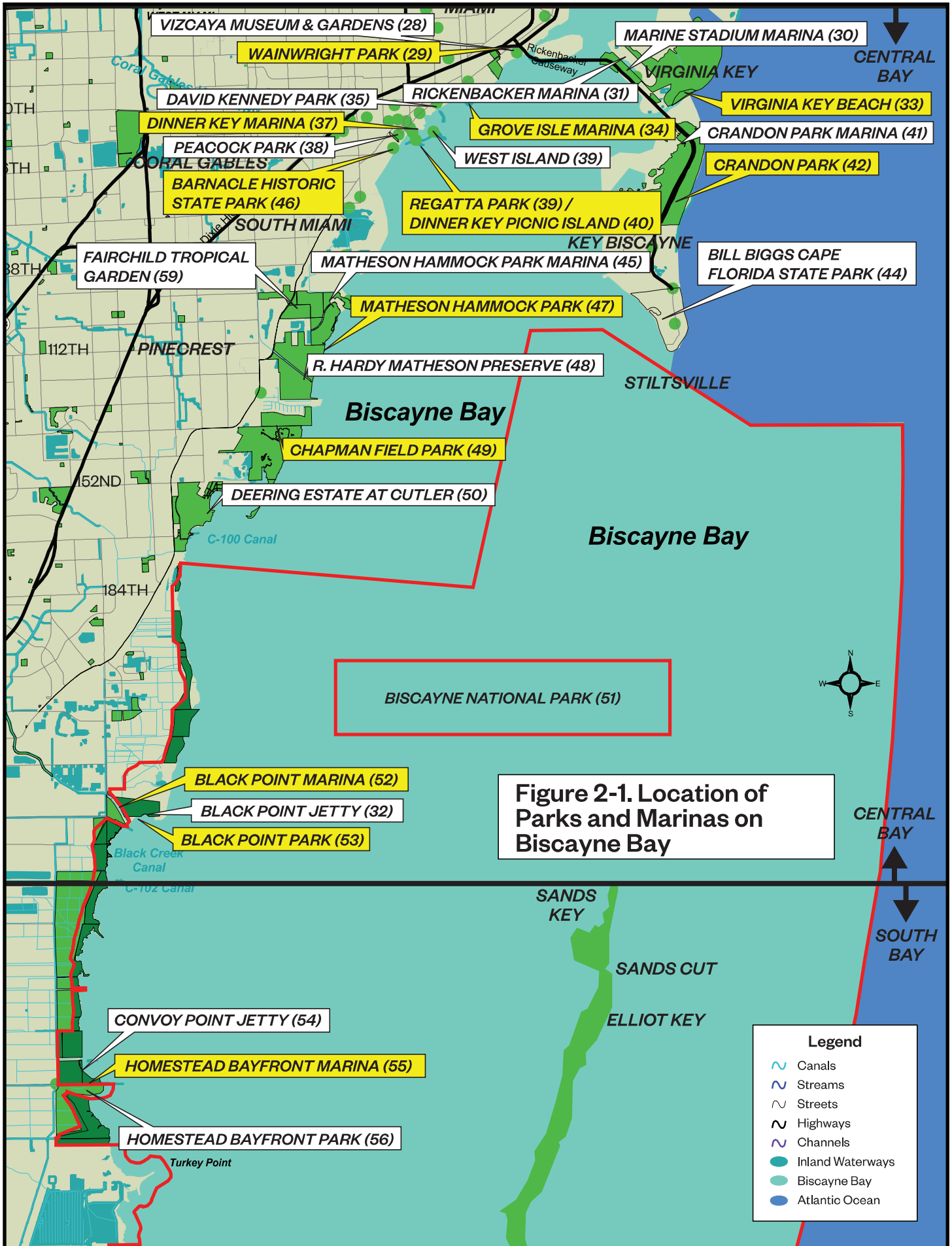
**BISCAYNE BAY USER INTERCEPT SURVEY
SCREENER/TALLY SHEET**

1. **Hand Respondent the White Card (Activities List).** Did you do any of these activities on Biscayne Bay in the past 12 months.
- NO.** Thank you. We are only interviewing people who use the Bay for recreation. *(Place a tic mark in column 4.)*
 - YES.** 2. Will you participate in a 10-15 minute interview about your use of Biscayne Bay?
 - NO.** Thank you. *(place tic mark in column 5)*
 - If language Barrier, (place tic mark in column 6)*
 - YES.** Are you a resident of Miami-Dade County?
 - YES.** Use resident survey. *(place tic mark in column 7)*
 - NO.** Use visitor survey. *(place tic mark in column 8)*

1	2	3	4	5	6	7	8
Site	Date	Time Period	Doesn't use Bay	Refusal	Language Barrier	Resident Interviewed	Visitor Interviewed

Figure 2-1. Location of Parks and Marinas on Biscayne Bay





WHITE CARD – BISCAYNE BAY ACTIVITIES LIST

<u>Number</u>	<u>Activities on Biscayne Bay</u>
100	Fishing
101	Snorkeling
102	Scuba Diving
103	Swimming
200	Sightseeing and/or Birdwatching on Boat
201	Partying on Boat
300	Water-skiing
301	Parasailing
302	Windsurfing
303	Kite Sailing
304	Paddleboarding
400	Personal Watercraft Boating (jet skis, wave runners, etc.)
500	Sailing
501	Canoeing / Kayaking
600	Viewing the Bay from Shore or by Air (including while dining, shopping, jogging, strolling, sightseeing, bird watching, and/or exercising)
700	Sunset Cruise
701	Water Taxi
900	Picnicking on Biscayne Bay
901	Participating in Biscayne Bay Cleanup Event

RESIDENTS - Biscayne Bay User Intercept Survey

HAND RESPONDENT MAP AND WHITE CARD WITH BISCAYNE BAY ACTIVITIES LIST

Q4. Which Bay-related recreation activities did you participate in during the past 12 months? Please read me the number corresponding to each activity on the card.

(If the respondent did not participate in any of these activities, politely end the interview. We are only interviewing those who participated in at least one of these activities in the past 12 months.)

Q5. As I read each activity, would you tell me how many days you participated in the activity over the past 12 months?

(For multiple activities on the same day, answer question only for most prominent activity of the day. If day was spent equally on two activities count ½ day, not full day for each of the two activities.)

Ask Questions 6 and 7 if respondent participated in Activity numbers 100 through 201.

Q6. For Activity Numbers 100 through 201, how many of those days did you use a private boat to participate in that activity?

Q7. For Activity Numbers 100 through 201, how many of those days did you use a rental or charter boat to participate in that activity?

Q8. If a boat was used for any of the activities, please refer to the map of Biscayne Bay. When you are boating, do you know when you are boating in Biscayne National Park?

YES NO

Q9. Please refer to the map of Biscayne Bay. Please indicate the general location(s) of the Bay where you participated in each activity – north, central or south. The north Bay is the Bay area north of the Miami River and Government Cut. The central Bay is from the Miami River / Government Cut to and including the Black Point Park and Marina. The south Bay is the Bay area south of the Black Point Park and Marina.

BISCAYNE BAY-RELATED ACTIVITIES IN PAST 12 MONTHS

Q4 Activity	Q5 Respondent # of days	Q6 # of days Private Boat used	Q7 # of days Rental Boat Used	Q9 Bay Location(s) of Activities (north, central and/or south)
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

RESIDENTS - Biscayne Bay User Intercept Survey

BAY-RELATED EXPENDITURES IN MIAMI-DADE COUNTY

Q10. On the most recent day that you participated in Bay-related recreation activities, about how much money did your party spend on the following items in Miami-Dade County?

(Survey Researcher Note: Please list expenditures under the predominant Bay-related activity that respondent participated in during that day. The expenditures in each column must represent 1-day only and not multiple days. However, if respondent gave expenses for multiple days, be sure to ask for number of days represented (in last row of table). You may have respondent refer to Section 3 of the GREEN CARD for a list of itemized expenditures.)

Expenditures in Miami-Dade County on Most Recent Day You Participated In Biscayne Bay-Related Activities

Expenditure Item	Fishing From Motor Boat (100)	Fishing From Shore (100)	Diving/ Snorkeling From Motor Boat (101 & 102)	Diving/ Snorkeling from Shore (101 & 102)
Boat fuel	\$	\$	\$	\$
Tackle, bait, and/or ice	\$	\$	\$	\$
Boat rental	\$	\$	\$	\$
Charter boat fee	\$	\$	\$	\$
Equipment Rental	\$	\$	\$	\$
Ramp, Marina and Parking Fees	\$	\$	\$	\$
Park Entrance Fees	\$	\$	\$	\$
Lodging (per night)	\$	\$	\$	\$
Camping fees (per night)	\$	\$	\$	\$
Food and Beverages – Stores	\$	\$	\$	\$
Food and Beverages – Restaurants/Bars	\$	\$	\$	\$
Auto gas	\$	\$	\$	\$
Auto Rental, Taxi, Bus fares	\$	\$	\$	\$
Shopping and Sundries (gifts, sunscreen, etc.)	\$	\$	\$	\$
No. of people in party who spent or benefited from these purchases (overall)				
Days Represented by Expenditures				

RESIDENTS - Biscayne Bay User Intercept Survey

Expenditures in Miami-Dade County on Most Recent Day You Participated In Biscayne Bay-Related Activities

Expenditure Item	Swimming (103)	Boating for sightseeing / partying (200 to 201)	Waterskiing / Parasailing / Windsurfing / Kite Sailing / Paddleboarding (300 to 304)	Personal Watercraft Boating (400)
Boat fuel	\$	\$	\$	\$
Tackle, bait, and/or ice	\$	\$	\$	\$
Boat rental	\$	\$	\$	\$
Charter boat fee	\$	\$	\$	\$
Equipment Rental	\$	\$	\$	\$
Ramp, Marina and Parking Fees	\$	\$	\$	\$
Park Entrance Fees	\$	\$	\$	\$
Lodging (per night)	\$	\$	\$	\$
Camping fees (per night)	\$	\$	\$	\$
Food and Beverages – Stores	\$	\$	\$	\$
Food and Beverages – Restaurants/Bars	\$	\$	\$	\$
Auto gas	\$	\$	\$	\$
Auto Rental, Taxi, Bus fares	\$	\$	\$	\$
Shopping and Sundries (gifts, sunscreen, etc.)	\$	\$	\$	\$
Number of people in party who spent or benefited from these purchases (overall)				
Days Represented by Expenditures				

RESIDENTS - Biscayne Bay User Intercept Survey

Expenditures in Miami-Dade County on Most Recent Day You Participated In Biscayne Bay-Related Activities

Expenditure Item	Non-Motorized Boating (Canoe/Kayak/Sailing) (500 & 501)	Viewing the Bay From Shore or Air/ Picnicking (600 & 900)	Sunset Cruise or Water Taxi (700 & 701)
Boat fuel	\$	\$	\$
Tackle, bait, and/or ice	\$	\$	\$
Boat rental / cruise fee	\$	\$	\$
Charter boat fee	\$	\$	\$
Equipment Rental	\$	\$	\$
Ramp, Marina and Parking Fees	\$	\$	\$
Park Entrance Fees	\$	\$	\$
Lodging (per night)	\$	\$	\$
Camping fees (per night)	\$	\$	\$
Food and Beverages – Stores	\$	\$	\$
Food and Beverages – Restaurants/Bars	\$	\$	\$
Auto gas	\$	\$	\$
Auto Rental, Taxi, Bus fares	\$	\$	\$
Shopping and Sundries (gifts, sunscreen, etc.)	\$	\$	\$
Number of people in party who spent or benefited from these purchases (overall)			
Days Represented by Expenditures			

Q11. **ASK RESPONDENTS WHO LISTED 901 - Participating in Biscayne Bay Cleanup Event:** Over the past 12 months, how many hours did you spend participating in a Biscayne Bay Cleanup Event (including today)? _____ hours

Q12. Over the past 12 months, did you purchase any goods or services in Florida that you needed to participate in Biscayne Bay-related activities (examples: boats, boat repairs, scuba / snorkeling equipment)?

- YES NO, Go to Q13.

Q13. What goods or services did you purchase, how much did you spend, what city or county did you purchase them in, and how many days per year, on average, did/will you use the purchased good or service?

Good or Service	Money Spent	County or Nearby City in Florida Where Purchased	Average Days per Year Good or Service Used

GREEN CARD – Resident – Biscayne Bay User Intercept Survey

PRIVACY STATEMENT

Your participation is voluntary. Since each interviewed person will represent many others not interviewed, your cooperation is extremely important. Hazen & Sawyer and Mars Research are conducting this study for Miami-Dade County and the South Florida Water Management District. Uses of the information include evaluating Biscayne Bay's current recreational activities and estimating the expenditures associated with these activities. This survey does not ask for any information that identifies you. All information from this survey will be available for distribution. The interview should take 10 to 15 minutes with an average of 12 minutes.

Section 1. Annual Household Income before Taxes are Deducted

Please give only the letter of your income category.

- A. Less than \$50,000
- B. \$50,001 to \$100,000
- C. \$100,001 to \$150,000
- D. \$150,001 to \$200,000
- E. \$200,001 or more

Section 2. Race/Ethnicity

A = White

B = Black or African American

C = American Indian or Alaska Native

D = Asian

E = Native Hawaiian or Other Pacific Islander

F = Other, please specify _____

Section 3. Itemized Expenditure List For Expenditures On Most Recent Day You Participated in Activity

Boat fuel

Tackle, bait, and/or ice

Boat Rental

Charter Boat Rental

Equipment Rental

Ramp, Marina, and Parking Fees

Park Entrance Fees

Lodging (per night)

Camping fees (per night)

Food and Beverages – Stores

Food and Beverages – Restaurants/Bars

Auto gas

Auto Rental, Taxi, Bus fares

Shopping and Sundries (gifts, sunscreen, etc.)

APPENDIX B

Biscayne Bay User Survey - Visitors

**BISCAYNE BAY USER INTERCEPT SURVEY
SCREENER/TALLY SHEET**

1. **Hand Respondent the White Card (Activities List).** Did you do any of these activities on Biscayne Bay in the past 12 months.
- NO.** Thank you. We are only interviewing people who use the Bay for recreation. *(Place a tic mark in column 4.)*
 - YES.** 2. Will you participate in a 10-15 minute interview about your use of Biscayne Bay?
 - NO.** Thank you. *(place tic mark in column 5)*
 - If language Barrier, *(place tic mark in column 6)*
 - YES.** Are you a resident of Miami-Dade County?
 - YES.** Use resident survey. *(place tic mark in column 7)*
 - NO.** Use visitor survey. *(place tic mark in column 8)*

1	2	3	4	5	6	7	8
Site	Date	Time Period	Doesn't use Bay	Refusal	Language Barrier	Resident Interviewed	Visitor Interviewed

WHITE CARD – BISCAYNE BAY ACTIVITIES LIST

<u>Number</u>	<u>Activities on Biscayne Bay</u>
100	Fishing
101	Snorkeling
102	Scuba Diving
103	Swimming
200	Sightseeing and/or Birdwatching on Boat
201	Partying on Boat
300	Water-skiing
301	Parasailing
302	Windsurfing
303	Kite Sailing
304	Paddleboarding
400	Personal Watercraft Boating (jet skis, wave runners, etc.)
500	Sailing
501	Canoeing / Kayaking
600	Viewing the Bay from Shore or by Air (including while dining, shopping, jogging, strolling, sightseeing, bird watching, and/or exercising)
700	Sunset Cruise
701	Water Taxi
900	Picnicking on Biscayne Bay
901	Participating in Biscayne Bay Cleanup Event

VISITORS - Biscayne Bay User Intercept Survey

HAND RESPONDENT MAP AND WHITE CARD WITH BISCAYNE BAY ACTIVITIES LIST

Q12. Which Bay-related recreation activities did you participate in during the past 12 months? Please read me the number corresponding to each activity on the card.

(If the respondent did not participate in any of these activities, politely end the interview. We are only interviewing those who participated in at least one of these activities in the past 12 months.)

Q13. As I read each activity, would you tell me how many days you participated in the activity over the past 12 months?

(For multiple activities on the same day, answer question only for most prominent activity of the day. If day was spent equally on two activities count 1/2 day, not full day for each of the two activities.)

Ask Questions 14 and 15 if respondent participated in Activity numbers 100 through 201.

Q14. For Activity Numbers 100 through 201, how many of those days did you use a private boat to participate in that activity?

Q15. For Activity Numbers 100 through 201, how many of those days did you use a rental or charter boat to participate in that activity?

Q16. If a boat was used for any of the activities, please refer to the map of Biscayne Bay. When you are boating, do you know when you are boating in Biscayne National Park?

YES NO

Q17. Please refer to the map of Biscayne Bay. Please indicate the general location(s) of the Bay where you participated in each activity – north, central, or south. The north Bay is the Bay area north of the Miami River and Government Cut. The central Bay is from the Miami River / Government Cut to and including the Black Point Park and Marina. The south Bay is the Bay area south of the Black Point Park and Marina.

BISCAYNE BAY-RELATED ACTIVITIES IN PAST 12 MONTHS

Q12 Activity	Q13 Respondent # of days	Q14 # of days Private Boat used	Q15 # of days Rental Boat Used	Q17 Bay Location(s) of Activities (north, central and/or south)
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

VISITORS - Biscayne Bay User Intercept Survey

BAY-RELATED EXPENDITURES IN MIAMI-DADE COUNTY

Q18. On the most recent day that you participated in Bay-related recreation activities, about how much money did your party spend on the following items in Miami-Dade County?

(Survey Researcher Note: Please list expenditures under the predominant Bay-related activity that respondent participated in during that day. The expenditures in each column must represent 1-day only and not multiple days. However, if respondent gave expenses for multiple days, be sure to ask for number of days represented (in last row of table). You may have respondent refer to Section 5 of the GRAY CARD for a list of itemized expenditures.)

Expenditures in Miami-Dade County on Most Recent Day You Participated In Biscayne Bay-Related Activities

Expenditure Item	Fishing From Motor Boat (100)	Fishing From Shore (100)	Diving/ Snorkeling From Motor Boat (101 & 102)	Diving/ Snorkeling from Shore (101 & 102)
Boat fuel	\$	\$	\$	\$
Tackle, bait, and/or ice	\$	\$	\$	\$
Boat rental	\$	\$	\$	\$
Charter boat fee	\$	\$	\$	\$
Equipment Rental	\$	\$	\$	\$
Ramp, Marina and Parking Fees	\$	\$	\$	\$
Park Entrance Fees	\$	\$	\$	\$
Lodging (per night)	\$	\$	\$	\$
Camping fees (per night)	\$	\$	\$	\$
Food and Beverages – Stores	\$	\$	\$	\$
Food and Beverages – Restaurants/Bars	\$	\$	\$	\$
Auto gas	\$	\$	\$	\$
Auto Rental, Taxi, Bus fares	\$	\$	\$	\$
Shopping and Sundries (gifts, sunscreen, etc.)	\$	\$	\$	\$
No. of people in party who spent or benefited from these purchases (overall)				
Days Represented by Expenditures				

VISITORS - Biscayne Bay User Intercept Survey

Expenditures in Miami-Dade County on Most Recent Day You Participated In Biscayne Bay-Related Activities

Expenditure Item	Swimming (103)	Boating for sightseeing / partying (200 to 201)	Waterskiing / Parasailing / Windsurfing / Kite Sailing / Paddleboarding (300 to 304)	Personal Watercraft Boating (400)
Boat fuel	\$	\$	\$	\$
Tackle, bait, and/or ice	\$	\$	\$	\$
Boat rental	\$	\$	\$	\$
Charter boat fee	\$	\$	\$	\$
Equipment Rental	\$	\$	\$	\$
Ramp, Marina and Parking Fees	\$	\$	\$	\$
Park Entrance Fees	\$	\$	\$	\$
Lodging (per night)	\$	\$	\$	\$
Camping fees (per night)	\$	\$	\$	\$
Food and Beverages – Stores	\$	\$	\$	\$
Food and Beverages – Restaurants/Bars	\$	\$	\$	\$
Auto gas	\$	\$	\$	\$
Auto Rental, Taxi, Bus fares	\$	\$	\$	\$
Shopping and Sundries (gifts, sunscreen, etc.)	\$	\$	\$	\$
Number of people in party who spent or benefited from these purchases (overall)				
Days Represented by Expenditures				

VISITORS - Biscayne Bay User Intercept Survey

**Expenditures in Miami-Dade County on Most Recent Day You Participated
In Biscayne Bay-Related Activities**

Expenditure Item	Non-Motorized Boating (Canoe/Kayak/ Sailing) (500 & 501)	Viewing the Bay From Shore or Air/ Picnicking (600 & 900)	Sunset Cruise or Water Taxi (700 & 701)
Boat fuel	\$	\$	\$
Tackle, bait, and/or ice	\$	\$	\$
Boat rental / cruise fee	\$	\$	\$
Charter boat fee	\$	\$	\$
Equipment Rental	\$	\$	\$
Ramp, Marina and Parking Fees	\$	\$	\$
Park Entrance Fees	\$	\$	\$
Lodging (per night)	\$	\$	\$
Camping fees (per night)	\$	\$	\$
Food and Beverages – Stores	\$	\$	\$
Food and Beverages – Restaurants/Bars	\$	\$	\$
Auto gas	\$	\$	\$
Auto Rental, Taxi, Bus fares	\$	\$	\$
Shopping and Sundries (gifts, sunscreen, etc.)	\$	\$	\$
Number of people in party who spent or benefited from these purchases (overall)			
Days Represented by Expenditures			

Q19. **ASK RESPONDENTS WHO LISTED 901 - Participating in Biscayne Bay Cleanup Event:**
Over the past 12 months, how many hours did you spend participating in a Biscayne Bay Cleanup Event (including today)? _____ hours

Q20. Over the past 12 months, did you purchase any goods or services in Florida that you needed to participate in Biscayne Bay-related activities (examples: boats, boat repairs, scuba / snorkeling equipment)?

- YES NO, Go to Q22.

Q21. What goods or services did you purchase, how much did you spend, what city or county did you purchase them in, and how many days per year, on average, did/will you use the purchased good or service?

Good or Service	Money Spent	County or Nearby City in Florida Where Purchased	Average Days per Year Good or Service Used

GRAY CARD – Visitor – Biscayne Bay User Intercept Survey

PRIVACY STATEMENT

Your participation is voluntary. Since each interviewed person will represent many others not interviewed, your cooperation is extremely important. Hazen & Sawyer and Mars Research are conducting this study for Miami-Dade County and the South Florida Water Management District. Uses of the information include evaluating Biscayne Bay's current recreational activities and estimating the expenditures associated with these activities. This survey does not ask for any information that identifies you. All information from this survey will be available for distribution. The interview should take 8 to 12 minutes with an average of 10 minutes.

Section 1. Modes of Transportation

- | | |
|------------------------------------|---|
| A Automobile | D Air – Other Florida city, City: _____ |
| B Air – Miami | E Cruise ship |
| C Air – Ft. Lauderdale / Hollywood | F Own boat |
| | G Other, Specify _____ |

Section 2. Primary Purpose of Trip

- | | |
|-----------------------------|---------------------------|
| A = Recreation or Vacation | C = Business trip |
| B = Visit family or friends | D = Business and Pleasure |
| | E = Other, Specify _____ |

Section 3. Annual Household Income before Taxes are Deducted

Please give only the letter of your income category.

- A. Less than \$50,000
- B. \$50,001 to \$100,000
- C. \$100,001 to \$150,000
- D. \$150,001 to \$200,000
- E. \$200,001 or more

Section 4. Race/Ethnicity

- | | |
|--------------------------------------|---|
| A = White | D = Asian |
| B = Black or African American | E = Native Hawaiian or Other Pacific Islander |
| C = American Indian or Alaska Native | F = Other, please specify _____ |

Section 5. Itemized Expenditure List For Expenditures On Most Recent Day You Participated in Activity

- | | |
|--------------------------------|--|
| Tackle, bait, and/or ice | Food and Beverages – Stores |
| Boat rental | Food and Beverages – Restaurants/Bars |
| Charter boat fee | Boat fuel |
| Equipment Rental | Auto gas |
| Ramp, Marina, and Parking Fees | Auto Rental, Taxi, Bus fares |
| Park Entrance Fees | Shopping and Sundries (gifts, sunscreen, etc.) |
| Lodging or Camping (per night) | |

APPENDIX C
General Resident Survey

**GENERAL RESIDENT INTERCEPT SURVEY
SCREENER/TALLY SHEET**

1a. Are you a permanent resident of Miami-Dade County?

- NO.** Thank you. We are only interviewing residents of Miami-Dade County. *(place tic mark in column 4)*
- YES.** Will you participate in a 5-10 minute interview about your recreation activities on Biscayne Bay, including whether you recreate at all on the Bay?
 - NO.** Thank you. *(place tic mark in column 5)*
If language Barrier, *(place tic mark in column 6)*
 - YES.** Go to Questionnaire. *(place tic mark in column 7)*

1	2	3	4	5	6	7
Site	Date	Time Period	Visitor	Refusal	Language Barrier	Interviewed

General Resident Intercept Survey – Biscayne Bay

Screening Criteria: 1) MUST BE a resident of Miami-Dade County

Survey number: _____

Date/time of Interview:

 Month Day Time

Interview Site: _____

Interviewer Name: _____

SECTION 1: Participation in Activities On or Near Biscayne Bay

I'd like to ask you some questions regarding your recreational uses of Biscayne Bay. Please refer to this map of Biscayne Bay while I ask the questions.

Q1. Have you visited any of the attractions listed in the boxes on this map in the last 12 months?

YES

NO, *Go to Q.4*

Q2. Which of these attractions have you visited during the past 12 months? Please read me the number corresponding to the attraction.

Q3. How many days have you visited each attraction during the past 12 months?

Q18. Attraction Number	Q19. Number of Days Respondent Visited Attraction In Past 12 Months
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

General Resident Intercept Survey – Biscayne Bay

HAND RESPONDENT MAP AND WHITE CARD WITH BISCAYNE BAY ACTIVITIES LIST

- Q4. Please look through the activities listed on this card. In the past 12 months, have you participated in any of the activities on Biscayne Bay? YES
 NO, *Go to Q.8*
- Q5. In which of these Bay-related activities did you participate during the last 12 months? Please read me the number corresponding to each activity on the card.
- Q6. As I read each activity, would you tell me how many days you participated in the activity over the past 12 months?
- Q7. For Activity Numbers 100 through 103, how many of those days did you use a boat to participate in that activity?

BISCAYNE BAY-RELATED ACTIVITIES IN PAST 12 MONTHS

Q5 Activity Number	Q6 Respondent # of days	Q7 # of days Boat used
— — —	— — —	— — —
— — —	— — —	— — —
— — —	— — —	— — —
— — —	— — —	— — —
— — —	— — —	— — —
— — —	— — —	— — —
— — —	— — —	— — —
— — —	— — —	— — —
— — —	— — —	— — —
— — —	— — —	— — —

- Q8. On a scale of 1 to 5, with 1 being least important and 5 being most important, how important is Biscayne Bay in terms of your decision to live in Miami-Dade County?

1 2 3 4 5

General Resident Intercept Survey – Biscayne Bay

Q9. Please refer to Section 1 of the BLUE CARD. Which were the most important reasons why you did not participate in Biscayne Bay related recreation activities in the past 12 months in order of their importance? (Indicate top three answers in order of importance.)

- | | |
|--|--|
| <input type="checkbox"/> a. Too busy to visit the Bay | <input type="checkbox"/> h. Bay is unattractive |
| <input type="checkbox"/> b. I never thought about/wasn't aware of it | <input type="checkbox"/> i. Not enough boat ramps / launching facilities |
| <input type="checkbox"/> c. I don't like saltwater recreation | <input type="checkbox"/> j. Not enough parking |
| <input type="checkbox"/> d. I prefer the Atlantic Ocean | <input type="checkbox"/> k. Not enough dry dock storage |
| <input type="checkbox"/> e. Bay is too polluted | <input type="checkbox"/> l. Not enough parks, undeveloped areas |
| <input type="checkbox"/> f. Bay is too crowded | <input type="checkbox"/> m. Not enough beach areas |
| <input type="checkbox"/> g. Not enough fish to catch | <input type="checkbox"/> n. Other reasons, specify: |

SECTION 2: Respondent Characteristics

- Q10. What is your zip code? _____ (5 digits)
- Q11. How many years have you lived in Miami-Dade County? _____
- Q12. Do you own your own boat? YES ____, Go to Question 13. NO ____, Go to Question 15.
- Q13. Is your boat registered in Miami-Dade County? YES ____ NO ____
- Q14. What is the length of your boat? _____
- Q15. Are you a member of a fishing or diving club? YES ____ NO ____
- Q16. In what year were you born? 19 ____
- Q17. Are you: Male? Female? (Observed, not asked)
- Q18. Please refer to Section 2 of the BLUE CARD and tell me which income category best describes your annual household income last year, before taxes. Please give me the letter on the card that corresponds to the category.
- A B C D E F G H I J K L M N O
- Refused Don't know
- Q19. Do you consider yourself to be Hispanic, Latino or of Spanish origin?
- Yes No
- Q20. Please refer to Section 3 of the BLUE CARD and tell me which category best describes you. Please read the letter of the category.
- A B C D E F, _____

This concludes your interview. Thank you for your time.

BLUE CARD – General Resident Survey

PRIVACY STATEMENT

Your participation is voluntary. Since each interviewed person will represent many others not interviewed, your cooperation is extremely important. Hazen & Sawyer and Mars Research are conducting this study for Miami-Dade County and the South Florida Water Management District. Uses of the information include evaluating Biscayne Bay's current recreational activities and estimating the expenditures associated with these activities. This survey does not ask for any information that identifies you. All information from this survey will be available for distribution. The interview should take 3 to 8 minutes.

Section 1. Reasons for Not Participating in Biscayne Bay-Related Recreation Activities

- | | |
|---|--|
| <input type="checkbox"/> a. Too busy to visit the Bay | <input type="checkbox"/> h. Bay is unattractive |
| <input type="checkbox"/> b. I never thought about/wasn't aware of it | <input type="checkbox"/> i. Not enough boat ramps/launching facilities |
| <input type="checkbox"/> c. I don't like saltwater-related recreation | <input type="checkbox"/> j. Not enough parking |
| <input type="checkbox"/> d. I prefer the Atlantic Ocean | <input type="checkbox"/> k. Not enough dry dock storage |
| <input type="checkbox"/> e. Bay is too polluted | <input type="checkbox"/> l. Not enough parks, undeveloped areas |
| <input type="checkbox"/> f. Bay is too crowded | <input type="checkbox"/> m. Not enough beach areas |
| <input type="checkbox"/> g. Not enough fish to catch | |
| <input type="checkbox"/> n. Other reasons, please specify: _____ | |

Section 2. Annual Household Income before Taxes are Deducted

Please give only the letter of your income category.

- A. Less than \$50,000
- B. \$50,001 to \$100,000
- C. \$100,001 to \$150,000
- D. \$150,001 to \$200,000
- E. \$200,001 or more

Section 3. Race/Ethnicity

- | | |
|--------------------------------------|---|
| A = White | D = Asian |
| B = Black or African American | E = Native Hawaiian or Other Pacific Islander |
| C = American Indian or Alaska Native | F = Other, please specify _____ |

APPENDIX D
General Visitor Survey

**GENERAL VISITOR INTERCEPT SURVEY
SCREENER/TALLY SHEET**

1a. Are you a permanent resident of Miami-Dade County?

YES. Thank you. We are only interviewing nonresidents of Miami-Dade County. *(place tic mark in column 4)*

NO. **1b. If at Miami International Airport ask 2, Otherwise Ask 3:**

2. Are you at this terminal because you are transferring between airplanes or from a cruise ship to an airplane?

YES. Thank you. We are only interviewing people who spent time in Miami-Dade County. *(place tic mark in column 5)*

3. Are you ending your visit to Miami-Dade County before noon tomorrow?

NO. Thank you. We are only interviewing people at the end of their visit. *(place tic mark in column 6)*

YES. **3.** Will you participate in a 5-10 minute interview about your visit to Miami-Dade County?

NO. Thank you. *(place tic mark in column 7)*

If language Barrier, *(place tic mark in column 8)*

YES. Go to Questionnaire. *(place tic mark in column 9)*

1	2	3	4	5	6	7	8	9
Site	Date	Time Period	Permanent Resident	Airport Transfer	Non Exit Visitor	Refusal	Language Barrier	Interviewed

General Visitor Intercept Survey – Biscayne Bay

Screening Criteria: 1) NOT a resident of Miami-Dade County
2) Meets Exit Condition

Survey number: _____
Date/time of Interview:

Month Day Time

Interview Site: _____

Interviewer Name: _____

Q1. How many people are with you on your visit to Miami-Dade County (do not count the respondent)?

people

Q2. How many of these people are not permanent residents of Miami-Dade County?

people

Q3. How many of these people are 16 or older (do not include respondent)?

people

Q4. Where is your primary residence?

City or nearest city County State Zip Code

Country: _____

- USA
- Canada
- Mexico
- Central/South America
- Australia/Oceania
- Japan
- Other Far East
- United Kingdom
- Other Europe
- Middle East
- Africa
- Other:

Q5. On this trip, is Miami-Dade County the only destination?

- YES, *Go to Q8.*
- NO, *Go to Q6.*

Q6. Is Miami-Dade County your primary destination for this trip?

- YES, *Go to Q8.*
- NO, *Go to Q7.*

Q7. Where did you last visit before coming to Miami-Dade County?

City or nearest city State Zip Code

Q8. Please look at Section 1 of the YELLOW CARD. How did you and those in your group who are not residents of Miami-Dade County, get to Miami-Dade County? Please give the letters of ALL that apply. (*Circle ALL that apply*)

- A = Automobile
- B = Air - Miami
- C = Air - Ft Lauderdale/ Hollywood
- D = Air - Other Florida city, Specify city, _____
- E = Cruise Ship
- F = Own boat
- G = Other, Specify _____

General Visitor Intercept Survey – Biscayne Bay

Q9. On this trip to Miami-Dade County, when did you first arrive in Miami-Dade County?

_____	_____	_____
Month	Day	Time

Q10. When do you plan to leave Miami-Dade County?

_____	_____	_____
Month	Day	Time

Q11. Including this trip, how many times have you visited Miami-Dade County in the last 12 months, that is since (date last year)?

of times

Q12. Including this trip, how many days have you spent in Miami-Dade County in the last 12 months?

of days

Q13. On this trip, how many nights will you have spent in Miami-Dade County?

of nights

If Question 13 is zero, then go to Question 16.

Q14. Please refer to Section 2 of the YELLOW CARD and tell me the number corresponding to where you stayed on this trip to Miami-Dade County? (*circle ALL numbers that apply*)

- | | |
|---|--|
| 1 = Hotel/Motel/Guest House/Bed & Breakfast | 4 = Condominium, or second home (own), excluding time shares |
| 2 = Home of family/friends | 5 = Vacation Rental or Time Share |
| 3 = Campground | 6 = Other, please specify _____ |

If Questions 14 is 1, then ask Question 15. Otherwise go to Question 16.

Q15. How many guest rooms are you, and the people with you, renting on this trip?

of Rooms

Q16. Please refer to Section 3 on your YELLOW CARD and tell me which reason best describes the primary purpose of your trip to Miami-Dade County. Please read the corresponding letter from the YELLOW CARD.

- | | |
|-----------------------------|---------------------------|
| A = Recreation or vacation | D = Business and pleasure |
| B = Visit family or friends | E = Other, Specify, _____ |
| C = Business trip | |

General Visitor Intercept Survey – Biscayne Bay

**HAND RESPONDENT MAP AND WHITE CARD WITH BISCAYNE BAY
ACTIVITIES LIST**

- Q20. Please look through the activities listed on this card. In the past 12 months, have you participated in any of the activities on Biscayne Bay? YES NO, *Go to Q.26*
- Q21. In which of these Bay-related activities did you participate during the last 12 months? Please read me the number corresponding to each activity on the card.
- Q22. As I read each activity, would you tell me how many days you participated in the activity over the past 12 months?
- Q23. For Activity Numbers 100 through 103, how many of those days did you use a boat to participate in that activity?

BISCAYNE BAY-RELATED ACTIVITIES IN PAST 12 MONTHS

Q21 Activity Number	Q22 Respondent # of days	Q23 # of days Boat used
— — —	— — —	— — —
— — —	— — —	— — —
— — —	— — —	— — —
— — —	— — —	— — —
— — —	— — —	— — —
— — —	— — —	— — —
— — —	— — —	— — —
— — —	— — —	— — —
— — —	— — —	— — —
— — —	— — —	— — —

- Q24. Are these Bay-related activities the primary reason you visited Miami-Dade County?
 YES NO
- Q25. On a scale of 1 to 5, with 1 being least important and 5 being most important, how important is Biscayne Bay in terms of your decision to visit Miami-Dade County?
1 2 3 4 5

Go to Question 27.

General Visitor Intercept Survey – Biscayne Bay

Q26. Please refer to Section 4 of the YELLOW CARD. Which were the most important reasons why you did not participate in Biscayne Bay related recreation activities in the past 12 months in order of their importance? (Indicate top three answers in order of importance.)

- a. Too busy to visit the Bay
- b. I never thought about/wasn't aware of it
- c. I don't like saltwater-related recreation
- d. I prefer the Atlantic Ocean
- e. Bay is too polluted
- f. Bay is too crowded
- g. Not enough fish to catch
- n. Other reasons, please specify: _____
- h. Bay is unattractive
- i. Not enough boat ramps/launching facilities
- j. Not enough parking
- k. Not enough dry dock storage
- l. Not enough parks, undeveloped areas
- m. Not enough beach areas

Finally, for statistical purposes, we need to know a few things about you.

Q27. How many years have you been visiting Miami-Dade County? _____ # of years

Q28. In what year were you born? 19 ____

Q29. Sex: Male Female **(Observed, not asked)**

Q30. Please refer to Section 5 of the YELLOW CARD and tell me which income category best describes your annual household income last year, before taxes. Please give me the letter on the card that corresponds to the category.

- A B C D E F G H I J K L M N O
- Refused Don't know

Q31. Do you consider yourself to be Hispanic, Latino or of Spanish origin?
 Yes No

Q32. Please refer to Section 6 of the YELLOW CARD and tell me which category best describes you. Please read the letter of the category.

- A = White
- B = Black or African American
- C = American Indian or Alaska Native
- D = Asian
- E = Native Hawaiian or Other Pacific Islander
- F = Other, please specify _____

This concludes your interview. Thank you for your time.

YELLOW CARD – General Visitor Intercept Survey

PRIVACY STATEMENT

Your participation is voluntary. Since each interviewed person will represent many others not interviewed, your cooperation is extremely important. Hazen & Sawyer and Mars Research are conducting this study for Miami-Dade County and the South Florida Water Management District. Uses of the information include evaluating Biscayne Bay's current recreational activities and estimating the expenditures associated with these activities. This survey does not ask for any information that identifies you. All information from this survey will be available for distribution. The interview should take 5 to 10 minutes.

Section 1. Modes of Transportation

A = Automobile

B = Air – Miami

C = Air – Ft. Lauderdale / Hollywood

D = Air – other Florida city, City: _____

E = Cruise ship

F = Own boat

G = Other, Specify _____

Section 2. Overnight Accommodations

1 = Hotel / Motel / Guest House / Bed & Breakfast

2 = Home of family/friends

3 = Campground

4 = Condominium or second home (own)

5 = Vacation rental or Time share

6 = Other, please Specify _____

Section 3. Primary Purpose of Trip

A = Recreation or Vacation

B = Visit family or friends

C = Business trip

D = Business and Pleasure

E = Other, please Specify _____

Section 4. Reasons for Not Participating in Biscayne Bay-Related Recreation Activities

___ a. Too busy to visit the Bay

___ b. I never thought about/wasn't aware of it

___ c. I don't like saltwater-related recreation

___ d. I prefer the Atlantic Ocean

___ e. Bay is too polluted

___ f. Bay is too crowded

___ g. Not enough fish to catch

___ n. Other reasons, please specify: _____

___ h. Bay is unattractive

___ i. Not enough boat ramps/launching facilities

___ j. Not enough parking

___ k. Not enough dry dock storage

___ l. Not enough parks, undeveloped areas

___ m. Not enough beach areas

Section 5. Annual Household Income before Taxes are Deducted

Please give only the letter of your income category.

A. Less than \$50,000

B. \$50,001 to \$100,000

C. \$100,001 to \$150,000

D. \$150,001 to \$200,000

E. \$200,001 or more

Section 6. Race/Ethnicity

A = White

B = Black or African American

C = American Indian or Alaska Native

D = Asian

E = Native Hawaiian or Other Pacific Islander

F = Other, please specify _____

Hazen

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